CMA
Competition & Markets Authority

Mobile ecosystems

Market study final report

10 June 2022

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The Competition and Markets Authority has excluded from this published version of the market study report information which it considers should be excluded having regard to the three considerations set out in section 244 of the Enterprise Act 2002 (specified information: considerations relevant to disclosure). The omissions are indicated by [✂]. [Some numbers have been replaced by a range. These are shown in square brackets.] [Non-sensitive wording is also indicated in square brackets.]

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1. Introduction

Context

1.1 This is the final report of our market study into mobile ecosystems in the UK.

1.2 On 15 June 2021, the CMA launched a market study into mobile ecosystems,[1] setting out its intention to gain a better understanding of a major component of the digital economy, and to gather evidence to inform an assessment of whether competition is working well for consumers and citizens in the UK. The study was scoped broadly, both to enable us to investigate the wide range of concerns that have been brought to our attention in these related markets, and to provide us with a holistic perspective of how each of the components of mobile ecosystems interrelate.

1.3 On 14 December 2021, we published our interim report, setting out our initial understanding of how the companies and markets within our scope function and our initial findings on each of the four key themes. We also identified a broad range of potential interventions to address our emerging concerns.[2]

1.4 As set out at the start of our study, our conclusions are contributing towards a broader programme of work, which includes the establishment of a new pro-competition regulatory regime for digital markets in the UK, and our active competition and consumer enforcement work.

1.5 Much progress has been made in this regard. Most recently, in May 2022, the government published its response to the consultation on a new pro-competition regime for digital markets, setting out its updated position on some key elements of the new regime, while re-affirming its intention to 'bring forward legislation to implement these reforms when Parliamentary time allows'.[3] We stand ready to assist the government in bringing forward the necessary legislation for the new regime and expect that our findings will help to inform its development. In the meantime, we continue to take further action using our existing tools in a number of areas.

Evidence Gathering

1.6 We have consulted a large number of parties throughout the last twelve months, which has enabled us to gather a broad range of evidence that reflects a diverse set of perspectives. This has included a high volume of

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[1] Mobile ecosystems market study case page.
[2] Mobile ecosystems market study interim report.
[3] Government response to consultation on a new pro-competition regime for digital markets, May 2022.

submissions from various groups of market participants both small and large, an online questionnaire for app developers, external consumer research, expert advice on mobile security and our formal requests for information. Figure 1.1 summarises the evidence gathering we have conducted over the course of the market study.

Figure 1.1: overview of our evidence sources

1.7 We are grateful to all those parties that have engaged with our work and enabled us to make substantial progress.

Our final report

1.8 This final report marks the end of our market study. The purpose of this report is to set out the conclusions we have reached on the state of competition in the markets within our scope, as well as our assessment on how to address the issues we have identified and the next steps beyond the study.

1.9 This final report sets out our understanding of how the companies and markets within our scope function. We do this at a high level in Chapter 2, which provides an overview of mobile ecosystems in the UK and why they are so important, highlighting the key similarities and differences between the

business models of Apple and Google, and setting out some descriptive statistics regarding various market outcomes.

1.10 The chapters that follow then provide a more focused and detailed description and assessment of competition within each of the major components of mobile ecosystems:

- Chapter 3 explains our findings regarding competition in the supply of mobile devices and operating systems;
- Chapter 4 and Chapter 5 do the same for native app distribution and mobile browsers respectively; and
- Chapter 6 outlines our findings on the role that Apple and Google play in competition between app developers.

1.11 Where there are elements of our work that are more complex or technical, or where our assessment is supported by a large volume of evidence, such as in relation to Google's contractual agreements with device manufacturers and app developers,[4] we have sought to provide additional detail in supporting appendices.

1.12 In Chapter 7, we explore the ways in which weak competition within and between Apple's and Google's mobile ecosystems is harming consumers and many small UK businesses. Chapter 8 sets out a high-level overview of the types of interventions that we have identified, and which current or potential future tools may be the most appropriate mechanism for taking them forward. This includes areas we consider would be best suited to being addressed through the new pro-competition regime for digital markets, and others where the CMA is taking direct action using its existing powers.

1.13 In Chapter 9, we set out and explain the reasoning for the CMA's decision to consult on making a market investigation reference in relation to the supply of mobile browsers and browser engines, and the distribution of cloud gaming services through app stores on mobile devices. We have published a consultation document alongside this report which sets out our reasoning for that market investigation in more detail.[5]

1.14 Chapter 10 concludes the report by highlighting the further work that the CMA will be undertaking to promote competition in mobile ecosystems now that the market study has ended. This includes through a wide range of direct action by the CMA in the digital sphere, continued support to government in

[4] See Appendix E for details on the agreements Google has with device manufacturers and app developers.
[5] Mobile browsers and cloud gaming MIR case page.

developing the new regime, and cooperation with other UK regulators and our international counterparts.

1.15 Through this final report, we have surfaced a great deal of information that was not previously in the public domain. However, there has also been some information we have chosen not to publish – in some cases because the information is highly commercially sensitive, and in others because parties that provided the information to us indicated that they wished to remain anonymous for fear of repercussions. There are as a result some instances where we have anonymised parties' submissions, presented numbers in ranges, or sought to make more generalised statements in order to convey the key messages. We indicate these instances with the use of [square brackets], and in some cases [✂].

1.16 We hope that the disclosure and detailed analysis of the evidence we have obtained so far helps to take forward global debate and public understanding on these important topics, and ultimately lead to more positive outcomes for consumers.

2. Overview of mobile ecosystems

Key findings

- While there are similarities in the range of products and services that Apple and Google provide, they each have different business models, which leads to them facing a different set of incentives when designing and managing their ecosystems.
- This is illustrated by the contrast in their primary sources of revenue – Apple makes around 80% of its global revenue from device sales, while Google makes around 90% of its revenue from advertising.
- Apple's mobile ecosystem is tightly integrated and generally referred to as being a closed system. Google's is more open in some regards, including in relation to native app distribution and browser competition on Android devices, though in practice it is able to achieve similar outcomes to Apple.
- Both Apple and Google are highly profitable (making £80 billion and £57 billion respectively in profit in 2021) and have been consistently so for many years, with high returns on capital employed, and high margins associated with their main revenue streams. In addition, both firms are earning substantial and growing revenues from their app stores.

Introduction

2.1 Mobile devices with internet connectivity such as smartphones and tablets play a fundamental role in the lives of UK citizens – providing fast and convenient access to a wide range of products, content and services. In addition to communication and state of the art cameras, mobile devices also give us instant access, either via dedicated apps or the through open web, to the latest news, music, TV and video streaming, fitness tracking, shopping, banking, food delivery services, maps and navigation, games, and many more. They can also be connected to, with the potential to control, a wide range of other technology and devices such as smart speakers, smart watches, home security and lighting, and even vehicles. These products and services are able to work in combination with each other, in a way that strengthens the value and functionality of each.

2.2 There has been a dramatic evolution in the role and uses of mobile phones over the last two decades. Mobile devices, and particularly smartphones, are the most commonly owned devices by UK consumers,[6] and are the most

[6] Ipsos MORI, Attitudes Towards IoT Security: Summary Report 2020.

widely used device for accessing the internet.[7] In 2020, UK adult internet users spent on average over three and a half hours a day online, with 68% of this time on smartphones, and just 18% and 13% on desktop[8] and tablets respectively.[9] Furthermore, mobile devices were estimated by one study to account for more than half of UK online shopping in 2019, with total mobile expenditure predicted to more than double by 2024.[10] Another study of mobile spending[11] in 2021 estimated that online spending 'outside of the home' was worth £179 billion. In addition to online spending, smartphones and watches are increasingly being used for contactless payments, as a substitute for cards and cash – nearly a third of the adult population were registered to use mobile payments by the end of 2020, an increase of 7.4 million people compared to 2019.[12]

2.3 As so many products and services are now accessed via a mobile device, the benefits for UK consumers and businesses of a highly competitive and dynamic market for mobile devices and the associated software are significant. Consequently, any developments in the competitive dynamics of these markets can have far reaching ripple effects across our economy and society. Therefore, in order to understand the extent to which these markets are working well for consumers, and to identify potential opportunities for greater competition in this sector, we must examine each of the key gateways through which mobile content is accessed. This is why we scoped our market study broadly, looking at competition between – and within – mobile ecosystems.

2.4 This chapter provides a high-level overview of mobile ecosystems in the UK by setting out the following:

- a description of what we mean by mobile ecosystems, and their key components;
- an explanation of the business models of Apple and Google, and how these lead to differing incentives and decisions for how to manage their ecosystems; and
- a summary of our profitability analysis regarding the financial performance of Apple's and Google's mobile ecosystems.

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[7] According to Online Nation 2021 report, 91% of households had a smartphone with internet access in 2020, compared with 65% for tablets and 47% for desktop computers.
[8] References to desktop devices throughout this report are also referring to laptops.
[9] Ofcom Online Nation 2021 report.
[10] United Kingdom (UK) Online Retailing via Mobile and Tablet, 2019 – 2024.
[11] Capturing the Mobile Pound | Kinetic.
[12] Contactless now accounts for more than a quarter of all UK payments | UK Finance.

What are mobile ecosystems?

2.5 While mobile ecosystems contain a broad spectrum of hardware and software, they can be broadly characterised as comprising the following core set of products:

- **mobile devices**: portable electronic devices that can be held easily in the hand, including smartphones and tablets, which can connect to the internet;
- **mobile operating systems:** the pre-installed system software powering mobile devices; and
- **applications (or 'apps'):** pieces of computer software providing additional functionalities to the devices and mobile operating system on which they are installed.

2.6 The majority of apps that users are most familiar with are what we refer to as **'native' apps** – these are apps written to run on a specific operating system and, as such, interact directly with elements of the operating systems in order to provide relevant features and functionality.

2.7 **Web apps**, which can be regarded as an alternative to native apps, are applications built using common standards based on the open web, and are designed to operate through a web browser (rather than being specific to an operating system).

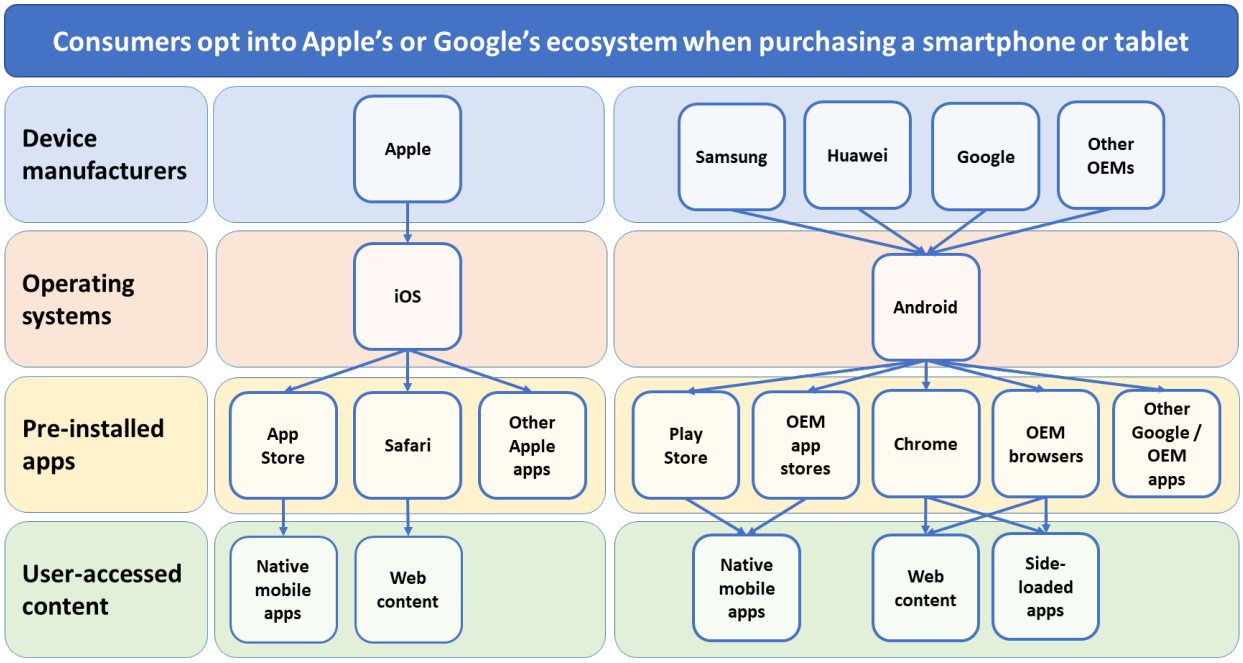
2.8 Some native apps come pre-installed on devices at the point of purchase, whereas other native apps and web apps can be selected and installed by the user, as follows:

- A range of **pre-installed native apps** come together with a given mobile device. The most important of these apps are mobile app stores and browsers. **Mobile app stores** are marketplaces for users to discover and download native apps on their mobile devices, while **mobile browsers** are apps used to access the web. Together, they constitute the two major access points for content and service providers to reach consumers, and every mobile device comes with at least one app store and browser pre-installed.
- **User-installed apps** can be installed by consumers at any point after they have purchased and setup their mobile device. They are primarily native apps that are distributed through mobile app stores but, can in some cases be distributed through the browser, which can be used to find

web apps, and also to download native apps directly (so called 'sideloading').

2.9 In the UK, consumers are faced with a binary choice between two mobile ecosystems – either Apple's or Google's. Figure 2.1 shows the nature of this choice between Apple's and Google's ecosystems, and in particular illustrates the control that each firm has over the main gateways in their respective ecosystems through which users access content online.

Figure 2.1: the choice between Apple's and Google's mobile ecosystems



Mobile devices

Smartphones and tablets

2.10 For the purpose of this market study, we use the term mobile devices relatively narrowly to refer to smartphones and tablets. This is consistent with the approach taken in work by regulators in other jurisdictions.[13]

2.11 There are many similarities between smartphones and tablets, both in terms of the supply chain, and also the functionalities that they offer. We also note that there are also some important differences in the way that these devices are used, in terms of consumer reach, the amount of time spent online, and the purposes they are used for. For instance, given their smaller size and more prevalent connectivity to mobile data, smartphones tend to be carried everywhere with their user, while tablets are in practice less mobile. Further,

[13] For example, with the European Commission's decision against Android decision against Android.

given tablets' larger screens, they may lend themselves slightly better to watching video content for longer periods.

2.12 Given these factors, there are some areas where we have separated out our analysis of smartphones and tablets, though these instances are limited by the availability of device specific data and evidence. However, due to the greater reach, use, and general importance to users, it is smartphones that have been the central of our study.

2.13 There are a large number of manufactures of mobile devices, though the majority of sales of new smartphones are shared between: Apple [40-50]%, Samsung [20-30]%, and Google [0-5]%, and the majority of new tablet sales shared between Apple [40-50]%, Amazon [20-30]% and Samsung [10-20]%.[14]

Connected devices

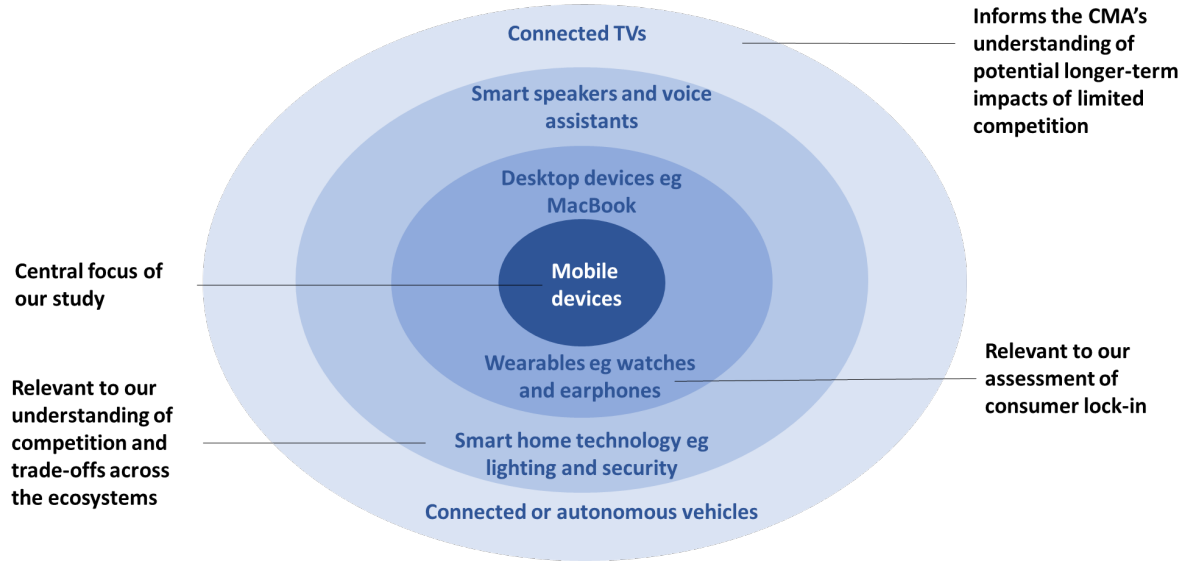
2.14 Within this study we are also interested in the wide range of products and services that can increasingly connect to, and in many cases be controlled by, mobile devices. Examples of such connected devices, which are often referred to as the 'Internet of Things', include wearables, such as watches and earphones, smart speakers, home security and lighting, TVs, and vehicles. The number of these devices is expected to grow to over 150 million in 2024, up from 13 million in 2006.[15]

2.15 Apple and Google also provide products in many of these downstream markets, such as in wearables (Apple Watch and Fitbit); smart speakers (Apple HomePod and Google Home); and operating systems for vehicle infotainment (Apple CarPlay[16] and Android Automotive OS).

2.16 As with apps and other downstream services, we are primarily interested in technologies that connect to mobile devices where they may either: further entrench Apple's or Google's hold over their users; or, where Apple and Google may use their gatekeeper positions to give a competitive advantage to their own apps and services in such downstream markets.

[14] CMA analysis of data from market participants, as a share of operating system activations. This analysis is set out in more detail in Chapter 3.
[15] Trend Deck 2021: Technology.
[16] We understand that Apple CarPlay is a complementary feature that can be added to vehicle infotainment systems to enable connectivity to Apple devices, rather than acting a stand-alone operating system.

Figure 2.2: devices within mobile ecosystems



Mobile operating systems

2.17 Mobile operating systems are pre-installed system-level software that come with smartphones and tablets, which enable them to run programs and applications. A mobile operating system loads when the device is turned on, and just like with a desktop computer, it displays a home screen with icons for selecting and accessing a range of applications, in addition to facilitating a range of less visible uses, like the input from a keyboard and mouse, managing memory allocated to programs, and keeping time.

2.18 Mobile operating systems include features similar in purpose to desktop computer operating systems, along with other features related to mobile telephony and data connectivity.

2.19 The operating system determines and controls a range of features that are important to users of mobile devices, ranging from the appearance of the user interface, through to the speed, technical performance, and security of the device. They can also determine what kinds of software can run on top, including all applications, such as native apps or websites run in a browser.

2.20 There are two main mobile operating systems in the UK – Apple's iOS and Google's Android – each installed on roughly half of active smartphones in the UK. Apple's operating system is tightly integrated with its devices and not available on other devices, whereas practically all other smartphones use a version of Android which is available on an open-source basis, with most

using Google's version subject to certain agreements between Google and device manufacturers.[17]

2.21 As suppliers of the two main mobile operating systems in the UK, Apple and Google are able to make a number of key decisions that can have significant implications for the providers of products and services that are accessed online. For instance, they can determine (or, in Google's case, heavily influence through contractual and financial agreements) which applications are pre-installed onto the device when it is first switched on. They can also place limits or restrictions on the channels through which software and applications can be downloaded onto the device.

App stores

2.22 An app store is an online marketplace for the buying and selling of native apps – they provide a platform that connects consumers with apps, and app developers with consumers. There are only a small number of app stores with a material share of native app distribution:

- The App Store is operated by Apple and is available only on its own devices. No other app stores can be accessed on Apple devices.
- The Play Store is operated by Google, and is generally pre-installed on Android devices,[18] in some cases alongside other app stores.
- A small number of mobile device manufacturers, including Samsung, Huawei and Amazon provide access to their own proprietary app stores. They achieve only a small share of downloads on their respective devices relative to the App Store and the Play Store (around [0-5]% between them).[19]

2.23 App stores enable consumers to search, select, purchase, install, and review millions of apps – there are around [1-1.5] million apps available on the App Store, and around [3-3.5] million apps available on the Play Store.[20] In parallel they enable many hundreds of thousands of app developers to describe, distribute and promote their apps to millions of users.

2.24 Operators of app stores take steps to ensure that apps on their stores meet minimum standards including in relation to quality, security, privacy, and legal

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[17] Chapter 3 and Appendix E provide further detail on these agreements.
[18] Google's agreements with manufacturers mean that the Play Store is pre-installed and prominently displayed on virtually all Android devices. Chapter 3 and Appendix E provide further detail on these agreements.
[19] CMA analysis of data from market participants. See Chapter 4 for more detailed analysis of market outcomes in native app distribution.
[20] Based on data submitted to us by Apple and Google.

requirements. Where apps are deemed not to meet these requirements, they are prevented from being distributed through the relevant store. Apple, Google, and other operators of app stores manage this through their app store review processes.

2.25 Apple and Google also distribute many of their own first-party apps through their app stores, making them available for download alongside those of their competitors. In this sense, they are competing in various app markets for which they also perform a powerful rule-setting function.

Mobile browsers

2.26 Browsers enable users of mobile devices to access and search the internet and interact with content on different sites. Other than through the app store, web browsers are the most important way for users of mobile devices to access content and services over the internet. In addition, browsers are one of the key sources of traffic for content providers, in particular search engine providers.

2.27 Mobile devices are generally sold with one or more browsers pre-installed, typically with one set as the default for instances when a user clicks on a link within another application. For example, Apple's iPhones and iPads come with Apple's Safari browser pre-installed, and mobile devices using the Android operating system generally come with Google's Chrome pre-installed. There are a large number of other browsers available – in a small number of cases these are pre-installed on Android devices by the individual manufacturer (eg Samsung Internet), while others such as Firefox and Edge can be downloaded by the user from an app store. Even so, the available data shows that the combined share of Safari and Chrome on mobile devices in the UK amounts to around 90%.[21]

2.28 Browsers are generally monetised through the sale of advertising on search engines, either by directing users to the browser vendor's search engine, or alternatively, through payments from a search engine provider that pays to become the default search engine on a browser. For browsers that are not operated by a provider of a search engine, Google is set as the default on the vast majority.

[21] Statcounter, Mobile & Tablet Browser Market Share United Kingdom, 2012 – 2022 (retrieved 7 April 2022).

2.29 A browser comprises two main elements:

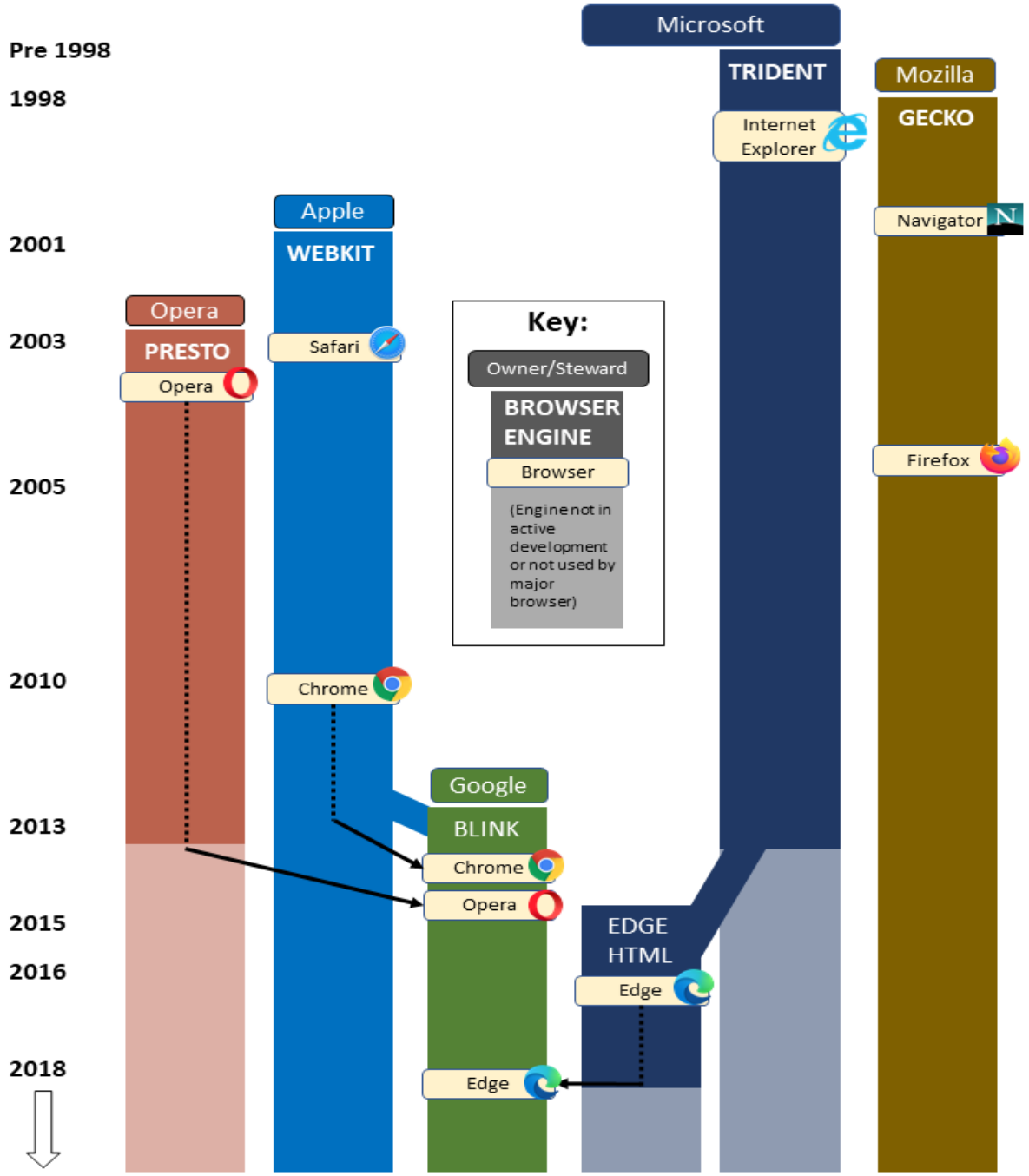
- A browser engine, which transforms web page source code into web pages that people can see and engage with, and which is responsible for the key functionality and web compatibility of a browser, as well as for performance issues such as speed and reliability.

- A branded user interface (UI), which is responsible for user-facing functionality such as synchronisation, remembering passwords and payment details, as well as the general appearance of features such as tabs and menus. The UI sits on top of the browser engine and comprises all the brands familiar to users, such as Chrome, Edge, Safari, Firefox, Samsung Internet.

2.30 Today, there are just three main browser engines under active development: Apple's WebKit, Google's Blink, and Mozilla's Gecko.[22] Apple requires all browsers on iOS to be built on WebKit, whereas browsers on Android devices are free to be built on any engine. Figure 2.3 illustrates the timeline for browser engine development since the late 1990s.

[22] Chapter 5 and Appendix F provide more detail on the history and importance of browser engines to browser competition.

Figure 2.3: timeline of modern browser development



Apple and Google are the key gatekeepers to online content

2.31 Operating systems, app stores, and browsers each act as a gateway between consumers and the businesses that want to reach them online:

- As providers of the primary mobile operating systems, Apple and Google can make decisions affecting the type of features on a user's device that apps can access and utilise and, to varying degrees, control which apps are pre-installed on devices.

- As providers of the two main app stores, Apple and Google effectively control the terms of access between consumers and developers of native apps. They decide which apps are allowed in their store, how apps are ranked and discovered, and the commission that will be taken from app developers' revenues.

- As providers of the two most widely used browsers and browser engines, Apple and Google determine the functionality and standards that will apply to providers of online content that want to reach consumers through websites and web apps via the open web.

2.32 In all three cases, Apple and Google have each captured such a large proportion and volume of consumers in the UK that their ecosystems are, for practical purposes, indispensable to online businesses. Apple and Google act as gatekeepers to most UK consumers with mobile devices, and as a result can set the rules of the game for providers of online content and services.

The business models of Apple and Google

2.33 On the face of it, from a consumer perspective, there are many similarities between Apple's and Google's mobile ecosystems. For example:

- while quality may vary, there are a set of hardware features that are common across many models of smartphone including, for example, a camera, touchscreen, GPS, and contactless payment technology;

- with regard to software, an operating system, an app store, a browser, a mapping service, and many other apps and services come pre-installed for free with all mobile devices; and

- the most popular and frequently used apps are generally available for download on most devices, with no major observable difference in prices, regardless of whether a consumer is accessing the App Store or the Play Store.

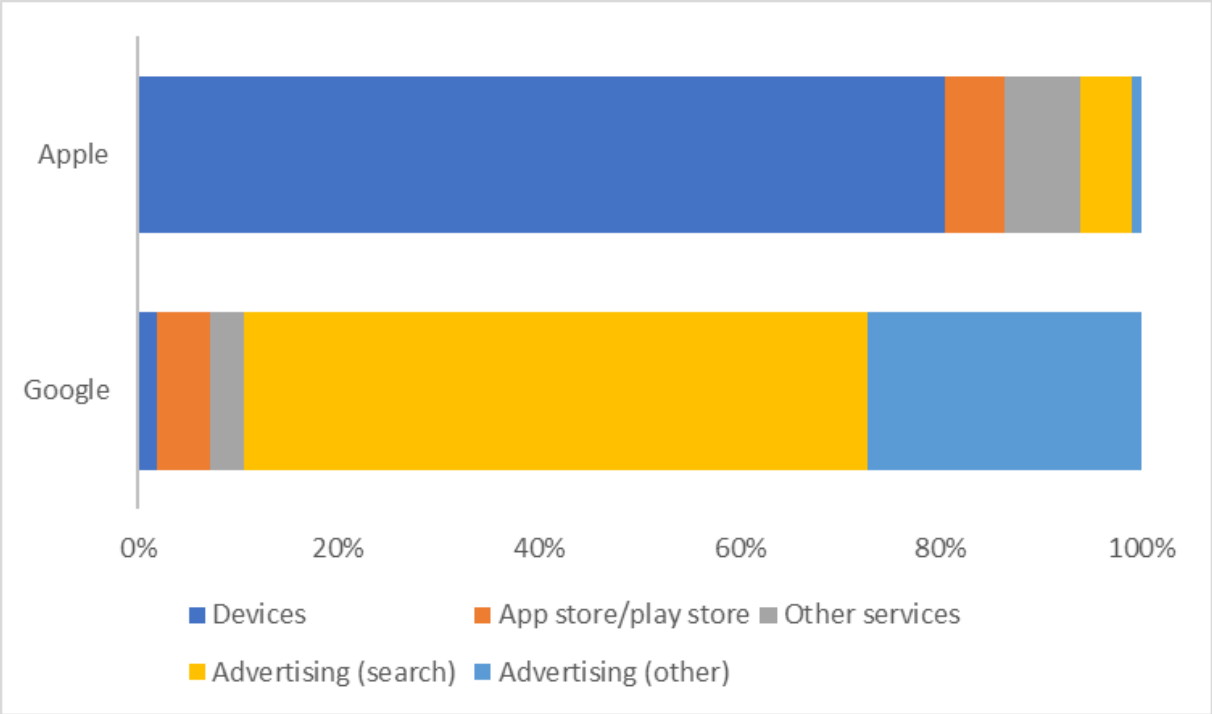
2.34 Despite these similarities, there are a number of important differences in the structure and focus of Apple's and Google's businesses that affect their incentives and decision-making in a number of areas. This is shown most starkly by an analysis of their primary sources of revenue, with Apple earning most of its revenue from devices, while Google is primarily an advertising business.

Revenue and incentives

Sources of revenue

2.35 Figure 2.4 provides a breakdown of Apple's and Google's total revenues, based on data provided to us by the companies in response to our requests. It shows that Apple makes the vast majority of revenue from selling devices (in particular the iPhone) whereas Google makes a similarly high proportion of its revenue from selling digital advertising (in particular search advertising).

Figure 2.4: breakdown of Apple's and Google's 2021 global revenue



Source: CMA analysis based on data from Apple's 10K report, and on data submitted by Google.[23,24]

2.36 The contrast in the source of their revenue means that the two companies inevitably face differing incentives in operating certain aspects of their ecosystems.

[23] Advertising (search) includes revenue from Gmail and Google Maps; Play Store does not include Play Store advertising revenue, which is instead included in Advertising (other).
[24] Google noted that this revenue has been calculated only on a subset of Google's revenue categories, ie Play Store (advertising and non-advertising), in-app advertising, display advertising, search advertising, YouTube (advertising and non-advertising), operating systems, Google maps, Gmail, browsers, and hardware. This does not cover all Google Services revenue, as reported in Google's 10K. Google noted that in compiling this data, several finance and engineering data systems had to be used which may not be used for financial reporting purposes. The revenue data does not include accounting adjustments (such as exchange rate impacts and discounts), is not US GAAP compliant, and may differ from publicly reported revenue.

Our assessment of Apple's incentives

2.37 As is shown by Figure 2.4, Apple is predominantly a seller of devices, from which it generates around 80% of its revenue globally, and its business relies on customers that make repeat purchases. It therefore has some incentive to invest in new or enhanced features, services, and connected devices over time to maintain loyal customers, and also to encourage periodic replacement of older devices. It also appears to have some incentive to add friction to the process of switching away from Apple, as it does not earn any material revenue from users of devices from other manufacturers.

2.38 Apple would not stand to gain from opening access to all of the products and services that complement its device hardware, for example by licensing its operating system to other manufacturers or by enabling all of its first-party apps to be used on other devices, as this could serve to improve the quality of rival devices, and possibly place downward pressure on the price of Apple's devices. In contrast, it would appear that Apple does have an incentive to provide access to app developers to features and functionality within the device – such as the camera or GPS technology – as these apps then serve to improve the quality and experience of Apple's mobile ecosystem. However, we also note that Apple itself competes in many downstream app markets, which may provide it with some conflicts of interest in this regard.

2.39 Apple earns substantial and increasing revenues from its App Store through commission on certain in-app payments and subscriptions, achieving higher gross profit margins than it makes on device sales.[25] Also, as it sells high-end devices towards the upper end of the price range, it is in its interests for users to access content on the mobile device in such a way that makes use of this high-spec technology. This suggests that Apple has a strong incentive to encourage its users to access online content such as games via native apps downloaded from its app store, rather than on the open web through a browser.

2.40 One area of alignment between the two firms' incentives is in relation to directing users of Apple devices to Google Search. As was set out in the CMA's Online Platforms and Digital Advertising market study, Google's payment to Apple in 2019 constituted the substantial majority of Google's total 2019 default payments made in relation to the UK.[26] In 2021, Google's

[25] We set out our detailed analysis of Apple's and Google's financial performance in Appendix C.
[26] As reported in the Online Platforms and Digital Advertising market study (Appendix H), Google paid around £1.2 billion for default positions in the UK alone in 2019.

estimated payments to Apple for search default status on Safari were £[1-1.5] billion.

Our assessment of Google's incentives

2.41 Google is predominantly an advertising business, with [around 90%] of its global revenue generated through advertising in 2021. As is shown by Figure 2.4, search advertising is the largest contributor, which relies on a thriving open web with all information being 'searchable'. Google therefore has a strong incentive to invest in products and services, such as its operating system and browser, in order to generate traffic for its search engine and its other services that earn advertising revenue, including YouTube. This strategy has been successful to date, with more time spent on Google sites each day (52 minutes) by UK internet users than on any others.[27] By provision of these services, it is also able to take an active role in maintaining and promoting common standards across the open web.

2.42 Google's incentives to prevent consumers switching between devices appear to be weaker than Apple's. This is partly because Android is present on many different devices on the market, but also because it earns a large proportion of its search advertising revenue on Apple devices (albeit that it shares a proportion of that revenue with Apple).

2.43 Like Apple, Google earns substantial and increasing revenue from its app store. This suggests Google's incentives between encouraging traffic through the web or native apps are somewhat more mixed than Apple's.

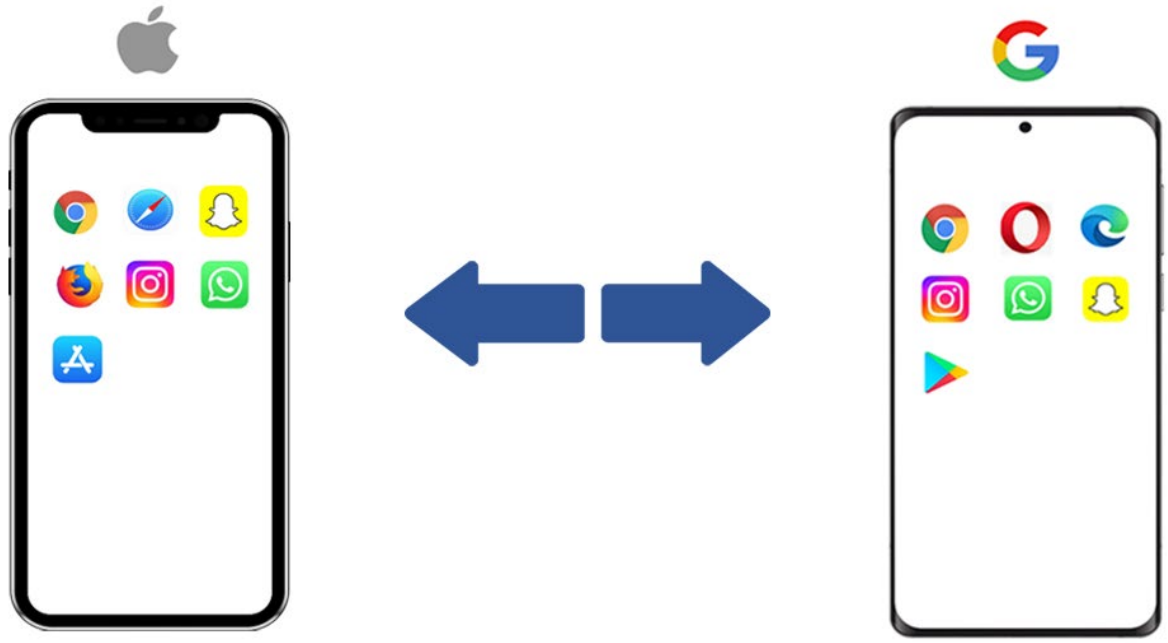
2.44 These differing incentives are the primary reasons behind Apple's ecosystem being less 'open' than Google's, and vice versa. The main differences in this regard are set out below.

Comparing access within Apple's and Google's mobile ecosystems

2.45 Apple's mobile ecosystem is tightly integrated and widely referred to as being closed, or a 'walled garden'. In contrast, Google's approach is more open with regard to some aspects of its ecosystem, though in practice it is able to achieve similar outcomes to Apple, supported in part by the various contractual and financial agreements it has in place with device manufacturers and app developers. The key differences are illustrated in Figure 2.5.

[27] Online Nation 2021 report (ofcom.org.uk).

Figure 2.5: comparison of key ecosystem features



Apple (iOS phones)	Feature	Google (Android phones)
App Store	Main app distribution route	Play Store
Up to 30%	Commission rate on app stores purchases	Up to 30%
No	Alternative app stores	Yes (not via Play Store)
No	Sideloading	Yes (with steps/warnings)
No	Access to cloud gaming through app stores	Yes
Safari	Main browsers	Chrome
WebKit	Web engine	Blink
No	Competing browser engines	Yes
Yes	Browsers pre-installed/set as default	Yes

2.46 This is explained below in relation to different elements of Apple's and Google's mobile ecosystems:

- **Licensing of operating systems:** Apple does not license iOS to other device manufacturers, nor does it allow consumers to install alternative operating systems on its devices. In contrast, Google allows device manufacturers to license the Android operating system, although this comes with a range of conditions and incentives that support the use and prominence of Google's other key services.

- **Channels for native app distribution:** Apple only allows native apps to be downloaded from its own proprietary app store. By contrast, users of Android devices have greater freedom to access and download apps from other sources, including alternative app stores, as well as to download apps directly from the web (though this comes with various warnings to users and involves multiple steps).

- **Browser engines and functionality:** both companies produce their own browsers and maintain their own underlying browser engines. Both browser engines are available on an 'open source' basis for other browser vendors to use. On iOS, Safari is pre-installed and set as the default browser, but users can download and use other browsers and also select them as the default option, however all browsers on iOS must be built upon Apple's WebKit browser engine. On Android, device manufacturers receive financial incentives from Google for pre-installing the Chrome browser. Users are able to access other browsers on Android, which are free to be built on any browser engine (though most use Google's Blink engine).

- **Interoperability of apps and devices:** the majority of Apple's apps and services are only available on Apple devices, with the notable exception of Apple Music. We understand there are also some limitations on the extent to which its connected devices, in particular the Apple Watch, are compatible with non-Apple mobile devices. Most of Google's apps and services are available on iOS, and its connected devices are compatible with Apple's mobile devices.

2.47 The nature and impact of these differing approaches are examined in detail in relation to operating systems, app stores, and browsers in the following three chapters.

Profitability of Apple's and Google's mobile ecosystems

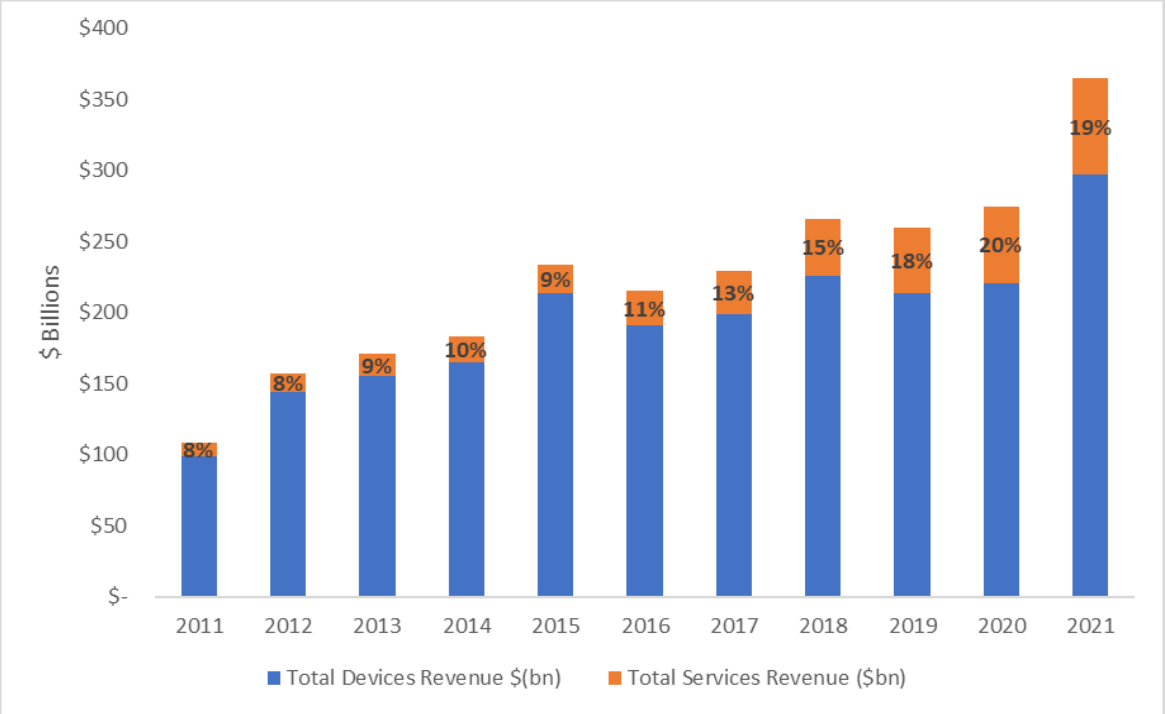
2.48 Despite the differences in business models and sources of revenue highlighted above, both firms continue to be highly profitable as their strong positions with respect to their mobile ecosystems translate into substantial revenues. This section summarises some of the main findings of our analysis of the financial performance of Apple's and Google's ecosystems, while this analysis is set out in full in Appendix C.

Services revenue has been growing for both firms

2.49 Both companies have experienced strong revenue growth over the last decade on a global and UK basis.

2.50 In 2021, Apple had total global revenues of £267.4 billion, which has more than doubled since 2011.[28] In the UK, we estimate that Apple had total revenues of around £[10-15] billion.[29]

Figure 2.6: Apple Global Revenue (Devices & Services) between 2011 and 2021[30]



Source: CMA Analysis from Apple 10K data

2.51 Up until 2015, devices were driving Apple's overall revenue growth. As is shown by Figure 2.6, devices revenue was relatively stable between 2016 and 2020, with growth in total revenue primarily driven by growth in services over this period. The App Store has been a key contributor to this growth, representing [20-40]% of Apple's global services revenue in 2020. We note that in 2021, devices revenue grew substantially, which we understand to be in part down to two new iPhone releases in the same financial year.

2.52 In 2021, Google Services – which includes all its activities relating to mobile devices – had global revenues of £173 billion, which grew 41% from

[28] Apple 2020 10K Report
[29] These are revenue figures provided by Apple which are based on Calendar Year 2020. Note, however, that net revenue for Advertising (third-party licensing) is not tracked at the country level by Apple. However, we have obtained estimates of the UK share of the value of the licensing payment from Google to Apple that allows us to estimate total UK revenues within the range provided above.
[30] For financial years 2011-2014 Apple provided a breakdown of Net Sales by Product in its 10K as: iPhone; iPad; Mac; iPod; Accessories; and iTunes, Software and Services. Therefore, this period we considered the category iTunes, Software and Services to be equivalent to Services, as provided in Apple's 10K from 2015 onwards.

2020.[31,32,33] Global revenues generated via mobile devices represented around two thirds of this total, at £112 billion. In the UK, the total revenue earned by Google was £[10-15] billion, of which [more than £7 billion] was derived from its mobile business.[34,35]

2.53 As with Apple, Google has seen rapid growth in the value of customers billings on apps, with Play Store revenues for 2021 at £[200-400] million.

Profits are persistently high, and growing

2.54 On a global basis in 2021, Apple made £80 billion in profit,[36] while Google made £57 billion.[37]

2.55 The fact that both Apple and Google earn substantial profits does not in itself raise competition concerns. In fact, for a period of time, such profits can be seen as a sign of innovative sectors working well, as the substantial investment and risk associated with bringing forward new innovation is rightly rewarded. This dynamic provides other businesses – and importantly their investors – with the required incentives to take such risks of their own.

2.56 However, we have seen that Apple's and Google's profitability has been sustained, and growing, for over a decade or more. Further, our analysis reveals that in addition to profits being high in absolute terms, they are also achieving very high margins and returns on capital employed. For example, we have estimated that in recent years, Apple's return on capital employed has been over 100% – very high in any sector.

2.57 Based on analysis from the CMA's market study into online platforms and digital advertising, we estimated that the return on capital employed for the Alphabet Group (Google's parent company) was 39% on average between 2011 and 2021. The market study into online platforms and digital advertising concluded that this figure had been well above any reasonable competitive benchmark for many years.

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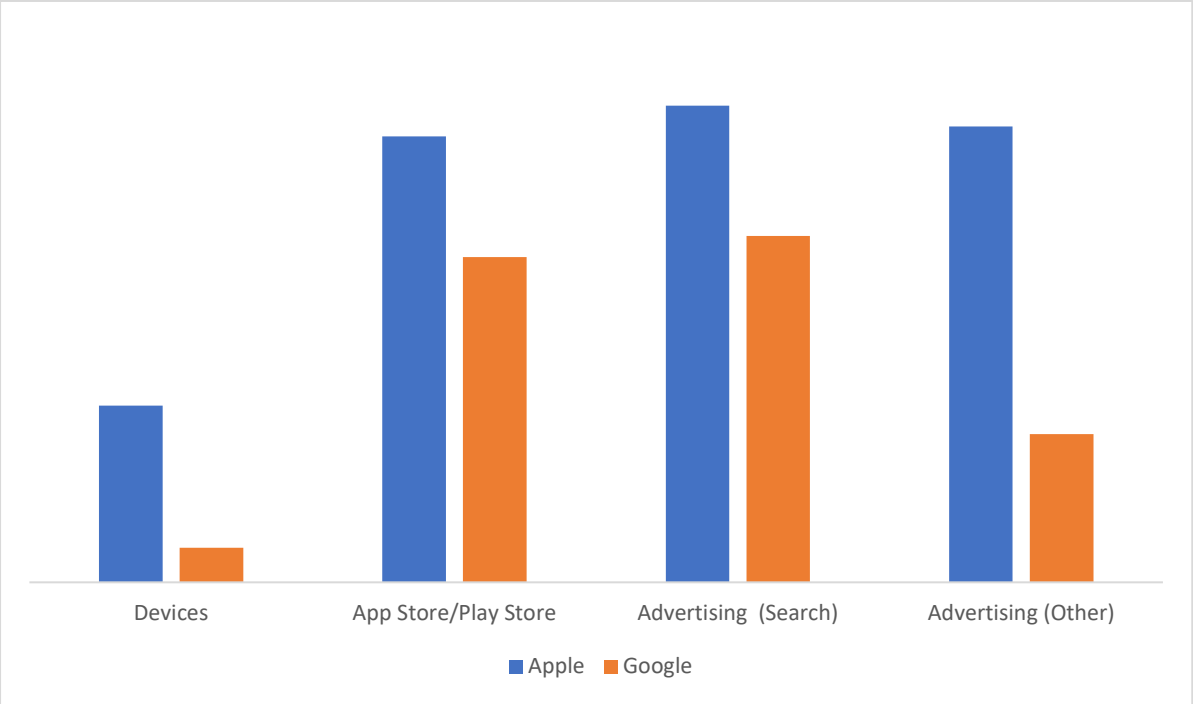
[31] Alphabet Inc 2020 10K Report
[32] Google Services global revenues for 2020 and 2021 are based on Google's 10K, p33.
[33] In this report, we used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.
[34] Google noted that this revenue has been calculated only on a subset of Google's revenue categories, ie Play Store (advertising and non-advertising), in-app advertising, display advertising, search advertising, YouTube (advertising and non-advertising), operating systems, Google maps, Gmail, and browsers. This does not cover all Google Services revenue, as reported in Google's 10K.
[35] Google noted that in compiling this data, several finance and engineering data systems had to be used which may not be used for financial reporting purposes. The revenue data does not include accounting adjustments (such as exchange rate impacts and discounts), is not US GAAP compliant, and may differ from publicly reported revenue.
[36] See Apple's 2021 10-K. This profit figure is disclosed as 'Income before provision for income taxes'.
[37] See Alphabet Inc's 2020 10-K. This profit figure is disclosed as 'Income before income taxes'.

2.58 Gross margins represent the amount of money that companies retain after incurring the direct costs of providing the goods and services. Figure 2.7 illustrates in relative terms the gross margins that Apple and Google each earned from their main sources of revenue in 2021.

Figure 2.7: gross margins by main sources of global revenue in 2021



Source: CMA analysis of data submitted by Apple and Google.[38,39]
Note: Apple earns revenue from search advertising through a revenue share agreement with Google. Google devices data excludes Fitbit.

2.59 We recognise that, in an ecosystem, the profits earned on one product or service should not be considered in isolation from the other products and services within the same ecosystem. Nevertheless, we consider information on gross margins to be informative of the performance of different business activities, which could feed into each firm's incentives.

[38] Advertising (Search) includes revenue from Gmail and Google Maps; Play Store does not include Play Store advertising revenue, which is instead included in Advertising (other). Google submitted with regards to Play Store advertising that it does not include all the costs that Play Store advertising would face if it were run as a standalone business (eg Android distribution costs, R&D costs and other investment costs).
[39] Google noted that in compiling this data, several finance and engineering data systems had to be used which may not be used for financial reporting purposes. The revenue and cost data does not include accounting adjustments (such as exchange rate impacts and discounts), is not US GAAP compliant, and may differ from publicly reported revenue and costs.

3. Mobile device and operating system competition

Key findings

- Just over half of all mobile devices in the UK are iOS devices made by Apple, with the iPhone accounting for 75% of the £11.7 billion worth of smartphones shipped into the UK in 2021. Practically all other smartphones and many tablets come with Google's Android operating system – creating an effective duopoly in operating systems.

- We have found that Apple and Google have substantial and entrenched market power in mobile operating systems as there is limited effective competition between the two and rivals face significant barriers to entry and expansion.

- Our findings of limited effective competition between Apple and Google are based on:

  - The supply of mobile devices and operating systems has segmented into broadly two groups – higher-priced and lower-priced devices. Apple's iOS devices accounted for 77% of devices sold for over £300 in 2021 whereas Android devices account for 100% of devices sold for £300 or less.

  - Users rarely switch between iOS and Android devices – with material perceived barriers to switching such as losing the ability to connect to other personal smart devices. These concerns are higher among Apple users.

  - Apple has been able to earn a return on capital employed on its devices that is well above any normal benchmark over the last five years. Google uses Android devices to support its highly profitable search advertising business and its increasingly important app store business.

- There are also significant barriers to entry and expansion – many of which would be very difficult to overcome. These include:

  - The need to achieve a critical mass of both users and app developers to succeed (ie indirect network effects). Even a new entrant using their own version of Android would struggle to attract users and app developers as they would not be able to provide access to Google's core apps and APIs, which are important to the functioning of native Android apps.

  - The difficulty in attracting third-party manufacturers to adopt a new operating system. Through its agreements with and payments to third-party manufacturers, Google effectively pays manufacturers to use its operating system and it would be very difficult for new entrants to replicate these payments.

  - The perceived barriers to users switching away from their current mobile ecosystems would substantially limit the chances of a new entrant.

Introduction

3.1 Consumers enter Apple's or Google's mobile ecosystem the first time they purchase a mobile device that uses Apple's or Google's operating system. A mobile device always comes with a pre-installed operating system – for example, Apple's iPhone always comes with iOS pre-installed on it and Google's Pixel smartphone always comes with Android pre-installed.

3.2 In this chapter, we consider the level of competition in the supply of mobile devices and operating systems by covering the following topics:

- an overview of the market;
- market outcomes and features, including shares of supply; and
- our assessment of the extent of competitive constraints faced by Apple and Google.

3.3 Our primary focus is on competition for consumers and, more specifically, for users of mobile devices and operating systems. In doing this we focus on competition for mobile devices and operating systems jointly, because for users, the choice of mobile device and operating system are part of the same purchasing decision.[40] As Google licenses Android to third-party device manufacturers we also consider competition for these third parties when assessing the barriers faced by new entrant operating systems below.

3.4 Our analysis in this chapter draws on a wide range of evidence, including information and data from market participants and third-party data. We have also considered evidence from consumer surveys, which can be helpful in understanding consumer behaviour and experiences with mobile devices. In particular, we have commissioned our own survey, which enabled us to collect quantitative data from a representative sample of UK smartphone owners on smartphone purchasing, switching and mobile app behaviours. In addition, we have referred to summaries of user surveys that were submitted to us by parties.[41]

[40] We make clear where evidence or analysis only relates to mobile devices or operating systems. This report does not consider competition between devices using the same operating system – this is because our primary focus in this study is on Apple's and Google's mobile ecosystem and devices using the same operating system are part of the same ecosystem. We have similarly not considered other aspects of competition in relation to the supply of mobile devices, such as supply chains, the relationship between manufacturers and retailers or users' mobile telephony contracts.
[41] We discuss both our own survey and third-party surveys in detail below.

Overview of the market

3.5 To enter Apple's mobile ecosystem a user must purchase an iPhone or iPad as Apple's iOS is not licensed to third parties. We consider these 'iOS devices'. In contrast, to enter Google's mobile ecosystem a user can purchase mobile devices from a range of manufacturers as Google licenses Android to third parties.[42] We consider 'Android devices' to be devices using a version of Android operating system that falls within Google's compatibility requirements.[43]

3.6 The one exception to this definition is that Huawei currently uses a version of Android that falls within Google's compatibility requirements, but relies on Huawei's Huawei Mobile Services instead of Google Mobile Services. This follows US legislation from May 2019 which meant that Huawei could no longer access Google's apps and services, including Google Mobile Services.[44] This version of Android is only used in Huawei's devices, and we consider such devices 'HMS devices'.

3.7 Finally, we consider any version of Android falling outside of Google's compatibility requirements is an 'Android Fork'. The only other operating system that we are aware of is Fire OS, an Android Fork developed by Amazon and only used in Amazon's own tablets.

3.8 In order to attract users, suppliers of mobile devices and operating systems will seek to make their devices attractive across a range of factors. This is because users consider a multitude of factors when choosing which mobile device to purchase. It is difficult to identify the exact importance of different factors due to their inter-related nature,[45] and the fact that preferences are likely to differ across users and user groups.[46]

3.9 Based on the evidence from our survey and surveys and responses received from market participants, we consider that Apple, Google and other device manufacturers and mobile operating system providers compete to varying

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[42] This means that Google also has to ensure Android is attractive to manufacturers so that they continue to use Android in their mobile devices. We consider this and the constraint it puts on Google in our assessment below.
[43] See Appendix E which sets out in detail Google's compatibility requirements.
[44] On May 16, 2019, the US Department of Commerce's Bureau of Industry and Security ("BIS") issued a final rule amending the Export Administration Regulations ("EAR") by adding to the Entity List Huawei Technologies Co., Ltd. and 68 of its non-US affiliates (collectively "Huawei"). See for example US Government Restricts Certain Exports to Huawei and Affiliates by Adding It to Entity List While Permitting Temporary Narrow Exceptions (last accessed on 21 April 2022).
[45] For example, when users cite the operating system, they may be thinking of specific aspects of the operating system including tied products/services.
[46] As set out below, there are some keyways in which Android and iOS users appear to differ such as the importance of the price of the mobile device in their decision making.

degrees over the following high-level dimensions of competition, which we will assess in this chapter:

- **The price of mobile devices:** users can purchase their mobile devices as a standalone product (especially the case for tablets) or at the same time as purchasing a mobile phone contract with a Mobile Network Operator. The price of both smartphones and tablets can vary significantly based on the model being purchased – for example, low-end smartphones cost as little as £25 in 2021 while some high-end models cost over £1,600.[47]

- **The quality of mobile devices:** users care about a number of factors related to the quality of mobile devices and operating systems, including:

  - **Features, functionality and performance:** users care about the features and functionality, as well as the overall performance, of the mobile devices (the hardware) and associated mobile operating systems (the software) they purchase. The features, functionality and performance of devices and operating systems can be broken down in many ways. This includes the ease of use, security and privacy features, battery life, camera quality, screen size among others. Manufacturers and mobile operating system providers compete by innovating to provide new or improve existing features and functionalities.

  - **Content available on their devices:** generally, mobile ecosystems that allow users to access more content, whether via native apps or mobile browsers, will be more attractive to users.[48] In relation to native apps, this will depend on the app stores available to users on that device. In addition, manufacturers or mobile operating system providers may make their own apps or services available only on their devices, or devices using their operating system, to attract users.

  - **Interoperability:** for some users, being able to use their mobile device with a range of other devices that they have, either other mobile devices or 'connected' devices such as smart watches, is an important factor when choosing a mobile device. Manufacturers and mobile operating system providers will therefore seek to ensure their

[47] CMA analysis of IDC data from IDC Mobile Phone Tracker 2021Q4.
[48] This means that Apple and Google can generally be expected to have an incentive to ensure that a large number and high quality of content providers make their content available within their mobile ecosystems. As set out in Chapter 2, such content providers have two entry points into mobile ecosystems – app stores and mobile browsers. These entry points, and the extent of competition for content providers at each, are discussed in subsequent chapters.

mobile devices are interoperable with a range of other devices, as well as offering their own range of compatible devices.

- **The brand of mobile devices:** for some users, the brand of the mobile devices, including the associated operating system, is an important factor in their choice of device. Users' perceptions of each brand will be driven by a variety of factors including past user experience, marketing and the dimensions of competition outlined above.

Market outcomes and features

3.10 This section covers market outcomes, including shares of supply and profitability, and other market features and parameters of competition, such as user behaviour, price and quality, which are relevant to inform the extent of competition in mobile devices and operating systems. We use the findings summarised in this section to inform our competitive assessment in mobile devices and operating systems, which is discussed in the following section.

Shares of supply

3.11 We have considered shares of supply in relation to mobile devices and also according to mobile operating systems on active mobile devices in the UK. Mobile devices encompass both smartphones and tablets.

3.12 There are some differences in relative shares and the size of competitors based on the type of mobile device, so we consider smartphones and tablets separately below.

3.13 We have calculated shares of supply using both data from market participants[49] and data from the International Data Corporation (IDC)[50] on the volume and value of devices shipped into the UK.[51] When estimating shares based on volumes data from market participants, we have considered shares based on both the number of active devices and on the number of new

[49] This may lead to an overestimate of the shares of supply as our dataset does not include evidence from all market participants. However, any overestimate is likely to be minimal as we have used data at the operating system level to understand the overall number of devices and we are not aware of any material operating systems other than those we have received evidence from.
[50] We understand that IDC's data is widely used within the industry we are examining.
[51] As set out in Appendix B, this data is based on the volume of devices shipped not the volume of those actually sold and on the average standalone device selling prices (excluding VAT).

sales,[52] but below focus on new sales for device manufacturers and on active devices for operating systems.[53]

Smartphones

3.14 Both globally and at the UK level, Apple and Google hold a *de facto* duopoly over operating systems for both smartphones and tablets – the available data shows that almost all smartphones are either iOS or Android devices.

3.15 Apple is also the largest device manufacturer, with iOS only available on Apple devices, whereas Android devices are manufactured by a number of third parties.

Smartphone manufacturers

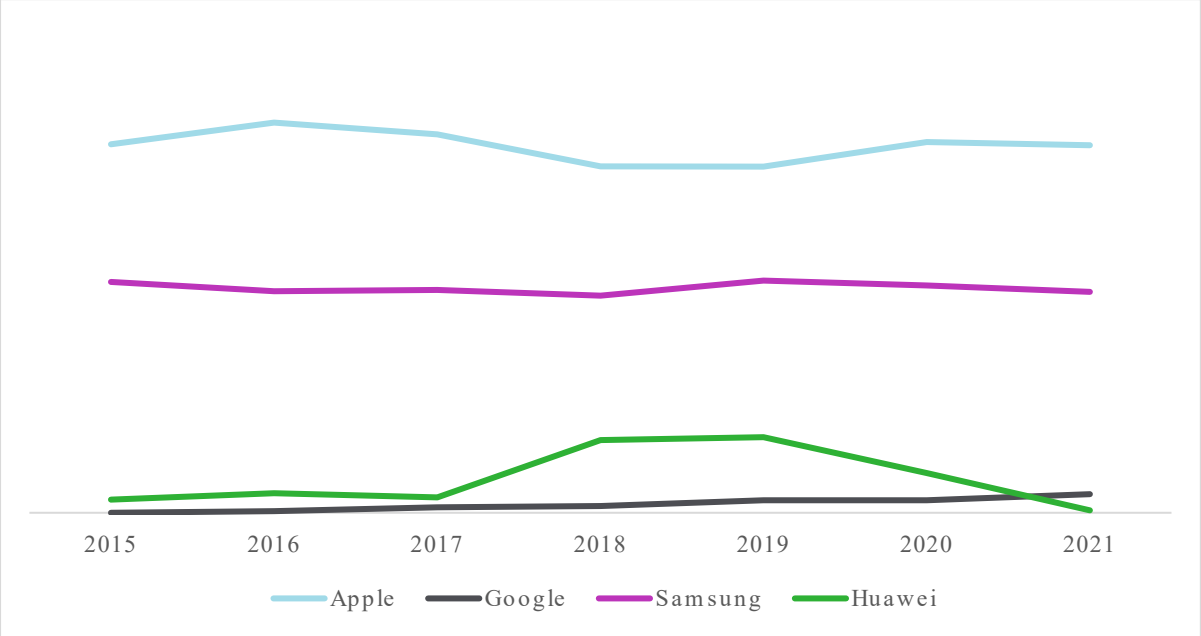
3.16 Figure 3.1 shows the shares of supply based on data from market participants for Apple, Samsung, Huawei and Google in terms of the volume of new smartphones in the UK for the period 2015 to 2021. As can be seen, in the UK:

- Between [40-50]% of new smartphones sold in each year of this period have been Apple's iPhones;
- Between [20-30]% of new smartphones sold in each year of this period have been Samsung phones, therefore Samsung has been the second largest manufacturer and the largest manufacturer of Android devices.
- Huawei was the second largest manufacturer of Android devices in 2018 and 2019 with its share peaking at [5-10]%. Huawei's sales have declined since it moved to using Huawei Mobile Services (see above) with a share of just [0-5]% in 2021.[54]

[52] A complete analysis of market shares is presented in Appendix B. We have not estimated volume shares based on active devices for manufacturers. This is because we were not able to obtain robust data on the number of active devices from all market participants.
[53] This is because operating systems can generate revenue from all active devices, whereas for most manufacturers revenue comes from the sale of new devices.
[54] Huawei has explained that, in addition to the US May 2019 legislation discussed above, other factors that affected the reduction in Huawei shares include: Huawei not launching a smartphone model in 2021 in the UK, and Huawei changing its commercial strategy to focus more on products such as PCs, wearable devices and audio devices.

- Google's Pixel smartphone share is very small, albeit growing – [0-5]% of new smartphones sales in 2021 in the UK, ie an increase by 50% compared to 2020 shares of supply.[55]

Figure 3.1: Manufacturer shares of supply in the sale of new smartphones in the UK (2015-2021)

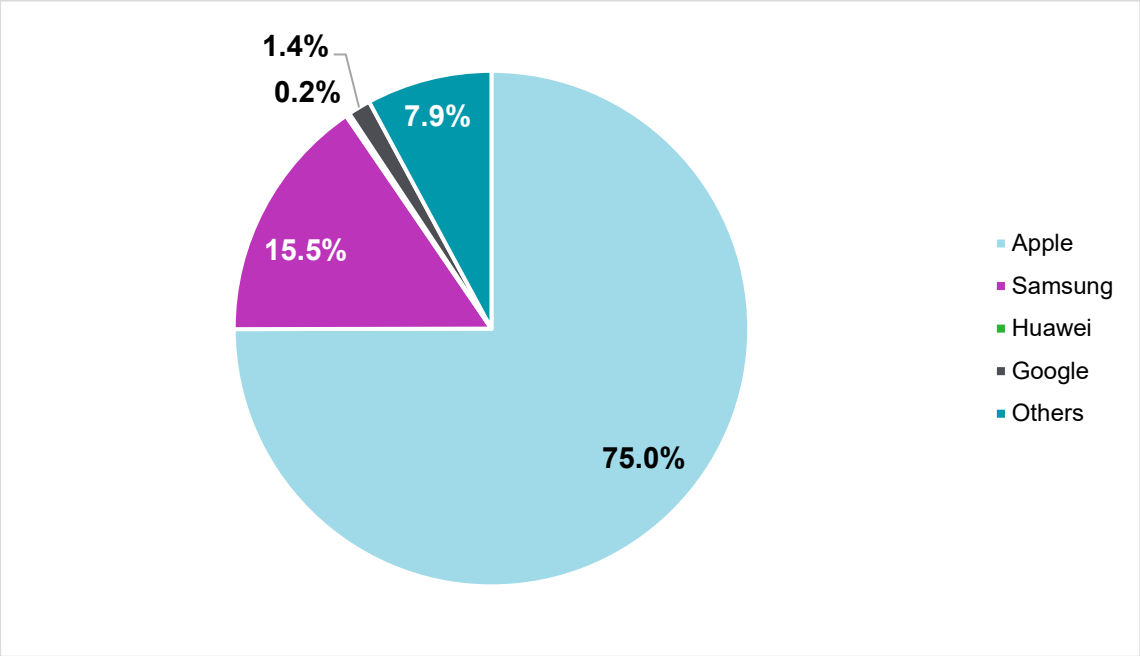


Source: CMA analysis of data from market participants
Notes: We have only received data from a limited number of manufacturers, so shares do not sum to 100% as total volumes are based on operating systems data to calculate the total number of new sales.

3.17 Figure 3.2 shows the shares of supply based on data from IDC for Apple, Samsung, Huawei and Google in terms of total value of smartphones shipped into the UK in 2021, which was equivalent to £11.7 billion in the same year.[56] The same relative ranking (amongst these four manufacturers)[57] as described above applies when considering revenue-based shares of supply, with Apple having the largest share in 2021 (75%) followed by Samsung (15%). As expected, and consistent with the pricing analysis presented below, Apple's share of the total value of devices shipped into the UK (based on analysis of IDC's data) is higher than its shares of supply in the sale of new smartphones (based on our analysis of data from market participants).

[55] We note that, as set out in Appendix B, Google data on new sales is based on the number of Android device activations. Google explained that it does not have internal data on the number of third-party Android devices sold and device activations are a reliable proxy for the number of Android devices sold.
[56] CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA". As noted above, figures exclude VAT.
[57] As noted in Figure 3.2, other manufacturers collectively had a share of 8% and some of these were larger than Google and Huawei in 2021.

Figure 3.2: Manufacturer shares of supply based on total value of smartphones shipped into the UK (2021)



Source: CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA"

Smartphone operating systems

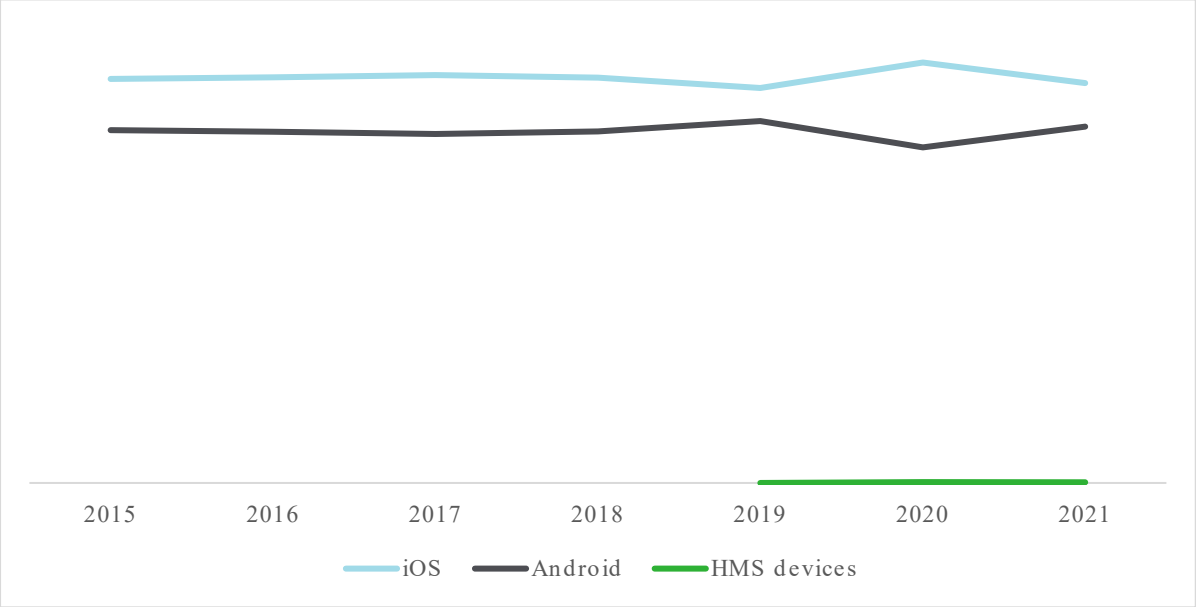
3.18 While there are several manufacturers of smartphones, virtually all active smartphones in the UK come with either the iOS or the Android operating system.[58] Figure 3.3 is based on data from market participants on active smartphones in the UK for the period 2015 to 2021.[59] [60] This shows that:

- between [50-60]% of active smartphones in each year of this period have been Apple's iOS devices (ie half or more of active smartphones in the UK have been iPhones);
- between [40-50]% of active smartphones in each year of this period have been Android devices; and

[58] Historically, there have been other large smartphone operating systems and attempts at entry by large companies providing operating systems in other markets – this is clearly illustrated by data from Statcounter, presented in Appendix B.
[59] We note that Apple provided data on "Transacting accounts". Transacting accounts correspond to the number of accounts that performed a transaction (download, purchase etc.) on the device. A transacting account could be linked to more than one smartphone, and one smartphone could be linked to more than one transacting account. This means that the number of transacting accounts may over or underestimate the number of active smartphones.
[60] We have not estimated operating system value shares based on IDC data. This is because, whilst Apple operates a vertically integrated business model, Google licenses the Android operating system to manufacturers. Given Google's business model, while IDC data captures the value of devices to these manufacturers, this is not equivalent to the value of Android devices to Google.

- currently Huawei's HMS devices have a very small share of active smartphones at [0-5%]% in 2021, although as outlined above they have only been available since 2019.

Figure 3.3: Operating system shares of supply in active smartphones in the UK (2015-2021)



Source: CMA analysis of data from market participants

Tablets

3.19 In 2021, tablets accounted for roughly 25% of the total market size of mobile devices when considering sales of new devices. We set out the key differences in shares of supply here and our detailed analysis can be found in Appendix B.[61]

Tablet manufacturers

3.20 Apple has consistently been the largest tablet manufacturer in the UK since 2015.[62] In 2021 Apple's share in tablets ([40-50]%) was only slightly lower than Apple's share in smartphones ([40-50]%).

3.21 The main difference compared with smartphones is that there is a third operating system – Amazon's Fire OS, which is only available on Amazon

[61] We have included both smartphones and tablets in the scope of our report given the concerns we have heard in relation to the key gateways in Apple's and Google's mobile ecosystem (app stores and browsers and browser engines) relate to both smartphones and tablets. However, given the larger scale of the smartphone market, the fact that responses (including survey material submitted by the parties) have focused predominantly on smartphones, and having considered that – with the exception of some differences highlighted in the share of supply analysis (resulting from the presence of a material third operating systems, ie Amazon Fire OS) – no market participants have suggested that tablets should be treated differently to smartphones, we have focused on smartphones in our analysis drawing out differences where relevant.
[62] CMA analysis of data from market participants.

Fire tablets. Amazon has been the second largest tablet manufacturer for most of the period considered, with Amazon's share of new tablets growing materially from [10-20]% in 2015 to [30-40]% in 2017 before declining to [20-30]% in 2021.[63]

3.22 Samsung has consistently been the largest manufacturer of Android tablets and the third largest tablet manufacturer for most of the period considered. Samsung's share has been fairly consistent, ranging between [10-20]% and [10-20]% of new tablets.[64]

3.23 According to IDC data, the total value of iOS, Android[65] and Fire OS tablets shipped to the UK in 2021 was £1.7 billion.[66] As with smartphones, Apple's share of supply based on the total value of these tablets shipped into the UK (based on analysis of IDC's data) is higher than its share of supply based on the sale of new tablets in the UK (based on our analysis of data from market participants). Apple shares of supply based on revenues in 2021 was 68%, followed by Samsung (13%) and Amazon Fire OS (9%).

Tablet operating systems

3.24 For tablet operating systems, the picture is slightly different to smartphones, due to the presence of Amazon's Fire OS, which is an Android Fork. However, Apple's iOS and Google's Android are still the largest two operating systems used, with over 70% of active tablets in 2021 in the UK. Of this, between [50-60]% of active tablets in 2021 have been Apple's iOS devices (ie iPads).[67] Google's Android has been the second largest operating system in terms of active tablets, but its share of active tablets has decreased from [20-30]% in 2017 to [20-30]% in 2021.[68] Amazon's Fire OS has been the third largest operating system in terms of active tablets with the proportion of active tablets running on Fire OS increasing from [10-20]% in 2017 to [20-30]% in 2021.[69]

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[63] CMA analysis of data from market participants.
[64] CMA analysis of data from market participants.
[65] For the purpose of our analysis of IDC data on tablets we have not split out Huawei's HMS devices from Android devices.
[66] CMA analysis of IDC data from "IDC PCD Tracker (Tablet)_FinalHistoricalPivot_2021Q4_CMA". Consistent with shares estimates based on data from market participants, this excludes Windows and Chrome tablets. We note that the total value of Chrome tablets is negligible (and less than £6m in 2021) and adding Windows devices to the calculation would increase the total market size to £ 2.1bn in 2021.
[67] CMA analysis of data from market participants.
[68] CMA analysis of data from market participants.
[69] CMA analysis of data from market participants. Historically there have not been any other tablet operating systems with a material share of supply in active tablets – see Appendix B.

Profitability

3.25 Apple's primary source of revenue comes from selling hardware and its associated operating systems. In 2021, around 80% of Apple's worldwide revenue came from its hardware, with 65% of that device revenue coming from the iPhone alone, see Appendix C. In the UK alone, Apple directly generated revenues of £[5.5-6] billion from iPhone sales and £[1-1.5] billion from iPad sales in 2021.

3.26 As set out in Appendix C, these devices are also highly profitable, with gross profit margins of 35% in 2021. Further, if Apple's 'Devices'[70] business was considered as a separate, standalone, business, and all the assets of the integrated devices and services business were allocated to Devices, the standalone Devices business would have earned a return on capital employed (ROCE) between 873% and 215% between 2017 and 2021. Even when taking our most cautious set of assumptions, our analysis suggests that Apple's return on capital employed for devices was above 80% in 2021, as set out in Appendix C. This is well above any normal benchmark ROCE level, before any incremental operating profits from services (such as the allocation of common costs) are included.

3.27 While Apple's services are becoming increasingly important to its business, and are also highly profitable, the importance of hardware sales means that Apple has an incentive to maintain the prices of its hardware, and this is consistent with the fact that most higher-priced mobile devices are Apple devices as set out above.

3.28 In contrast, Google has a very small share of both smartphones and tablets as set out above. Rather the majority of Android devices are manufactured by third parties who are effectively paid to use the Android operating system as set out in more detail below and in Appendix E.

3.29 Google's primary source of revenue comes from selling digital advertising, primarily search advertising, where its position in digital advertising is supported by its agreements with and payments made to device manufacturers (as well as the payments Google makes to Apple for search default status on Safari, see Chapter 5). As set out in Appendix C, Google was highly profitable through the last 10 years, making high profits and we estimated Google's ROCE was 39% on average between 2011 and 2021 and the market study into online platforms and digital advertising concluded that

[70] As set out in Appendix C, devices refers to the following categories, together: iPhone, Mac, iPad, Wearables, Home and Accessories. We note that this is referred to as 'Products' in Apple's 10K.

Google's ROCE had been well above any reasonable competitive benchmark for many years.[71]

3.30 Finally, Google said that licensing Android for free 'has helped increase the number of smartphone owners by enabling [manufacturers] to develop quality smartphones and tablets at low cost'. Google said that this encourages more developers to create engaging apps and web-based services creating more opportunities for it to generate advertising revenue.[72] This is consistent with the fact that most lower-priced mobile devices are Android devices, as set out below.

User behaviour

3.31 Understanding how users behave the way they do in the mobile ecosystems market is crucial to our assessment of how well the market is working.

3.32 To inform our assessment in this area, we have undertaken an independent survey as well as considered survey evidence received from various parties about user purchasing decisions.

3.33 The CMA conducted an online survey between February and April 2022 among a representative sample of UK smartphone users with the aim of better understanding UK smartphone user behaviour and switching. Survey participants were recruited via a randomised method to achieve a representative sample of UK smartphone users.[73] Overall, there were 2,244 responses to this quantitative survey with a response rate of 4.72%. This was complemented by twenty in-depth qualitative interviews with Marginal Users (users that considered switching operating system when purchasing a new smartphone but ultimately did not),[74] who were sampled from the quantitative survey, to help understand their behaviour in more depth.[75]

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[71] CMA's Online platforms and digital advertising market study, Appendix D. As set out in Appendix C this has been updated during this study to consider 2020 and 2021.
[72] See Google's Statement of Scope Response, page 4 at Response: Google (publishing.service.gov.uk).
[73] Specifically they were recruited via an SMS message sent to a smartphone device following a Random Digit Dial (RDD) approach.
[74] Throughout this report, we have applied the following definitions: Marginal Users are users that considered switching operating system when purchasing a new smartphone but ultimately did not; Non-Considerers are users that did not consider switching operating system when intending to buy a new smartphone; Non-Switchers are all users that did not switch operating system when purchasing a new phone – this group includes both Marginal Users and Non-Considerers; Switchers are users that switch operating system when purchasing a new phone. For the purpose of our competitive assessment we have focused on both Marginal Users and Switchers as these are the users that could exert a competitive constraint on Apple and Google from switching between the two mobile ecosystems.
[75] See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, for full technical details and results of this CMA research.

3.34 In line with the CMA's good practice guidance on surveys we assess the quality of survey evidence across multiple criteria.[76] Our assessment based on these criteria concludes that this CMA survey is robust and representative of the target population of interest, allowing full evidential weight to be applied to the data. However, we have greater concerns over the quality of survey evidence from other parties. Therefore, while the results of the CMA survey are generally consistent with the results of surveys submitted by parties (see below), we place more weight on the CMA's survey where results are inconsistent.

3.35 With respect to third-party surveys, these have been conducted as part of the company's general commercial strategies in order to assess user behaviour and preferences in their respective markets.[77] We have observed that parties undertake research into their own products and also into those of their rivals, as would be expected. The data set out in this chapter (and elsewhere in the report) should not be assumed to offer insights into any particular party's commercial strategies.[78]

3.36 Drawing on the survey evidence outlined above, the remainder of this section summarizes our findings in relation to whether users are generally buying their first device or a replacement device, whether the same users have both iOS and Android devices and whether users buying a replacement device switch between mobile operating systems.

3.37 First, we have found that **users are generally buying replacement devices so are already currently either within Apple's or Google's ecosystems.**[79]

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[76] The criteria include the surveys sampling frame, questionnaire, fieldwork, the response rate, representativeness of the achieved sample, and the consistency and quality of the final data set. See the CMA merger survey good practice guidance.
[77] This research has been undertaken in a commercial context providing data suited to commercial purposes. However, this type of research has limitations in that it often uses online panels. Using online panels can lead to sample bias when respondents are drawn from a panel which does not rely on randomisation methods for its recruitment. Whilst a panel can be made to look like a representative cross-section of consumers in terms of its demographic profile, the characteristics of people who join an online panel may be different from other consumers. This can result in online panels biasing samples towards more affluent, digitally confident and urban consumers. Evidence in the academic research literature suggests that those who join an online panel spend more time on the internet and engage more actively than other consumers in searching for better deals online. This bias can influence research findings on issues such as switching and barriers to switching. More generally, response rates to online surveys can be low (with the resulting risk of non-response bias). Despite these limitations, the research provided by parties provides some relevant evidence of consumer behaviour in this market, especially in relative terms when comparing data across brands/devices and over-time. Throughout this chapter, we have used this evidence to supplement findings from the CMA bespoke survey.
[78] Due to concerns that, by explaining the results of the user surveys, we may inadvertently reveal sensitive commercial data, we have not published the sources of the surveys and, in some instances, we have redacted the specific findings.
[79] Based on the shares of supply set out above, a relatively small proportion of existing mobile device users will be within Amazon's ecosystem (ie own one of Amazon's Fire OS tablets) and Huawei's ecosystem (ie own a HMS device).

- Especially for smartphones, most users are purchasing a replacement device,[80] with our survey finding that for only 2% of users (1% of iOS users and 3% of Android users) is their current smartphone their first smartphone.[81] This is also consistent with the high rates of smartphone ownership in the UK.[82]

- While higher[83] than for smartphones, the proportion of new users purchasing tablets is also low. For example, survey data from Q1 2019 showed that 13% of tablet purchasers are buying their first tablet.[84]

3.38 Google said that because manufacturers cannot discriminate between new and existing users, new users constrain behaviour in relation to existing users. While this may be the case to some extent, the fact that most users are buying replacement devices suggests that the competitive conditions faced by suppliers of mobile devices and operating systems will largely depend on the behaviour of and barriers to switching for existing users.

3.39 Second, we have found that **users generally do not have both an iOS and an Android device.** Most users appear to only have smartphones that use one operating system – 80% of users appear to only use one smartphone and evidence suggests that even when users are purchasing an additional smartphone, it is normally one using the same operating system.[85]

3.40 While there is more cross-ownership when considering smartphones and tablets with different operating systems, this appears still to be low. For example, our survey showed that of respondents who owned an iPhone, 63% also owned an iPad while only 7% an Android tablet, and 13% an Amazon Fire tablet.[86] Similarly, of respondents who owned an Android smartphone, 36% also owned an Android tablet, while 18% also owned an iPad, and 18%

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[80] This is also consistent with the survey evidence on the top reasons why users purchased a new device. For example, a 2021 survey submitted to us [by a party] showed that across all respondents who had purchased a smartphone, the top three reasons for purchasing a new device were that they "wanted newer device than one I had" [30-40]%, "my contract had come to an end" [20-30]% and "Previous phone had poor battery life" [20-30]%.
[81] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 13.
[82] For example, research from Ofcom shows that 91% of UK households own a smartphone and smartphones are the device most used among UK internet users to go on online. See OFCOM online nation 2021 report.
[83] One manufacturer said that it considered this was the case for several reasons including: (i) different usage patterns to smartphones which mean tablets are used less frequently reducing the need to replace them; (ii) differences in usage patterns also mean the performance needs of tablets are lower meaning they should stay competent for longer; (iii) their bigger size means better usage of internal components to enable better efficiency and performance such that they stay competent for longer; and (iv) manufacturers tending to upgrade their tablets less frequently than smartphones.
[84] This is in part likely to be due to lower tablet ownership rates. For example, Ofcom's Technology Tracker survey shows that in 2021 65% of respondents reported (aged 16 and over) owning a tablet. See Interactive report - Ofcom
[85] A survey of iPhone buyers in the UK found only [0-10]% were buying an additional phone with [30-40]% of those having an Android device. [✂]
[86] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 21.

a Fire OS tablet.[87] This is also consistent with evidence from app developers that only a small proportion of their users access their apps on both iOS and Android devices.

3.41 Third, we have found that **users buying replacement devices do not generally switch mobile operating system, and this is particularly the case for Apple users.** Further, our survey shows that, among **Non-Switchers, only a small proportion consider switching operating system when purchasing a new smartphone.**

3.42 While neither Apple or Google could provide data for us to calculate actual rates of switching, survey evidence shows there is limited switching in practice between mobile devices with different operating systems and users are more likely to switch from Android devices to iOS devices than vice versa.

3.43 For example, based on our survey evidence dated April 2022, we found that **8% of users who purchased an iPhone as their current smartphone had switched from an Android smartphone and 5% of users who purchased an Android smartphone as their current smartphone switched from an iOS smartphone**.[88,89] In addition, our survey finds that **only 11% of the Apple users and 12% of the Android users are Marginal Users**.[90]

Prices

3.44 Apple, Google, Samsung and other manufacturers consider price to be an important dimension of competition. We have therefore conducted an analysis of the prices of mobile devices to inform our competitive assessment – focusing on comparing prices of devices using different operating systems.

3.45 We used data from IDC on the volume and value of devices shipped into the UK to understand the prices, excluding VAT, at which iOS devices and Android devices are sold.[91] This analysis is shown in Figure 3.4 for smartphones – we present our findings for tablets in Appendix B.

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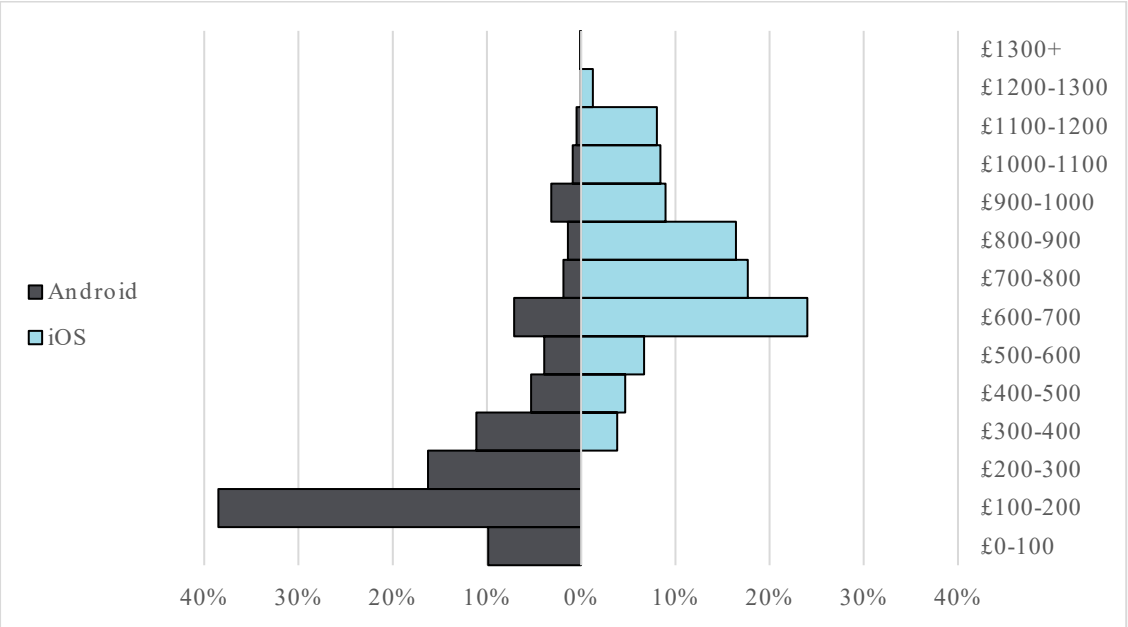
[87] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 21.
[88] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 13. This is consistent with evidence submitted by the Parties, which showed that during 2020 between [0-10]% of users who purchased a new Android device had switched from an Apple device. In contrast, between [10-20]% of users who purchased a new Apple device had switched from an Android device.
[89] When considering users that had purchased a smartphone in the past 12 months, 7% of iOS users had switched from an Android device and 4% of Android users had switched from and iOS – see Appendix D.
[90] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 24.
[91] As set out in Appendix B, this data is based on the volume of devices shipped not the volume of those actually sold and average selling prices.

3.46 Figure 3.4 shows the proportion of iOS smartphones and Android smartphones respectively at each £100 price band in 2021. As illustrated in Appendix B, this picture does not change when comparing iOS devices to Samsung devices only.

Figure 3.4: Proportion of smartphones shipped into the UK by £100 price bracket (2021)



Source: CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA"
Notes: For details on how the number of units shipped and average selling price data were consolidated, see Appendix B.

3.47 While there are both types of devices sold at most price points (although no Apple devices are sold for less than £300), **the evidence is consistent with iOS smartphones dominating the sales of higher-priced devices and Android smartphones the sales of lower-priced devices**.[92]

3.48 The IDC data indicates the same broad picture for tablets.[93] In particular, in 2021 it indicates that:

- iOS dominates the sales of higher-priced devices and tablets using Google's Android and Amazon's Fire OS tablets the sales of low-priced devices. In 2021 the majority of Android tablets (83%) were sold for £200 or less. Similarly, the vast majority of Fire OS tablets (97%) were sold for £200 or less, whereas the data indicates that no iOS tablets were sold for £200 or less in 2021.[94]

[92] As illustrated in Appendix B, this is consistent when considering iOS and Samsung devices only.
[93] For a complete analysis, please refer to Appendix B.
[94] CMA analysis of IDC data from "IDC PCD Tracker (Tablet)_FinalHistoricalPivot_2021Q4_CMA".

- All iOS tablets were sold for £200 or more, in which only 21% of rival devices were sold.[95]

- The majority (51%) of Windows devices in the data were sold for more than £700 and Apple's tablets in the same price bracket only account for 7% of its sales.[96] We note that most of these devices were manufactured by Microsoft[97] and we have not generally considered them to be tablets in our broader analysis.[98]

Quality

Features, functionality and performance

3.49 The survey evidence indicates that specific features such as battery life,[99] camera quality and screen size are some of the most important smartphone features for purchasers across different operating systems.

3.50 For example, in our survey 47% of iOS users and 56% of Android users referred to screen size and quality as an important factor influencing the decision to purchase their current smartphone.[100] Similarly, battery life and camera were considered important features by 42% and 43% of iOS users, respectively – for Android users, these figures are 51% and 50%.[101]

3.51 Security and privacy, which are determined to a large extent by the operating system, were identified as important factors in the purchase decision for 29%

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[95] CMA analysis of IDC data from "IDC PCD Tracker (Tablet)_FinalHistoricalPivot_2021Q4_CMA".
[96] CMA analysis of IDC data from "IDC PCD Tracker (Tablet)_FinalHistoricalPivot_2021Q4_CMA".
[97] Microsoft explained that if offers Surface devices that run Windows, but does not offer any tablets running a mobile operating system. However, Microsoft also explained that certain devices such as its Surface laptop face competition from Apple's high-end iPad Pro.
[98] See CMA analysis of IDC data from "IDC PCD Tracker (Tablet)_FinalHistoricalPivot_2021Q4".
[99] We understand that battery life is a function of both the hardware (eg the actual battery used) and the operating system.
[100] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5. In addition, screen size and quality are the most important reasons for purchasing an iPhone for 6% of all iOS users, and the second and third most important reason for 11% and 16%, respectively. Overall, out of twelve reasons considered, screen size is the sixth most important reason for iOS users. For Android users, this is the most important reason for 10% of all users, and the second and third most important reason for 14% and 16%, respectively. Overall, this is the fourth most important reason (out of 12) for Android users. See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 6 and 7.
[101] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5. In addition, battery life is the most important reason for purchasing an iPhone for 5% of all iOS users, and the second and third most important reason for 11% and 15%, respectively. It is the eighth most important reason overall (out of 12). For Android users, this is the most important reason for 8% of all users, and the second and third most important reason for 15% and 17%, respectively, and the fifth most important reason out of 12. Camera is instead the most important reason for 6% of all iOS users and 8% of all Android users, while it is the second and third most important reason for 11% and 12% of iOS users and for 13% and 14% of Android users. Camera is the seventh most important reason (out of 12) for iOS users and the sixth for Android users. See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 6 and 7.

of iOS users and 22% of Android users.[102] [103] According to evidence submitted by Apple, for users, security and privacy is one of the top three reasons for purchasing an iPhone.[104] However, our survey finds that, while security and privacy are more important for iOS users than Android users,[105] they are relatively less important than other factors. For example, while brand and price are the most important factors for 35% and 18% of users, privacy and security are the most important reason for purchasing an iOS smartphone for only 6% of users, and the second and third most important reason for 7% and 8%, respectively.[106]

3.52 In addition, there is at least a perception among users that Apple's devices are of a higher quality than those of other manufacturers. For example, a survey [submitted by a party] shows that Apple's brand scored higher than Samsung's brand on statements such as 'is a premium brand' (77% vs 54%), 'has products with the latest innovation' (68% vs 62%) and 'has products with appealing design' (64% vs 56%).

3.53 While we have not received substantive evidence of differences in actual quality between mobile devices, we have received evidence relating to how innovation has improved the quality of devices over time from Apple, Google and others. For example, Figure 3.5 shows improvements in the features and capabilities of iPhones[107] and Figure 3.6 is a visual representation provided by Google of the major iOS and Android releases over time.[108]

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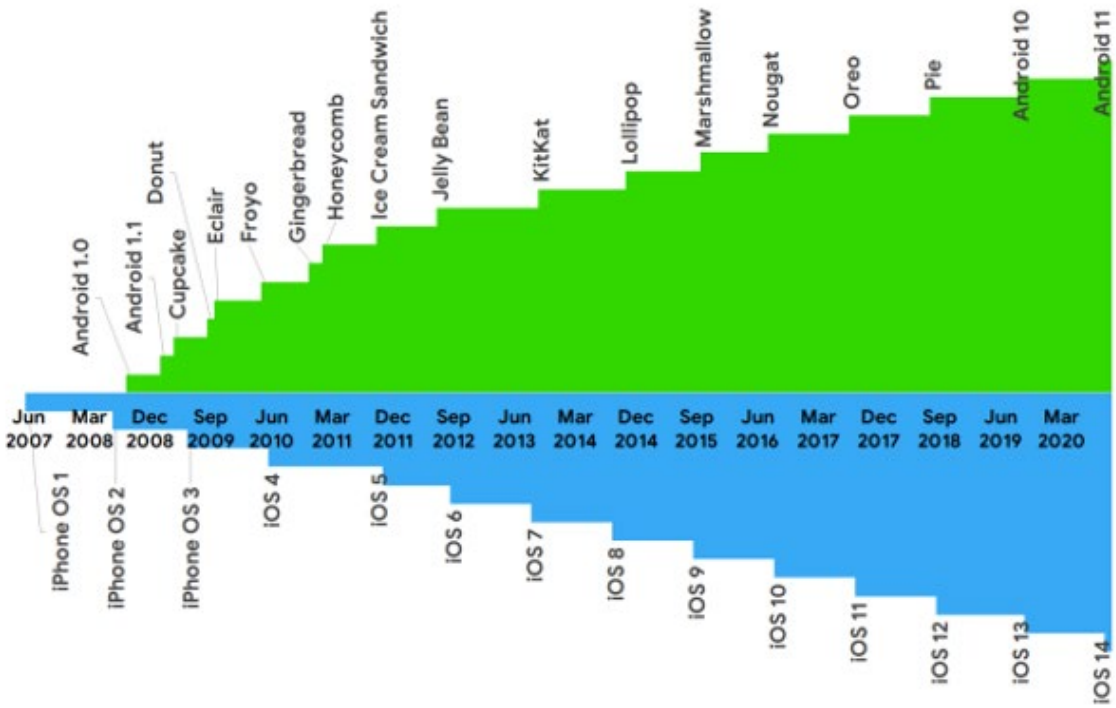
[102] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5.
[103] We note that in the response to the Interim Report (available at Response: Apple (publishing.service.gov.uk)), Apple has argued that some of the suggested remedies might lead to privacy and/or security risks for users on its devices. We have considered Apple's arguments on privacy and security in later chapters.
[104] See Apple's response to our interim report.
[105] For Android users, security and privacy are even less frequently referred to as the first (4%), second (3%) and third (7%) most important reasons.
[106] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 6.
[107] Apple also provided a list of examples amongst the many enhancements and innovation it has introduced over just the last 5 years that included: hardware and software innovations which improve the processing speed, functionality and quality of its mobile devices and connected devices such as innovations in chips, haptics and materials such as its Ceramic Shield Glass; hardware and software innovations in relation to privacy features such as Apple's Face ID; and software innovations at the operating system level that are provided to developers to assist in building new and improved apps such as CoreML and ARKit.
[108] Google also provided a list of examples that included: software innovations aimed at improving the performance, battery and memory of Android devices; software innovations aimed at improving the privacy and security of Android devices; and software innovations aimed at improving the user experience, including wellbeing.

Figure 3.5: Improvements in device features and capabilities from the iPhone to iPhone 13 Pro

	iPhone	iPhone 13 Pro
Screen Size (inches)	3.5	6.7
Resolution	480 x 320	2778 x 1284 Screens: OLED; HDR; Edge-to-Edge; True Tone
Processor	412 Mhz Samsung ARM	A15 Bionic
Max storage	8GB	1TB
Networks	Wi-Fi, GSM, EDGE, Bluetooth	Wi-Fi 6 w/ MIMO, Gigabit LTE Bluetooth 5.0, 5G
Camera	2 megapixels	12 megapixels (both front and back cameras) Optical zoom, digital zoom, ultra-wide angle, telephoto LIDAR, night portrait, portrait mode, live photo, cinema mode
Battery Life (hours)	Talk: 7, Video: 10, Web: 10, Audio: 40	Video: 28, Audio: 95
Additional features		GPS, Facetime, Siri, Face ID, NFC, UWB, wireless charging, water & dust resistance

Source: Apple

Figure 3.6: Android vs iOS Releases (2007 to 2020) as presented by Google



Source: Google
Notes: Green indicates major version releases of Android, and these are Google's names for each version of Android while blue indicates major version releases of iOS. The scale of different updates may vary and does not necessarily indicate the total level of innovation – ie while there have been more versions of Android this does not necessarily mean there has been more innovation of the Android operating system and we have not sought to assess this. The chart does not capture Google's latest release, ie the Android 12, and Apple's latest release, ie the iOS 15.

Content

3.54 Evidence from market participants has shown that overall, the quantity and quality of content available in a mobile ecosystem is important to users.

3.55 This is because operating systems are two-sided platforms that exhibit indirect network effects – users value an operating system more the greater volume and quality of content they can access on that operating system. In turn, content providers value an operating system more the greater the number of users using that operating system. We consider how these effects may be a barrier to entry in relation to mobile operating systems in this chapter and native app distribution in Chapter 4.

3.56 The importance to users of the quantity and quality of content available in a mobile ecosystem is reflected in the views we have received. For example Huawei told us that 'the richness of the ecosystem affects a user's purchase decisions' and that 'a lack of apps would act as a major deterrent to users'. It also told us that 'if the basic applications that users want are not pre-installed on a mobile device, this may influence their decision whether to purchase the device.' Huawei provided research which supported this, showing [✂].[109]

3.57 As set out in Chapter 4, many of the same popular native apps are available on both iOS and Android devices.[110] In contrast, Figure 4.3 in Chapter 4, shows the proprietary app stores of Huawei's HMS devices and Amazon's Fire OS tablets have a much smaller number of native apps and app developers.

Interoperability

3.58 Manufacturers and mobile operating system providers offer a range of devices which are interoperable within a given ecosystem, some of which are also interoperable with mobile devices using other operating systems (ie across ecosystems). For example, in terms of other devices offered, Apple offers devices such as the Apple Watch and AirPods, Google offers various Google Nest products and Samsung offers the Galaxy Watch and Galaxy Buds.

3.59 Users consider it is important that their mobile device works with a range of other devices that they have, either other mobile devices or 'connected' devices such as smart watches.

[109] This is also supported by the example of Amazon's Fire Phone which used Amazon's Fire OS. It was launched in the UK in September 2014 but exited a year later. One of the reported reasons for its lack of success was a narrow selection of apps, including the inability to offer the Google Mobile Services suite of apps. For example, see Amazon Fire Phone: Why It Failed to Take Off | Time, Fire Phone one year later: Why Amazon's smartphone flamed out - CNET, Why did the Amazon Fire Phone Fail? - HubPages

[110] For example, we have estimated that 85% of the top 5,000 apps on the App Store also list on the Play Store and vice versa. See Chapter 4 for details.

3.60 For example:

- in our survey, compatibility with other personal smart devices was mentioned as an important factor influencing purchasing decisions by 31% of iOS users and by 15% of Android users;[111]

- in a 2022 survey submitted to us by [a party], [40-50]% of iPhone buyers surveyed reported that it was extremely important to their smartphone purchasing decision that Apple products work well with other Apple products;[112,113] and

- a survey that was submitted [by a party] found that 33% of UK iPhone users stated that the device working with their other devices was a reason to choose iOS.[114]

Brand

3.61 Brand is also an important factor in users' decision-making process – consistently cited as one of the top criteria for purchasing a new smartphone. Our survey shows that brand is the most important reason for iOS users when purchasing a new iPhone. 66% of all iOS users consider brand to be an important aspect when purchasing a new smartphone, with 35% considering it to be the most important reason (14% the second most important and 9% the third).[115] For Android users, brand is also important, albeit less so compared to iOS users. 45% of all Android users referred to brand as an important feature when buying a new phone, with 16% considering it to be the most important feature (13% the second most important and 7% the third).[116]

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[111] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5 . This was the most important feature for 6% of iOS users and the second and third most important reasons for 8% and 7% of iOS users. It was also the fourth most important reason overall and out of 12 possible reasons considered. Compatibility with other devices is less relevant to Android users (ranking as eleventh out of 12 overall), with only 1% referring to this as the most important reason and 2% and 4% as the second and third most important reasons. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 6 and 7.
[112] Result reported for "all products".
[113] Among iPad owners (64GB), research also shows that the most important factors driving the decision to purchase an iPad are security and past positive experience with Apple products. A 2022 survey shows that 'security' and 'privacy' ([80-90]%) and 'past experience with Apple products' ([80-90]%) are among the top iPad purchase factors. 'Works well with other Apple products and services' ([60-70]%) also features highly in this list of purchase factors.
[114] In 2022, [60-70]% and [70-80]% of UK iPad owners (64GB and 256GB, respectively) considered that the iPad working well with other Apple products and services was very important to their tablet purchasing decision.
[115] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 5 and 6.
[116] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 5 and 7.

3.62 Our survey evidence shows that between iOS purchasers and Android purchasers, there is little difference in the importance placed on the operating system. 40% of iOS users and 42% of Android users consider the operating system as an important feature when purchasing a new device.[117] However, as outlined above, iOS purchasers are more likely to care about the brand and product design. This may reflect the fact that Android purchasers can choose between a number of different smartphone brands all using Android.

Competition assessment

3.63 In this section we consider the competitive constraints faced by Apple in relation to its mobile devices and associated operating system iOS and the competitive constraints faced by Google in relation to its Android operating system. In doing so, we have not carried out a formal market definition assessment, but instead looked at the competitive constraints faced by Apple and Google from across the sector including focusing on direct indicators of market power and barriers to entry and expansion.[118] This is also the case for our competitive assessment within Chapters 4, 5 and 6.

3.64 The remainder of this section is split into two parts:

- First, we consider the extent of competition between Apple and Google to attract users to their mobile ecosystem. In doing so, we consider the extent to which Apple and Google compete on price and other features of mobile devices and operating systems, such as quality and brand. We further consider the extent to which Apple or Google are constrained by user switching or the threat of users switching from using Apple devices to Android devices or vice versa. In doing so, we consider whether there are barriers to users switching between mobile ecosystems and the implications of this for competition.

- Second, we consider the extent to which Apple or Google are constrained by the threat of entry or expansion by competing suppliers of mobile devices or operating systems.

3.65 We note that Apple and Google may compete to ensure users consume content on their devices and also to attract content providers and app

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[117] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5.
[118] This is in common with the standard approach in CMA market studies, which do not seek to establish whether a firm has dominance in a defined market, but are focussed on assessing the range of competitive constraints applying to firms, and how these could be strengthened. In a market study, the CMA considers 'the extent to which a matter in relation to the acquisition or supply of goods or services of one or more than one description in the United Kingdom has or may have effects adverse to the interests of consumers' (Enterprise Act 2002, section 130A(2)).

developers. These forms of competition are discussed in subsequent chapters and referred to where relevant as part of the assessment of competitive constraints below.[119]

3.66 We note that in theory Google could be constrained by manufacturers of Android devices switching to use another operating system in their mobile devices. However, currently Android is the only licensable mobile operating system in the UK (and is the only large licensable operating system we are aware of internationally)[120] with other operating systems with any material presence in the UK only being used in first-party devices.[121] As such any constraint on Google from these manufacturers would only arise from them using a new entrant operating system (including entering with their own) and is considered as part of our assessment of barriers faced by potential entrants.

Extent of competition between Apple and Google's to attract users to their ecosystems

3.67 Market participants have told us they face strong competition and in particular, that they compete strongly on the quality and the price of the mobile devices and operating systems they offer. For example:

- Apple told us that it 'competes vigorously with Samsung, Google, Huawei and other Android device manufacturers' and 'strives to attract and retain consumers who might otherwise be tempted to purchase an Android device […]'.[122] Apple submitted that its ability to compete successfully depends heavily on ensuring the continuing and timely introduction of innovative new products, services, and technologies to the marketplace and this has seen it invest tens of billions of dollars in R&D in just the past few years. Apple further told us that its devices 'compete in markets characterized by aggressive price competition and resulting downward pressure on gross margins' and 'price sensitivity on the part of consumers'. Apple recognised that it 'is active predominantly in the premium segment, while Android phones are offered both at the "budget" end of the market and in the premium segment' but also highlighted that

[119] The former will be considered in Chapters 4, 5 and 6 where we explore competition in relation to app distribution, browsers and competition between app developers. The latter will be considered in Chapters 4 and 5 where we explore competition in relation to app distribution and browsers as those are points at which content providers enter a mobile ecosystem.
[120] For example, Android has a share of just over 70% of worldwide smartphone operating systems based on Statcounter data. See Mobile Operating System Market Share Worldwide | Statcounter Global Stats, last accessed on 3 May 2022.
[121] Apple's iOS, Amazon's Fire OS and Huawei's version of Android using Huawei Mobile Services are all only used in first-party devices.
[122] Apple response to the Interim Report, available at Response: Apple (publishing.service.gov.uk)

'[…] it is wrong to infer that this would imply limited competition'.[123] This is because '[…] there are competing devices at each price point at which Apple devices are sold […]' and '[…] Apple constantly monitors and benchmarks its performance in the UK against rivals, on a weekly basis […]'.[124] Further, according to Apple, '[…] users stay with Apple or aspire to purchase an Apple device because they prefer it'.

- Google said that the pressure to innovate and produce new versions and features for Android is the most significant competitive pressure it faces, with Apple's iOS being its most significant competitor in this activity. Google also told us that it considers that users take into account the device and/or contract price, but also stated that 'price is unlikely to be determinative of the decision to choose an Android or iOS device since […] there is considerable overlap between Android and iOS devices at a broad range of price points'.[125] In doing this Google, highlighted how Apple competed with lower-end Android devices through the SE range of iPhones. Google told us that 'Android smartphones and iPhones compete for sales across many segments' and '[…] even if Android's device share is smaller for high-priced devices than for low-priced devices, this does not mean that Android devices do not exert competitive pressure on iPhones'.[126]

- Samsung said that innovation was important in providing the best experience for consumers and making its products more attractive in the face of innovation by rivals. [✂] Samsung also said that price is [an important] driver of the purchase decision [✂]. Samsung also said that it had a strong focus across all price points, [✂], and that Apple had entered the mid-tier price segments with the iPhone SE.[127]

3.68 We have considered these arguments and concluded that, in the round, the evidence we have gathered suggests there is limited effective competition between iOS and Android mobile devices.

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[123] See Apple's response to our interim report.
[124] Ibid.
[125] For example, Google told us that 'Samsung, for example, has been at the forefront of introducing new mobile designs and innovations for a decade, such as the 'phablet' design, borderless and dual screens, and the flip-phone. Samsung competes fiercely with Apple for high-value consumers on innovation'. Google also told us that '[…] competition for users of higher priced devices has an outsized importance. Premium device owners spend more on apps and search more online, and therefore represent greater potential sources of revenue as they acquire services and content on the device.'
[126] See Google's response to our interim report.
[127] Similarly, Huawei considers price [of devices] to be one of the key parameters of competition in the UK.

3.69 This is based on our assessment of:

- the nature of price and quality competition (including competition over brand) between iOS and Android devices; and
- the extent to which users switching may impose competitive constraints on both iOS and Android devices.

3.70 We discuss each of these in turn below.

Nature of quality and price competition

3.71 The evidence received throughout this study suggests that mobile devices are broadly segmented through product differentiation into higher-priced devices and lower-priced devices. Apple's offering only targets higher-priced devices and, as Apple does not target lower-priced devices,[128] Android devices dominate this segment.

3.72 In terms of quality, it is clear that over time Apple and Google have improved the features, functionality and performance of their operating systems and Apple and other manufacturers, including Samsung, have improved their devices over time. This will have benefitted users over time as the quality of mobile devices has increased.[129]

3.73 However, suppliers of mobile devices and operating systems may have an incentive to improve the features, functionality and performance of their devices and operating systems for a number of reasons, including:[130]

- As a result of competitive pressure from their rivals. Given these factors are important for users, the possibility of users switching to rivals is likely

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[128] Our survey also shows that only less than 10% of iOS users purchased their iPhone used or were gifted a used iPhone. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, accompany Data Tables, 'Q.4 How did you get your current personal smartphone?'.

[129] We have also considered the extent to which Apple and Google have differentiated and improved the availability of content and interoperability of devices over time. We found that, while the content available through mobile devices is important to users generally, the availability of third-party content does not play a material role in driving whether a user chooses an iOS device or an Android device. This is because many of the same popular native apps are available on both iOS and Android devices (see Chapter 4). Consistent with this survey evidence shows that apps, the prices of apps and the range of apps appear to have limited importance to users in their choice of device given the multiple dimensions (eg camera type, battery life) considered by users when purchasing a device (see Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 5). We have considered the extent to which the availability of first-party apps and services across devices and the interoperability of other smart devices could influence users switching behaviour in the next sub-section.

[130] We note that, while innovations may benefit smartphone users, elements of those innovations can also reduce competition. For example, if an innovative new product is not designed to interoperate between different mobile ecosystems then, while users benefit from the innovative product, they may also at the same time face higher actual or perceived barriers to switching. Our assessment of barriers to switching is set out below.

to generate incentives for suppliers to innovate in order to make sure they are competitive relative to their rivals.

- In order to generate incentives for users to replace their current mobile devices. Manufacturers who generate revenue for each smartphone sold have an incentive to innovate in order to ensure that users want to buy a replacement smartphone – meaning there is a constraint from existing devices in users' pockets. The incentives for this will differ depending on the significance of the revenue generated from upfront device sales, as well as factors such as the support provided to existing devices[131] or number of other manufacturers using the same operating system.[132]

- In order to increase the opportunities for generating additional revenue within the mobile ecosystem. Both manufacturers and operating systems generate revenue from users when they are within an operating system.[133] This means that they have an incentive to innovate in ways that increase the usage of mobile devices by users (eg in terms of engagement or time spent) or increase the offerings available through apps (if innovations allow app developers to offer additional services or features that are charged for). This may be of increasing importance given the more limited opportunities for further revenue growth in hardware.[134]

3.74 Therefore, the mere presence of innovation does not imply strong competition in mobile devices. More generally, it is difficult to understand how high this level of innovation is (as, for example, it is hard to measure the degree of innovation in mobile devices) and whether it could have been even higher if competition was stronger.

3.75 Quality can also drive users' perceptions of different brands and lead to brand loyalty. In this regard, our survey found that iOS users put more emphasis on smartphone brand than Android users (35% of iOS users cited it as the most important factor in their decision of which smartphone to choose compared to

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[131] As iOS updates have generally been provided to iPhones for five to six years this provides Apple with a greater incentive to innovate in its hardware as that is where the greatest difference between its new and existing smartphones will be. • Chart: How Long Does Apple Support Older iPhone Models? | Statista

[132] As Android manufacturers have to meet certain compatibility criteria set out by Google there are limits on the extent to which they can differentiate the operating system on their devices from other Android manufacturers (although they could differentiate based on the first-party apps or services they offer on the device). This might mean that Android manufacturers have a greater incentive to engage in hardware innovation to ensure they stand out from other manufacturers using the same operating system.

[133] For example, Android manufacturers can receive a share of the revenue Google generates from advertising, and in some cases from Play Store transactions, on their devices.

[134] For example, due to high ownership rates in countries such as the UK and increases seen in the length of time users are holding onto their devices.

16% for Android users)[135] and Apple has argued that owners of its devices are highly satisfied and that users consider its devices to be of a higher quality than those of rivals.[136]

3.76 However, we have not received substantive evidence to show that there is a quality difference between iOS devices and Android devices at comparable price points. In addition, a preference for a certain brand can be driven by actual or perceived differences in quality or other factors that influence the value a user places on a device.[137] It is likely that, at least in part, the importance of smartphone brands reflects perceived differences in quality and the value that consumers place on different features of iOS and Android devices which reduces the extent of competition between rivals.[138]

3.77 Market participants such as Apple, Google and Samsung, have argued that there is some competition, with Android and iOS devices available at most pricing points. However, throughout this study, we have not received substantive evidence showing that Apple, Google and other manufacturers adjust prices in reaction to competition, beyond some evidence from Apple showing that it monitors rivals during its normal course of business.[139]

3.78 On the contrary, the pricing evidence we have considered is consistent with a segmentation of the market, with iOS devices dominating the sales of higher-priced devices and Android devices the sales of lower-priced devices.

3.79 This is illustrated in Figure 3.7, which shows iOS and Android shares of supply for smartphones sold for £300 or less and for smartphones sold for more than £300.[140] In particular, the IDC data indicates that:

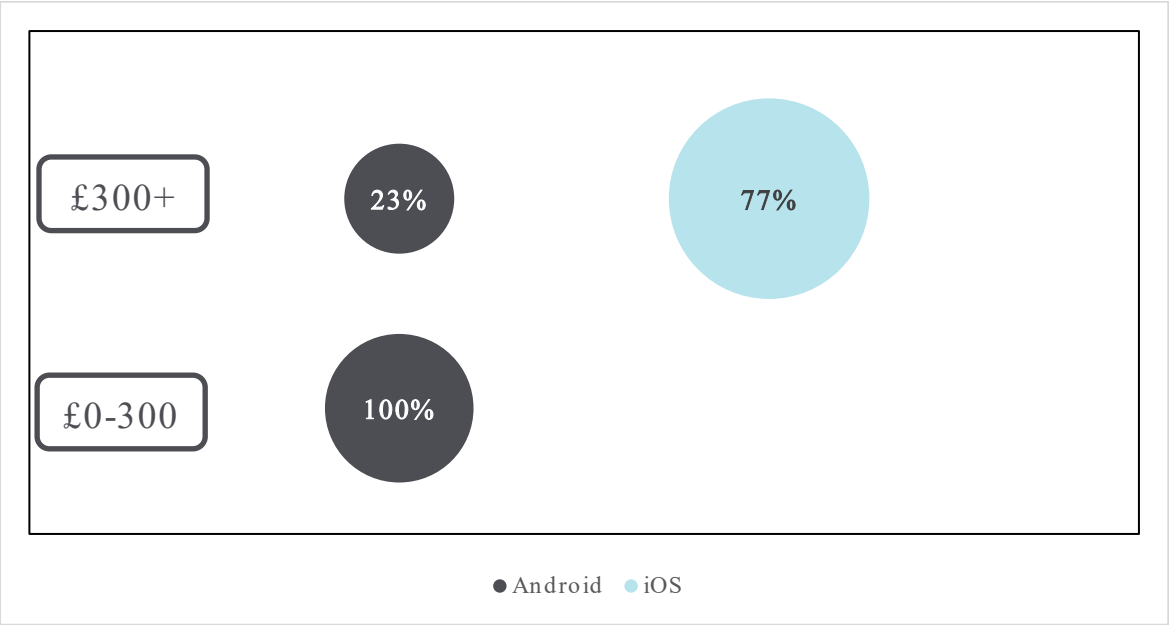
- In 2021, Android's share of smartphones sold for £300 or less was 100%.[141] This, and the fact that 65% of Android smartphones were sold

[135] For Android a further 13% considered it the second most important factor and 7% the third most important factor. For iOS 14% considered it the second most important factor and 8% the third most important factor. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 6 and 7.
[136] Apple response to the Interim Report, paragraphs 1 and 16.
[137] Actual differences in quality can arise due to genuine preferences for a mobile device over another, for example based on a hardware or software quality assessment. Perceived differences in quality can arise due to investments in marketing and branding and reduce the extent of competition between rivals.
[138] This is also considering that Apple has a strong "brand intimacy", which could impact users perception of iOS devices and in turn impact the extent to which they compete with Android devices – see Apple claims third place in 2022 brand intimacy rankings | AppleInsider, last accessed on 3 May 2022.
[139] See for example Response: Apple (publishing.service.gov.uk).
[140] Based on data from IDC on the volume (total units) of devices shipped into the UK in 2021. For details on the IDC data, see Appendix B.
[141] CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA".

for £300 or less in 2021, shows Android devices face limited effective competition for users buying lower-priced phones.[142]

- In 2021, iOS's share of smartphones sold for more than £300 was 77% (and thus Android's 23%).[143] This picture has been fairly consistent since 2017. This shows iOS devices face limited effective competition for higher-priced devices.

Figure 3.7: Operating system shares of supply based on total volume of smartphones shipped into the UK (2021) for devices sold for £300 or less and devices sold for more than £300[144]



Source: CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA"
Notes: For details on how the number of units shipped and average selling price data were consolidated, see Appendix B. The size of the bubble indicates the total number of Android/iOS smartphone devices shipped to the UK in 2021.

3.80 The findings presented above are consistent with survey evidence that suggests that price is particularly important for Android users. For example, 54% of all Android users mentioned 'overall price' as an important factor in their decision with 29% considering it the most important factor. In contrast, only 39% of iOS users mentioned it as an important factor with 18% considering it the most important factor.[145]

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[142] This is despite Apple, Google and Samsung all referencing Apple's introduction of the iPhone SE and its move into the mid-tier pricing – currently the iPhone SE appears to retail for at least £360 when new, which is above the price that most Android devices are sold at. For example, see Apple iPhone SE 64GB (2nd Generation) (pricerunner.com) last accessed on 6 June 2022.
[143] CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA". In 2021, this corresponded to all iOS devices, while only 35% of Android devices were sold for more than £300.
[144] The picture does not change if we apply a different cut-off. For example, looking at smartphone devices sold for £600 or less, we find that, in 2021, Android shares of supply for such devices was 83%, while iOS shares of supply was 17%. Considering instead devices sold for more than £600, Android shares of supply was 13% in 2021 and iOS 87%.
[145] For Android a further 14% considered it the second most important factor and 7% the third most important factor. For iOS 12% considered it the second most important factor and 6% the third most important factor.

3.81 In the round, we consider the difference between the positions of iOS and Android devices in terms of pricing is consistent with limited effective competition. We consider this evidence together with our findings on profitability and the evidence on barriers to switching (see below) to inform the extent of competition between iOS and Android devices as set out in our conclusion below.

Barriers to switching between mobile devices with different operating systems

3.82 As set out above, only a small proportion of mobile device purchasers switch between mobile devices with different operating systems each year. The proportion switching from iOS to Android is smaller than Android to iOS.[146]

3.83 Factors such as barriers to switching, consumer disengagement, satisfaction with the characteristics of Android and iOS devices and brand loyalty may each impact prevailing switching rates.

3.84 For example, Apple has argued that low switching rates are driven by high customer satisfaction. According to Apple, '[s]urvey evidence available to Apple in the ordinary course not only confirms that users are highly satisfied on average with their iOS devices, but also shows that those who are not have a higher propensity to leave their respective ecosystem.'[147] Apple has also highlighted survey evidence which, in Apple's view, shows that 'the vast majority of customers that actually switched mobile [operating system] experienced no switching barriers'. They also said that the survey found no substantial difference in the switching experience of users switching from Android to iOS compared to those switching the other way around.

3.85 Our survey evidence is consistent with users being highly satisfied with their smartphone devices.[148] However, while high satisfaction levels are a useful indicator of consumer experiences, they do not necessarily imply strong competition between iOS and Android devices. In particular, we are mindful

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Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 5, 6 and 7.

[146] According to Google users can easily switch from Android to iOS particularly as Google has facilitated switching for Android users wishing to move to iOS. For example, in Google's response to our interim report), it highlighted that: Google makes own first-party apps available on both Android and iOS; Google messaging protocol (RCS) is interoperable; Google supports data and subscription portability, and Google offers hardware interoperability for peripheral devices (such as Fitbit, Chromecast and Nest devices).

[147] See Apple response to our interim report.

[148] For example, our survey shows that, when asked 'how satisfied are you with current smartphone', on a 0 to 10 scale, 74% of iOS users and 69% of Android indicate their degree of satisfaction is between 8 and 10. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 11. As expected, for those that switched brand, satisfaction is significantly higher with current device compared to previous device (72% 8-10 for current compared to 41% for previous). Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 14. For additional details, see Appendix D.

that many of the potential harms from weak competition in technology markets may not be visible to consumers, particularly where they relate to missing out on new products and services that never make it to market, or where harms are imposed more directly on business users – we discuss this further in Chapter 7.

3.86 Furthermore, in this case low switching rates are likely to also be influenced by consumer brand,[149] disengagement, and barriers to switching. For example, in relation to consumer disengagement:

- Our survey evidence shows that 31% of iOS users and 35% of Android users reported that they could not see any significant benefits from switching operating system.[150] While this could be driven by genuine preference over a given operating system, it is also consistent with consumer disengagement.

- Our survey found only a small sample of users that considered switching when purchasing a new smartphone but ultimately did not ('Marginal Users') – 11% for Apple and 12% for Android.[151]

3.87 Beyond this there may also be certain factors that:

- cause users to perceive switching to be difficult or costly (eg because it would pose a 'hassle'), discouraging potential switchers; and

- impose actual costs on users that do switch (eg financial costs, time costs or learning costs).

3.88 Perceived barriers to switching, which discourage switching, may have a greater direct impact on switching rates than some actual costs for users that do switch. However, it is also relevant to consider actual costs because they are likely to reinforce perceived barriers to switching if or when users learn of them, from personal or second-hand experience.

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[149] For example, our survey suggests that 47% of iOS users and 38% of Android users are happy with their preferred brand – further, 37% of iOS users identify more closely with iOS than Android, while the reverse is true for 44% of all Android users that do not switch operating system. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 26 and 27.
[150] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 26 and 27.
[151] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 24.

3.89 Evidence from market participants (including survey evidence) and our survey suggested that users face four categories of potential barriers to switching between mobile devices with different operating systems:

- learning costs associated with switching mobile ecosystem;
- transferring data and apps across devices;
- managing subscriptions across devices; and
- the availability and characteristics of Apple's and Google's first-party (ie developed and operated by Apple and Google) apps, services, and other devices.

3.90 We discuss each of these barriers in detail below. We consider that, in aggregate, they pose material perceived barriers to switching. In particular, survey evidence shows:

- 64% of Marginal Users mentioned at least one of the barriers to switching identified above as a reason for not switching.[152] This figure is even higher for 'Non-Considerers', at 69%.[153]
- Users perceive learning costs associated with switching, transferring data and apps across devices and the availability of other Apple and Android products and other devices as barriers to switching. This is less the case for managing subscriptions and the availability of first-party apps and services.
- To some extent these perceived barriers apply to switching away from both Android and iOS, although several appear more significant with respect to switching from iOS to Android.

3.91 Taken together, these perceived barriers will reduce the threat to Apple and Google that users may switch mobile ecosystem, for example to make savings or access new features. This may lessen the competitive constraints that apply to Apple and Google.

3.92 Actual barriers faced by those switching ('Switchers') were lower than the perceived barriers among users that did not switch when purchasing a new

[152] Considering iOS and Android Marginal Users separately, 79% and 45% mentioned at least one of the barriers to switching identified as a reason for not switching. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Pages 43 and 46.
[153] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Page 43.

smartphone ('Non-Switchers').[154] However, the survey evidence shows that users who had 'ever switched' are generally more confident with smartphone technology. This could in part explain why these users face lower actual barriers to switching.[155] In addition, 35% of Switchers were dissatisfied or fairly dissatisfied with at least one aspect of the switching journey, implying barriers to switching impose at least some cost on users switching.[156]

Learning costs associated with switching mobile operating systems.

3.93 Users may need to adapt to different controls, functionality, and features if they switch to a different operating system. Users considering switching are likely to perceive this as a 'hassle' that would discourage them, while users who switch are likely to incur time costs learning to adapt to a different device.[157]

3.94 The extent to which learning costs deter switching may depend on, for example, users' confidence in drawing on available tutorial information and their broader digital literacy. Some users may not consider learning costs a deterrent to switching, while they may be a significant deterrent to those least confident in their ability to adapt to a new device.

3.95 Our survey found that, in 2022, 31% of iOS Marginal Users and 21% of Android Marginal users stated that they did not want to spend time learning how to use an alternative operating system as one of reasons why they did not switch device.[158] In addition, 34% of iOS Marginal Users and 16% of Android Marginal Users felt that 'it would be too much hassle to switch to an

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[154] Non-Switchers include both Marginal Users and Non-Considerers. 11% of all Switchers (in either direction) found the switching experience fairly difficult or very difficult and only 5% were very dissatisfied or fairly dissatisfied with the overall switching journey. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 36 and 37.
[155] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Page 31.
[156] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Page 67.
[157] Learning costs were also identified as a barrier to switching in the following enforcement decisions and market studies: European Commission, Commission Decision of 18 July 2018: Google Android, recitals 523, 524, 527; the Netherlands Authority for Consumers & Markets, Market study into mobile app stores, p. 55; Australian Competition & Consumer Commission, Digital platform services inquiry, Interim report No. 2 – App marketplaces, p. 38.
[158] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are even higher for Non-Considers, with 41% of iOS users and 29% of Android users mentioning not wanting to spend time learning how to use another operating system as a reason for not switching. Furthermore, for all iOS users that did not switch operating system, for 11% learning costs was the most important driving factor and the third most important reason for not switching overall (out of 18). For all Android users that did not switch operating system, for 6% learning costs was the most important driving factor and the sixth most important reason overall (out of 18).

Android phone/iPhone'.[159] When instead considering Switchers, we find that only 7% were very dissatisfied or fairly dissatisfied with the experience of using a new app store and only 3% with using a new operating system.[160]

3.96 In the round, the available evidence suggests that the learning costs associated with adapting to the different controls, functionality and features of an operating system create perceived barriers to switching, deterring users from switching operating system. Survey evidence suggests that these barriers are perceived more widely among iOS than Android users. However, this is rarely reported as a problem in practice for those consumers that have switched operating system when purchasing their current device. This may be because users' perception of the challenges associated with learning how to use a new operating system are overstated or because those who are less confident in learning a new operating system are less likely to switch.

Transferring data and apps across devices

3.97 There are different tools available to transfer data held by apps and services (such as contacts, photos and videos, text messages and in-game progress) and data about which apps a user had installed on their prior device when switching from an iOS to an Android device, or vice-versa.[161]

3.98 Views from market participants suggest that content is usually readily available after the switch is finalised and the transferred data is then easily accessible to users on their new phone.[162]

3.99 However, the extent of the data which can be transferred may vary. For example, while the available cable options offered to users switching away from iOS are broadly similar in scope to the 'Switch to iOS' app in the other direction (for example in terms of the extent of which data and apps can be transferred),[163] this is not always the case for wireless and cloud-based options.[164] We heard these limitations are in place because Apple does not

[159] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are slightly lower for iOS Non-Considers, at 22%. Figures are slightly higher for Android Non-Considerers, at 19%.
[160] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 39.
[161] As described in Appendix D, these include third-party apps as well as apps and other options offered by manufacturers and operating system providers
[162] For details, see Appendix D.
[163] For details, see Appendix D.
[164] For example, according to Google, the data that can be transferred using the cloud includes contacts, calendar events and photos and videos. The following data do not currently transfer when using a wifi solution: free apps, message history, call history, display and accessibility settings, home screen layout, and email accounts. See Appendix D.

offer necessary APIs to enable third-parties' direct wifi switching option to transfer these data.

3.100 Our survey found that, in 2022, 38% of iOS Marginal Users and 14% of Android Marginal Users stated that they were concerned about losing data when switching operating system as one of reasons why they did not switch device.[165] Among Switchers, we find that 13% were very dissatisfied or fairly dissatisfied with the process of transferring data from their old phone, 17% with transferring music and 8% with accessing apps from the old phone to the new phone.[166]

3.101 On balance it appears that a significant number of users are concerned that it may be difficult or impossible to transfer data such as contacts, messages, and passwords, as well as apps, to a new device. While some users may feel confident using guidance, switching apps and tools to manage this process, others will not and may find that these approaches do not transfer all the data that they require to their new device reliably. This is likely to discourage switching or impose, for example, time costs on switchers as they resolve any resulting issues.

3.102 Our survey data indicates that iOS users in particular perceive that switching could impose such costs, and, because of concerns around transferring data and apps after switching, a large proportion of iOS users are deterred from switching operating system. We find that this perception is weaker among Android users.

Managing subscriptions across devices

3.103 Some app developers suggested that policies in relation to the use of Apple's and Google's proprietary systems for in-app purchases may cause some users to have to repurchase or resubscribe to paid-for apps and in-app content after switching.

3.104 App developers also stated that users still may not be able to manage (eg upgrade or cancel) pre-existing subscriptions to paid-for apps and in-app content after switching to a device that uses a different operating system,

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[165] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are slightly lower for iOS and Android Non-Considers, at 28% and 10%, respectively. Further, for all iOS users that did not switch operating system, for 10% concern about losing data when transferring to Android when was the most important driving factor and the fourth most important reason for not switching overall (out of 18). For all Android users that did not switch operating system, only for 1% concern about losing data when transferring to Android when was the most important driving factor and the ninth most important factor overall (out of 18).
[166] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 39.

even if they have recovered access to their paid-for in-app content. As such, a user may need to cancel subscriptions on their prior device before switching and re-purchasing them.

3.105 Our survey found that, in 2022, 12% of iOS Marginal Users and 2% of Android Marginal Users stated that they were concerned about losing paid-for subscriptions and content in apps after switching.[167] Notably, no one referred to concerns over losing paid-for subscriptions and in app content as the most important reason for not switching. Yet, we note that in 2021, only [10-20]% of iOS users had at least one subscription to a third-party app though this has been increasing over time.[168] As such, while the current evidence suggests only a small proportion of users perceived this as a barrier to switching, its impact may increase if subscriptions continue to grow.

3.106 When instead considering Switchers, we find that only 13% were very dissatisfied or fairly dissatisfied with at least one between accessing paid-for subscriptions on their new phone and managing subscriptions after switching.[169] Again, given only [10-20]% of iOS users have at least one subscription to a third-party app, this might be a greater actual concern for the subset of users with a subscription.

3.107 In summary, the evidence gathered suggests that most users do not perceive managing subscriptions across devices after switching operating system as a barrier to their switching decision. Only a small proportion of survey respondents (including both Marginal Users and Non-marginal Users alike) referred to concerns on losing paid-for subscriptions and in-app content as a reason for not switching. Furthermore, the survey evidence suggests that most users are satisfied with the process of managing and accessing paid-for subscriptions when switching. In practice, this finding may be in large part down to the fact that currently only a fairly small proportion of switchers are likely to have subscriptions.

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[167] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are slightly lower for iOS Non-Considers, at 5%, and slightly higher for Android Non-Considerers, at 3%.
[168] This is calculated as the ratio between all consumers with at least a subscription to a third-party app (snapshot at December 2021) and the total number of iOS transacting accounts in 2021.
[169] This is calculated considering everyone that was very dissatisfied or fairly dissatisfied with at least one between (i) accessing paid-for subscriptions on their new phone, and (ii) managing subscriptions after switching. These are 20 users out of a total of 153 users that switched operating system when purchasing their current phone.

The availability and characteristics of first-party apps, services and other devices.

3.108 We received a range of evidence and views from stakeholders on whether the availability and characteristics of first-party apps, services and devices could pose barriers to switching.

3.109 Some parties highlighted that almost all of Apple's first-party apps and services (including eg iMessage) are unavailable on Android devices.[170] Thus iOS users would lose access to them on their mobile device if they switch to Android. By contrast, Google makes many of its core first-party apps and services available to iOS users.

3.110 We also heard concerns that users of multiple Apple devices may lose access to shared functionality between first-party apps, services and other devices (including connected devices). For example, we understand that some first-party connected devices (eg Apple Watch) cannot be used in conjunction with Android devices, while some apps and connected devices offer limited functionality when used on or with Android devices (eg AirPods).

3.111 Users may also take account of how Apple devices may offer a better quality of experience than Android devices when interacting with Apple devices owned by friends or family. The features of iMessage may also make using a new Android device harder.

3.112 Our survey found that, in 2022, 44% of iOS Marginal Users stated, as a reason for not switching, 'because I have other devices linked to my phone/operating system (iOS)'[171] – this is the most frequently quoted reason for not switching.[172] [173] Other devices are less important for Android users – 17% of Android Marginal Users mentioned other devices as a reason why they did not switch.[174]

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[170] Apple stated that only Apple Music, Apple TV+, DarkSky Weather and Shazam are available as apps across a range of non-iOS devices (however we note that DarkSky Weather is not available on Android). Apple stated that it makes Apple TV+ and Apple Music available across a range of non-iOS devices because users expect them to be available in this way. iOS apps and services not available on Android (alongside DarkSky Weather) include the App Store, Apple Arcade, Apple Books, Apple Pay, Apple News+, iTunes Store and iMessage.
[171] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are slightly higher for iOS Non-Considers, at 52%.
[172] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 28.
[173] The survey also finds that compatibility with other personal smart devices is the fourth (out of 12) most important reason for users purchasing an iOS device. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 6.
[174] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. As set out in Appendix D, these percentages are slightly higher for Android Non-Considers, at 26%. Further, other devices are quoted as the most important reason for

3.113 When instead considering Switchers, we find that only 8% of all users are very dissatisfied or fairly dissatisfied with the process of connecting to other devices post-switch.[175] However, survey results also suggest that users switching away from iOS have a lower proportion of iOS devices compared to other Apple users and that users switching away from Android have a higher proportion of iOS devices compared to other Android users.[176] This is consistent with other devices being a pull factor towards the iOS ecosystem and might explain why switchers do not see other devices as an actual barrier.

3.114 Family and friends using the same operating system is also often referred to by users as a reason why they decide not to switch. This is particularly the case for iOS users, with 33% of iOS Marginal Users mentioning 'my friends and family use the same OS' as reason for not switching.[177] In contrast only 7% of Android Marginal Users referred to friends and family using Android as a reason for not switching.[178]

3.115 Finally, considering the availability of first-party apps, our survey evidence suggests that this is not seen as reason for not switching by the majority of users. Only 9% of iOS Marginal Users and 10% of Android Marginal Users quoted 'iOS/Android has access to a wider range of mobile apps' as reason for not switching.[179] Only 9% of iOS Marginal Users and 6% of Android Marginal Users refer to 'I use apps not available on Android' as a reason for not switching.[180]

3.116 In the round, we consider that the availability and characteristics of other devices and family and friends using the same operating system pose significant perceived barriers to switching, particularly for users switching from iOS to Android. Given the high proportion of iOS users that own multiple

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not switching by 3% of all Android users – for 6% and 3% they are the second and third most important reason, respectively. Overall, they are the eighth most important reason for not switching (out of 18).

[175] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 38.

[176] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Pages 34 and 35.

[177] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. This figure is slightly lower for Non-Considerers at 32%. For 19% of all iOS users, this was either the first (5%), second (7%) or third (7%) most important reason. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 28.

[178] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. This figure is slightly higher for Non-Considerers at 9%.

[179] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18. This is slightly lower for iOS Non-Considerers at 6% and slightly higher for Android Non-Considerers at 18%.

[180] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Table 18.

Apple devices[181] and the potential replacement cost of devices such as smart watches, this barrier is likely to affect significant numbers of users.

3.117 However, our survey evidence also found a lack of user concerns regarding the loss of access to Apple's first-party apps. This outcome is UK-focused and could indicate that UK users are accustomed to using alternatives (eg WhatsApp), unlike in other countries where iMessage or FaceTime may be locking users into iOS.

Conclusion

3.118 The evidence received throughout this study suggests that the supply of mobile devices and operating systems has segmented broadly into two groups – higher-priced devices and lower-priced devices.

3.119 Apple's offering targets higher-priced devices and, while Android devices are available in this segment, they do not appear to impose a strong competitive constraint on Apple.

- We found that iOS smartphone devices account for 77% of devices sold for over £300 in 2021.
- We also found that, in relation to higher-price devices, users are loyal to Apple, are less concerned about device prices and face material perceived barriers to switching. In contrast, while Android users appear to face lower perceived barriers to switching, they care more about the price of devices and are therefore unlikely to 'trade-up' and switch to a higher-priced device.

3.120 As Apple does not supply lower-priced devices, Android devices dominate this segment and face limited effective competition.

- We found that there were no iOS devices sold for £300 or less in 2021, meaning Android smartphone devices account for 100% of devices sold for £300 or less in 2021. As these users are more price sensitive, they are unlikely to trade up, reinforcing the limited effective competition iOS devices impose within this segment.

[181] For example, our survey indicates that 83% of iPhone users have at least one other Apple product. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Page 34.

- In addition, our survey also shows that only less than 10% of iOS users purchased their iPhone used or were gifted a used iPhone, suggesting limited competition from used iOS devices within this segment.[182]

3.121 We also found that users rarely switch between iOS and Android devices. Low switching rates could be driven by a number of factors, including barriers to switching, consumer disengagement, satisfaction with the characteristics of Android and iOS devices and brand loyalty. In particular, we found that there are material perceived barriers to switching. These include: (i) learning costs; (ii) barriers relating to the transfer of data and apps across devices; and (iii) barriers relating to losing access to other devices (including connected devices) and having a worse experience of interacting with friends' and family's devices. The perceived barriers to switching are also higher among iOS users than Android users.[183]

3.122 Finally, we also found that Apple has been able to earn a return on capital employed on its devices that is well above any normal benchmark over the last five years. While Google does not directly monetise Android, Google uses Android devices to support its highly profitable search advertising business and its increasingly important app store business.

3.123 When considered in the round, this evidence demonstrates there is limited effective competition between iOS and Android devices. We expect the lack of effective competition faced by Apple's iOS devices and Google's Android devices allows Apple to charge above a competitive rate for its devices or supply a lower quality of operating system and devices and allows Google to supply a lower quality of operating system.

Competitive constraint from potential entry or expansion

3.124 We have also considered the extent to which Apple or Google are constrained by the threat of entry or expansion by competing suppliers of mobile devices[184] or operating systems.

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[182] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, accompany Data Tables, 'Q.4 How did you get your current personal smartphone?

[183] While the actual barriers to switching appear to be lower than the perceived barriers, just over a third of users that had switched operating system were dissatisfied with at least one aspect of the switching journey. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Page 67.

[184] This is because users may switch based on hardware factors (ie the device) as well as software features (ie the operating system) such that if a new device manufacturer entered it could in theory constrain Apple if it attracted users based on its hardware offering. Such a new entrant may also constrain Google to the extent it used either an alternative version of Android or an entirely different operating system.

3.125 We set out the demand-side and supply-side barriers faced by potential entrants below. The evidence suggests that, while the barriers faced by suppliers of mobile devices are not insurmountable, new entrant mobile operating systems face significant barriers to entry and expansion and therefore do not exert a material competitive constraint.

3.126 This is illustrated by the exit or unsuccessful entry of well-resourced companies in smartphones such as Microsoft and Amazon. The presence of barriers to competition is also shown by the difficulties faced by those using versions of Android without Google Mobile Services – for example, Huawei's share of new sales declined materially after it could no longer access Google's apps and services, including Google Mobile Services.[185]

Barriers faced by suppliers of mobile devices

3.127 Manufacturers have told us that new suppliers of mobile devices face demand and supply side barriers to entry and expansion.[186] However, these barriers do not seem insurmountable if manufacturers are willing to use the Android operating system which, as outlined above, is the only licensable operating system in the UK. For example, Huawei is an example of a relatively new entrant in the UK that was able to grow to have a material share in the UK – peaking at [0-10]% of active smartphones in 2019 as can be seen in Figure 3.1 above.[187]

3.128 However, if a new supplier entered using the Android operating system, then this would not place a constraint on Google at the operating system level. In addition, it is not clear that such new entrants are exerting a material constraint on Apple given, as set out above, we have found there is limited effective competition between iOS and Android devices.[188]

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[185] The existence of barriers to entry in the supply of mobile operating systems is also consistent with evidence from [an Android device manufacturer], which highlighted the costs and uncertainty associated with developing mobile operating systems.
[186] These included: (i) economies of scale in the manufacturing process; (ii) upfront and ongoing R&D costs that are needed to develop and maintain innovate mobile devices to attract users; (iii) ensuring the device comes with a wide variety of apps and services; and (iv) brand loyalty to existing brands, especially as the high level of device ownership means growth can most easily be achieved by attracting existing users from another brand.
[187] Other new entrants such as Xiaomi, OPPO and OnePlus were also identified by manufacturers, but so far appear to have a fairly small share in the UK. In 2021 their shares vary between 1% and 2.5% of active smartphones in the UK based on Statcounter data. See Mobile Vendor Market Share United Kingdom | Statcounter Global Stats last accessed on 6 June 2022.
[188] For example, manufacturers also identified existing brand loyalty and barriers to users switching as barriers to entry and expansion. As outlined above, iOS users are less likely to switch operating system than Android users, place more value on brand and also face higher perceived barriers to switching.

Barriers faced by suppliers of mobile operating systems

3.129 In this section we consider the barriers faced by potential suppliers of mobile operating systems. In particular, we consider barriers arising from:

- the development and maintenance of the underlying software needed for a mobile operating system;
- the need to attract users and app developers to use an operating system (ie indirect network effects); and
- the need to attract manufacturers to adopt an operating system.

3.130 Overall, we consider that new entrant operating systems face material barriers to entry and expansion for the reasons outlined below. These barriers generally reinforce each other and are also reinforced by the material perceived barriers to user switching outlined above, which make it more difficult for any new entrant to attract users away from their existing operating system.

The development and maintenance of a mobile operating system

3.131 There are significant economies of scale to providing a mobile operating system. Developing a completely new operating system requires significant time and financial resources, and maintaining it so that it stays competitive (eg via frequent updates and improvements) is also very resource intensive. Moreover, attracting users, developers and manufacturers requires significant marketing efforts.[189]

Indirect network effects

3.132 As outlined above, operating systems exhibit indirect network effects – the benefit to users of an operating system increases with the volume and quality of native apps they can access on that operating system, and similarly the benefit to app developers increases with the number of users they can access on an operating system.

[189] The existence of such economies of scale was confirmed by operating system providers. For instance, Huawei told us that there are barriers to entry and expansion in the provision of mobile operating systems, including the need for long-term technical efforts and substantial financial investment and Amazon told us it invested significant time and resources in the development of Fire OS, the devices that run it, and the apps that run on it. In addition, Apple told us that the investments it has made in iOS have amounted to 'billions of dollars' and that '[a] material part of these costs is fixed and unlikely to vary much with the number of users/app developers.'

3.133 The presence of indirect network effects acts as a particular barrier to new entry and expansion as it creates a 'chicken and egg' problem – an operating system needs a critical mass of users to attract app developers, but also need a critical mass of app developers to attract users.

3.134 As set out in Chapter 4, evidence indicates that many app developers, particularly the most popular app developers accounting for the majority of downloads, make their native apps accessible on both iOS and Android. This means that iOS and Android benefit from large indirect network effects.

3.135 These indirect network effects act as a significant barrier to entry and expansion for alternative mobile ecosystems who cannot offer the same app ecosystems and so struggle to attract users and app developers.[190] As set out below, this is also compounded by a lack of access to Google Mobile Services.

3.136 In theory, web apps and cross-platform development tools could mitigate indirect network effects to some extent. This is because both tools allow app developers to make their content available across operating systems without developing multiple native apps. If widely adopted these could make it easier for new entrants to quickly gain access to a large volume of quality content without relying on app developers incurring the costs of developing native apps.

3.137 However, we do not consider this to the be case at present:

- Chapter 5 sets out how web apps are not currently comparable to native apps in terms of features, functionality or performance, though we understand this is to a large extent due to restricted functionality available through Apple's WebKit browser engine. Therefore, only attracting web apps as a form of providing content is not currently an option for new entrants, and as such the functionality of Apple's WebKit browser engine reinforces the position of Apple and Google in mobile operating systems.[191]

- Chapter 4 sets out how currently app developers appear to prefer developing separate native apps for each operating system to using

[190] Other mobile operating system providers submitted that obtaining a wide range of native apps, including the most popular and successful native apps, can be very difficult for new operating systems, creating a significant barrier to entry.
[191] As discussed in Chapter 4, several technical experts have put to us that one of the main benefits of web apps is the ability to make a single app available through browsers on all operating systems (rather than producing a separate native app for each operating system). Therefore, the limited support for web apps on iOS devices is also likely to impact on the viability and use of web apps on Android devices.

cross-platform tools[192] for several reasons, including that they consider native apps are better optimised for each operating system. In addition, cross-platform tools would only facilitate entry if they widened their product offering to include a new operating system.

Attracting manufacturers

3.138 Any new operating system would either have to also manufacture its own devices (ie use an integrated model like Apple) or license its operating system to third-party device manufacturers (or do both as Google does). All of the manufacturers currently licensing an operating system in the UK use Google's version of Android.[193] We set out below why new entrants are unlikely to be able to attract these manufacturers away from Google's version of Android.

3.139 In doing this we first set out manufacturers' agreements with Google and in that context, we then consider barriers arising from:

- financial incentives offered by Google to device manufacturers; and
- the lack of access to Google Mobile Services for new entrants not using Google's version of Android.

3.140 In summary, most manufacturers use Google's version of Android for their devices given it is widely used by both users and app developers and required for accessing Google's popular apps, including the Play Store, and a number of APIs on which many native Android apps rely to function properly. Furthermore, as explained in Appendix E, there are significant financial benefits associated with compliance with certain promotion and placement requirements in relation to Google apps in Google's agreements with manufacturers, which further reduce manufacturers' incentive to switch away.[194]

3.141 As a result, we consider that new entrant operating systems, including those using versions of Android that do not use Google Mobile Services, would find

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[192] As discussed in Chapter 4, Google has a cross-platform tool called Flutter. See Beautiful native apps in record time | Flutter.
[193] Based on the information available. Other operating systems are used only in first-party devices by Apple, Amazon and Huawei as far as we are aware.
[194] We have also received evidence that Google's Anti-Fragmentation Agreements historically prevented manufacturers from using alternative operating systems. These Anti-Fragmentation Agreements were deemed to be anti-competitive by the European Commission in its Android Decision as they hampered the development of Android Forks and have now been replaced by the ACC. In the Android Decision the provisions considered to be problematic were those that obliged manufacturers not to fork Android and not to distribute any devices using Android Forks alongside devices running on Google-compatible versions of Android. In contrast, under the ACC in the UK and EEA manufacturers can distribute Android Forks alongside compatible versions of Android (subject to certain branding requirements). European Commission decision of 18.07.2018 - Case AT.40099 - Google Android, paragraphs 1036 (3) and 1076 (currently on appeal).

it very difficult to attract manufacturers away from the Android operating system in order to enter and compete with Apple and Google.

- *Context: Google's agreements with manufacturers*

3.142 Google has a series of agreements with manufacturers of Android devices – our understanding of the hierarchy and relationship between these agreements is set out in Figure 3.8 below.

3.143 First, Google licenses the 'Android' trademarks to manufacturers to use on mobile devices conditional on those mobile devices meeting Google's compatibility criteria.[195] Manufacturers which then want to license any of Google's other apps and services relating to the Android operating system need to enter Google's Android Compatibility Commitment (ACC) under which they agree to maintain compatibility with a baseline version of Android.[196]

3.144 Second, Google allows manufacturers to license Google Mobile Services (GMS), a collection of popular Google apps including Play Store, Google Maps, YouTube, and Gmail as well as Google Play Services, a set of proprietary features, functionalities, and APIs that can be included in apps developed for Android devices which use GMS.[197] If a manufacturer wants to pre-install one of Google's apps included in the GMS suite then the manufacturer has to pre-install all of them and place the Play Store on the default home screen and the rest of the apps in a 'Google' folder on the default home screen.

3.145 As noted above, the GMS suite includes the Play Store which is an important app, as through this, manufacturers can provide users with access to a large volume of native Android apps which, as set out in Chapter 4, cannot currently be replicated by other Android app stores. In addition, GMS also includes a number of Google's apps and proprietary APIs that are important for ensuring that many native Android apps operate as they should do as outlined below.[198]

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[195] See Android Brand guidelines and Android Compatibility Program Overview | Android Open Source Project.
[196] These conditions are set out in the Compatibility Definition Document (CDD) and set out in more detail in Appendix E. Google told us it sought compatibility commitments when Android was nascent and the CDD's compatibility requirement incentivised developers to write apps for Android, improved the availability and reliability of Android apps and enabled Android to compete better with iOS and other operating systems to attract developers.
[197] As detailed in Appendix E and Chapter 4, the APIs included in Google Play Services are updated via the Play Store.
[198] As explained in Appendix E, Google Play Services APIs allow third-party developers to make use of basic features and functionalities such as push notifications, location, advertising or security services, to communicate with Google's first-party services (such as Google Maps, Search, Gmail, and Translate on Android) and create rich features compatible with Android. Further, Google apps rely on some of these APIs to work properly.

3.146 GMS is licensed through the European Mobile Application Distribution Agreement (EMADA) and entering the EMADA is conditional on the manufacturer using a compatible version of Android and entering Google's ACC. Manufacturers also need to pay a license fee per activated device as set out in Appendix E and we understand from Google that it receives revenue from this EMADA license fee and incurs costs through its Placement Agreements as described below. As set out in Appendix E, data from Google shows that in 2020 and 2021 payments made under the Placement Agreements were slightly larger than the license fees revenues generated under the EMADA.

3.147 Third, Google allows manufacturers in the UK to separately license Google Search and the Google Chrome browser. Licensing these two apps is conditional on the manufacturer entering Google's ACC, thus using a compatible version of Android, and the EMADA.

3.148 Fourth, Google offers EMADA partners payments, both fixed payments per activated device and revenue shares. These payments are conditional on the manufacturer entering the EMADA (and thus the ACC) and compliance with certain requirements in relation to Google apps such as Google Search, Google Chrome and (in some cases) the Play Store.

3.149 Payments from Google to device manufacturers are made through the following agreements:

- **Placement agreements**: these are per-device 'activation payments' for each device on which manufacturers pre-install the Google Search or Google Search and Chrome apps and satisfy certain placement obligations for either Google Search or both. If manufacturers pre-install and comply with the placement requirements in respect of Google Chrome in addition to Google Search they earn a substantially larger payment per device.

- **Revenue sharing agreements:**

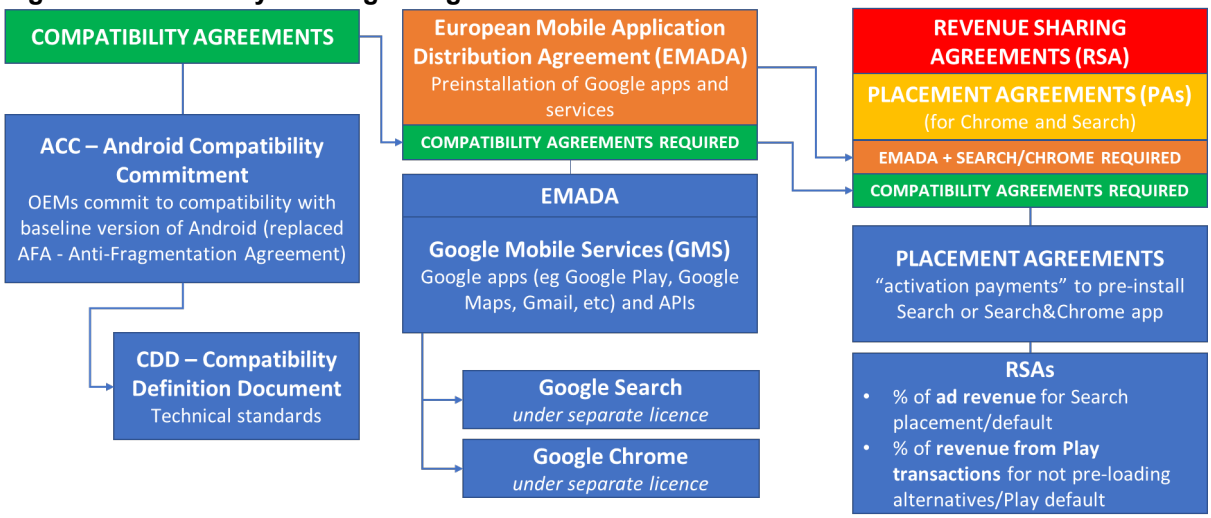
  - Google shares a proportion of net advertising revenue from specific search access points on manufacturers' devices in return for meeting a number of placement and promotion requirements relating to Google's apps including Google Search and Google Assistant such as setting the Google Search app as the default search engine on all

preloaded manufacturer browsers.[199] The proportion of revenue shared with the manufacturer increases the more requirements that are met by a device.

– Google shares a proportion of net revenue from Play Store transactions where devices meet certain additional requirements in relation to the Play Store, namely setting the Play Store as the default app store and not preloading similar services, such as alternative app stores, on those devices.

3.150 The exact proportion of revenue Google shares with manufacturers via its Revenue Sharing Agreements usually varies by manufacturer.[200]

Figure 3.8: Hierarchy of Google's agreements with manufacturers



Source: CMA analysis

3.151 Google told us that 'RSAs reflect the normal competition' between apps (and app stores) to seek promotion on manufacturers' devices. It also told us that this competition better enables manufacturers to 'monetise the screen space on their devices' and thus leaves them with 'more funds to invest in new and improved handsets (or to facilitate lower prices)' and to 'offer a user interface that competes closely with Apple's "clean" out-of-the-box set-up'.

3.152 In the following sub-sections we detail how these agreements and financial incentives lead to barriers to entry for new operating systems. We set out the impact they have on competition in native app distribution in Chapter 4,

[199] Google told us that third-party browsers (as opposed to manufacturer browsers) can have non-Google search services set as default instead, provided that they are not placed on the default home screen (unless in a folder) or the minus one screen. Google also told us that after the EC's decision in *Google Android* the default search service in Chrome is set according to the Android choice screen mechanism that applies in the UK and EEA.
[200] See Appendix E.

competition between browsers in Chapter 5 and competition between app developers in Chapter 6.

- *Barriers arising from financial incentives offered by Google to device manufacturers*

3.153 Google's revenue share agreements all include setting Google Search as the default search engine on all preloaded manufacturer browsers. This allows Google to generate revenue from selling search advertising, which it then shares with manufacturers.

3.154 As outlined above, the revenue Google generates from the EMADA license fee is lower than the cost it incurs through the Placement Agreements, meaning that together they represent a net cost for Google. This, combined with the revenue sharing agreements it has in place with manufacturers means that **Google effectively pays device manufacturers to use its operating system.** As such it would be unlikely for a new entrant to be able to charge a fee for its operating system and entry would only be rational if the new entrant could monetise the operating system in another way, for instance, through monetising the default position at search access points. However, due to the strength of Google's position in search engines and search advertising, Google is better able to monetise and can profitably make significant payments to manufacturers that new entrants are unlikely to be able to replicate.

3.155 Google is able to use its market power in search engines and search advertising[201] in order to protect its position in mobile operating systems. This in turn allows it to reinforce its position in search and search advertising. In particular:

- The revenue sharing agreements via which Google shares its search advertising revenue with manufacturers are conditional on them using a compatible version of Android and licensing Google's apps and APIs included in GMS (including the Play Store) which are important for ensuring that many native Android apps operate as they should. This ensures that manufacturers only receive a portion of Google's revenue if

[201] In the Online Platforms and Digital Advertising Market Study the CMA found: (i) Google has significant market power in the general search sector, having had a share of supply of around 90% or higher in the UK for more than a decade, and in search advertising, where it accounts for over 90% of search advertising revenues. (ii) Google's market power in search advertising has allowed it to charge higher prices to advertisers than its competitors – on a like-for-like basis, Google's prices are on average [30-40]% higher on mobile devices than its main rival Bing. (iii) Having been by far the largest search engine for more than a decade, Google benefits from higher perceived quality among many consumers, can generate more search advertising revenues from a given default and is able to pay more for default positions than other search engines. See Online Platforms and Digital Advertising market study, Final report (publishing.service.gov.uk), pages 73 and 211 and paragraph 3.149.

they use Google's version of Android and a core set of Google's apps, (including the Play Store) are pre-installed on their devices.

- Google's extensive pre-installation and default positions act as a significant barrier to expansion for rival search engines, by limiting their ability to access consumers, build their scale and grow into stronger competitors over time.[202]

- The revenue sharing agreements also reinforce Google's position in search advertising. This is because manufacturers' use of Android allows Google to access extensive first-party data which is likely to give it a substantial advantage over smaller rivals in advertising, creating a barrier to entry and expansion.[203]

3.156 Given that rivals are unlikely to be able to replicate the payments Google makes to manufacturers, switching away from Android would entail manufacturers missing out on significant financial benefits from pre-installing and meeting certain requirements in relation to Google's apps (which are all very popular with users).

3.157 In addition to the costs associated with foregoing Google's revenue sharing agreements, manufacturers would incur further costs when switching away from Android. Specifically, manufacturers incur certain 'integration costs' when optimising their devices for a new operating system.[204]

- *Barriers arising from the lack of access to GMS*

3.158 The indirect network effects between users and app developers (see above) mean that the value of an operating system to a manufacturer increases with the number of users of that operating system and the volume and quality of native apps available from app developers.[205] In particular:

- While an alternative operating system may be able to replicate some of the factors users care about (eg in terms of the features and functionality

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[202] See also Online Platforms and Digital Advertising market study, Final report (publishing.service.gov.uk), paragraph 3.149.
[203] For example, Google can access extensive data on user location, including through Android smartphones, on which half to two thirds of users have location services activated; this allows search advertising to be more effectively targeted based on location. See Online Platforms and Digital Advertising market study, Final report (publishing.service.gov.uk), paragraph 5.60.
[204] That is, costs involved in making sure their devices work with a specific operating system. This is illustrated by [✂].
[205] For example, Huawei told us that '[a]s the number of users of an operating system increases, this increases the value of that system to other users, [manufacturers] and app developers.' In addition, Huawei said that the number of app developers determines the scale of the operating system's ecosystem, with more developers leading to a richer ecosystem improving the user experience and thus number of users and also increasing the attractiveness of the operating system to manufacturers.

they offer) if it only offers users a limited app selection then it is less attractive to users and in turn to manufacturers.[206]

- Similarly, while factors that app developers care about could be matched by rival operating systems (eg in terms of development tools) if an alternative operating system is only used by a lower volume and value of users then it is less attractive to developers and in turn to manufacturers.[207]

3.159 This means that Android is highly attractive to manufacturers as:

- a large number of users are familiar with it – in the UK in 2021 there were [30-40] million active Android smartphones and [5-10] million active Android tablets; and

- it provides easy access to a large volume of native apps, including the most popular and successful native apps – in the UK in 2021 there were [900,000-1,000,000] app developers making a total of [3-3.5] million native apps available on Android devices through the Play Store.

3.160 Other than Apple's iOS, which Apple does not license to third parties, no other mobile operating system could provide manufacturers with access to such a large number of users or such a large volume of native apps, including the most popular and successful native apps.

3.161 In theory, the fact that Android is open source and can be used to start a new operating system makes entrants using a version of Android better placed than other new entrants to overcome this barrier and a more credible option for manufacturers. However, Google's agreements set out above are a barrier to this.

3.162 Specifically, the licence of Google Mobile Services (which encompasses key Google apps and Google Play Services APIs), is conditional on the manufacturer using a compatible version of Android. This has two important implications.

3.163 First, it means that Android Forks do not have access to Google's popular native apps.[208] Manufacturers told us that the availability of popular apps, and

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[206] A limited app selection makes an operating system less attractive to manufacturers as they would themselves find it harder to attract users to their devices.
[207] The fact that an operating system is used by low volume and value of users makes it less attractive to manufacturers as they would find it harder to ensure their devices provide access to a larger volume of high native apps, including the most popular and successful native apps.
[208] Although they are still available through web browsers.

in particular Google apps, ideally pre-installed 'out-of-the box', is an important success factor for a given mobile operating system.[209]

3.164 In relation to these apps, Google told us that it does not license its native apps for mobile devices that use version of Android which fail to meet its compatibility requirements, but that they are accessible through web browsers on such devices. Google said that this was because there is a material risk that its apps would not run properly on such devices and that this would harm its reputation.

3.165 Second, GMS also includes Google Play Services a set of proprietary features, functionalities, and APIs that can be included in apps developed for Android devices which use GMS. The importance of Google Play Services means that many Android apps would not work properly on versions of Android not using GMS.

3.166 As set out in Chapter 6, APIs are technological specifications that enable app developers to gain access for their apps to the mobile device's hardware features, such as a camera or location services, or to particular services and other apps installed on the device. On Android devices, some of these APIs are housed in the Android open-source code and some in GMS. Google estimated that, as of April 2022, [70-80]% of apps available on the Play Store use at least one Google Play Services API.[210]

3.167 Where relevant APIs are housed in GMS it means that, to access relevant hardware or services, native Android apps have to integrate with Google's apps (eg to provide mapping functionality based on Google Maps) and/or Google's APIs (eg to provide push notifications). Where this is the case such features and functionality do not work on devices running versions of Android that do not use GMS.

3.168 This means that many native Android apps relying on APIs included in Google Play Services for certain functionalities may not function properly on versions of Android without GMS pre-installed. Consistent with this we understand from

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[209] For example, Samsung told us it stopped using Microsoft Windows OS because consumers were increasingly familiar with Android and expected it, 'as well as the huge range of apps and functionalities offered by the wider ecosystem' which Microsoft Windows 'could not match; As noted above while Huawei uses a version of Android that meets Google's compatibility requirements, US legislation in May 2019 means that Huawei can no longer access Google's apps and services, including Google Mobile Services. Huawei provided a research report according to which the absence of Google Mobile Services (GMS) and the Play Store was a significant factor in the perception of success of its products by customers; Amazon told us that customers expect a certain 'out of the box' experience with popular and desirable apps pre-installed on their device and that some of the most popular apps are Google apps such as Google Maps and YouTube, which are included in the GMS suite.

[210] Google told us that while many third-party Android apps use at least one Google Play Services API, this is not a good indication of the effort/costs a developer would need to incur to port their app to an Android device that does not include Google Play Services.

Google[211] and others[212] that having GMS installed is needed to ensure that both Google apps and many third-party Android apps work properly on that device.[213]

3.169 Given the importance of GMS, including Google Play Services, to the functioning of Android apps, alternative operating system providers would need to replicate the APIs contained within GMS in order to successfully compete and this would require substantial financial investment.

3.170 Google submitted that developing similar APIs to those contained in GMS is expensive but not insurmountable for manufacturers or operating system providers that do not want to preinstall Google Play Services on their devices. However, it also submitted that it invests millions of pounds every year in developing and maintaining Google Play Services and that the cost of developing versions of Google's first-party apps that do not depend on the presence of Google Play Services or the Play Store could be significant.[214]

3.171 Moreover, to the extent that the gap between the features and functionalities offered by the APIs in Android Open-Source Project and the APIs in Google Mobile Services increases over time, the investment needed would also increase and it would become even more difficult for app developers to port their apps to Android Forks or other versions of Android not using Google Mobile Services.

3.172 Finally, even after having replicated such APIs, alternative providers would still face significant challenges to attract developers given the additional cost developers would need to incur to integrate with such new set of APIs.

3.173 Google said that whether or not a device manufacturer chooses to license GMS on top of Android does not alter the availability of Android or any of its features. However, we understand that devices that include the proprietary

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[211] See Appendix E.
[212] For example, Huawei told us that its smartphones sales revenue dropped [materially for both smartphones and tablets] between 2019 and 2020. According to Huawei, this was primarily attributable to the lack of availability of apps that rely on GMS on newer models of Huawei smartphones and tablets. These apps were not available as from May 2019 Google Mobile Services could not be pre-loaded on these Huawei devices nor downloaded after purchase. Huawei's sales decreased further in 2021 when compared to 2020 and Huawei again told us this was due to the lack of access to Google Mobile Services as well as other factors.
[213] Further and as outlined above, Amazon's Fire Phone was launched in the UK in September 2014, but exited smartphones a year later. The Fire Phone used Amazon's Android Fork Fire OS and it has been reported that the inability to offer the GMS suite of apps, made it difficult for its Fire Phone to successfully compete. See Amazon Fire Phone UK Release: Handset launches today | Trusted Reviews, Amazon stops selling Fire smartphone - BBC News Amazon Fire Phone: Why It Failed to Take Off | Time, Fire Phone one year later: Why Amazon's smartphone flamed out - CNET and Why did the Amazon Fire Phone Fail? - HubPages.
[214] As detailed in Appendix E, Google told us that its first party apps and Google Play Services rely on the presence of the Play Store on the device to act as their 'trusted updater' and updates to third-party applications follow the same mechanism. Moreover, the Play Store itself also includes specific APIs which developers can use for certain functionalities.

APIs in Google Play Services tend to have access to more up-to-date features, because Android Open-Source Project (AOSP) must be updated by device manufacturers, which often do not upgrade devices in a timely manner.

3.174 Google submitted that there are reasons for including a given API in Google Play Services and not in the open-source Android code, including the extent to which the API contains proprietary software to Google, the frequency of updates it needs, whether it enables services that require contact with Google's servers or that should be consistently deployed on all versions of Android (including older ones).[215]

3.175 In summary, the evidence we have seen suggests that there are material barriers, including financial ones, for alternative operating system providers who cannot access GMS and that this impacts their ability to attract app developers to develop for their operating systems and, in turn, users.

Conclusion

3.176 We have found that Apple and Google have an effective duopoly in the provision of operating systems that run on mobile devices:

- Apple's iOS is only used in Apple devices so Apple's share of mobile devices mirrors its share of mobile operating systems. Apple is the largest manufacturer of mobile devices in the UK and has a share of [50-60]% of active smartphones as well as [50-60]% of active tablets in the UK. In addition, Apple's iPhone accounted for 75% of the £11.7 billion worth of smartphones shipped into the UK in 2021.

- Google has a small presence in mobile devices with most Android devices being manufactured by third parties. However, Google's Android is the second largest mobile operating system, with Android devices accounting for [40-50]% of all active smartphones and between [20-30]% of active tablets in the UK in 2021.

3.177 We have found limited effective competition between Apple and Google based on:

- The supply of mobile devices and operating systems has segmented into broadly two groups – higher-priced devices and lower-priced devices. Apple's iOS smartphone devices accounted for 77% of devices sold for

[215] Google further submitted that housing APIs in GMS allows Android devices to have the most up to date version of these APIs, ensuring that apps relying on these APIs work on all Android devices with GMS, even when the manufacturer does not update the underlying Android operating system version.

over £300 in 2021 whereas Android smartphone devices account for 100% of devices sold for £300 or less.

- Users rarely switching between iOS and Android devices. Low switching rates could be driven by a number of factors, including barriers to switching, consumer disengagement, satisfaction with the characteristics of Android and iOS devices and brand loyalty. In particular, we found that there are material perceived barriers to switching. These include: (i) learning costs; (ii) barriers relating to the transfer of data and apps across devices; and (iii) barriers relating to losing access to other devices (including connected devices) and having a worse experience of interacting with friends' and family's devices. The perceived barriers to switching are also higher among iOS users than Android users.

- While the actual barriers to switching appear to be lower than the perceived barriers, just over a third of users that had switched operating system were dissatisfied/fairly dissatisfied with at least one aspect of the switching journey.

- Apple has been able to earn a return on capital employed on its devices that is well above any normal benchmark over the last five years. While Google does not directly monetise Android, Google uses Android devices to support its highly profitable search advertising business and its increasingly important app store business.

3.178 In addition, there are material barriers to entry and expansion faced by rival providers of operating systems – meaning Apple and Google are not constrained by other providers. This includes:

- Barriers that are intrinsic such as strong indirect network effects and economies of scale in the development and maintenance of mobile operating systems.

- Barriers that result from Google's agreements with, payments to and its key apps and services provided to manufacturers. These mean that Google effectively pays manufacturers to use its operating system and rivals are unlikely to be able to replicate these payments. Switching away from Android would entail manufacturers missing out on significant financial benefits from pre-installing and meeting certain requirements in relation to Google's apps (which are all very popular with users). In addition, a new entrant using a version of Android without GMS would lose access to many popular Google apps and other Android apps which rely on Google's APIs to function properly.

- Barriers that result from the perceived challenges users face in switching between mobile ecosystems.

3.179 Based on the evidence reviewed, we found that both Apple and Google have substantial and entrenched market power in mobile operating systems. Absent intervention, the lack of effective competition faced by Apple's iOS devices and Google's Android devices allows Apple to charge above a competitive rate for its devices and/or supply a lower quality of operating system and devices and allows Google to supply a lower quality of operating system. Given Apple's business model, this conclusion relates to its devices and operating system in combination.

4. Competition in the distribution of native apps

Key findings

- App stores generated net revenues of [over £600 million] in the UK in 2021 with over 95% going to the App Store and Play Store. Apple and Google each have substantial and entrenched market power in the distribution of native apps within their ecosystems. The App Store has a monopoly over downloads on iOS devices and the Play Store accounts for over 90% of native app downloads across Android, HMS, and Fire OS devices.

- Apple prohibits other app stores and sideloading on iOS. Google allows alternatives, yet the outcome on Android is much the same, in part due to material barriers to entry and expansion faced by rival app stores.

- Development and usage of other ways to access content on mobile devices, such as using web apps, is substantially lower than native apps, and they are not regarded currently as a viable alternative by many app developers. This is reinforced by restrictions on functionality within Apple's ecosystem, which also undermine the availability of web apps on Android.

- There is limited competition between the App Store and Play Store for both app developers and users. Given the lack of user switching between them, the largest app developers view distribution through both app stores in parallel as essential.

- The App Store and Play Store face a limited competitive constraint from alternative devices such as PCs, laptops and gaming consoles. These devices are primarily used for different purposes and are mainly viewed by users as complements rather than substitutes for the use of native apps on mobile devices. There is also limited evidence that users would switch away from purchasing content and features in native apps to purchasing it through these alternative devices or alternative channels (eg browsers on mobile devices).

- The lack of competition faced by the App Store and Play Store allows them to charge above a competitive rate of commission to app developers.

- Both the App Store and Play Store require certain app developers to use their payment systems for in-app purchases and charge a commission of up to 30%, which contributes to the substantial and growing profits made by Apple and Google in relation to their app stores. If other distribution channels were effective constraints on the App Store and Play Store, we would expect to see lower commission rates or increased quality.

Introduction

4.1 In this chapter, we consider the level of competition in native app distribution by covering the following topics:

- an overview of the market;
- market outcomes, including shares of supply and commission rates; and
- our assessment of the extent of competitive constraints faced by Apple and Google.

Overview of the market

4.2 As set out in Chapter 2, app stores are a gateway between mobile device users and app developers. That is, they are a way for: (i) app developers to distribute their products and services to users; and (ii) users to find and install native apps and engage with the products and services of app developers. As app stores serve to connect two different customer groups – users and app developers, they are a two-sided platform.

4.3 As discussed in Chapter 3, one important characteristic of mobile devices is that they provide users with access to a wide range of apps. This means that app developers create value for the mobile ecosystem when they offer their apps within that ecosystem. Equally, mobile ecosystems provide value to app developers by providing them with access to a large number of users. Currently app stores are an important part of this value creation by enabling app developers to connect with users. As such, app stores and app developers have a two-way relationship creating value for the entire ecosystem.

4.4 Below we present an overview of the role of native app distribution in Apple's and Google's mobile ecosystems, including an overview of Apple's App Store, Google's Play Store, and other app stores available on Android devices, HMS devices, and Fire OS tablets.

Availability of app stores across mobile devices

4.5 App stores are the main way through which mobile users access native apps and the App Store provided by Apple and the Play Store provided by Google are the main app stores within their respective ecosystems. There are also third-party app stores, including those of Samsung, the largest manufacturer of Android devices; Huawei, which now uses a version of Android that uses

Huawei Mobile Services (HMS devices); and Amazon, which uses Fire OS, an Android Fork, in its tablets.

4.6 Table 4.1 provides an overview of the availability of these app stores in the iOS and Android mobile ecosystem as well as the ability for users to sideload other app stores (ie directly downloading from the app developer's website).

Table 4.1: Availability of app stores

App store	Apple's devices	Samsung's devices	Huawei's devices	Google's devices	Amazon's devices
App Store	Yes (preinstalled)	No	No	No	No
Play Store	No	Yes (preinstalled)	Not anymore[2]	Yes (preinstalled)	Possible[3]
Galaxy Store	No	Yes (preinstalled)	No	No	No
AppGallery	No	Possible	Yes (preinstalled)	Possible	Unknown
Amazon App store	No	Possible[1]	Possible[4]	Possible[1]	Yes (preinstalled)
Sideloaded other Android app stores	No	Possible	Possible	Possible	Possible

Note: Fire OS is unable to support automatic updates in relation to sideloaded apps and there can be differences between the apps available on Android and on Fire OS mobile devices due to the decision of app developer. [2] New Huawei devices could no longer install the Play Store after May 2019 due to a US trade ban (see Chapter 3). [3] Because Fire OS devices are not CDD-compliant, Google does not license Google Mobile Services (GMS) which includes the Play Store to these devices. Google explained that while it is aware of online articles and tutorials showing users how to sideload the Play Store on to Amazon Fire devices it does not support users sideloading the Play Store on such devices due to security and privacy risks and the risks of apps not working which would impact on the Play Store's reputation. [4] Online resources indicate that it is possible to sideload the Amazon App Store on Huawei devices.
Source: Information from Apple, Samsung, Huawei, Google, Amazon and 10 Google Play Store Alternatives for Huawei Phones | CellularNews.

4.7 In the iOS ecosystem, the App Store is the only approved app store and comes pre-installed on all iOS devices. Apple does not allow the distribution of apps whose primary purpose is to distribute a competing app store.[216] Non-iOS devices cannot install the App Store.

4.8 Google's ecosystem is more open than Apple's in that users can use third-party app stores on Android to acquire native apps.[217] However:

- Third-party app stores are not available to be downloaded through Google's Play Store but can be pre-installed by manufacturers or sideloaded by users.[218]

- Samsung's Galaxy Store is pre-installed on Samsung devices (alongside the Play Store) and is not offered for sideload onto other devices.

[216] Clause 3.3.2 of the Apple Developer Program License Agreement (last accessed on 7 June 2022).
[217] See the section below on the overview of other app stores available on Android.
[218] Clause 4.5 of the Google Play Android Developer Distribution Agreement prevents the distribution through the Google Play Store of apps whose primary purpose is to distribute a competing app store. See Google Play.

- Huawei's AppGallery has been pre-installed on all Huawei smartphones since January 2019 and on all HMS tablets. It has been the default on Huawei's smartphones launched in the UK since on or after August 2019.[219]

- Amazon's Appstore is pre-installed on all Amazon tablet devices[220] and can be sideloaded by users of Android devices.

4.9 There are also other third-party app stores that can be sideloaded on Android such as APKpure, Aptoide, F-Droid. Evidence from app developers and the limited engagement we have had from these alternative app stores suggests that their usage is low.

4.10 All of these app stores provide users with various services designed to enhance their experience of app stores. These include services relating to the discovery of apps,[221] such as search features, suggesting apps to users, displaying ratings and reviews given by other users; account management (such as management of subscriptions).[222] Some app stores also include other services such as customer support and handling of queries related to refunds; parental controls; security protections, and protecting users from harmful apps (including through the app review process and the monitoring of apps already published).[223] Specific app stores also contain certain features, such as Apple's Family Sharing[224] (which allows sharing across family members) and Google's Play Points[225] (allowing users to earn points and rewards to use on various apps and games).

App store business models

Apple's and Google's business models in relation to the App Store and Play Store

4.11 Apple's main revenue source comes from selling hardware and its associated operating systems. However, it also generates 'services' revenue from other sources, including the App Store. The App Store revenue comes from (i) the commission charged in relation to app purchases and in-app purchases of

[219] If the AppGallery is not the only app store installed on the device, AppGallery will not be set as default and users can choose which store to use for downloading apps.
[220] It was also preinstalled on Amazon's Fire Phone before the Fire Phone was discontinued.
[221] See Google Policy Centre, App discovery and ranking; Categories and Discoverability - Apple Developer.
[222] Similar services are offered by the Amazon Appstore, Samsung Galaxy Store or Huawei AppGallery.
[223] See Chapter 6 on the app review process.
[224] Family Sharing - Apple (UK).
[225] Google Play Points | Google Play Console.

digital content for third-party apps downloaded from the App Store and (ii) advertising revenue generated through App Store Search Ads.[226]

4.12 Apple explained that its in-app payment system allows Apple to collect commission for all the functions that it has put in place (including technology, customer connection and consumer trust) which lead to in-app purchases.[227] We set out the services provided by app stores below.

4.13 Apple submitted that its hardware revenue share is declining and that there is stable growth in the service aspects of its business. This growth is also reflected in our assessment of Apple's profitability, in particular:[228]

- In 2021, services accounted for approximately 31% of total gross profit globally, up from 24% in 2018.
- The services segment as a whole has substantially higher gross profit margins (70% in 2021) than those for Apple's devices (35% in 2021) and its gross profit margins for services have been increasing over time.
- Within the services segment, we estimated that the App Store's gross profit margins are [75-100]% in 2021.

4.14 Google generates the large majority of its revenue through selling digital advertising (including inside free apps monetised through advertisements). But the importance of the Play Store revenue in Google's business is increasing (accounting for approximately [0-20]% of global mobile revenue in 2021). This includes revenues from (i) the commission charged in relation to paid-for apps and in-app purchases of digital content for third-party apps downloaded through the Play Store and (ii) advertising revenue generated through the Play Store.

4.15 Google submitted that it uses its in-app payment system to collect a commission fee, in respect of paid apps or in-app content, 'for the services it provides to developers and users' and 'the value that [the Play Store] as a whole provides to app developers'. We set out the services provided by app stores below.

4.16 As set out in Appendix C, the Play Store also makes high gross margins ([50-75%]) and operating margins ([50-75])% in 2021.

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[226] See Apple Search Ads.
[227] See Response: Apple (publishing.service.gov.uk).
[228] See Appendix D for more detail.

4.17 Google submitted that its ad funded business model incentivises it to allow developers more methods to connect with users (for example, through third-party app stores, sideloading, web apps, websites) as the more ways users have to access content, the greater the amount of content they access and the more opportunities Google has to generate advertising revenues.[229] We consider below the extent to which users and app developers use such alternatives.

The business models of other app store providers on Android

4.18 Samsung's business is primarily focused on the sale and marketing of Samsung hardware including mobile devices. It is currently the largest manufacturer of Android mobile devices and offers the proprietary Galaxy Store which is preloaded on all Samsung mobile devices. Samsung told us it uses the Galaxy Store to differentiate its devices from other Android devices (eg through exclusive content and features) and also as an additional source of revenue from the distribution of apps through the store. [✂].

4.19 Huawei is a global provider of information and communications technology infrastructure and smart devices, including mobile devices. Huawei was previously the second largest manufacturer of Android devices and in May 2018 it started to offer the Huawei AppGallery app store in addition to the Google Play Store on these devices. Since May 2019 Huawei cannot pre-install Google's services anymore and only pre-installs the AppGallery on its HMS devices (see Chapter 3). Huawei said that the AppGallery is a relatively new entrant with a modest market presence, and its focus is on providing a good product for the user, rather than seeking to rival major app store providers, such as Apple and Google, directly.

4.20 Amazon has a retail business and also develops devices such as tablets, e-readers and many other products.[230] Its Amazon Fire Tablets use the Fire operating system which is an Android fork. As part of the offering on its tablets, Amazon offers the Amazon Appstore which is the only pre-installed app store on Fire operating system tablet devices, but this can also be sideloaded onto Android devices.

The development of native apps to work on iOS and Android devices

4.21 App stores distribute apps that are native to each mobile ecosystem, and they tend to be operating system specific – that is, Android app stores distribute

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[229] See Google's Statement of Scope Response, page 4 at Response: Google (publishing.service.gov.uk).
[230] Including audio, visual and audio-visual content, games, a browser, advertising, cloud computing, and voice assistants.

native Android apps that would not work on iOS devices and similarly the App Store distributes native iOS apps that would not work on Android devices. We understand from app developers that they often also need to tailor the app distributed through different channels on Android to comply with the terms of each distribution channel and also to make adjustments depending on what APIs they can rely on.

4.22 For apps to work on an Apple mobile device, they have to interact with Apple's iOS. Apple operates a 'closed' business model, meaning that the contents and code of the iOS system are not published, or directly available to app developers.

4.23 On the other hand, Android is open source, which means that any manufacturer could develop an operating system based on the open-source Android code.[231] Most Android devices are manufactured by third parties. As set out in Chapter 3, when using a Google-compatible version of Android, manufacturers are able to license the Android trademarks from Google as well as certain apps (eg Play Store, Chrome, Google Search) and the Google Play Services.

4.24 Google Play Services is the proprietary middleware software provided by Google that requires contact with Google's servers and includes a collection of proprietary APIs.[232] Similarly to Apple, these Google APIs in Google Play Services are available to app developers, but Google does not make publicly available the back-end system behind those APIs. Google told us that the availability of Google Play Services' features, functionalities, and APIs does not depend on how an app is installed onto a GMS device and that developers do not need to sign up for the Android developer program to access Google Play Services Software Development Kits (which are publicly available) to integrate such functionalities. We understand that the majority of app developers rely on access to these APIs within Google's Google Play Services to deliver functional Android apps because their apps have been built assuming the Google Play Services APIs will be available. For example, Google estimated that in April 2022 [70-80]% of apps available on the Play Store used at least one Google Play Services API.[233]

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[231] See Chapter 3.
[232] Other manufacturers can implement their own middleware software alongside Google Play Services or as a replacement for it.
[233] Google told us that while many third-party Android apps use at least one Google Play Services API, this is not a good indication of the effort/costs a developer would need to incur to port their app to an Android device that does not include Google Play Services because, among other reasons, that would depend on the number and complexity of the APIs the developer uses in its app.

4.25 All app store operators, and in particular Apple and Google, provide software, tools and services to app developers to attract them to develop and list apps on their app store. These include tools for app development, testing and quality control;[234] APIs (eg that help enhance an app's functionality); guides and documentation with instructions on how to use the development tools; as well as advice and support. In addition, they make available a number of services and tools to help developers promote and distribute their apps to users. These include giving developers access to a platform on which to make their products available, tools to manage the release of their apps and updates and access to analytics about app performance.[235] They also include app discovery tools and features, services related to compliance (eg with tax), as well as marketing tools and services.[236]

4.26 Access to the app store's software, tools and services is conditional on app developers adhering to a number of agreements and guidelines. Some of these documents are publicly available and some are confidential between the developers and the app store provider.

- For access to the App Store, this includes entering into the Apple Developer Program License Agreement, joining the Apple Developer Program for an annual fee of $99 per year, and complying with Apple's App Store Review Guidelines. [237]

- App developers who want to distribute apps on the Play Store must sign up for a Google Play Developer Account, accept the Google Play Developer Distribution Agreement and pay a one-time registration fee of $25. Among other things, the Google Play Developer Distribution Agreement requires app developers to comply with Google's Developer Program Policies.[238]

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[234] For Apple, see eg Apple Developer Program - Apple Developer and Apple introduces new developer tools and technologies to create even better apps - Apple (UK). For Google, see eg Overview of Google Play services | Google Developers and How to use Play Console - Play Console Help as well as Developer Guides | Android Developers. For Amazon, see App and Game Development | Amazon Appstore Developer Portal and App and Game Development | Amazon Appstore Developer Portal. Similar services are offered by the Samsung Galaxy Store or Huawei AppGallery.
[235] For example Google Play Console | Google Play Console and App Store Connect - Apple Developer. Similar services are offered by the Amazon Appstore, Samsung Galaxy Store or Huawei AppGallery.
[236] For example Helping Developers Succeed - Play Console Help and Featured | Apple Developer Documentation. Similar services are offered by the Amazon Appstore, Samsung Galaxy Store or Huawei AppGallery.
[237] See Agreements and Guidelines - Support - Apple Developer, which includes a link to the 'Apple Developer Program License Agreement' and 'Xcode and Apple SDKs Agreement' (it sets out the terms and conditions that govern the use of Xcode developer tools and software development kits (SDKs)), and Enrollment - Support - Apple Developer for more information on enrolment in the Apple Developer Program and applicable fees.
[238] A copy of the Google Play Developer Distribution Agreement is available online at Google Play (effective as of 17 November 2020). See also How to use Play Console - Play Console Help regarding the requirements to set up a Google Play Developer Account. Google's Developer Program Policies can be accessed online at Developer Program Policy - Play Console Help.

- Other app stores work in a similar way to the App Store and Play Store by requiring app developers to comply with their own terms or 'rules' of access in order to distribute their apps.[239]

4.27 Aspects of these rules seek to promote and maintain the quality and safety of apps available in the respective app stores. For example, they include requirements about the content of apps; privacy (including the way in which apps collect customer data); and security.

4.28 The App Store and Play Store require that in-app payments relating to digital content must be made through their own proprietary payment systems, through which they handle the processing of the transaction and also deduct a commission of up to 30%[240] before the payment is then remitted to the app developer. Apple's and Google's rules relating to in-app payments are explained further in Chapter 6 and Appendix H.

4.29 Rules for access to the App Store and Play Store are enforced by Apple and Google through an app review process, which applies both the first time that an app is listed on each app store and also for app upgrades. Apps and updates may be rejected because of bugs or minor issues, issues relating to compliance with the guidelines, or in some cases, because of serious issues (eg spyware or malware) or other contraventions of the app store policies. We discuss in more detail in Chapter 6 the practices associated with Apple and Google's control over the App Store and Play Store.[241]

Market outcomes

4.30 In order to understand the relative position and size of different app stores, we have considered the data on the number of native app downloads, number of users downloading native apps, the number of native apps available and the number of app developers for each app store.

4.31 We have also considered the quality of app stores, commission rates charged by different app stores and gathered data on the total customer billings made through proprietary in-app payment systems and the revenues generated through commission fees charged on transactions made through these payment systems.

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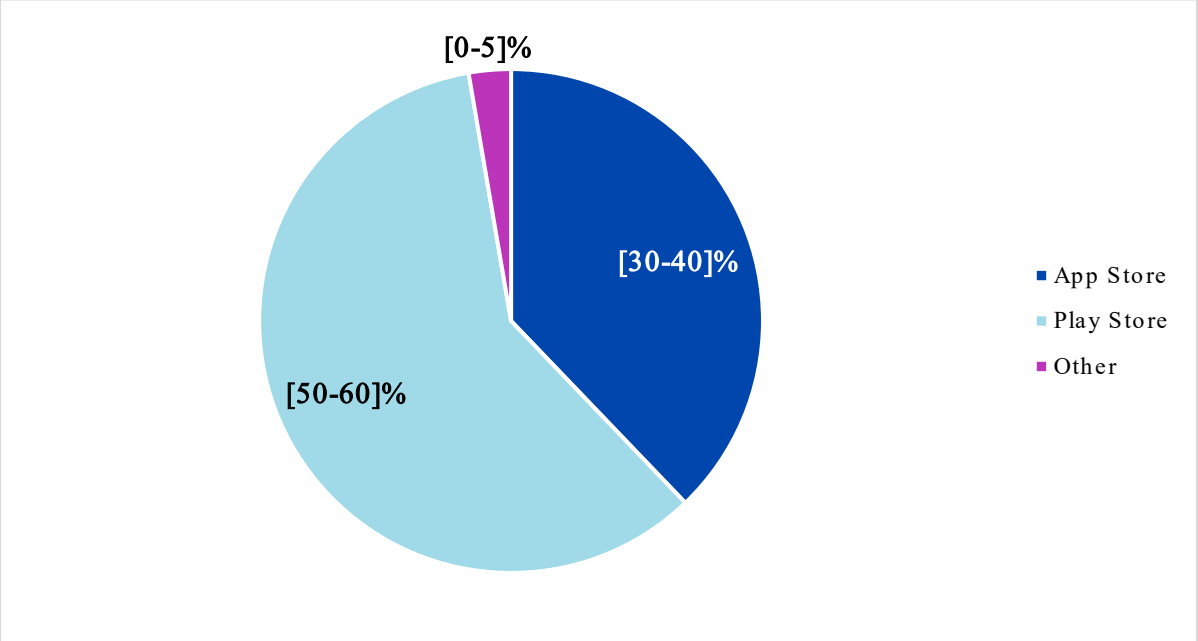
[239] See Amazon Developer Services Agreement; Samsung Galaxy Store Seller Portal; AppGallery Policy Center-AppGallery Connect Agreement-AppGallery Connect Service and Agreement.
[240] Both Apple and Google apply a lower commission of 15% in certain circumstances, described further below.
[241] See in particular App Review - App Store - Apple Developer and Publish your app - Play Console Help.

Shares of supply

4.32 As can be seen by Figure 4.1, the App Store and the Play Store together represent over 95% of native app downloads through app stores across iOS devices,[242] Android devices, HMS devices and Fire OS devices in the UK in 2021. Other app stores collectively represented [0-5]% of native apps that were downloaded through an app store (ie excluding sideloading).[243]

Figure 4.1: The proportion of downloads by app store across iOS devices, Android devices, HMS devices and Fire OS devices in the UK in 2021



Source: CMA analysis of data from market participants.
Notes: Based on first time downloads and individual segments are based on mid-points of the relevant range and not the actual data. For Apple this data is specific to the UK App Store, includes both first-party Apple apps and third-party apps and corresponds to transactions done through an iPhone or iPad.

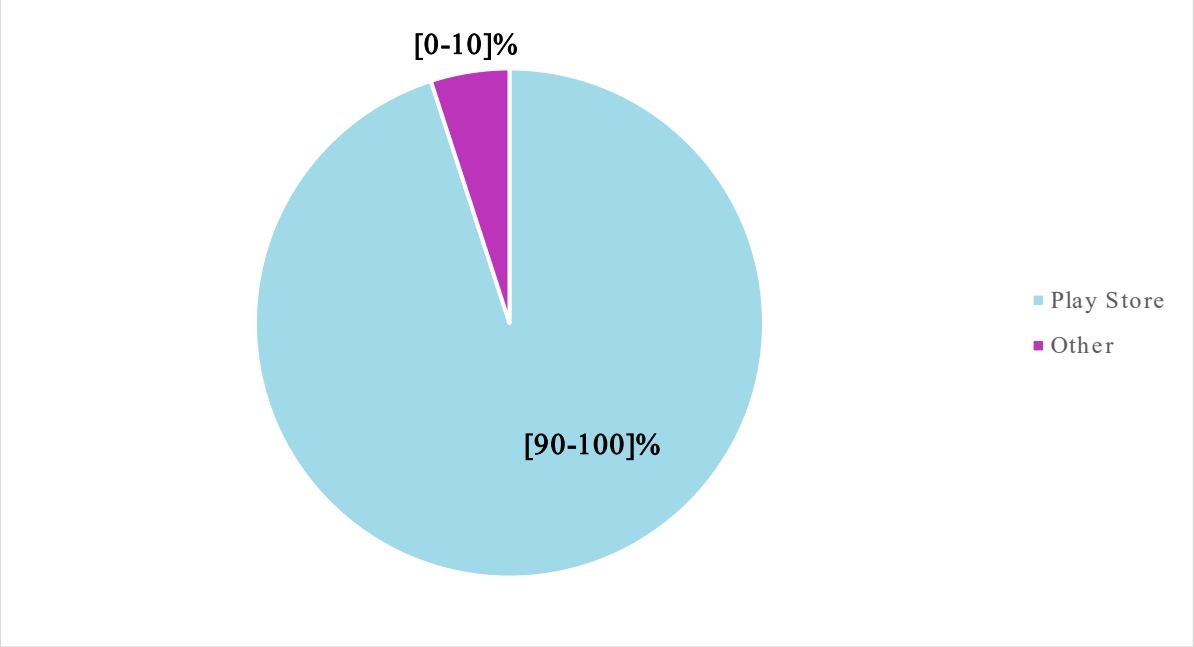
4.33 Given the evidence of low levels of user switching between devices as set out in Chapter 3, iOS users and Android users could be considered different customer groups. Therefore, we have also considered downloads for iOS devices and Android devices separately.

4.34 As set out above, the App Store is the only app store allowed on iOS devices, and therefore it has a 100% share, or a monopoly, in relation to native app downloads through app stores on iOS devices in the UK.

[242] For Apple this data is specific to the UK App Store, includes both first-party Apple apps and third-party apps and corresponds to transactions done through an iPhone or iPad.
[243] These figures are likely to overestimate the share of the App Store and Play Store to some small extent (as do those in Figure 4.2), as they do not include all alternative app stores. We expect any overestimation to be marginal as the results are consistent with evidence received from app developers on the relative importance of different app stores.

4.35 Figure 4.2 shows the shares of native app downloads of different app stores across Android devices, Huawei's HMS devices[244] and Amazon's Fire OS devices in the UK in 2021. The Play Store is the main app store used representing around [90-100]% of native app downloads through these app stores in the UK in 2021. Downloads through alternative app stores represent just [0-10]%.

Figure 4.2: The proportion of downloads by app store across Android devices, HMS devices and Fire OS devices in the UK in 2021



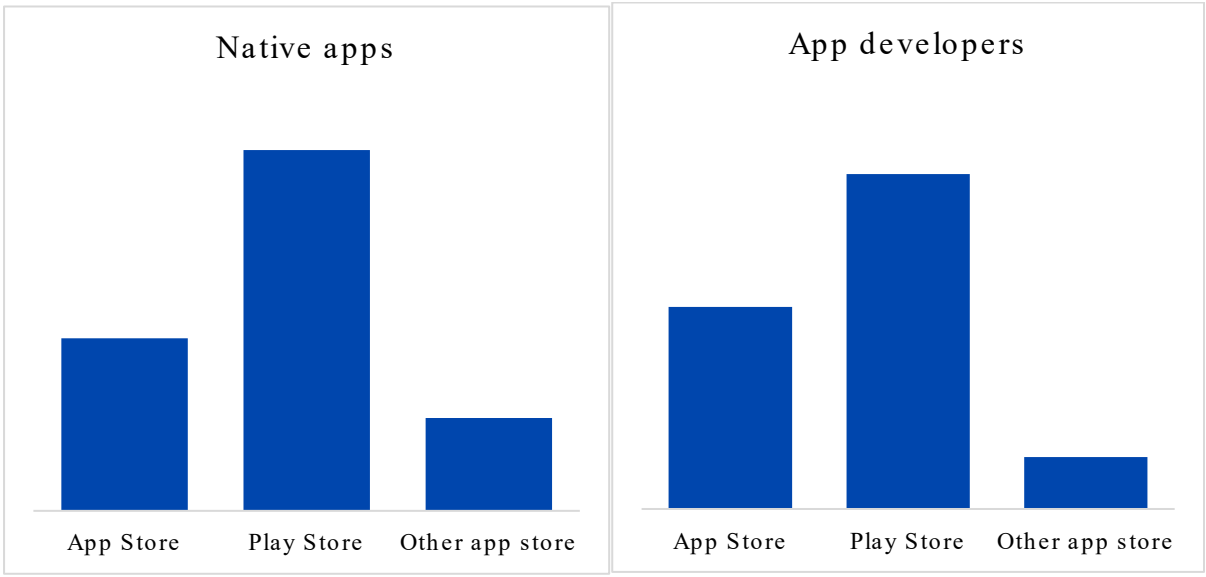
Source: CMA analysis of data from market participants.
Notes: Based on first time downloads. Individual segments are based on mid-points of the relevant range and not the actual data.

Availability of native apps and app developers

4.36 In terms of native apps and app developers, Figure 4.3 uses monthly data to show the average number of native apps and average number of app developers available through certain app stores in the UK in 2021. Apple's and Google's app stores are significantly larger in terms of both native apps and app developers than [the next largest app store]. In addition, in the UK, the Play Store itself has significantly more native apps and app developers than the App Store in 2021 (roughly [3-3.5] million vs [1-1.5] million apps and [900,000-1,000,000] vs [500,000-600,000] app developers), despite the most popular native apps with the most downloads being available on both App Store and Play Store as outlined below.

[244] As set out in Chapter 3, Huawei currently uses a version of Android that falls within Google's compatibility requirements, but relies on Huawei's Huawei Mobile Services instead of Google Mobile Services due to US legislation in May 2019 which meant that Huawei could no longer access Google's apps and services, including Google Mobile Services.

Figure 4.3: Number of native apps and app developers available in each app store in the UK in 2021 (average of monthly data)



Source: CMA analysis of data from market participants.
Notes: [><]. For the purposes of confidentiality, we have removed the y-axis.

4.37 We also analysed the number of apps in the App Store and the Play Store considering only those that have been downloaded at least once in a year in the UK. We found that in 2021 there were [1-1.5] million apps which had at least one download through the App Store in the UK and [1.5-2] million apps which had at least one download through the Play Store in the UK.[245] This shows that in 2021 the difference between the two app stores was smaller when considering just apps with downloads and that there were many apps on the Play Store with no downloads in the UK.

User download activity

4.38 In terms of users downloading native apps, we have monthly data for the App Store and other app stores, but only daily data for the Play Store.[246]

4.39 The monthly data shows that Apple is considerably larger than [the next largest app store] in terms of the number of users downloading native apps in any given month. In particular, in the UK:

- on average [20-30] million users downloaded at least one native app from the App Store in any given month in 2021; and

[245] These apps could have been downloaded by non-UK users.
[246] We have not aggregated this data to calculate a monthly number as at least some users are likely to have downloaded native apps on multiple days during the period.

- in contrast, an average of [2.5-3] million users downloaded at least one native app from [the next largest app store] per month in 2021.

4.40 While Google's data is not directly comparable, it shows that on any given day during a short period in 2022, on average between [1.5-2.5] million users downloaded at least one native app through the Play Store.

Commission rate, customer billings and shares of revenue from in-app payment systems

4.41 Apple and Google both currently take a commission of 30% for payments made via Apple IAP and Google Play's billing system, except in limited circumstances where a lower commission rate is applied, as described in Appendix H. Other Android app stores such as Samsung Galaxy Store,[247] Amazon Appstore[248] and Huawei AppGallery[249] charge a similar 30% headline commission rate.

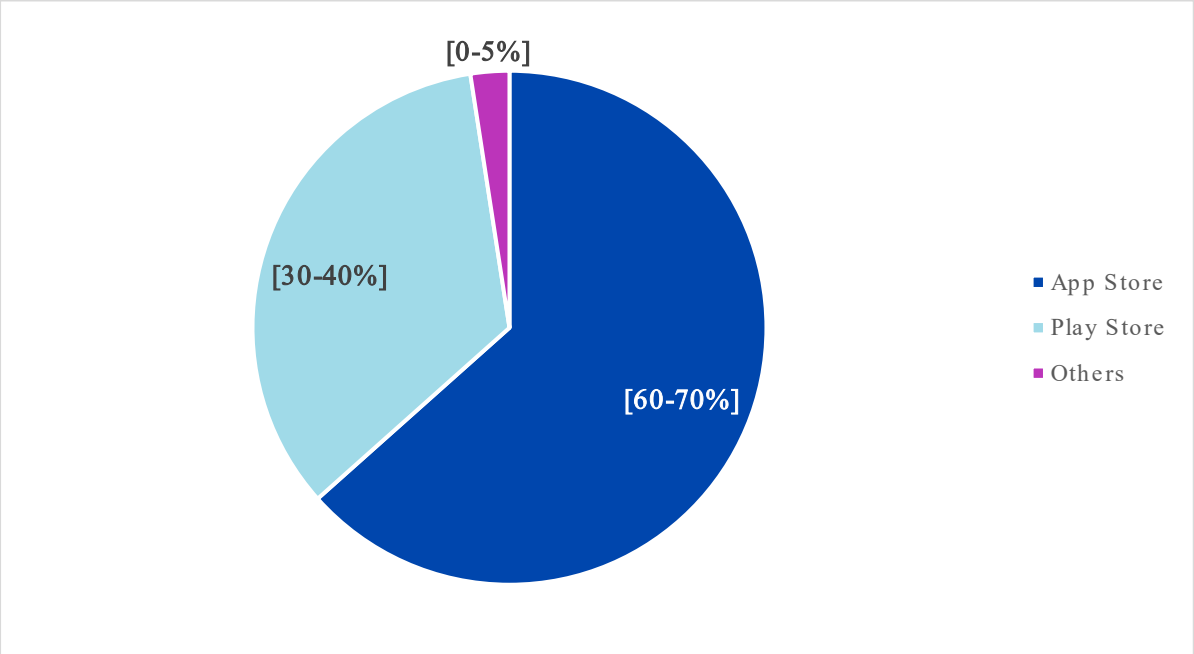
4.42 We received data from these app stores on the total customer billings made through their in-app payment systems and the revenue they have generated through those payment systems.[250]

4.43 Overall, we found that the total amount of customer billings through the main app stores in 2021 in the UK (ie Amazon AppStore, AppGallery, App Store, Galaxy Store and Play Store) in 2021 was [over £2 billion] and the total net revenue was [over £600 million].[251]

4.44 Figure 4.4 shows that in the UK, Apple's App Store has the highest share with [60-70]% of the net revenue across the five app stores, followed by Google's Play Store with a share of [30-40]%. The remaining three app stores represent collectively [0-5]% of the net revenues.

[247] Samsung Galaxy Store Seller Portal (samsungapps.com) section 6.1.
[248] Amazon Developer Services Agreement. This does vary with a 20% rate for in-app subscription products sold through mobile devices for movies and television.
[249] Document (huawei.com)
[250] Net revenue was not available for the Galaxy Store and on a conservative basis we have assumed its headline rate of 30% was paid on all customer billings.
[251] We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.

Figure 4.4: The proportion of net revenue through the app store billing system on the AppStore, AppGallery, App Store, Galaxy Store and Play Store in the UK in 2021

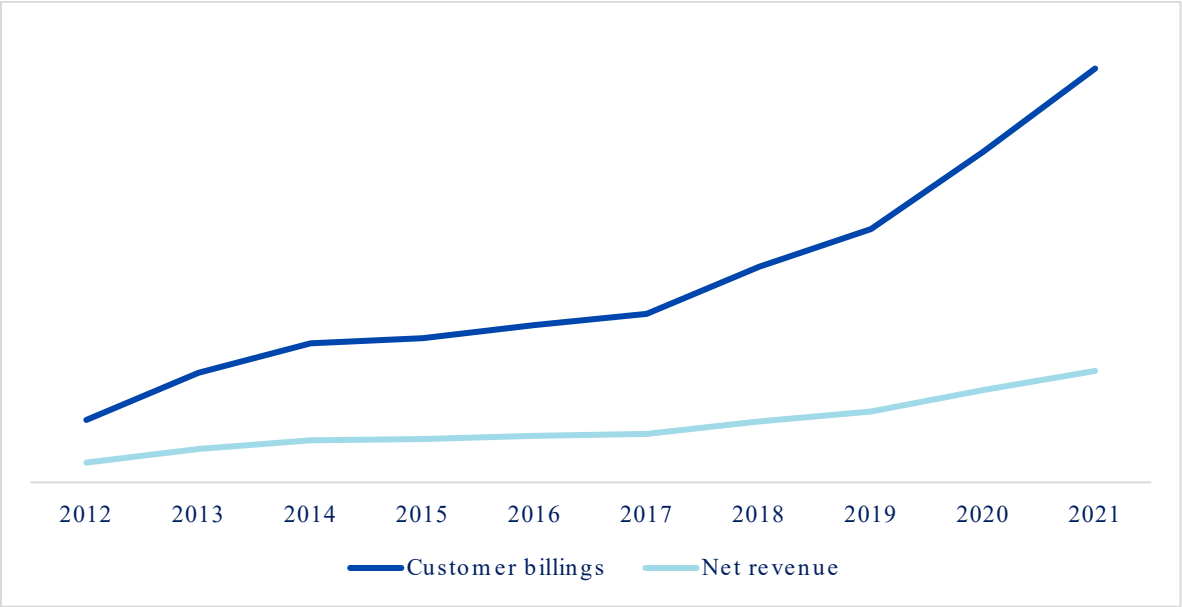


Source: CMA analysis of data from Amazon, Huawei, Apple, Samsung and Google data.
Notes: Individual segments are based on mid-points of the relevant range and not the actual data.

4.45 Figure 4.5 and Figure 4.6 show, separately for Apple and Google, how total customer billings and net revenue[252] generated through these payment systems in the UK have changed over time. Both Apple and Google have seen rapid growth in both customer billings and net revenue over the last five years. In addition, both are higher for the App Store than the Play Store.

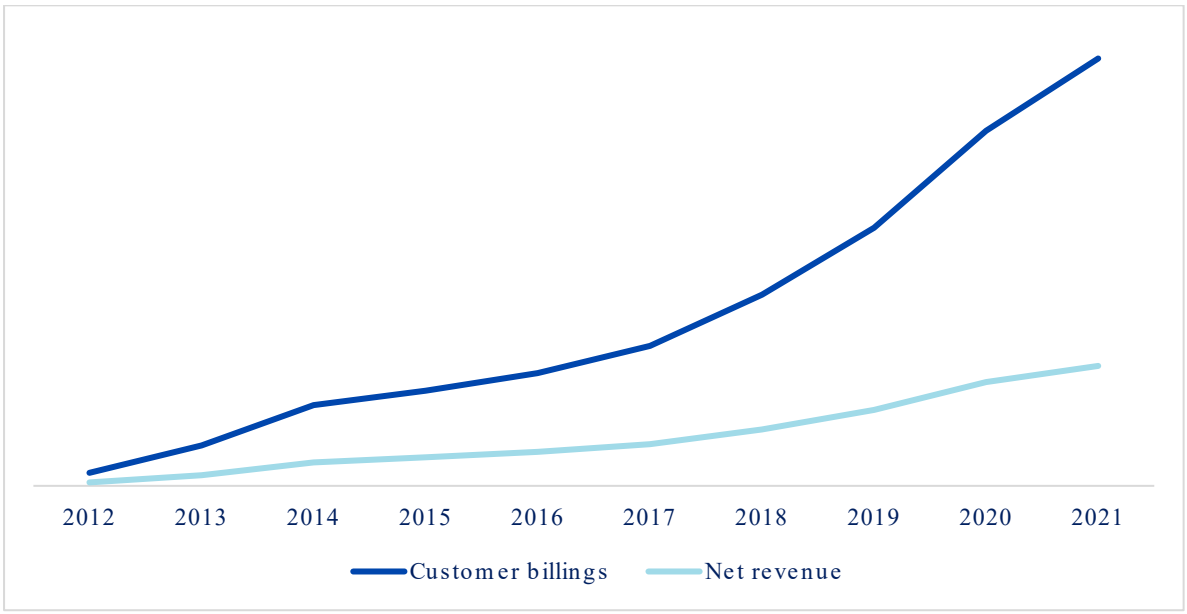
[252] That is, the revenue that Apple and Google retain from transactions made through their payments systems in the UK.

Figure 4.5: Total customer billings and net revenue through Apple IAP in the UK (2012 to 2021)



Source: CMA analysis of Apple data.
Notes: We understand that both customer billings and net revenue include user spending on Apple's first-party apps and third-party apps where such payments are made through Apple IAP (on an iPhone and iPad). The information is specific to the UK App Store.

Figure 4.6: Total customer billings and net revenue on apps (including Play Pass) through Google Play's billing system in the UK (2012 to 2021)



Source: CMA analysis of Google data.
Notes: We understand that both customer billings and net revenue include user spending on Google's first-party apps where such payments are made through Google Play's billing system.

4.46 In 2021, both Apple IAP's average commission and Google Play's billing system's average commission were [between 25% and 30%]. We consider whether these commission rates reflect strong competition below.

4.47 Finally, we also requested data from Apple and Google in relation to the average annual customer billing through Apple IAP and Google Play's billing system per user of the App Store and Play Store (see Table 4.2).

- For the period 2018-2021, the average customer billings per App Store User per year was between £[0-25] and £[25-50], while the average customer billings on apps (including Play Pass) per active Android mobile device was lower at £[0-25] in 2018 and £[0-25] in 2021.[253] The gap between the two has narrowed slightly since 2018 however it increased in 2021.

- For the App Store we also received data based on users of the App Store that engaged in a billable transaction in the UK.[254] This was below £100 for the period 2018-2021 and increased to £[100-125] in 2021.

Table 4.2: Average annual billings per user in the UK (2018-2021)

Year	***App Store***		***Play Store***	
	Average customer billings per App Store User	Average customer billings per App Store User engaging in a billable transaction	Average customer billings on apps per active Android mobile device	Average customer billings per Play Store User engaging in a billable transaction
2018	£[0-25]	£[50-75]	£[0-25]	No equivalent data
2019	£[25-50]	£[75-100]	£[0-25]	
2020	£[25-50]	£[75-100]	£[0-25]	
2021	£[25-50]	£[100-125]	£[0-25]	

Source: CMA analysis of Apple and Google data.
Note: We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database. The Google data includes the Play Pass.

Quality

4.48 The quality of the services they provide is a parameter of competition between app stores. For example, Google said that the Play Store must relentlessly improve and innovate its service to stay competitive and identified a number of innovations in 2021 for both users and app developers.[255] Similarly, Apple explained that it is consistently working to improve the App Store experience for developers and users including by introducing new or improved features and enhancing its quality and provided a list of recent key innovations relating to the App Store.

[253] CMA analysis of Apple and Google data. We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.
[254] That is, spending based on the users who actually made a transaction through Apple IAP in the UK.
[255] See Response: Google (publishing.service.gov.uk).

4.49 However, a number of stakeholders have suggested that outcomes for users, particularly in relation to quality and user experience, could be improved. For instance:

- Microsoft[256] suggested that improved access to alternative app stores could improve outcomes in relation to security, quality, discoverability and user experience;
- Flick Type[257] told us that competing app stores could improve quality of user service and promote innovation in privacy and security features, such as fraud detection; and
- Epic[258] told us that alternative app stores would inject innovation and consumer choice into the mobile ecosystem.

4.50 Similarly, as discussed in Chapter 6, we have heard concerns that app review processes are opaque, and rules appear to be inconsistently applied, resulting in delays and uncertainty which can add to development costs and hinder innovation by app developers.

4.51 Assessing the extent of competition on quality and innovation is inherently difficult (as set out in Chapter 3) and we have therefore considered this evidence in the round alongside other evidence on the strength of competition.

Competition assessment

4.52 In this section, we have considered the competitive constraints faced by the App Store and Play Store in native app distribution.

4.53 To the extent that Apple and Google do not face strong competitive constraints from actual or potential alternative methods of app distribution, each are likely to have market power through their operation of the App Store and Play Store. We have discussed below how this affects the commission rates they charge, and we will cover specific practices resulting from their operation of the App Store and the Play Store in Chapter 6.[259]

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[256] Microsoft response to our interim report.
[257] Flick Type response to our interim report.
[258] Epic response to our interim report.
[259] This includes the app review process, the ranking of apps on the relevant store and associated advertising services provided to app developers.

4.54 We have assessed the following three potential competitive constraints faced by Apple's App Store and Google's Play Store:

- First, we have considered the constraint from alternative methods of accessing apps within each mobile ecosystem. This includes alternative methods of native app distribution such as pre-installation, alternative app stores and sideloading and web-based alternatives to native apps. We assessed the direct constraint arising from alternative app stores and the barriers to entry and expansion within the iOS and Android ecosystem.

- Second, we have considered the constraint on Apple and Google from the risk of losing consumers and app developers to each other's app stores. That is, we focus on the indirect constraint that app stores across mobile ecosystems place on each other.

- Third, we have considered the constraint from alternative devices, such as PCs, laptops, games consoles and smart TVs, and the marketplaces associated with those devices.

Competitive constraints from within each mobile ecosystem

4.55 App developers can use alternatives to Apple's App Store and Google's Play Store to distribute their native apps.

4.56 In this section we first consider the constraint placed on Apple and Google by the following alternative methods of native app installation:

- **pre-installation of native apps**: this relates to the fact that Android device manufacturers can pre-install their own apps or apps from third-party developers on their devices;

- **alternative app stores within the mobile ecosystem**: this relates to where users could use an alternative app store without switching device; and

- **sideloading**: this is where an app developer's native app is downloaded by the user directly from the developer's web page or via peer-to-peer transfer.

4.57 Second, we consider web-based alternatives to native apps. Specifically, we assess the extent to which accessing websites and web apps on mobile devices to purchase and consume digital content or services are a competitive constraint on the distribution of native apps.

Alternative methods of native app installation

Pre-installation

4.58 **Pre-installation of third-party native apps on iOS devices is not an alternative within Apple's ecosystem and thus does not constrain the App Store.** Apple does not currently pre-install any third-party apps on its devices and we are only aware of one historical example of this.[260]

4.59 In contrast, pre-installation is allowed in Google's ecosystem and Google said that pre-installation is a viable alternative through which app developers can distribute their native apps. Google said that app developers such as Facebook, Microsoft and Spotify all have pre-installation agreements with manufacturers.[261]

4.60 However, the pre-installation of third-party native apps on Android devices does not appear to be a viable alternative to the Play Store for the vast majority of app developers (particularly many smaller app developers) and thus does not constrain the Play Store for the following reasons.

4.61 First, evidence from the manufacturers suggests that they are only likely to pre-install the most popular apps (including Google's, as discussed in Appendix E), their own first-party apps, or those of Mobile Network Operators. As a result, pre-installation is not a viable option for most app developers. For example, outside of its own apps and Google's apps, Samsung told us it had global agreements to pre-install a small number of popular native apps and non-global agreements to pre-install additional native apps, including those of Mobile Network Operators.

4.62 Further, not all of these third-party native apps are necessarily installed on all of a manufacturer's devices. For example, Huawei identified a number of different third-party non-Google apps that were pre-installed. Nearly all of these were pre-installed on less than half of Huawei's devices in any one year.

4.63 Second, none of the app developers that we requested information from identified pre-installation as an alternative to the Play Store. Indeed, only a few mentioned it as being a method for distribution on Android devices, with one app developer saying its app was pre-installed on a limited number of smartphones and another app developer saying pre-installation accounts for

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[260] We understand that Apple previously pre-installed Google Maps, but this has not occurred since the release of the iPhone 6 (in September 2014) and Apple now pre-installs its own first-party alternative to Google Maps. See ACCC's Digital platform services inquiry, Interim report No. 2 – App marketplaces.
[261] See Google's response to the Statement of Scope at Response: Google (publishing.service.gov.uk).

less than 10% of its global installs.[262] Generally, app developers that had pre-installation agreements with manufacturers suggested that while there was some positive effect on app usage and sign-ups, the effect was somewhat modest and not a credible alternative to app stores.

4.64 Finally, as noted by the Australian Competition and Consumer Commission (ACCC), app developers have access to virtually all users who have an Android device through the Play Store, and to do the same through pre-installation would require coming to agreements with several manufacturers. As also noted by both the Netherlands Authority for Consumers & Markets (ACM) and the ACCC in their recent reports, there are likely to be costs involved in terms of the fees paid to manufacturers as part of any pre-installation agreements and the costs of negotiating those agreements.[263] While some app developers could benefit from this arrangement if costs are lower than the commission paid to the Play Store, for the majority of app developers (including those with free apps on the Play Store), this is likely to make pre-installation both infeasible and financially very costly.

Alternative app stores

4.65 As noted above, Apple does not allow third-party app stores on iOS devices[264] and as set out below, the sideloading of alternative app stores (or any other apps) is not currently permitted on iOS. This means that there are currently no rival app stores on iOS devices and no prospect of new entry such that **Apple does not face a constraint from alternative app stores on iOS devices.**

4.66 In contrast, alternative app stores to the Play Store are available on Android devices. They can either be pre-installed by the device manufacturer (eg Samsung pre-installs its Galaxy Store) or sideloaded by the user. Users cannot download alternative app stores from the Play Store.[265]

4.67 Google submitted that it faces competition from other Android app stores and, in particular, from Samsung's Galaxy Store which is pre-installed on all Samsung devices. In total, Google estimated that between 60-90% of UK Android devices in use have another Android app store pre-installed as Huawei also pre-installs its Huawei App Gallery, based on those parties'

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[262] Instead, several app developers focused on the fact that pre-installations can increase user engagement and discovery with only some mentioning it can lead to incremental new users.
[263] ACM, Market study into mobile app stores, 11 April 2019, p 50 and ACCC, Digital platform services, page 29.
[264] This includes app stores not being allowed in the App Store. See Apple Developer Program License Agreement, Article 3.3.2.
[265] See Google's Developer Distribution Agreement, Article 4.5 which states 'You may not use Google Play to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play.'

market shares, according to public sources. However, Google also told us that in 2021 in the UK, [30-40]% of newly activated Android mobile devices had only the Play Store pre-installed.

4.68 Google submitted that installation via third-party mobile app stores operates in essentially the same way as via the Play Store. Google said that app stores typically provide similar services including a 'storefront' to users from which they can find and download apps as well as security, marketing and in-app billing system services with similar headline fees to developers of around 30%. Google also said that some app stores may seek to attract users with special offers.[266] Finally, Google said that it does not restrict developers from distributing their apps outside of the Play Store and this is specifically stated on its Play Console Help Page.[267]

4.69 However, we concluded from the evidence we have gathered that **alternative apps stores place only a limited constraint on the Play Store within the Android ecosystem** for the reasons set out below.

- *Usage of alternative Android app stores*

4.70 First, **the usage of alternative Android app stores, both by device users and app developers, is substantially lower than the Play Store.**

4.71 In the UK, Samsung's Galaxy Store is the most widely available alternative app store within the Android ecosystem[268] as the Galaxy Store is pre-installed on all Samsung smartphones (which is the largest manufacturer of Android smartphones as set out in Chapter 3). Thus, there are many Android devices with both the Play Store and Galaxy Store.

4.72 As described above, the AppGallery is a relatively new entrant with a modest market presence. In contrast to the evidence submitted by Google, we understand that only a small number of Android devices have both Huawei's AppGallery and Play Store pre-installed.[269]

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[266] For example, Samsung's website for the Galaxy Store states 'Find and install your favorite [sic] games in a flash. Score Galaxy exclusive benefits whenever you discover a game that interests you. And check out our game-changing exclusives you can only get at Galaxy Store. You can also enjoy top games with 10% off all in-app purchases.' See Galaxy Store | Apps & Services | Samsung UK.
[267] Understanding Google Play's Payments policy - Play Console Help.
[268] As set out below, Google provided data showing that in May 2021 [3.5 - 4] million off-Play Store installs were sideloaded. This includes downloads from alternative app stores that were not preloaded which suggests that downloads through non-preloaded app stores are very low. The number of sideloaded apps was based on installations that occurred while the device had an internet connection and on active GMS devices (ie Android devices with Google's apps and services preloaded) with Google Play Protect enabled which account for around [90-100]% of GMS devices in the UK.
[269] This is because Huawei's AppGallery was only introduced into the UK in 2018 and has only been pre-installed on Huawei devices since January 2019. Since May 2019 Huawei has not been able to pre-install the Play Store due to legislation in the US (see Chapter 3) meaning the period where both were pre-installed was small.

4.73 More generally, on various metrics provided by app store providers, the Play Store in the UK is by far the largest Android app store as shown in:

- Figure 4.2 shows how the Play Store accounts for [90-100]% of downloads across Android devices, HMS devices and Fire OS devices in 2021; and
- Figure 4.3 shows that the Play Store had a much larger number of native apps available to download than [the next largest app store] across Android devices, HMS devices and Fire OS devices in 2021.

4.74 The evidence from our survey[270] supports these findings. In particular, 92% of Android users downloaded apps through the Play Store.[271] Further, while 30% used at least one alternative Android app store at some point,[272] the Play Store was the method used most often by 90% of Android users.[273]

4.75 Second, **app developers do not consider such alternative Android app stores to be a suitable alternative to the Play Store.** For example, app developers we contacted did not identify alternative app stores as suitable alternatives when asked about whether they could recapture users' time and revenue if their apps were withdrawn from the Play Store.

4.76 This does not mean app developers do not also use other Android app stores. Despite the costs involved (such as the costs of integrating their native apps with these app stores and adjustments needed due to different app store policies), some app developers said there were some benefits to using alternative app stores and referred to reasons such as accessing more users,[274] more favourable revenue share agreements or diversification of strategy. That other Android app stores are used by app developers for reasons such as providing access to more users, but not considered as alternative to the Play Store, suggests that they are seen as complements to, rather than substitutes for, the Play Store.

4.77 Overall, the usage of these Android app stores by app developers we contacted appears to be lower. For example, while all those app developers

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[270] See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, for full technical details and results of this CMA research.
[271] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 44.
[272] Of these Samsung's Galaxy Store was the most cited with 23% of Android users downloading an app onto their smartphone through the Galaxy Store. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 44 and page 71.
[273] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 44.
[274] For example, this could be because the service being offered by the app developer relies upon network effects with the value of the service to users increasing when the number of other users using the service increases.

listed their apps on the Play Store, less than a third listed them on Samsung's Galaxy Store, with the numbers for other Android app stores being smaller still. Consistent with this, evidence provided by app developers showed that downloads from alternative app stores were very low, with only one app developer being an exception to this.[275]

- *Barriers faced by alternative Android app stores*

4.78 **We consider that alternative Android app stores, especially new entrants, also face barriers to effective competition:**

- There might be limits on the usage of the alternative app stores operated by manufacturers. For example, while manufacturers' app stores could be sideloaded, we set out below that sideloading is limited in practice. Similarly, while one manufacturer could seek to enter into pre-installation agreements with another manufacturer, there is no evidence this occurs in practice. The incentive to pre-install another manufacturer's app store is further reduced by manufacturers' agreements with Google leading to the pre-installation of the Play Store which provides access to such a large range of apps.

- App stores benefit from both network effects and economies of scale. In particular, there are significant indirect network effects at play in the provision of app stores – the benefit to users of an app store increases with the volume and quality of apps they can access through that app store and similarly the benefit to app developers increases with the number of users they can access through an app store. The presence of indirect network effects is likely to act as a particular barrier to new entry and expansion as it creates a 'chicken and egg' problem – an app store needs a critical mass of users to attract app developers, but also need a critical mass of app developers to attract users.

4.79 Samsung provided views that were consistent with alternative Android app stores facing higher barriers to competing. In particular, Samsung told us that its approach 'reflects the difficulty of directly competing against app store benefiting from first mover advantage and network effects'.

[275] Epic Games provided evidence that for the four months its Fortnite app was listed on the Play Store, [more downloads were through the Galaxy Store than through the Play Store]. One of Epic Games' other native apps, Houseparty, was only available on Android devices on the Play Store.

- *Google's agreements and policies*

4.80 Fourth, we consider that **a range of practices by Google limit the constraint from alternative Android app stores, including new entrants.**

4.81 In particular, below we consider in detail how Google's agreements with manufacturers and app developers limit the constraint from alternative Android app stores (those of both manufacturers and other third parties). As a general point, the constraint from third-party app stores is likely to be reduced irrespective of these agreements as Google does not allow them on the Play Store[276] and, other than those preloaded by manufacturers, they have to be sideloaded by users. For the reasons outlined below, sideloading is not currently an effective way to reach users of Android devices.

- *Agreements on the pre-installation of the Play Store*

4.82 As set out in Chapter 3, and in more detail in Appendix E, Google has a range of agreements with manufacturers, through which it ensures that the Play Store is pre-installed and prominently placed on the device home screen of the vast majority of Android devices. In particular, only if the Play Store is pre-installed and prominently placed can a manufacturer:

- License key Google apps and APIs. This means manufacturers have a strong incentive to pre-install and prominently place the Play Store as the apps and APIs included in the GMS suite are popular and they ensure that as many Android native apps as possible will work on their devices.[277,278]

- License Google Chrome and Search apps and, subject to certain additional requirements, receive substantial payments, including a proportion of Google's advertising revenue generated on relevant Android devices. This means manufacturers have a strong incentive to pre-install and prominently place the Play Store – as the Chrome and Search apps are very popular apps with users and the payments Google shares with

[276] Google explained that it has an app review process which screens for security risk and compliance with Google's policies. Google explained that while this can be done for individual apps it cannot be done for alternative app stores as it would have to screen every app that the alternative app store distributes if it listed app stores in the Play Store. In addition, Google explained that in relation to some app stores it is aware of material concerns such as hosting pirated apps. Google explained that it does allow apps that offer access to multiple cloud-based services as they do not install additional app packages onto the device.
[277] As detailed in Appendix E, where a developer uses Google proprietary APIs for its apps, the proper functioning of it can only be guaranteed if the device also runs Google Play Services. In this regard Google estimated that, as of April 2022, [70-80]% of apps available on the Play Store use at least one Google Play Services API.
[278] As set out in Chapter 3, if a manufacturer wants to pre-install one of Google's apps included in the GMS suite then the manufacturer has to pre-install all of them and place the Play Store on the default home screen and the rest of the apps in a "Google" folder on the default home screen.

manufacturers are material such that, without a similar position in search advertising, rivals cannot replicate them.

4.83 The pre-installation and prominent placement of the Play Store mean that users have little incentive to use other Android app stores, given that the Play Store provides Android users with access to a large volume of quality native apps (and more than any other app store).

4.84 Further, the Play Store is not only linked to other elements of the GMS suite contractually (as set out above), but also from a technical perspective. In particular, Google told us that its APIs in GMS are updated frequently to ensure new and improved features (including security updates) are consistently available on all Android devices and this process occurs via the Play Store. Google told us that the Play Store has always had this function and, given updating the APIs included in GMS requires the device manufacturer to grant it certain 'sensitive capabilities', it is particularly important for device security that this happens via a Google source. However, while Google has provided us with some reasons for this,[279] Google has not set out why such Google source should necessarily be an app store.

4.85 Google has these agreements with manufacturers who also have their own first-party app stores and thus are competitors in native app distribution. For example, as set out above, Samsung, which is the main manufacturer of Android devices in the UK,[280] has its own app store (the Galaxy Store) and receives the highest aggregate payments from Google among the Android manufacturers shipping devices into the UK.

4.86 As further detailed below, documentary evidence from Google indicates that it perceived increasing competitive threats to the Play Store from alternative app distribution channels. We are also aware of some attempts from Samsung to establish exclusive arrangements with developers for some of their apps or in-app content.[281]

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[279] Google told us that: "Updating Google software through proprietary app stores ensures swift, secure, and verified updating, which benefits consumers"; "Google has invested significantly in tuning its middleware update process through the Play Store to optimise between pushing timely updates and minimising the impact on the user"; and "Google has also combined its proprietary installation and update technology and infrastructure for first-party and third party apps and [Google Play Services] through the Play Store because they share certain basic needs".

[280] See Chapter 3 and Annex B for a discussion of Samsung's share of supply in the UK for both smartphones and tablets. Samsung is also the largest Android manufacturer based on data from Statcounter, see Mobile Vendor Market Share Worldwide | Statcounter Global Stats and Tablet Vendor Market Share Worldwide | Statcounter Global Stats.

[281] A large app developer discussed with Samsung the possibility to offer some exclusive content for one of their games through the Galaxy Store however this agreement did not materialise.

- *RSA 3.0*

4.87 Google's most recent revenue sharing agreements (RSA 3.0) with manufacturers generally include the possibility for manufacturers to earn a share of Play Store revenue if they meet certain obligations in relation to the Play Store. These agreements were introduced at the same time as an initiative targeting major game developers named Project Hug (see below) and implemented over the course of 2020 with various manufacturers.

4.88 As set out in Chapter 3 and in more detail in Appendix E, as part of this latest iteration of revenue sharing agreements, manufacturers that comply with certain placement and default requirements relating to Google Search and Google Assistant can also receive a share of Google's net revenue from Play Store transactions, if they also meet additional requirements relating to the Play Store. These requirements are setting the Play Store as the default app store and not preloading similar services to the Play Store, such as alternative app stores, launchers and apps not available on the Play Store, on their device.[282]

4.89 In total, [30-40]% of Android devices activated in 2021 in the UK had the Play Store as the only pre-installed app store. This number includes Google's Pixel devices which account for [0-5]% of both smartphones and tablets. In addition, [10-20]% of the Android devices activated in 2021 in the UK comply with the additional obligations not to preinstall similar services to the Play Store such that they receive a share of revenue from Play Store transactions.[283]

4.90 These agreements, which lead to the exclusive pre-installation of the Play Store, cover a material number of new Android devices and could represent a further barrier to effective competition from alternative app stores as well as alternative distribution channels. In particular, RSA 3.0 allows Google to use its current position in native app distribution to disincentivise the pre-installation of rival app stores and the usage of alternative distribution channels by manufacturers in a way that rivals cannot counter, given that they do not have the same number of users on their app stores and do not have the scale to match such payments.[284]

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[282] Under the previous RSA version, no payments for Play Store revenue were made to manufacturers by Google. We understand launchers to be user interfaces initiated by, for example, pressing on the home button, invoking the default home screen, or by an initial boot-up of the device.
[283] Google told us the RSA between Samsung and Google does not contain any restriction preinstalling alternative app stores.
[284] Consistent with this interpretation, one app developer told us that it was impeded in coming to an agreement with manufacturers to have its installer pre-loaded on devices due to agreements between manufacturers and Google.

4.91 We are aware that concerns have been raised about agreements of this type between Google and Samsung (the largest Android manufacturer and operator of the Galaxy Store) since they could reduce the competitive pressure the Galaxy Store places on the Play Store.[285] Documentary evidence from Google and responses from both parties show that Google and Samsung have discussed the possibility of Samsung receiving a portion of Google's net revenue from Play Store transactions.[286] However, no agreement was ever reached and [✂].

- *Project Hug*

4.92 Another Google agreement that has the potential to further reduce the competitive constraint from rival Android app stores stems from 'Project Hug'. Based on Google's internal documents we understand this initiative to be part of a number of related initiatives targeting app developers (and particularly games developers) and alternative app store providers.[287]

4.93 Project Hug was implemented in 2019 and involved targeting a number of major app developers (those app developers that signed up are estimated to represent close to 10% of the Play Store net revenue in 2021) to encourage them to continue to develop and distribute their apps via the Play Store and encourage developers to adopt other Google products.

4.94 Documents received from Google indicate that Project Hug was designed to improve developers' sentiment towards distributing on the Play Store (including on the commission rate) and a reaction to increased competition from alternative app distribution channels.[288] Although, at the same time, Google's internal assessment also concluded that scaling distribution outside the Play Store could be challenging for developers and [✂].

4.95 Google told us that the value it provides to developers under Project Hug comes in several forms, including in relation to the use of other Google's products and services such as Google's cloud, advertising and marketing services. In particular, [✂]. The documentary evidence from Google also

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[285] Specifically a complaint filed by a coalition of 39 attorneys general in the United States District Court, Northern District of California ("the Utah complaint"), considered that 'Google intended to pay its most threatening competitor [Samsung] to stop competing' in app distribution (see paragraph 146, State of Utah et al v. Google LLC et al, 3:21-cv-05227, First amended complaint filed 1 November 2021). In addition, a second complaint filed by Epic Games against Google in the same court ("the **Epic complaint**"), considered that 'Google attempted to negotiate a deal with Samsung that would prevent the Galaxy Store from becoming a competitive threat' (see paragraph 119, Epic Games, Inc. v. Google LLC et al, Case Number 3:2020cv05671, updated complaint filed 19 August 2021).
[286] [✂].
[287] Project Hug has also been raised as part of the Utah complaint and the Epic complaint made in the US.
[288] We consider this includes alternative app stores seeking exclusive listings from app developers – as noted in the Utah compliant, the Galaxy Store, had secured an exclusive listing from the popular app Fortnite. See Amended.complaint.Utah1.Nov.pdf (mlex.com).

shows that Google estimated the value of these benefits to equate to an effective reduction in the commission rate to the relevant developers.

4.96 In exchange for the benefits listed above, under Project Hug developers agree to treat the Play Store at least comparably to other distribution platforms in terms of feature and content availability and timing of launch of their apps. In particular, developers agree to [✂].

4.97 Evidence gathered from certain game app developers indicates that Project Hug did generate benefits for them by improving the terms of the deal with Google, but did not change their strategy on where to list their games. More specifically, app developers told us that they considered the Play Store part of their distribution strategy irrespective of Project Hug and that the risk of them distributing entirely outside the Play Store was low since they could not afford to leave the Play Store due to its large user base. Nonetheless, some of them did have discussions with other app stores regarding exclusive content within the app or time limited exclusivity on other app stores.

4.98 We are concerned that while Project Hug provided benefits to certain top app developers in the short term, including commercial benefits related to the use of other Google products and services, it was aimed at reducing competition in the long term by undermining emerging competition from other distribution channels.[289]

4.99 Even though developers would have used the Play Store irrespective of Project Hug, we consider the initiative had two impacts (i) in the short run it increased app developers' willingness to pay the commission rate because overall they received value from a better deal on other Google's products and services; and (ii) it pre-empted any future potential attempt from alternative app stores to establish exclusive distribution deals (for exclusive distribution of the app or exclusive content in the app) with them.

4.100 In other words, Google reacted to the potential threat of distribution through other channels by raising the barriers for other app stores to compete by attracting exclusive content, since that would require app developers to forego greater benefits from Google. Moreover, we are concerned that the additional integration with Google products further increases developers' reliance on Google and makes it more difficult for them to leave the Play Store as a

[289] As detailed in Appendix E, based on documentary evidence submitted by Google, Google identified that Project Hug might discourage relevant developers from co-listing on other app stores in addition to the Play Store – with the view that this would create a cycle for Play whereby alternative app stores would have less top titles and in turn less users, which in turn would reduce smaller developers' incentive to co-list on several app stores. Such a cycle would reduce the risk of spending being diverted away from the Play Store and to alternative stores.

distribution channel in the future, thus strengthening Google's position in native app distribution.[290,291]

Sideloading

4.101 Apple does not allow users to sideload native apps on its devices – Apple submitted that this is because the 'iPhone was designed as a closed ecosystem where the operating system, iOS, was configured to prevent third-party applications or software from being downloaded to the phone'.

4.102 In theory, users could get around Apple's restriction on sideloading by engaging in a process called 'jailbreaking' which allow users to install software not available through the iOS App Store and thus sideload alternative app stores and apps.[292] However, we understand that jailbreaking is technically difficult, and a violation of Apple's terms, so it is unlikely to be a viable option for the vast majority of users.[293]

4.103 We understand that other exceptions to the App Store's restriction on sideloading are limited in nature and cover programs such as Apple's TestFlight[294] and Apple Developer Enterprise Program.[295,296]

4.104 Therefore, **the App Store does not face a competitive constraint from users sideloading apps.**

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[290] As outlined above, the Project Hug initiative included value for developers in the form of Google's cloud, advertising and marketing services, which encourages developers to adopt other complementary products and services offered by Google and thus deepens its relationship with such developers.
[291] We understand from Google, that Google has started to introduce an updated version of the Project Hug initiative aimed at ensuring that app developers provide Play Store users with equivalent content as they do on other platforms and they launch their apps on Play at the same time as they are launched on iOS. In addition, Google told us that the updated version of Project Hug 'was designed to promote Play as the go-to destination for top games developers, and to foster the opportunity for cross-Google collaboration with its gaming partners'. We understand that the requirement to launch their apps on the Play Store before or at the same time as when launched on iOS was also a requirement for developers participating in the original version of Project Hug. We note that to the extent that these strategies are more widely adopted it will be important to consider their impact on the competitive constraints faced by the Play Store and if such agreements further entrenched the Play Store's already strong position.
[292] Jailbreaking permits root access to iOS such that the restrictions put in place by Apple can be bypassed. For example, see Is jailbreaking safe? | Norton.
[293] For example, see The Life, Death, and Legacy of iPhone Jailbreaking (vice.com). In addition, Apple said that engaging in jailbreaking is a violation of the iOS end-user software license agreements and that, under those agreements, Apple may deny service for an iPhone or iPad that has installed any unauthorised software via jailbreaking. Reflecting this, none of the app developers who responded to our requests for information considered this to be an alternative method through which to distribute apps. Indeed, one app developer said that it does not support its native app on devices which have been found to be jailbroken.
[294] Apple's TestFlight allows app developers to invite up to 10,000 users to sideload their apps for the purpose of testing. See TestFlight - Apple Developer.
[295] The Apple Developer Enterprise Program only allows large organisation to develop and deploy proprietary, internal-use apps to their employees.
[296] We also understand that Apple has taken action against app developers found to be in breach of its Enterprise program. For example, see Apple bans Facebook's Research app that paid users for data | TechCrunch.

4.105 In contrast, sideloading is possible on Android devices. Google said that sideloading requires a few more steps than using an app store, but is neither materially more time consuming nor cumbersome. Google cited the example of Epic Games' Fortnite app, where Samsung produced a guide showing 12 steps to install Fortnite via the Galaxy Store compared to 16 steps when done via sideloading.

4.106 Google also said that, while there are security risks, Android users can configure their browser to allow sideloading by default in the future by enabling downloads from 'unknown sources'. Users that do this do not have to go through the additional steps, but users who do not configure their browsers in this way will have to go through the steps for each sideloaded app.

4.107 Google said that sideloading is a viable way of distributing apps to users, especially 'in circumstances where the app is well-known and users are motivated to seek it out'. For example, Google said that Epic Games' Fortnite app can be sideloaded, as can WhatsApp.

4.108 **We have found evidence that sideloading places only a very limited constraint on the Play Store** at present, for the following reasons.

4.109 First, while the data we have on sideloading is limited, it indicates that only a small proportion of downloads on Android devices are via sideloading.[297] For example, Google provided data showing that in February 2022 [3-3.5] million off-Play Store installs were sideloaded (this includes downloads from alternative app stores that were not preloaded).[298] This compares to an average of [100-200] million installs per month through the Play Store during 2021.

4.110 Second, the majority of app developers that responded to our request for information did not use sideloading as a distribution channel or identify it as an alternative to the Play Store. Reasons provided for this included the process users have to go through on Android devices to sideload apps (discussed below), that sideloaded apps may lead to a suboptimal experience as features may break and because it requires users to turn off the security settings on their device.

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[297] Consistent with this, our survey found that only 12% of Android users had downloaded apps directly from a website without using an app store and only 1% of Android users said it was the method used most often. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 44.
[298] This was based on installations that occurred while the device had an internet connection and on active Google Mobile Services devices (ie Android devices with Google's apps and services preloaded) with Google Play Protect enabled, which account for [90-100]% of GMS devices in the UK.

4.111 Other app developers said their apps could be sideloaded, but just over half said they did not actively use the channel. Consistent with this, evidence provided by app developers showed that sideloading as a proportion of all downloads on Android devices was very low, with only two app developers who responded to our information requests being an exception to this.[299]

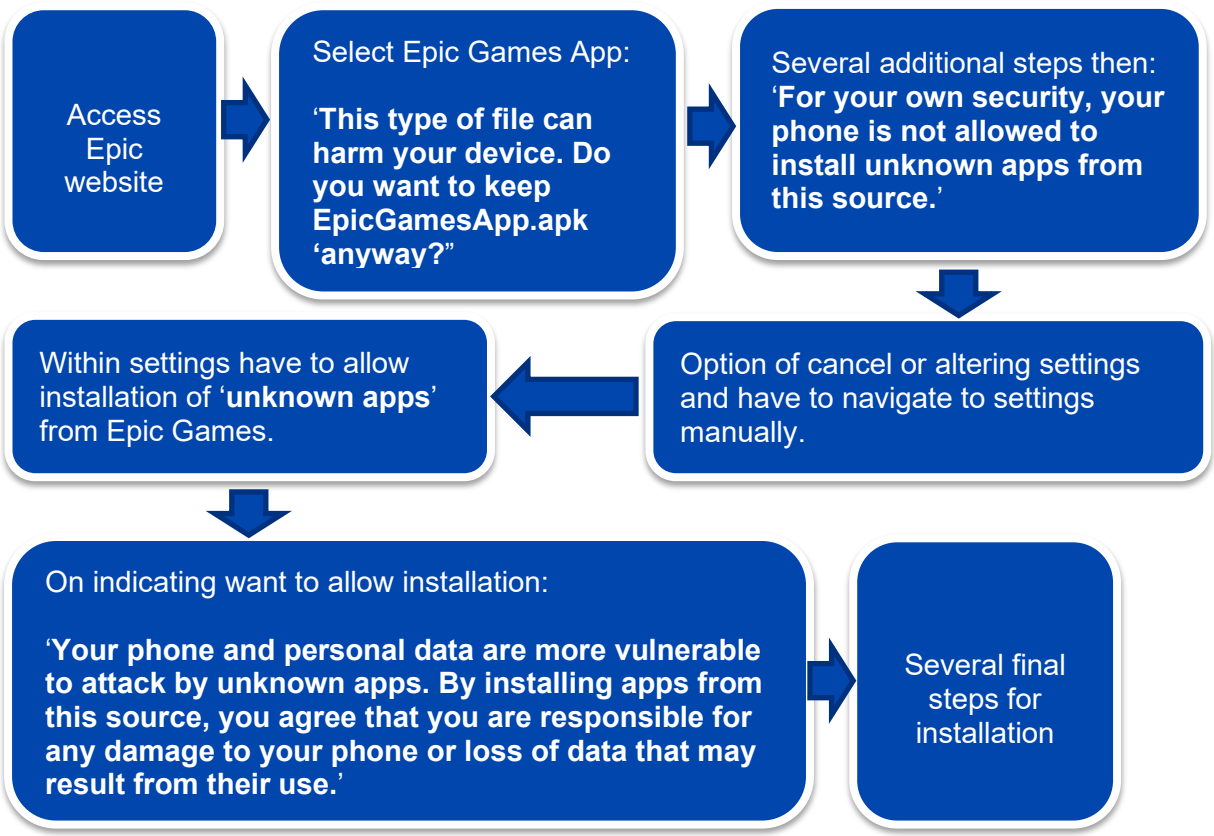
4.112 Google specifically identified Epic Games as an app developer who has a native app (in this case Fortnite) that users can sideload. While this is the case, Epic Games cited difficulties in doing so.[300]

4.113 Third, we understand that there are factors that are likely to limit the viability of sideloading as an alternative to the Play Store for both users and app developers.

4.114 The first of these is that sideloading on Android devices involves an extended process and the lowering of Android's security settings. For example, Figure 4.7 below shows the process for sideloading the Epic Games App based on information provided by Epic Games. We understand from Google that device manufacturers can amend the steps involved in sideloading and language used in any warnings as they see fit. We are aware of at least one manufacturer that has made a substantive change to the steps involved or language used on Android devices.

[299] One app developer provided evidence from October 2019 when roughly one third of its installations and updates on Android devices were outside the Play Store.
[300] Epic Games said that for the four months its Fortnite app was listed on the Play Store, a similar proportion of its downloads came through the Play Store and sideloading. One of Epic Games' other native apps, Houseparty, was only available on Android devices on the Play Store and Epic Games outlined that the Android operating system makes it unreasonably difficult for users to sideload apps and, as set out below, identified a number of issues around sideloading.

Figure 4.7: Sideloading process for the Epic Games App



4.115 As can be seen above, a user has to go through multiple steps and faces several warnings that are worded in a way that is likely to reduce the likelihood of users sideloading apps. Indeed, several app developers identified this as a challenge involved in using sideloading.[301]

4.116 Our understanding is that these steps are the same for all sideloaded apps and as such do not take account of the individual risk of the app the user is trying to download. However, as set out above, users can configure their browsers to allow sideloading by default, meaning these steps are not needed.[302]

4.117 Epic Games also said that in certain circumstances users may not be able to sideload at all on Android devices. Epic Games submitted that:

- Users enrolled in Google Play Protect may be prevented from installing or have an app forcibly removed from their device if it is deemed 'harmful'.

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[301] Although we understand that any app can launch the relevant Settings screen proactively to prompt users to allow installs from 'unknown sources', thereby avoiding the need to show users a dialog box beginning "For your own security, your phone is not allowed to install unknown apps from this source. You can change this in Settings". See Making it safer to get apps on Android O.

[302] Google confirmed that once a user had been through the process with a particular source it did not need to go through the process again with that source.

- Users enrolled in Google's 'Advanced Protection Program' are prevented from sideloading any apps. These users can only use either the Play Store or another pre-approved, pre-installed app store (if available).

4.118 Sideloaded apps can also face some limitations in terms of what APIs and functionalities they can access. We understand from a third-party blog post that the upcoming Android 13 operating system version will introduce certain restrictions on how sideloaded apps downloaded outside an app store can use accessibility APIs. These APIs are particularly useful when creating apps for users with disabilities.[303] This change will further increase the number of steps required to use a sideloaded app that relies on these accessibility APIs compared to an app from an app store.[304]

4.119 The second factor is that sideloaded apps do not automatically update – the user has to manually update the app. One app developer, Epic Games, explained that this can be burdensome and time-consuming for its users given one of its native apps, Fortnite, is typically updated every other week.[305]

4.120 Although we understand Google has introduced changes to the way in which sideloaded apps can be updated with Android 12,[306] we heard from F-Droid, an alternative app store provider, that these changes still have limitations and provide a 'second rate' experience. Moreover, this change will affect only a small number of Android devices in the short term because the majority of active Android devices use older versions of the Android operating system.[307]

4.121 Finally, while their policies and approaches towards sideloading differ, Apple and Google both submitted that sideloaded apps create additional security risks for users.[308] We consider such security justifications in Appendix N.

Web-based alternatives to native apps

4.122 Both Apple and Google consider that users are able to access and purchase content on mobile devices through web-based alternatives, including websites

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[303] See Android 13's sideloading restriction makes it harder for malware to abuse Accessibility APIs (esper.io).
[304] We understand from Google that, by their very nature, accessibility APIs are powerful and sensitive, and mimic some capabilities of system apps, which make them an attractive and active target for dangerous malware development. The new feature is therefore aimed at protecting users from malware like 'FluBot' that masquerade as legitimate apps and rely on those accessibility permissions to compromise user data and devices. See FluBot Malware: How It Spreads and How to Remove It - FraudWatch.
[305] Epic Games also explained that depending on the version of Android operating on the device, the user may have to go through many or all of the same steps.
[306] Google introduced new features that will enable even sideloaded apps to update automatically. See Google's Statement of Scope response at Response: Google (publishing.service.gov.uk) and Features and APIs Overview | Android Developers.
[307] According to StatCounter, in April 2022 in the UK, there were only 21.8% Android devices using Android 12.0. See Android Version Market Share United Kingdom | Statcounter Global Stats.
[308] For example, Google said that the additional steps, at least in the first instance of sideloading, are both modest and required for security reasons.

and web apps, and that these alternatives place a competitive constraint on their app stores.[309]

4.123 Modern web apps (which run on browsers), have more functionality than a regular webpage, including opportunities for interactions and, partially operating offline, and (on Android) providing push notifications. They also have added functionalities such as faster loading and the option to be added as an icon on a mobile device home screen just like a native app.[310]

4.124 Web apps can in principle deliver efficiency savings for content providers. This is because the content provider can develop one web app which can be used across browsers on any operating system due to the common standards of the open web. Web apps may involve lower development and maintenance costs compared to native apps, as these generally have to be written separately for each operating system.[311] Web apps therefore could enable content providers to make their content available to a potentially much larger user base.

4.125 Many app developers told us that such hypothetical efficiency savings would be outweighed by the existing discoverability challenges of web apps. In fact, some app developers highlighted that developing a web app would result in incremental costs, as they would need to continue to develop native apps.

Competitive constraint from web apps in Apple's ecosystem

4.126 **The evidence suggests that currently web apps place only a very limited constraint on the App Store** within Apple's ecosystem, for the following reasons.

4.127 First, although Apple submitted there are not significant differences in the functionality of web apps depending on the browser a developer or a user chooses to use,[312] Apple does impose restrictions on the browser engine that web browsers use on iOS devices. In particular, all web browsers on iOS devices have to use Apple's WebKit browser engine (eg Google Chrome on

[309] Websites and web apps are discussed in more detail in the next chapter.
[310] For further details on web apps see Chapter 5.
[311] As discussed below, some cross-platform development tools are available, however, the uptake of these tools seems limited at present with all the app developers we requested information from developing native apps separately for iOS and Android.
[312] Apple also stated that several large app developers have made apps available as web apps including Facebook, Starbucks, Pinterest, Google, Match, Uber and the Financial Times. Apple also said that some of the most advanced streaming game services had opted to offer their games via web apps rather than release their services through the App Store as native apps. We consider the example of cloud gaming as web apps in Chapter 6.

iOS devices is based on Apple's WebKit, rather than Google's Blink browser engine).

4.128 Apple has acknowledged that web apps cannot access all of the device features that are available to native apps and that in limited cases web apps can experience latency and other degradations in quality compared to native apps. However, it stated that for many types of apps, web apps can offer a feature rich experience that is comparable to native apps in terms of functionality, ease of use and user experience.

4.129 We understand from online content providers and app developers that the use of the WebKit browser engine materially restricts the functionality of web apps compared to native apps, as considered further in the next chapter. Some examples of reduced functionality available for web apps on iOS devices include:

- lack of push notifications: WebKit does not support push notifications to a user's home or lock screen;[313]
- lack of full screen display: the browser's user interface remains visible in web apps;[314]
- lack of Web-Bluetooth**:** which provides the ability to connect and interact with Bluetooth Low Energy peripherals, such as printers and scanners, payment devices, smart lighting and home automation;
- iOS mutes web apps by default**:** and touch input from users is required for audio to work;
- lack of access to hardware rendering: web apps have to rely on software-based, single-thread rendering, which means less efficient processing and ultimately results in greater battery drain; and
- an inability to prompt users to add an icon to their home screen, such that iOS users must click on the Safari browser and then click the 'share button' and scroll to select the 'Add to Home Screen' feature in order to place a web app icon on their home screen.[315]

[313] Apple has announced it is now in the process of implementing push notifications in WebKit. See iOS 16 enables web push notifications with Safari update - 9to5Mac and iOS 16 Preview - New Features - Apple.
[314] However, we understand that for web apps pinned to the home screen (which is only possible on Safari but not on other browsers on iOS) users can turn off the browser's UI. See Chapter 5 for further details.
[315] This contrasts to the situation on Android devices where users can be sent a prompt that encourages them to add the web app to their home screen.

4.130 Second, as discussed in more detail in Chapter 5, Apple's support of web apps on non-Safari browsers is even more limited than on its own Safari browser. For example, parties submitted that Apple does not allow any browser other than Safari to offer the functionality that enables users to add the icon of a web app to the home screen. We understand that this functionality is a prerequisite for any web app experience to resemble that of a native app.

4.131 Third, while most app developers that responded to our requests for information did offer the same products and services through web apps or web pages as through their native apps, most did not consider web apps and webpages to be adequate substitutes to native apps. Most of these app developers cited the inferior or limited functionalities and performance of web apps compared to native apps.

4.132 Moreover, app developers provided mixed responses on the potential for web apps to compete with native apps, even absent the WebKit restriction imposed by Apple. In particular, developers of apps which are complex, or which require high performance, did not consider web app development to be an appropriate substitute for native app development due to the remaining differences in functionalities which they believe to deliver a degraded user experience or reduced discoverability by users.

4.133 Fourth, this was supported by our survey where only 8% of iOS users said they used a mobile browser to install a web app icon on their screen without using an app store and only for 2% was it the way they used most often.[316,317] In contrast, 95% of iOS users stated the App Store was the main way they got apps onto their smartphone.[318]

Competitive constraint from web apps in Google's ecosystem

4.134 Google said it had an incentive to support web alternatives as Google is an ad-funded business and increasing the volume of high-quality content

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[316] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 43.
[317] We asked respondents about the alternative ways in which they had accessed the services for which they had an app on their smartphone separately in relation to four app categories – gaming, entertainment/TV, dating and music apps. This indicates a higher level of usage of websites overall, but the survey does not allow us to understand the frequency with which alternatives were used and for what purpose. For example, 20% of iOS users accessed the mobile gaming services they had an app for on their smartphone through a browser on a smartphone and 11% through a browser on a tablet. These figures were 34% and 21% for Entertainment/TV apps and 29% and 13% for music apps. For dating apps these figures were 29% and 6% respectively but due to sample size this was across all users. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 46, 51, 56 and 58.
[318] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 43.

increases the opportunities to show users relevant ads.[319] Google said that web apps (including progressive web apps) are becoming increasingly sophisticated and are often comparable in quality to native apps such that Google considers them to be a viable alternative to native apps.[320]

4.135 Despite this, the evidence suggests that web apps are not currently a viable alternative to native Android apps for many app developers. This means that the competitive constraint from web apps on the Play Store is currently limited. This is for the following reasons.

4.136 First, we understand that while web apps on Android devices have greater functionality than on iOS devices, some app developers have told us that they consider there is still a gap in functionality between native Android apps and web apps. For example, Match Group said that on Android devices, web apps have better functionality in terms of push notifications, storing of offline data and better geolocation among others, but that there is still a gap between the performance, speed and quality of native apps and web apps on Android devices.

4.137 In addition, as has been put to us by several technical experts, one of the main benefits of web apps for app developers is the ability to make a single app available through browsers on all operating systems (rather than producing a separate native app for each operating system). Therefore, the limited support for web apps on iOS devices is also likely to impact their availability on Android devices. In particular: (i) there is more limited benefit to developing one web app across Android and iOS devices if there are limited features and functionality for web apps in one of these ecosystems; and (ii) the potential savings in development costs are reduced if a developer has to develop a web app for Android but also develop a native iOS app.[321]

4.138 Reflecting this, most app developers submitted that they did not currently consider web apps and webpages to be adequate substitutes to native Android apps as discussed above and further detailed in Chapter 5.

4.139 Second, Google's data on the number of installations of progressive web apps via Chrome on Android devices indicates that web apps are used much less

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[319] In this regard, Google said that Android is a leader in facilitating web app technologies as recognised by third-party reports. For example, see The state of PWA support on mobile and desktop in 2020 | Blog | simplabs.
[320] Google identified several app developers that used web apps, including Twitter. Google pointed to public sources stating that when Twitter started using a web app, it saw a 65% increase in pages per session, a 75% increase in Tweets sent, and a 20% decrease in bounce rate, while the size of their app decreased by over 97%. See Twitter Lite PWA Significantly Increases Engagement and Reduces Data Usage (google.com).
[321] For example, in response to questions from the CMA, we were told that 'Apple's requirement that browsers use WebKit browser engine also impedes the development of the web platform as a whole, slowing adoption of web apps, and - for developers who want to offer a consistent cross-platform experience - reducing the functionality of web apps to the lowest common denominator.'

than native apps on Android devices. Google estimates that in the UK, progressive web app icons were installed by users on the screens of their Android devices via Chrome a total of [5–5.5] million times in 2019 (and declined to [4–4.5] million installs in 2021).[322] This is compared to the installation of [1.5–2] billion native apps from the Play Store for the UK in 2019 and [2-2.5] billion in 2021.

4.140 This was supported by our survey where only 6% of Android users said they used a mobile browser to install a web app icon on their screen without using an app store and only for 1% was it the way they used most often.[323] In contrast, 90% of Android users stated the Play Store was the main way they got apps onto their smartphone.[324]

Conclusion on the constraints within each mobile ecosystem

4.141 Overall, the evidence suggests that the constraint from within each mobile ecosystem is limited:

- **Pre-installation:** Apple does not allow it on iOS devices and on Android it is not a viable alternative to the Play Store for the vast majority of app developers.

- **Alternative app stores:** Apple does not allow alternative apps stores on iOS devices. While such app stores are available on Android devices, the outcome is much the same. The Play Store accounts for [90-100]% of downloads and alternatives face material barriers such as indirect network effects and Google's agreements which lead to the pre-installation and prominent placement of the Play Store.

- **Sideloading:** Apple does not allow sideloading on iOS devices. While it is allowed on Android devices, it is not widely used by users or app developers including due to the process users have to follow, which includes warnings of the potential security risks of sideloading.

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[322] This does not include any progressive web app icons installed by users on their screens from alternative browsers on Android or any or other web apps / webpages bookmarked by users onto their screens.
[323] We asked respondents about the alternative ways in which they had accessed the services for which they had an app on their smartphone separately in relation to four app categories – gaming, entertainment/TV, dating and music apps. This indicates a higher level of usage of websites overall, but the survey does not allow us to understand the frequency with which alternatives were used and for what purpose. For example, 24% of Android users accessed the mobile gaming services they had an app for on their smartphone through a browser on a smartphone and 6% through a browser on a tablet - these figures were 35% and 14% for Entertainment/TV apps and 30% and 9% for music apps. For dating apps these figures were 29% and 6% respectively but due to sample size this was across all users. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 46, 51, 56 and 58.
[324] Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figure 44.

- **Web-based alternatives**: Development and usage of web apps is substantially lower than native apps and this is reinforced by restrictions on the functionality of web apps within Apple's ecosystem, which also undermine the availability of web apps on Android.

Competitive constraints between Apple's and Google's app stores

4.142 Next, we have considered the strength of competition between the App Store and Play Store that may result from having to attract app developers and users to each platform.[325]

App developers

4.143 App developers use app stores as a gateway to access mobile device users, and a particular gateway is more valuable to an app developer the more users they can access through it. This means that mobile ecosystems can compete for app developers both directly (eg in terms of the services they offer) and indirectly, by attracting users to their mobile ecosystems.

4.144 It is also important for mobile ecosystems to ensure that they attract a wide range of quality app developers. This is because the overall app ecosystem is an important factor in users' choice of mobile device – as set out in Chapter 3, both past and current rivals to Apple and Google have either lost or struggled to attract users due to their weaker app ecosystems.

4.145 Both Apple and Google have told us that they competed with each other to attract app developers to their app stores.[326]

4.146 In the sub-sections below, we consider the constraints that exist as a result of app developers reacting to either an increase in prices or decrease in quality

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[325] In this section we have not considered the constraint from either potential new entrant app stores that might arise due to entry at the mobile operating system or app stores on Huawei's HMS devices or Amazon's Fire OS tablets. This is because, as set out in Chapter 3, these alternative mobile operating systems place a limited constraint on Apple and Google at the operating system level given significant barriers to entry and expansion.
[326] Apple submitted that there is a cost to developing a native app such that it needs to ensure that iOS is attractive to app developers otherwise they may not use iOS or may prioritise other digital platforms (eg Android or games consoles). It also told us that developers are sensitive to factors including commission rates, the technical capabilities of devices, the available developers tools, the number of users and on the amount users are expected to spend that platform, and other services offered by the platform. Apple said that it has improved the terms it offers to developers over time. Google submitted that it competes to bring developers to Android and keep their attention, as developers shift their resources and attention to the distribution channel that maximises their returns. Google said it faces fierce competition from Apple, with some high-profile app developers prioritising the App Store, given the volume and higher value of Apple users. It also said that it has reduced its service fees and introduced new features, investment and innovations to remain competitive and attractive to developers. Google's Statement of Scope response available at Response: Google (publishing.service.gov.uk).

of app stores, by deciding to list their apps only on the Play Store and not Apple's App Store or vice versa.[327]

4.147 The Play Store was materially larger than the App Store in 2021 in the UK in terms of apps (roughly [3-3.5] million vs [1-1.5] million) and app developers (roughly [900,000-1 million] vs [500,000-600,000])[328] so some app developers only develop for one or the other. For example, there are new apps being developed all the time and these app developers may well decide to develop for just one mobile ecosystem in the first instance (for example, due to resource constraints).

App developers delisting from either the App Store or Play Store

4.148 Most large and popular third-party apps are present on both Apple's iOS and Google's Android.[329] For example, we have estimated that 85% of the top 5,000 apps on the App Store also list on the Play Store and vice versa.[330] This was supported by evidence from a broad range of parties, including Apple and Google, and all of the large app developers from whom we requested information.[331]

4.149 For app developers that have apps on both app stores, delisting from either the App Store or Play Store is unlikely to be a credible option. One of the key benefits to app developers of developing for iOS and Android is the ability to reach virtually all active smartphone users with the App Store and Play Store providing access to [50-60]% and [40-50]% of UK smartphone users respectively. As these users do not multi-home across iOS and Android, the App Store and Play Store both provide app developers with access to a large number of unique mobile device users.

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[327] For example, existing apps could delist from either the App Store or Play Store if they currently use both or if only using one of them would have to redevelop their app to switch to the other. In contrast, new apps would be deciding which app store to develop for.
[328] The evidence we have received suggests that single homing apps are smaller or less well-known apps with low levels of downloads.
[329] This is also consistent with the findings of studies by other national competition authorities. For example, see Digital platform services (accc.gov.au), page 36.
[330] CMA analysis of data from Apple and Google. The top 5,000 apps have been identified based on downloads – for the App Store these accounted for around 75% of all downloads and for the Play Store around 63%. This figure was estimated using text similarity between the app names listed on each store. Many apps are identically named on each store but some apps have slight variations between stores. App names above a certain similarity threshold were considered a match. A sample of edge cases were reviewed manually to confirm the accuracy of the approach.
[331] For example, Apple told us that popular and successful app developers almost universally choose to multi-home, that is, make their apps available on both Android and Apple devices. Google told us that app developers typically multi-home across different operating systems and devices with many of the same apps, including popular apps (eg Amazon, Facebook, WhatsApp, Instagram, Netflix, Spotify among others) and Google's apps, being available on both Android and Apple devices. Google said that this means users have access to similar app catalogues.

4.150 Delisting from the App Store is likely to be particularly unattractive as:

- the App Store also provides access to [50-60]% of active tablets (compared to [20-30]% through the Play Store); and
- Apple users are more valuable to apps using in app payment systems – for the UK in 2021 the average App Store user spent £[25-50] through Apple IAP[332] compared to the average of £[0-25] per active Android mobile device through Google Play's billing system.[333,334]

4.151 Ultimately, for these app developers, delisting from the App Store or Play Store would mean forgoing existing revenue generated from users of that app store. Consistent with this, we have not seen evidence of large app developers delisting from the App Store or Play Store, with the exception of Epic Games, and app developers who responded to us did not see this as an option.

4.152 Competition for app developers may also exist in relation to the prices charged in relation to and features of the native app made available on each app store. Evidence from app developers does show that, at least in some cases, they are willing to differentiate their app offerings across the App Store and Play Store. For example, some app developers explained that their native apps differed between iOS and Android devices because of differences in the functionality allowed by each operating system.

4.153 However, the competitive constraint placed on Apple and Google by any such differences depends on whether it would lead to users switching between using apps downloaded from the App Store and apps downloaded from the Play Store and vice versa. As set out below, we do not consider that the threat of such user switching places a significant constraint on Apple or Google in practice.

App developers switching between the App Store or Play Store

4.154 Some app developers only list on one of the App Store or Play Store at present. These app developers could theoretically constrain Apple or Google to some degree by switching between the two apps stores. However, we

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[332] We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.
[333] Spending on apps including Play Pass. We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.
[334] This is also supported by evidence from the US where survey evidence shows that Apple users tend to earn and spend more than Android users. See iPhone Users Spend $101 Every Month on Tech Purchases, Nearly Double of Android Users, According to a Survey Conducted by Slickdeals (prnewswire.com).

understand this would involve redeveloping their native apps at significant cost:[335]

- native apps are written in the specific coding language for that operating system with the coding language of iOS and Android differing such that a developer would have to re-write its apps in a different coding language; and

- native apps are built using the specific framework of an operating system and these frameworks may differ across operating systems[336] such that a developer would have to re-write its apps where relevant elements of these frameworks differed.

4.155 This means that app developers would face a cost for redeveloping their apps for use in the App Store or Play Store.[337] Given this and uncertainty around whether they would be able to replace their existing user base, app developers told us that it is not an option to switch from the App Store to the Play Store or vice versa. This is likely to be particularly the case for those only using the App Store, given users on average spend more per year through Apple IAP than Android users spend through Google Play's billing system (as set out in the market outcomes section above).

4.156 Further, app developers only using one of the App Store or Play Store are likely to have smaller and less popular apps and therefore it is not clear that app developers of this nature would place a material constraint on Apple or Google in any event. This is illustrated by the level of multi-homing among large apps – as outlined above we estimated that of the top 5,000 apps on the App Store 85% are on the Play Store and vice versa.

[335] Some app developers may use cross-platform tools which allow them to develop one app that can be used across different mobile ecosystems. The use of such tools may mitigate some of these costs, however, it also implies that they are on both Android and iOS devices so we have not considered this further.
[336] For example, app developers explained that the user interface, APIs, development and deployment tools, app store rules and requirements, features and functionalities of each operating system may differ.
[337] Although the extent of that cost is likely to differ by app developer depending on the nature of their apps. For example, one app developer told us that each of its native apps had common underlying technologies that they interoperate with which means that a proportion of the code for each app was common. The app developer said that 40-60% of the code was common for its apps depending on the app in question. The higher the proportion of code that would be common across native apps the lower the cost of redeveloping the app.

New app developers first deciding between the App Store or Play Store

4.157 Given the costs involved in developing native apps and the uncertainty of how new apps will perform, app developers may only develop their new apps for one mobile ecosystem initially.[338]

4.158 There appears to be some competition for new app listings between Apple and Google. They both provide app developers with tools and services aimed at making it easier for apps to be developed for their respective ecosystems and they have improved these tools and services over time. This is likely to have reduced the costs for app developers making it more attractive to develop for their mobile ecosystems. Apple and Google have also provided app developers with new functionality over time – providing them with new ways to innovate, increase content and generate revenue making opportunities.

4.159 However, this is likely to apply to new and thus less well-known apps making up a small proportion of downloads. Furthermore, if these apps become successful, they are likely to have an incentive to develop for both mobile ecosystems given they each provide access to a separate group of users. It is also not clear that these new apps would be visible to and affect the decisions of most users. While we have found that the availability of apps in general is important and a barrier to entry for new operating systems, as set out in Chapter 3, the availability of third-party content does not play a material role in driving whether a user chooses an iOS device or an Android device. In particular, most large and popular third-party apps are present on both Apple's iOS and Google's Android and survey evidence shows that apps, the prices of apps and the range of apps appear to have limited importance to users in their choice of device given the multiple dimensions (eg camera type) considered by users when purchasing a device (see next sub-section).

4.160 Google has also said that new cross-platform tools are enabling app developers to build an app once and run it across iOS and Android and other operating systems without the need for any material re-coding or other work. Google submitted that 1 in 8 new apps on the Play Store were created using its own cross-platform tool Flutter.[339]

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[338] For example, Apple stated that 'app developers may face constraints to multi-homing (including liquidity or resource constraints) and therefore focus at first on the mobile platforms that are most profitable. Therefore, various mobile [operating systems] and other platforms have to compete for novel apps, ie for the entrants, who will typically not multi-home initially. It is important for mobile platforms to attract such entrants, as they often reflect the forefront of innovation, and help differentiate a mobile platform against its rivals.'
[339] See Beautiful native apps in record time | Flutter and Google I/O 2021: Flutter 2.2 adds monetization hooks as it gains traction | ZDNet.

4.161 While it is unclear to what extent app developers use these tools in practice, they can remove the need for app developers to decide on which ecosystem to develop for first and so reduce the extent to which Apple and Google compete for that initial exclusivity. However, we note that none of the large app developers who we contacted had used these cross-platform tools and some explicitly said that they would not use them, for example, because native apps are better optimised for each operating system.[340,341]

Users switching between the App Store and Play Store

4.162 If sufficient numbers of users were willing to switch between the App Store and Play Store – by buying a new device – then this could in principle constrain Apple and Google. As set out in Chapter 3, users generally have either an iOS device or an Android device and we consider it unlikely that the relatively small number of users with both an iOS device and an Android device would provide a competitive constraint on Apple or Google.

4.163 This means that users who wish to switch between the App Store and Play Store must also switch between using an iOS device and an Android device by purchasing a new mobile device. This is likely to be the case if the app stores are an important consideration in users' choice of device. In this regard, both Apple and Google consider their respective app stores to be an important part of the offering to consumers that comes with their mobile device and operating system and that they compete with each other for users.[342]

4.164 As a general point, our assessment in Chapter 3 found that there is limited effective competition between iOS devices and Android devices. For example, the supply of mobile devices and operating systems has been segmented into broadly two groups (ie higher-priced and lower-priced devices) and users

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[340] Two respondents to our online app developer questionnaire mentioned such cross-platform tools with one explaining they were not suitable for the apps it developed and the other explaining that they work well in categories such as games, but that in other categories native apps are usually used.
[341] For example, one app developer said that the technologies underlying a cross-platform development tool are held back by the pitfalls of both operating systems and the time taken to build the technology on top of updates to both operating systems. In this regard, Google acknowledged that some app developers prefer to develop apps specifically for different platforms, so that they can (in their view) take the fullest advantage of the features provided by each platform. Google also said that the Flutter team tries to identify and remove impediments that might inhibit a developer from taking full advantage of each operating system.
[342] For example, Apple told us that 'the importance of a thriving app ecosystem for the success of a device can hardly be overstated' and that iOS and Android compete fiercely in terms of app availability. Apple considers the importance of the app ecosystem is also reflected in the importance of the operating system in users' decision making – Apple noted that [✂]. Google told us that '[operating systems] and app stores compete as a system' and that 'Play forms an important part of the Android platform that Google creates for [manufacturers], users and app developers.' Google considers providing access to a wide range of popular and high-quality apps is important and users have access to similar app catalogues across iOS and Android. Google stated that as over 90% of apps are free on both the App Store and Play Store the cost of apps is of 'very limited (if any) importance to users in deciding between' iOS and Android devices. 'Rather, it is the quality of apps available that matters to users.'

rarely switch between iOS and Android devices with there being material perceived barriers to switching between iOS and Android devices.

4.165 Further, it is more likely that users would switch device if the actions of Apple or Google led to the largest app developers (accounting for most downloads) delisting from the App Store or Play Store. However, as set out above it is unlikely that these app developers would delist from one of these app stores, due to the volume, value and uniqueness of users on each.

4.166 While app developers may differentiate their app offerings across the App Store and Play Store (eg in terms of functionality as outlined above), we do not consider that this would lead to users switching between iOS and Android devices in order to access a different app store. This is both due to the general reasons set out above as well as the following factors:

- Both new and existing users of mobile devices have limited awareness of the conditions at the app store level and the extent to which they differ between the App Store and the Play Store (in particular for first time device buyers). For example, users would generally need access to a native app on both app stores to understand any differences in its detailed functionality. This would also be the case for in-app purchases and subscriptions which account for most of the user spending as set out in Chapter 6.

- Apps, the prices of apps and the range of apps appear to have limited importance to users in their choice of device given the multiple dimensions (eg camera type, battery life) considered by users when purchasing a device[343] and the complexity of the costs they have to take into account (eg immediate cost for the phone versus deferred costs for apps, in-app purchases and subscriptions). This is supported by the literature on consumer myopia (ie consumers care more about present

[343] In this regard, citing the findings of the Dutch competition authority, Apple considers that importance of the price and range of apps relative to other factors (including device brand, camera quality, screen size, etc.) is driven by a lack of differentiation in the price and range of apps available across Apple's ecosystem and Google's ecosystem, such that users focus on areas of greater differentiation. Google stated that the cost of apps is of 'very limited (if any) important users' due to the fact that over 90% of apps on both the App Store and Play Store are free to download such that competition was on the quality of apps available. Google cited evidence from Statista that 96.7% of apps available on the Play Store and 92.9% of apps on the App Store in March 2021. Statista, Distribution of free and paid apps in the Apple App Store and Google Play as of March 2021.

costs over future costs),[344] evidence from our consumer survey[345] and the surveys we have received.

- Finally, the cost of a new device is likely to significantly outweigh any differences in the costs of apps. Users are unlikely to invest in a new smartphone due to a small rise in the prices of apps caused by an increase in the commission rate, especially when most native apps are free. For example, the average price of an Apple smartphone in 2021 was £779[346] considerably higher than the [£100-125] spent by UK users of the App Store engaging in a billable transaction in 2021.[347,348] We consider it even less likely that Android users would be likely to switch to a more expensive device. This is because the majority of Android smartphones were sold for less than £300 in 2021 (65%)[349] whereas Apple's cheapest device, the SE iPhone, retails on a standalone basis at £360,[350] Android users tend to be more price sensitive (as set out in Chapter 3) and we observe lower levels of spending in the Play Store (see Table 4.2).

Waterbed effect

4.167 Apple also argued that its App Store and the decisions it makes regarding it cannot be assessed in isolation from the rest of its business.[351] It argued that the commission it charges in relation to apps, in-app payments and subscriptions generates an incremental revenue flow which gives it an incentive to lower the price and increase the quality of its devices.[352]

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[344] In particular, a user's decision to purchase any device is likely to be driven more by the immediate costs ie price of the device rather than any future costs such as app prices or in-app purchases. This is due to present biased preferences, that is, the tendency to assign greater relative weight to costs and benefits that are closer to the present, when considering trade-offs between two future moments (O'Donoghue and Rabin, 1999). More broadly, Ericson and Laibson (2018), introduce the idea of present-focused preferences (present bias being a special case of present focused preferences) which results in users making more impatient choices in the present by focusing on immediate payoffs. See O'Donoghue and Rabin (1999), Doing It Now or Later, American Economic Review Vol. 89, NO. 1, March; Ericson and Laibson (2018), Intertemporal Choice, NBER Working Paper Series, Working Paper 25358.
[345] The "range and quality of mobile apps available on the device" and the "price of subscriptions/content for apps available on the devices" were the least important factors mentioned, when users were asked what influenced their smartphone purchase decision. Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', Figures 5, 6 and 7.
[346] CMA analysis of IDC data "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4". As set out in Appendix B, this data is based on the volume of devices shipped not the volume of those actually sold and on the average stand alone device selling advertised prices (excluding VAT).
[347] See Table 4.2 above.
[348] While users would be switching to an Android device and the average price of an Android device is lower than the average price an Apple device, we consider it unlikely that a user would switch from a higher-end expensive Apple device to a lower-end cheaper Android device. However, expenditure on apps, in-app purchases and subscriptions is increasing over time.
[349] See Chapter 3 and Appendix B.
[350] See for example Apple iPhone SE 64GB (2nd Generation) (pricerunner.com) last accessed on 6 June 2022.
[351] See Apple response to our interim report.
[352] In support of this Apple has submitted a theoretical model which supports this waterbed effect under a number of conditions; and also submits that, while its margins on the iPhone have continuously decreased since 2012, App Store revenues have grown.

4.168 We acknowledge that there may be some waterbed effect as Apple has some incentive to lower the price of its devices or to increase quality in order to capture more app distribution revenue in the App Store. Further, we note the commission charges are not the only revenues that would contribute to this effect since Apple also receives considerable revenue from Google in return for Google Search having the default search status on the Safari browser as set out in Chapter 5.[353]

4.169 However, Apple has not provided any empirical or documentary evidence to substantiate its claims that pricing decisions made by Apple at the device level are affected by service revenues such as the revenue from the App Store. We consider it unlikely that if service revenues were such a key factor in setting the prices of devices that there would be no analysis seeking to optimise the pricing structure between the App Store and mobile devices. This is especially as optimising the pricing structure would not be trivial, particularly in the context of the observed increases over time in service revenues.

4.170 Even if there was some waterbed effect, this does not mean that Apple faces a strong competitive constraint in relation to either native app distribution or mobile devices. In fact, a waterbed effect may occur even where there is a monopolist operating on a particular market.[354]

Conclusion on competitive constraints between Apple's and Google's app stores

4.171 Overall, we have found that Apple and Google face a limited constraint from each other in relation to the presence of each other's app stores. This is because:

- The largest app developers accounting for most downloads are present on both the App Store and Play Store and **would not delist from one of these app stores, due to the volume, value and uniqueness of users on each** – this is particularly the case in relation to Apple, whose users on average spend more per year through Apple IAP than Android users spend through Google Play's billing system.

- Users generally do not have both iOS devices and Android devices. This means that an iOS user would need to purchase a new device in order to access the Play Store, and an Android user would need to purchase a new device in order to access the App Store. As found in Chapter 3, such

[353] We consider that Android device manufacturers are also likely to have an incentive to reduce device prices in order to capture more search advertising revenue through their Revenue Sharing Agreements with Google (see Appendix E for details on these agreements).
[354] Genakos and Valletti (2011), Testing the "waterbed" effect in mobile telephony, Journal of the European Economic Association, 9(6), 1114-1142.

switching is limited in practice and there are additional factors, such as the lack of transparency of app store conditions (eg the price, quality and range of apps), that make such switching unlikely in response to changes in the price or quality of apps available in different app stores.

Competitive constraints from alternative devices

4.172 Apple and Google submitted that they face competition from alternative devices (eg gaming consoles, laptops), as users can access the same content through both native apps on mobile devices and alternative devices. In addition, Apple and Google submitted that it is also possible to buy content or features[355] on another platform and then access them through a native app. In such situations Apple or Google would not receive a commission and they argued that this possibility is a constraint on their app stores.[356] That is, Apple and Google could be constrained by users moving purchases from within the native app to other platforms.

4.173 Evidence suggests that some users do access the same content through both native apps on mobile devices and also through alternative devices. However, this varies based on the native app in question.

4.174 For example, our survey suggested that across four app categories between 53% and 93% users accessed the same content via other methods in addition to the native app.[357] Evidence from app developers who responded to requests for information provided mixed evidence on the extent to which users accessed content across different platforms – for some it was very high (eg over 80% of users) whereas for others it was very low at less than 10% of users. In addition, others do not make their apps (or equivalent content) available outside of mobile devices at all (eg some very popular gaming, dating or messaging apps are only available on mobile devices).

4.175 More generally our analysis of the evidence provided by app developers indicates that there is limited substitutability between native apps on mobile devices and alternative devices for both app developers and users. Reasons for this include:

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[355] For example, in relation to a gaming app a user may purchase additional coins through a games console that are then used online.
[356] See Google's and Apple's responses to our interim report. Some specific app categories that were raised include gaming, dating, video streaming and music streaming.
[357] The four app categories were gaming, dating, entertainment/TV and music apps. The questions related to all apps within those categories and do not allow us to understand the frequency of use of either the native app or any alternative methods. See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, pages 74, 78, 81 and 84.

- There is evidence that the same content is not always available across native apps on mobile devices and other platforms. This is because some app developers do not consider alternative devices to be substitutes for mobile devices due to the functionality available on alternative devices[358] or because low-end games for mobile devices are not suitable for game consoles which usually offer high-end games that require considerable investment.

- Different devices may have different use cases from a user perspective such that even when users access the same content through other devices this does not mean they are substitutes but rather complements – for example, mobile devices may be used 'on the go' where it is not possible to access other devices.[359]

- There may also be asymmetric substitutability – for example, a user with a games console will almost certainly have a mobile device, but many mobile device owners do not have games consoles and are unlikely to switch due to the high upfront costs of games consoles.[360]

4.176 As outlined above, Apple and Google could be constrained by users moving purchases from within the native app to other platforms. However, the evidence we received from app developers suggests that only a subset of mobile apps offer users the option to purchase the same content outside the native app (eg through a website) and then use it within the native app.[361] Further, there are barriers to incentivising users to move their purchases outside of the native app. As well as the inherent friction experienced by a user when they leave a native app to pay elsewhere, the anti-steering rules of Apple and Google reduce the ability of app developers to inform and steer

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[358] For example, a lack of Google Play Services functionalities.
[359] For example, Microsoft told us that while some of its apps such as Outlook appear to have more multi-homing between mobile and PC, this may be due to consumers using these for different purposes. A significant amount of usage of mobile platforms is unique to mobile scenarios (while traveling, for example), where other types of non-mobile platforms are not a viable option.
[360] For example, our survey found that only 44% of those using gaming apps also had a games console and of those spending money in the native app on either the smartphone or iPad/tablet on content used in gaming apps only 50% also had a games console. For the first of these figures see Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study' accompany data tables, dated June 2022, Tab '3538 coded tabs v3', table for "Q17. Which of the following products do you personally own and use?". The second of these figures was calculated separately based on the question "Q17. Which of the following products do you personally own and use?" and "Q32. How, if at all, have you spent money on gaming apps (eg levels, tokens) that are on your smartphone in the last 12 months?" and the base was the 363 smartphone users with gaming apps who purchased content in the app on their smartphone or tablet/iPad.
[361] To offer this option, app developers need to have other channels that sell the content to be used in the mobile app. We heard from some developers that they only provide their app on mobile devices and have no such alternative channels on which users can purchase content for the mobile app. Another app developer told us they do not offer users the option to access in the mobile app the content purchased elsewhere.

users towards cheaper alternatives on alternative devices thus reducing the constraint they place on the App Store and Play Store.[362]

4.177 This is supported by data we received from some of the developers that answered our request for information which shows the revenue generated in 2020 from native apps on mobile devices is several times higher than the revenue generated through other channels. Further, many app developers who used Apple's or Google's in-app payment systems did not consider they could avoid an increase in commission rates by encouraging users to shift transactions outside of the mobile apps because they anticipate mobile app users will not switch their purchases to the other channels of the developer.

4.178 Our survey results found that the native app was the main method used to purchase content to be used in the native app in relation to three of the four categories and that in two cases[363] less than a quarter of users making purchases through their native apps also used another method.[364] Therefore, most users using the native app to purchase content to be used in the native app do not use another channel. Further, for those users that use multiple channels to purchase content to be used in the native app, our survey did not identify the frequency with which different methods were used or whether they were used in the context of the same native app or across different native apps.

4.179 Finally, we note that while users moving purchases to an alternative channel may in theory provide some competitive constraint on the commission rates charge by Apple and Google (given the current pricing structure), it would provide a weaker or no constraint on the non-price aspects of the App Store and the Play Store. In particular, app developers will still need to accept the terms and conditions imposed by Apple and Google to distribute their native

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[362] See Chapter 6. These rules do not prevent app developers from using other means (such as email communications) to tell users about alternative payment options, although this was prohibited by Apple's rules until October 2021.

[363] These were music apps and gaming apps. In relation to dating apps we found 5 out of 46 users making purchases through their native apps also used another method. See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 48, 49, 53, 54, 60 and 61, Table 23 and Pages 75, 79, 82 and 85.

[364] The one exception was entertainment/TV apps where the main method of purchasing content, cited by 52% of iOS users and 49% of Android users, was through packages (eg Amazon Prime, Sky Sports) and 49% of users making purchases in the native apps also used other means such as content packages. While the native app was the main method for purchasing content in relation to music apps (57% of iOS users and 43% of Android users) and only 18% that used the native app also used another method, there was generally a high proportion of users purchasing content outside of the native app. For example, 34% of iOS users and 37% of Android users that purchased content accessed in the native app purchased at least some of their content via a package. The higher usage of payment method outside of a native app in music and entertainment apps may be explained at least in part by the fact that many music apps and some entertainment/TV apps do not allow users to purchase content within their native app because they operate under Apple's reader app rule or Google's consumption only rule. See Accent Report 'Consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated June 2022, Figures 48, 49, 53, 54, 60 and 61, Table 23, page 79, 85.

apps on the App Store and Play Store, respectively (see Chapter 6 for more details).

4.180 On balance, the evidence suggests that Apple and Google face a limited constraint from alternative devices and users switching away from purchasing content and features in native apps.

Assessment of the commission level charged by Apple and Google

4.181 Both Apple and Google have told us that they compete on the commission rates they charge to app developers on sales of digital content.[365] We have therefore considered whether the commission rates charged by Apple and Google reflect strong competition.

4.182 Apple and Google currently charge a commission of 30% for payments for digital content made via Apple IAP and Google Play's billing system, except in limited circumstances where a lower commission rate is applied as described in Appendix H and discussed below.[366,367] In 2021 only [10-20]% of apps in the App Store and [0-10]% of apps in the Play Store generated commission revenue.

4.183 We assessed the level of this commission to identify if this is set at a competitive level by looking at:

- the competitive environment in which the commission charges are set;
- profits made by Apple and Google both in app distribution and across their ecosystem; and
- potential benchmarks in markets with similar products.

[365] See Apple's and Google's responses to our interim report.
[366] For Apple this rule had applied since they introduced Apple IAP in 2008. In contrast, on the Play Store, some app developers have at different points in time used their own billing system. However, in September 2020, Google clarified that all developers selling digital goods in their apps are required to use Google Play's billing system (see Android Developers Blog: Listening to Developer Feedback to Improve Google Play) and Android Developers Blog: Allowing developers to apply for more time to comply with Play Payments Policy).
[367] In March 2022, Google also announced that for certain app developers it intends to change its approach to billing in the Play Store, by allowing users to choose between Google Play's billing system and other alternatives provided by the app developer as long as they meet Google's safety standards. Google is currently trialling this change with Spotify. We do not currently have information on how this is going to affect the commission level paid by app developers to Google. See Android Developers Blog: Exploring User Choice Billing With First Innovation Partner Spotify.

The implications of the competitive environment on the commission rate

4.184 As set out in this chapter, we have found that Apple and Google have substantial and entrenched market power in native app distribution, with limited constraints on either the App Store or the Play Store.

- On iOS this is driven by a lack of alternatives to download native apps since there is only one app store (ie Apple's App Store), Apple preventing sideloading on iOS devices, limited usage of web apps, and pre-installation being limited to Apple's apps.

- On Android, this is driven by a limited constraint from alternative app stores (which have [less than 10]% of native app downloads), limited sideloading and web app usage and very few opportunities for pre-installation.

4.185 While Apple prohibits alternative app stores on iOS devices, the Play Store faces some direct competition from other app stores on Android devices, such as the Samsung Galaxy Store. We have not found evidence that these alternative app stores compete directly with the Play Store on the grounds of price, by offering lower commissions (for example, as set out above Samsung, Huawei and Amazon also all charge a headline commission of 30%).

4.186 While in a few instances Samsung has offered better terms to game developers, this did not have a similar impact on the commission level charged by the Play Store to game developers (see above discussion on Project Hug) and no apparent impact on the commission charged by the App Store. The limited competition over the level of the commission from alternative app stores may be due to a range of factors set out above in this chapter, which limit the ability of alternative app stores to attract transactions away from the Play Store and overall mean that they place a limited constraint on the Play Store.

4.187 With regards to competition between the Apple and Google ecosystems, both Apple and Google submitted that they recently introduced commission discounts which have been driven in part by competition.[368]

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[368] In addition, Apple argued the 30% commission was determined in competitive conditions in 2008 and has not increased and in fact, it has only decreased over time. We consider that even if the 30% share was competitive at the time and set in the face of some competition, that does not mean that the same commission rate over a decade later and in a mature market is still at the competitive level. Further, while innovative products can charge a higher price at the start, over time we would expect that price to reduce as competitors catch-up and the product is less of an innovation. In fact, the Epic litigation case revealed that in 2011 an Apple employee noted in

4.188 Both Apple[369] and Google[370] have reduced the commission rate for subscriptions after the first year to 15% in 2016 and 2018 respectively. Google further reduced the commission rate to 15% for all subscriptions from the first day of a subscription from January 2022.[371] Moreover, from January 2021 businesses earning under $1 million can benefit from a reduction of the commission to 15% in the App Store,[372] and in July 2021 Google applied a similar reduction. However, Google applied a reduced 15% commission rate to the first $1 million of global earnings of all app developers.[373,374]

4.189 We found that the changes made prior to 2022, have resulted in a small decrease in the average commission rates for Apple's and Google's payment systems, which however remain between 25% and 30% in 2021.[375] We do not consider this to be a material reduction. This demonstrates that in practice, despite the appearance of large and widespread discounts, these lower rates only apply to a small proportion of the total value of transactions – this is because the vast majority of Apple's and Google's app store revenues come from a small number of larger apps as noted in Chapter 6.[376]

4.190 Moreover, there is no clear evidence that there has been a change in competitive pressure to prompt these discounts since 2016 and as outlined above there is limited effective competition between Apple and Google. We also note that these discounts may have come, at least in part, due to other

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an email that the commission rate might need to be reduced to 25% or 20% if there is 'enough challenge from another platform or web based solutions' (see Exhibit No. PX-0417 in the Epic Trial). In this regard, the App Store is insulated from direct competition on iOS devices and we have not seen material decreases in the commission rate despite the Play Store offering very similar services to app developers.

[369] In 2016, Apple reduced the commission on subscriptions after their first year to 15% (see Auto-renewable Subscriptions - App Store - Apple Developer).

[370] In 2018, similar to Apple, Google lowered its service fee on subscriptions after their first year to 15% (see Changes to Google Play's service fee in 2021 - Play Console Help).

[371] In January 2022, Google further reduced its service fee to 15% for all subscriptions from the first day of a subscription (see Android Developers Blog: Evolving our business model to address developer needs).

[372] In January 2021, Apple introduced the Small Business Program (see App Store Small Business Program), where app developers that earn no more than $1 million in the previous year pay 15% on in-app transactions.

[373] In July 2021, Google lowered its service fee to 15% for the first $1 million of global earnings to all app developers (see Changes to Google Play's service fee in 2021 and Boosting developer success on Google Play).

[374] We note that, to date, we have not seen a response from Apple to Google's further reduction to subscriptions.

[375] The average commission rate for Google in 2021 reflects only six months of the program offering app developers discounts for the first $1 million of revenue earned introduced in July 2021 which had a small decreasing effect on the average commission rate when the policy changes took full effect. This calculation of the average commission does not take into account benefits that app developers receive from the cross-sales of services at better terms such as those offered by Google to a small number of game app developers (see the discussion of Project Hug for more details).

[376] These large apps would not benefit from Apple's Small Business Program and only to a limited extent from Google's discount on the first $1 million of global earnings. Although Google has lowered its service fee to 15% for all subscriptions going forward, this appears likely to have a limited effect on Google's overall revenues from the Play Store as Google receives a relatively low proportion of its revenues from subscriptions ([10-20]% in 2021) and the incremental effect of the new discount is only on new users or those users with a subscription for less than one year. In the case of Apple, the discounts have been introduced since at least 2021 and their effect will be fully reflected in the average commission rate for 2021 presented above.

factors beyond competition such as regulatory, legislative, and enforcement pressure.[377]

The link between profitability and commission level

4.191 To assess whether the 30% commission rate is reflective of the competitive level, we have also considered the profitability of Apple's and Google's app stores. As discussed in Chapter 2, with more detail in Appendix C, Apple and Google have been making substantial profits overall since at least 2011 and in relation to their app stores since at least 2018.[378] While we do not have information on the App Store operating profit margin, we estimate that the App Store's gross profit margin in 2021 was [75-100]%. The Play Store's global operating margins were [50-75]% in 2021 while their gross profit margins were [50-75]%. This is consistent with market power.

4.192 This suggests that the profits generated in the App Store and Play Store are not being competed away by other app store providers.

4.193 Both Apple and Google have argued that the App Store and Play Store are closely linked to the rest of their mobile ecosystems, such that there are common development costs.[379] In addition, Apple argued that these common costs cannot be meaningfully separated and their business decisions are made based on overall revenues across the ecosystem.[380]

4.194 We recognise that the profits earned on one product or service should not necessarily be considered in isolation from the other products and services within the same ecosystem. Nevertheless, it is helpful to understand the extent to which distinct business activities are able to generate revenues over and above their directly attributable costs. This can be informative where they operate under different competitive conditions.

4.195 First, in a competitive market we would expect to see a relationship between the commission fees and the costs for providing the product or service. We understand that app stores are characterised by economies of scale as outlined above. Given this and the increases in the size of the App Store and Play Store over time we would have expected a decrease in the commission level in a competitive market. Despite this, the headline commission rate for both Apple and Google have remained at 30% with the effective commission

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[377] For example, Apple's CEO, Tim Cook, stated during the testimony in the Epic case that the reduction to 15% for the Small Businesses Program was driven by a desire to help small businesses during Covid-19, while also being aware of pressure from on-going lawsuits and other investigations. MLex | Apple CEO pressed by judge about competition during Epic Games US antitrust trial.
[378] Due to data limitations we could not extend the analysis of app store profitability further back in time.
[379] See Appendix C.
[380] See Appendix C.

being [between 25% and 30%] for both firms despite the discounts outlined above.

4.196 We have not seen evidence to indicate that the commission rates are set based on the costs associated with operating app stores.[381] This is supported by an internal Google document from 2019 which stated that the [✂].

4.197 Second, even if we consider Apple's and Google's profitability across their mobile ecosystems it can be seen that:[382]

- First, across their entire business, we estimate that in 2021 Apple had a 42% gross margin and Alphabet Inc had a 57% gross margin and a 31% operating margin.

- Second, both Apple and Google's overall business have a high average Return on Capital Employed (ROCE) which is a better measure of their overall economic profitability:

  - We calculated that Apple generated a ROCE of the combined devices and services business which varied from 1091% in 2017 to 312% in 2021 in our central analysis, and was consistently above 100% even when applying our most cautious sensitivity analysis.

  - We found that the Alphabet Group (of which Google is part of) generated an average ROCE of 39% over the period between 2011 and 2021.[383] We also estimated a ROCE for 2018 for the Google segment of the Alphabet group of 38%. This increased to 44% if the European Commission fine which Alphabet accrued in its 2018 accounts is excluded.[384]

4.198 These returns are well above any normal benchmark ROCE level and demonstrates that Apple and Google have higher returns than might be expected in a competitive market.

Potential benchmarks

4.199 To assess whether the 30% commission charged by Apple and Google is reflective of a competitive level of commission it is useful to compare it with appropriate benchmarks. Both Apple and Google have made submissions

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[381] We note that when the commission level was introduced by Apple, it was described as a means to only cover the App Store costs (see Steve Jobs introduces the App store – iPhone SDK Keynote – YouTube). However, as we show below, the App Store generates revenues in excess of its costs.
[382] See Appendix C.
[383] CMA Online platforms and digital advertising market study, Appendix D.
[384] CMA Online platforms and digital advertising market study, Appendix D.

arguing that other app stores and digital stores charge similar 30% commissions.

4.200 While we note that these comparisons show that commissions charged via Apple IAP and Google Play's billing system are broadly similar to those charged by other app stores and game consoles stores, it is difficult to draw a direct comparison for a number of reasons as described below.

4.201 First, the App Store and Play Store are not an appropriate benchmark for each other. As set out in this chapter, both have market power within their respective mobile ecosystems.

4.202 In addition, other Android app stores are not an appropriate benchmark as we have found that the barriers to competition set out above (eg indirect network effects) mean that in practice these app stores do not have strong incentives to lower their commission rates due to their limited ability to attract customers away from Google's Play Store.

4.203 Second, Apple and Google pointed to the fact that console games stores charge 30% commission rates, but we consider that these stores are not good comparators because they:

- use a different business model where consoles are priced at low, no, or negative margin, while profits are subsequently generated through the sale of games and subscriptions (eg Microsoft's Store on Xbox, PlayStation Store), [385] unlike Apple and Google that are profitable without the app store revenue;[386] and

- also limit direct competition from other providers since we are not aware of more than one app store being allowed on a games console.

4.204 Third, we have also considered whether the PC games stores are a potential benchmark. In particular, Apple submitted that it referred to PC games commission in 2008 when it launched the Apple IAP, where Steam, a digital game store available on desktop devices, was charging 30%.

4.205 While we have not carried out a detailed assessment of competition in the distribution of PC games, we consider that the following observations undermine Apple's contention that just because it set the commission rate at

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[385] For example, see Microsoft Says Xbox Consoles Have Always Been Sold at a Loss (pcmag.com), All Games Consoles Are Sold at a Loss. Here's Why... (makeuseof.com), Sony is selling the PS5 at a loss, investors told - Polygon, Sony Is Selling the PS5 at a Loss, but Investors Shouldn't Worry | Nasdaq and slide 16 on page 9 of Q3 FY2020 Consolidated Financial Results (sony.com)
[386] Appendix C.

the same level as Steam in 2008, this can be taken as evidence that the 30% commission rate is competitive. In particular:

- There is a wider range of distribution channels for PC games developers including the possibility to publish on multiple stores or allowing users to download directly from the game developer's own website.

- There is a wider range of commission rates in PC games stores that are below 30% depending on the type of game and store. For example, Games Jolt has a 0-10% commission,[387] Epic Games Store has a 12% commission,[388] and Microsoft Store on Windows has a 12% commission for games.[389]

- While we understand that Steam is the largest PC distribution store for PC games, and has a market share of 50-70% of the world's PC game downloads in 2020 which is consistent with market power,[390] there is evidence that it has reacted to competition from new entrants. In particular, new entry at the end of 2018 coincided with a restructuring of Steam's commission rates such that app developers generating more revenue benefit from higher discounts (the commission rate decreased from 30% to 25% for revenues between $10-50 million and decreased further to 20% for revenues above $50 million for each game).[391] In addition, according to some sources, this has also spurred more competition on quality (eg store front improvements, offers for users).[392]

4.206 Overall, we consider that the lack of competition faced by the App Store and Play Store allows them to charge above a competitive rate of commission to app developers. If other distribution channels, such as sideloading or alternative app stores, were effective constraints on Apple's and Google's app stores, we would expect to see lower commissions and/or better quality of app stores.

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[387] Sell Your Games - Game Jolt.
[388] Announcing the Epic Games Store (unrealengine.com)
[389] Building a new, open Microsoft Store on Windows 11 | Windows Experience Blog.
[390] 75 Steam Statistics: 2020/2021 Facts, Market Share & Data Analysis | CompareCamp.com
[391] Steam introduced the new commission structure in December 2018 (Steam: Steamworks Development: New Revenue Share Tiers and other updates to the Steam Distribution Agreement), just before Discord reduced its commission to 10% (Discord | Discord Wiki | Fandom), and Epic Games Store entered the market with a 12% commission (Announcing the Epic Games Store (unrealengine.com)).
[392] A year in, the Epic Games Store's fight against Steam has made PC gaming better for everyone (pcworld.com)

Conclusion

4.207 We have found that both Apple and Google have substantial and entrenched market power in native app distribution.

4.208 Overall, we have found that the constraint from within each mobile ecosystem is limited:

- **Pre-installation:** Apple does not allow it on iOS devices and on Android it is not a viable alternative to the Play Store for the vast majority of app developers.

- **Alternative app stores:** Apple does not allow alternative app stores on iOS devices. While such app stores are available on Android devices, the outcome is much the same. The Play Store accounts for [90-100]% of downloads and alternatives face material barriers such as indirect network effects and Google's agreements which lead to the pre-installation and prominent placement of the Play Store.

- **Sideloading:** Apple does not allow sideloading on iOS devices. While it is allowed on Android devices, it is not widely used by users or app developers including due to the process users have to follow, which includes warnings of the potential security risks of sideloading.

- **Web-based alternatives**: The development and usage of web apps is substantially lower than native apps and this is reinforced by restrictions on the functionality of web apps within Apple's ecosystem, which also undermine the availability of web apps on Android.

4.209 We have also found that Apple and Google place a limited competitive constraint on each other in relation to native app distribution. This is because:

- The largest app developers accounting for the most downloads tend to multi-home on both the App Store and Play Store and would not delist due to the volume, value and uniqueness of users on each – this is particularly the case in relation to Apple whose users spend more.

- An iOS user would need to purchase a new device in order to access the Play Store, and an Android user would need to purchase a new device in order to access the App Store. As found in Chapter 3, such switching is limited in practice and there are additional factors, such as the lack of transparency of app store conditions (eg the price, quality and range of apps), that make such switching unlikely in response to changes in the price or quality of apps available in different app stores.

- We have also found that Apple and Google face a limited competitive constraint from alternative devices. These devices are primarily used for different purposes (eg native apps on mobile devices are used ‘on the go’) and are mainly viewed by users as complements rather than substitutes for the use of native apps. Consistent with this, generally, app developers did not consider their offerings on alternative devices to be substitutes for their offerings on mobile devices. In addition, there is limited evidence that users would switch away from purchasing content and features in native apps to purchasing it through these alternative devices or alternative channels (eg browsers on mobile devices).

4.210 Finally, we have found that Apple’s and Google’s substantial and entrenched market power in native app distribution is reflected in the commission rate they charge app developers for digital purchases which is set above the competitive level. The effective rate of commission has stayed between 25% and 30% over the years for both Apple and Google. This allows them to make substantial and growing profits (with high margins) from their app stores which have not been competed away by other distribution channels, such as sideloading or alternative app stores. If other distribution channels were effective constraints on Apple’s and Google’s app stores, we would expect to see lower commissions and/or increased quality.

4.211 We further explore in Chapter 6, how Apple’s and Google’s substantial and entrenched market power in native app distribution is also reflected and impacts the operation of their app stores and competition between app developers (including key restrictions on the types of apps that are permitted to operate on their app stores and rules for app developers).

5. Mobile browser and browser engine competition

Key findings

- Browsers are a crucial gateway for people to access the web from mobile devices and are one of the most used apps on users' phones. As a result, browsers are also important to businesses seeking to reach consumers.

- The combined share of supply for Apple's and Google's browsers on mobile devices in the UK is around 90%, with Safari having a share of close to 50% and Chrome around 40%.

- Browser engines are the critical technology that enables browsers to load and display content on a web page. They are fundamental to the performance and capability of a browser. In 2021, 97% of all mobile web browsing in the UK was performed on top of either Apple's or Google's browser engine.

- These positions provide Apple and Google with substantial market power in mobile browsers and browser engines.

- Mobile devices typically have either Chrome or Safari pre-installed and set as default at purchase, and this gives Apple and Google a key advantage over other browser vendors.

- On iOS devices, Apple bans the use of alternative browser engines – meaning it has a monopoly over the supply of browser engines on iOS. We heard concerns that Apple has not implemented (or substantially delays) a wide range of key features in its browser engine, impacting many UK web developers and businesses. This restriction has two main effects:

  - it severely limits the potential for rival browsers to differentiate themselves from Safari on factors such as speed and functionality, meaning Apple faces less competition; and

  - it materially inhibits the functionality of web apps, which raises developers' costs, deprives consumers of innovative apps and limits the competitive constraint web apps could have on native apps.

- While security and privacy are key dimensions of quality for mobile device users, evidence from security experts that we consulted suggests Apple's ban on the use of alternative browser engines is not necessary in order to provide secure browsing. In certain respects, the ban could also potentially even harm security, by limiting competition to improve security.

Introduction

5.0 Web browsers are a type of mobile application that enable users of mobile devices to access and search the internet and interact with content on the open web.[393] Other than app stores, web browsers are the most important way for users of mobile devices to access content and services over the internet, with users reportedly spending a higher proportion of their time on browsers than on any other single native app.[394]

5.1 In addition, browsers are one of the key sources of traffic for search engine providers as well as other businesses that want to reach users with their content and products. Browsers also play a key role in enabling businesses to monetise their content by serving users with advertising (or 'ads').

5.2 In this chapter, we consider the level of competition in the supply of mobile browsers by covering the following topics:

- an overview of the market, including how browsers work, their business models, and the nature of competition;
- market outcomes, including shares of supply; and
- an assessment of competition, including barriers to effective competition, between browsers and browser engines.

Overview of the market

How browsers work

5.3 Browsers comprise two main elements:

- a browser engine, which transforms web source code into web pages (or web apps – applications which run in web browsers) that people can see and engage with; and
- a branded user interface (UI), which is responsible for user-facing functionality.

5.4 Browser engines interpret the source code of each web page. The main reason that web pages may look, load and work differently in different

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[393] Web browsers provide the same function on desktop and other devices.
[394] Kargo & Verto Analytics - Web vs App report 2019. The report says that approximately 17% of users' time is spent on mobile web (Safari and Chrome), with the next closest apps being Facebook with 14% and YouTube with 8%.

browsers is their browser engines. The browser engine is responsible for key functionality in a browser including its web compatibility (ie the browser's ability to properly access and display the content on a particular web page). The browser engine also determines the range of possible user inputs (eg camera, microphone or video game controller). As a result, browser engines control the type of content that can be developed on the web, and significantly influence the products and services which consumers can access online.

5.5 There are three browser engines with a material market share: Google's Blink, Apple's WebKit and Mozilla's Gecko.[395] As described below, most Android browsers are based on Blink, and Apple mandates that all browsers on iOS are based on WebKit.

5.6 The browser UI is responsible for features such as favourites, browsing history and remembering passwords and payment details. It also determines the layout of the navigation bar and settings. The default search engine is set as part of the browser UI.

5.7 Web content can be accessed through dedicated browsers or through native apps' in-app browsers.[396] Examples of native apps with in-app browsers include a large variety of different types of apps, including chat apps such as Snapchat or WeChat, online social networks such as Facebook or Instagram, search widgets such as Google Search and Microsoft Bing Search, and email clients such as Gmail. Dedicated browsers and in-app browsers use the same set of browser engines controlled by Google, Apple and Mozilla.

Browser vendors' business models

5.8 As is shown by Table 5.1, some companies operate as standalone browser vendors, while others provide browsers alongside other complementary services, including search engines.

[395] Browser engines are run on an 'open source' basis. This means that they can benefit from contributions from developers. An important consequence of their open-source status is that a developer can use their existing code as the starting point from which to develop their own browser engine (so-called 'forking').
[396] In-app browsers typically have a reduced feature set compared to a dedicated browser app, with features (such as push notifications) typically arriving later on in-app browsers than on dedicated browsers. Steiner, Thomas. "What is in a web view: An analysis of progressive web app features when the means of web access is not a web browser." Companion Proceedings of The Web Conference 2018. 2018.

Table 5.1: Ownership and stewardship of browsers, browser engines and search engines by selected stakeholders

Organisation	*Browser*	*Browser engine steward*[*]	*Search engine*
Google	Chrome	Blink	Google Search
Apple	Safari	WebKit	-
Microsoft	Edge	-	Bing
Mozilla Foundation	Firefox	Gecko	-
Samsung	Samsung Internet	-	-
Opera	Opera	-	-
DuckDuckGo	DuckDuckGo Privacy Browser	-	DuckDuckGo
Vivaldi Technologies	Vivaldi	-	-
Brave Software	Brave	-	Brave Search
Yandex	Yandex Browser	-	Yandex Search
Moonchild Productions	PaleMoon, Basilisk	Goanna	-

[*] As described below, modern browser engines are rarely proprietary; this table indicates where organisations are the steward of an open-source browser engine in active development. Opera used a proprietary engine (Presto) until the release of Opera 15 in 2013.

Rationale for developing and distributing a browser

5.9 Browsers are not monetised directly, as web content can be provided through mobile browsers for free and users are not charged for using a browser. However, browser vendors are still able to generate revenues through their browser, primarily from search advertising (ie paid-for results to online search queries).

5.10 Browsers generally come with a default search engine and thereby function as an important access point for search engines to users.[397]

5.11 Browser vendors that have their own search engine can set this as the default in their browser and thereby increase their own search advertising revenue. Microsoft and Yandex are examples of companies that link their browsers and search engine in this way.

5.12 While Google also used to do this, following the European Commission's *Google* Android decision and the remedy that was imposed, Google no longer sets Google Search as the default in the UK and the EEA but provides a

[397] Competition and Markets Authority (2020), Online platforms and digital advertising market study, Appendix H.

choice to users via a search engine choice screen. However, in practice almost all users choose Google Search: in the UK in 2021, Google Search was chosen in [90% to 100%] of cases in which the choice screen was displayed. Therefore Google continues to generate substantial revenue from users of its browser via search advertising.

5.13 Browser vendors without a search engine sell the default setting to a search engine provider. Apple, Mozilla and Samsung's browsers are all monetised in this way. The sale of search defaults attracts large payments, which are typically made on a revenue-share basis.[398] Google's estimated payments to Apple for search default status on Safari were £[1-1.5] billion in 2021 for the UK, with the substantial majority of this (£[0.5-1] billion) relating to mobile.[399] This represents a significant increase since 2019.[400]

5.14 Browser vendors can also earn revenue from other forms of advertising, for example by promoting sites or showing static or video ads (display advertising) on the 'new tab' landing page. This typically accounts for a relatively small proportion of their revenue.

5.15 Some browser vendors have other supporting motivations for distributing their browser:

- **Complementing other products they sell:** mobile device manufacturers such as Apple and Samsung developed their browser to make their devices more attractive and to improve the 'out of the box' experience for users.

- **Strengthening a position in another market:** for example, Apple can take decisions with regard to its browser functionality that can encourage greater use of native apps that are downloaded from its app store (which benefits Apple financially through commissions and advertising). Whereas Google may encourage browsing to ensure the existence of content which can be found by its search engine (which benefits Google financially through advertising).

- **Public interest:** several browser vendors are not-for-profit, or have broader public missions. For example, Firefox is developed by a subsidiary of the non-profit Mozilla Foundation, as part of its mission of a

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[398] Competition and Markets Authority (2020), Online platforms and digital advertising market study, Appendix H, paragraphs 17-30. Submissions from Google suggest payments to Apple constitute the substantial majority of Google's total default payments.
[399] Converted from US dollars to British pounds sterling (Bank of England, series XUAAUSS, 31 December 2021).
[400] Competition and Markets Authority (2020), Online platforms and digital advertising market study, Final Report, paragraph 3.106.

decentralised, interoperable and open web. Tor, operated by the non-profit Tor Project, has a mission to provide private access to an uncensored web.[401]

Rationale for developing a browser engine

5.16 All three major browser engines are open-source projects: they are not directly monetised, their code can be viewed by anyone and anyone can suggest changes.[402] However, each browser engine has a 'steward', and it is the steward that determines which changes are ultimately accepted and that is therefore in control of the open-source project.

Box 5.1: History of browser engine development

- In the early years of the web, the most popular browser engines (the Netscape browser engine and Trident, the browser engine used in Microsoft's Internet Explorer) were proprietary.
- Gecko was the first of the major modern browser engines to launch as an open-source project. Its code was made open source in 1998.
- Apple created WebKit by forking an existing open-source browser engine, KHTML, in 2001. In 2005, Apple made WebKit open source.
- Google launched Chrome using WebKit in 2008.It deployed a new browser engine for Chrome, Blink, by forking WebKit in 2013.
- Microsoft switched from using its proprietary EdgeHTML browser engine for Edge to Blink in 2020.

See Appendix F for a more detailed description of the history of browser engine development.

5.17 The stewards of the three main browser engines each have different rationales for developing their respective browser engine.

5.18 Apple requires all browsers on iOS to use its WebKit browser engine. Development of the WebKit browser engine therefore allows Apple to control the use of browsers on its devices. Apple may be incentivised to invest in WebKit in order to compete as a supplier of mobile devices (although this incentive is likely to be limited given that many other factors are more

[401] Tor Project website (retrieved 7 April 2022).
[402] The Open-Source Initiative provides full list of criteria it considers to 'open source' on its website (retrieved 7 April 2022).

important for users' decision of which mobile device to purchase, as set out in Chapter 3).[403] Apple submitted that WebKit 'focuses on providing stability, performance, battery efficiency, privacy, security, and ease of use' for iOS device users. While in principle WebKit can be used by a browser on non-iOS devices, none of the main browsers on Android use WebKit (although, as described above, Blink was itself originally a fork of WebKit).

5.19 Google has stated publicly that it launched Blink to 'spur innovation and over time improve the health of the entire open web ecosystem'.[404] This is supported by Google's internal communications, which we have reviewed. As explained in Chapter 2, Google's primary source of revenue comes from search advertising, which is closely tied to web use – Google therefore has a strong financial incentive to support increased web browsing activity.

5.20 Mozilla told us that it develops the Gecko browser engine 'to shape the internet and pursue our public mission of a decentralised and open web'.

Nature of competition

5.21 Browsers and browser engines compete in the following ways:

- **browsers compete for users:** browsers primarily secure users through pre-installation and default settings on mobile devices. For users that actively choose their browser, browsers can seek to distinguish themselves on several dimensions of quality, which include:
  - web compatibility (determined by the browser engine),
  - performance and user-facing features, and
  - privacy and security.
- **browser engines compete for browsers:** browser engines compete to be chosen by browsers (currently only possible on Android where browser engine choice is unrestricted) by ensuring strong compatibility with online content and by implementing advanced features which enable browsers to provide a better user-facing experience.

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[403] Apple submitted that Safari was one of the differentiating features of the original iPhone, and that Safari was the first mobile browser that was as capable and powerful as a desktop browser. According to Apple, where browsers for other mobile operating systems at the time reflowed, reformatted, or simply broke the look and feel of web pages, mobile Safari presented the web fully and offered simple zoom and scrolling features that was unmatched at the time. A Google document discussing Google's rationale for launching Blink in 2013 stated that for their platform to be attractive to users, Apple would need to improve browser performance, likely through increased investment in WebKit.
[404] Blink: A rendering engine for the Chromium project, Chromium Blog, 3 April 2013.

- **browser engines compete for online content providers:** browser engines compete to be prioritised by online content providers (ie businesses with websites) for compatibility by: (i) providing access to a large userbase (through their inclusion in popular browsers); and (ii) including new features which online content providers can use to develop their content.

5.22 These three potential forms of competition are closely linked, as ultimately consumers use browsers to access the content produced by online content providers, and online content providers do so to attract users (and generate revenue, ultimately, through direct sales or advertising).

Market outcomes

5.23 In this section we present shares of supply of browsers and browser engines before considering how browsers meet users' needs in terms of: (i) web compatibility and developer functionality; (ii) performance and user-facing features; and (iii) privacy and security.

Shares of supply

5.24 Both globally and at the UK level, Apple's Safari and Google's Chrome browser are the largest browsers on mobile devices (as well as desktop). The available data shows that the combined share of these two browsers on mobile devices in the UK amounts to around 90%, with Safari having a share of close to 50% and Chrome a share of around 40%.[405]

5.25 Apple and Google also have the largest browser engines: a combined share of almost 100% on mobile devices in the UK. This largely mirrors the respective shares of their operating systems, with WebKit accounting for just over 50% and Blink just under 50%.[406,407]

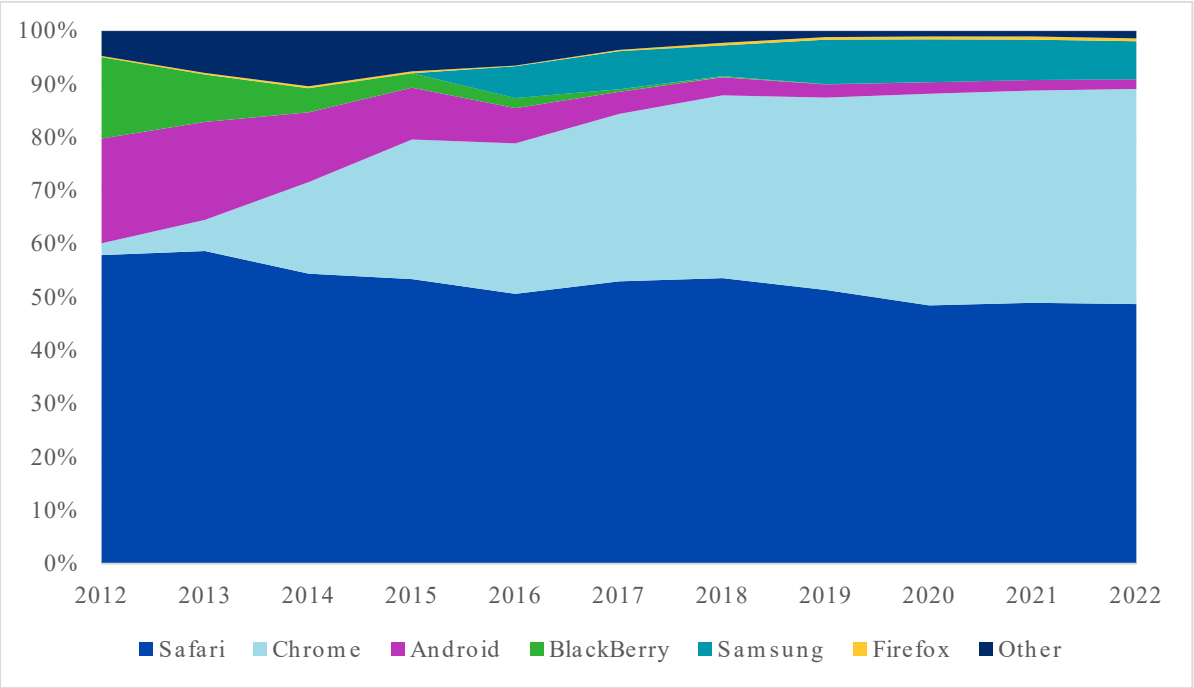
[405] Statcounter, Mobile & Tablet Browser Market Share United Kingdom, 2012 – 2022 (retrieved 7 April 2022).
[406] See Table 5.2 and Statcounter, Mobile & Tablet Browser Market Share United Kingdom, 2012 – 2022 (retrieved 7 April 2022).
[407] We have assessed shares of supply using two different metrics: (i) page views, ie the total number of pages loaded or reloaded in a browser; and (ii) usage, measured in minutes. A page view is a request to load or reload a single web page of an internet site. This request usually results from a user who clicks on a link that points to the web page (Statcounter Frequently asked questions).

Browser shares of supply over time

5.26 Figure 5.1 below shows the evolution of shares of supply for browsers on mobile devices in the UK from 2012 until 2022.[408] In particular:

- Over time Safari's share of supply has been relatively stable, although it has decreased slightly since 2012. In contrast, Chrome's share of supply increased substantially, from 2% in 2012 to 40% in 2022.
- Samsung Internet is the only other browser with a share above 5%. It gained share significantly in 2016 and has remained at around 6% to 8% since.

Figure 5.1: UK browser share of supply (mobile)



Note: Mobile refers to smartphones and tablets. The figure was calculated based on page views data from Statcounter. Android refers to AOSP-based browsers developed on top of the web browser apps made available through the Android Open-Source Project. European Commission, Google Android decision, footnote 1034.

5.27 We have also considered shares of supply for browsers for mobile and desktop devices combined.[409,410] Overall, this presents a similar picture to the supply of browsers on mobile.

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[408] Statcounter, Mobile & Tablet Browser Market Share United Kingdom, 2012 – 2022 (retrieved 7 April 2022). Share of supply calculated based on usage minutes data submitted by Google confirm that Chrome and Safari have been holding a joint share of supply of over 80% on mobile devices in the UK in the last few years, and that Samsung Internet is the next largest competitor in the mobile browser market (App Annie browser usage data).
[409] Desktop browsing provides a useful point of comparison, given its longer history. It is also relevant to the network effects generated by web compatibility, which are described below, as much of the underlying technology is shared between desktop and mobile browsers.
[410] Statcounter, Browser Market Share for the United Kingdom 2012-2022 (retrieved 11 April 2022).

5.28 In particular:

- Safari and Chrome are also the largest browsers when considering mobile and desktop devices combined. However, Safari's position is weaker (35% compared to 49% on just mobile devices in 2021), while Chrome's position is stronger (48% compared to 40% on mobile devices in 2021).
- Both Safari's and Chrome's position has been growing over time, although their share has remined relatively stable in the last few years.
- Historically, Microsoft's Internet Explorer and Mozilla's Firefox had significant positions, with Internet Explorer being the largest and Firefox the third largest browser in 2012. However, over time, their shares decreased significantly, with each falling below 5% by 2019. Also, Edge, which replaced Internet Explorer, was able to only recapture a fraction of Internet Explorer's share, and currently holds a share of around 7%.

Browser and browser engines shares of supply by operating system

5.29 As set out above, each browser has an underlying browser engine. Since the browser engine can differ by operating system, we have assessed shares of supply for browsers and browser engines by operating system. As set out in Chapter 3, Apple and Google effectively have a duopoly in relation to mobile operating systems, therefore we have limited our assessment to iOS and Android.

5.30 For iOS, Table 5.2 below shows the following:

- Safari is the main mobile browser on iOS in the UK, with a share of supply of 90% in 2021. The only other sizable browser is Chrome, with 9%.
- Given that Apple requires all browsers on iOS to use Apple's WebKit browser engine, WebKit on iOS has a share of supply of 100%.

Table 5.2: 2021 UK mobile browser and browser engine share of supply by operating system

%

iOS*			**Android**		
Browser	*Browser Engine*	*Mobile*	*Browser*	*Browser Engine*	*Mobile*
Safari	WebKit	89.8	Chrome	Blink	73.8
Chrome	WebKit	8.9	Samsung Internet	Blink	15.4
Other	WebKit	1.3	Firefox	Gecko	3.5
			Smaller browsers†	Blink	6.4
			Other/unknown	Other/unknown	0.9

Source: App Annie browser usage data provided by a browser vendor.
Note: Calculated based on usage minutes data from App Annie.
* iOS data was only available for the first three quarters of 2021.
† DuckDuckGo's browser engine (OS's WebView) is counted as Blink (2%) on Android.

5.31 For Android, Table 5.2 shows the following:

- Chrome is the main browser on Android in the UK. With a share of supply of 74% in 2021, its position is very strong, although less so than Apple's position on iOS. Samsung Internet is the largest competitor to Chrome on Android, with a share of 15%, while the next largest competitor, Firefox, has a share below 5%.

- While browsers on Android are free to choose their browser engine, almost all browsers use Google's Blink browser engine, resulting in Blink holding a share of at least 95%. The key exception is Firefox, which uses Mozilla's Gecko browser engine.

5.32 When considering browser engine shares across iOS and Android, WebKit has a share of supply of just over 50%, while Blink's is just under 50%.[411]

Web compatibility and developer functionality

5.33 Users want a browser which is compatible with most web pages (ie a browser that can load the content of websites without breaking any functionality).

5.34 Developers want access to new features which allow them to build innovative web pages and web apps. This attracts users, helping businesses to grow. When one browser engine introduces new functionality for web developers, other browser engines may not implement the same functionality, or may implement it more slowly. As a result, web pages which use the new functionality will not work as well on all browsers, degrading browser compatibility.[412] Google has implemented a particularly wide range of functionality in its Blink browser engine, from technology to enable web apps to new device APIs; indeed, we heard some complaints that the pace and nature of Google developments have made it difficult for other browser vendors to maintain compatibility.

5.35 Overall, modern browsers have achieved and maintained a fairly high degree of compatibility. However, there are notable exceptions, such as where Apple has refrained from implementing functionality (see 'WebKit feature support and performance' and 'Support for web apps' below).

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[411] WebKit's share is calculated based on the share of iOS in 2021. Blink's share is calculated based on the share of Android in 2021 but excluding Gecko and the other/unknown category on Android. Statcounter, Mobile operating system share of supply UK 2021, Table 5.2.
[412] See, for example, Appendix F, figure F.3, illustrating changes in browsers' compatibility in a set of selected functionality in 2021.

5.36 All content providers we spoke to reported that they ensure compatibility with Chrome (and therefore Blink). Many specifically said that they ensure compatibility on both Chrome and Safari (ie Blink and WebKit) because these are the most popular browsers.

Performance and user-facing features

5.37 Browsers compete in terms of their performance and the speed at which a browser responds to a user's actions.

5.38 One important measure of browser speed is how fast a web page loads. Browser engines' architecture is very important to browser speed. Direct comparison of browsers' performance is not straightforward (for example, it is influenced by the hardware and operating system); however, many browser vendors ranked Chrome as the fastest browser, and this is consistent with the results of a consumer survey commissioned by the Australian Competition and Consumer Commission (ACCC).[413]

5.39 Browsers also compete to provide user-facing features: for example, on desktop, Chrome's key differentiating feature at launch was 'draggable tabs'. Other common browser features include password managers, ad-blocking and auto-complete.

Privacy and security

5.40 Browsers are able to control which data is shared with advertisers, and can provide additional privacy protections for users, for example by including a built-in Virtual Private Network (VPN) or by limiting third-party cookies (see Appendix J). The ACCC's survey found that privacy features are the most frequent reason users choose Firefox on their smartphone, but several other browsers (including Safari, DuckDuckGo and Brave) have also sought to differentiate themselves by providing greater privacy, collecting less information themselves and sharing less information with advertisers.

5.41 Browsers also compete to provide a secure browsing experience.[414] Modern browsers have multiple layers of security to protect users; however, new security flaws are regularly discovered and must be rapidly patched to prevent harm. WebKit receives security updates less frequently than Blink, as updates

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[413] Roy Morgan Research (2021), Consumer Views and Use of Web Browsers and Search Engines, Table 5. When asked about the main reason they preferred their smartphone browser, 'speed' was mentioned by 4% of Chrome users (whereas, for example, it was only mentioned by 2% of Firefox users).

[414] In 2019 consumer research commissioned by Microsoft (based on US and Indian users of desktop and/or mobile devices), security was the most frequent characteristic of their primary browser which users considered to be most important.

are combined with updates to iOS itself.[415] Browsers can also protect consumers through features like integrated anti-spyware, anti-phishing, and antivirus.

Competition assessment

5.42 In this section, we consider the extent to which the high market shares maintained by Apple's and Google's browsers are maintained by barriers to competition, assess the overall extent of competition in browsers and browser engines, and finally consider whether alternative ways of accessing content online could constrain mobile browsers.

Barriers to competition

5.43 The main barriers to competition we have identified relate to:

- the browser engine restriction on iOS;
- web compatibility;
- native apps' use of in-app browsers;
- pre-installation and defaults;
- restrictions on access to functionality; and
- revenue sharing agreements in search.

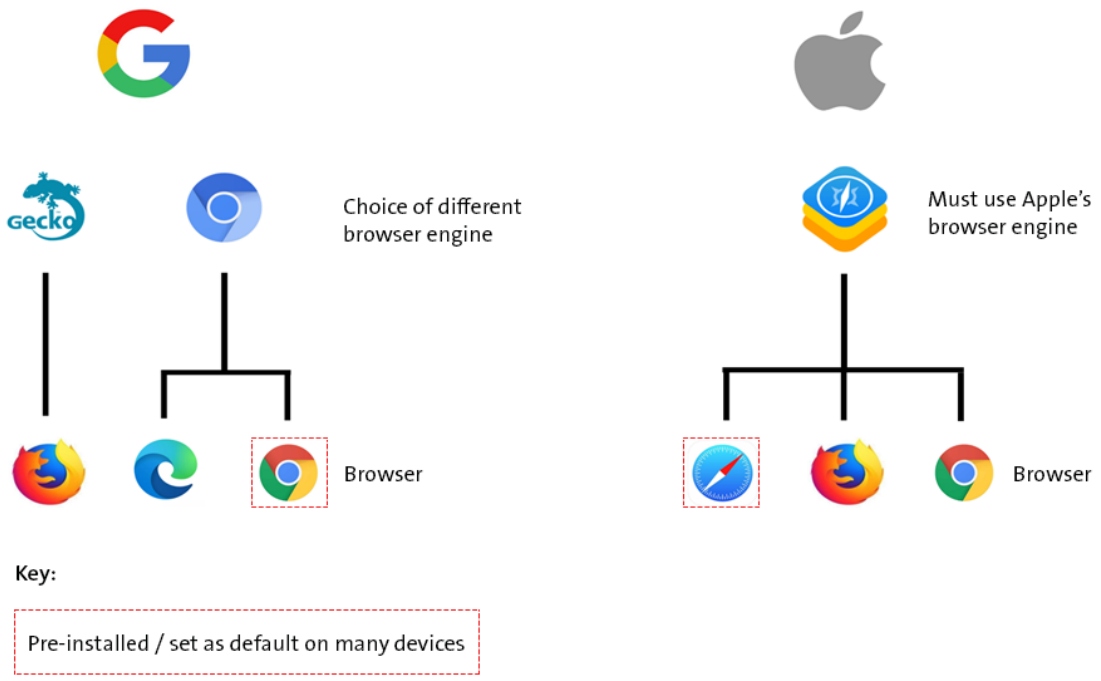
5.44 We have explained our findings on each in turn below. While the first three barriers primarily relate to browser engines, and the remaining barriers primarily relate to browsers, the importance of browser engines to browsers means that all barriers are relevant to understanding browser competition.

Browser engine restriction on iOS

5.45 Since the introduction of third-party apps on the iPhone in 2008, Apple has required all browsers on iOS to use WebKit as their browser engine and browser vendors are not able to make any adjustments to WebKit but have to rely on the engine already installed by iOS. This lack of choice is illustrated in Figure 5.2.

[415] Appendix F provides a more detailed assessment of this issue.

Figure 5.2: extent of browser engine choice within each ecosystem



Impact of the WebKit restriction

5.46 As a result of the WebKit restriction, there is no competition in browser engines on iOS and Apple effectively dictates the features that browsers on iOS can offer, to the extent that they are governed by the browser engine. For example, browsers are less able to accelerate the speed of page loading, and cannot display videos in formats not supported by WebKit.[416]

5.47 While Apple submitted that WebKit permits substantial differentiation between browsers and allows developers to build features and interfaces on top of WebKit, several browser vendors submitted that, due to the key role of browser engines, they are limited in differentiating their browser from other browsers on iOS. For example, one browser vendor submitted that it is not possible to offer as attractive or differentiated features to users on iOS, while another submitted that it is not able to substantially differentiate its browser from other browsers on iOS.

5.48 The WebKit restriction also means that browser vendors that want to use Blink or Gecko on other operating systems have to build their browser on two different browser engines. Several browser vendors submitted that needing to

[416] The AV1 video format is a modern video format which is supported by other browser engines, but not WebKit.

code their browser for both WebKit and the browser engine they use on Android results in higher costs and features being deployed more slowly.[417]

5.49 Two browser vendors submitted that they do not offer a mobile browser for iOS due to the lack of differentiation and the extra costs, while Mozilla told us that the WebKit restriction delayed its entrance into iOS by around seven years.

- *Poor WebKit feature support and performance*

5.50 A large number of stakeholders made submissions that WebKit lags behind other browser engines in terms of the developer features it supports and its user-facing performance and capabilities. We received submissions from a wide range of browser vendors, technical experts and web and app developers. For example:

- [One party] submitted that, due to the WebKit restriction, Chrome on iOS offers less attractive or differentiated features and that WebKit lags behind other browser engines in terms of compatibility. [This party] further told us that user feedback on crashes on iOS are 'an order of magnitude higher' than on Android.

- Microsoft submitted that it believes that Blink provides better standards support and performance than WebKit, and that this means that Edge on iOS is slower than Edge on Android and new and evolving web standards are less likely to be supported.

- Mozilla told us that its browser on iOS is more limited than its browser on Android.

- We heard extensive complaints about the state of WebKit from developers who create websites compatible with it. Over 40 respondents to our interim report expressed concerns about the WebKit restriction and its impact on web apps. In particular, web developers said:

  – 'Due to the popularity of iPhones, what Safari on an iPhone can do becomes the baseline for what the web is capable of. That means one company, Apple, gets to set the baseline for the web. With the current state of things, Apple has no incentive to raise this baseline.

[417] While we understand that browser vendors would be able to base their browser on WebKit also on other operating systems, given the concerns raised about the performance of WebKit (as discussed below), this is unlikely to be an attractive alternative.

Safari will continue to be the #1 browser choice on iPhones by virtue of being the only choice.'[418]

- The 'lack of engine diversity means Safari does not have to prioritise fixing bugs and addressing issues developers have'.[419]
- Safari 'lags behind… both in terms of unresolved bugs… and support for community features available on other platforms';[420]
- 'It's widely believed in the web development community that Apple is crippling Safari to prop up the App Store.'[421]
- Apple 'has been able to slow the development for so long without real competition pushing them to evolve the engine like the others.'[422]
- 'Due to this restriction, and Apple's underinvestment in the web, as engineers and companies wishing to support iOS users we have to go to extensive lengths to provide alternative implementations due to the lagging performance and compatibility characteristics of this engine.'[423]

5.51 Several developers commented that, absent the WebKit restriction, they would be able to ask users to switch to an alternative browser which supported better features.

5.52 Additionally, we engaged with various stakeholders on test suites that compare WebKit to other browser engines. We focussed on compatibility and feature support as these appear to be particularly important. This assessment appears to confirm stakeholders' submissions that WebKit lags behind other browser engines (see Appendix F for our more detailed assessment).

5.53 Apple submitted that, to the extent that certain features are not available at a given time, that may be due to differences in product development priorities, time and resource constraints, Apple's concerns about security, privacy or performance issues with those features and related technical barriers, or lack of clear demand for such features. Apple further noted specific features that it is actively working on supporting.[424]

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[418] Response to Interim Report, Developer C.
[419] Response to interim report, Developer – Alistair Shepherd.
[420] Response to interim report, Developer – Kimberley Blessing.
[421] Response to Interim Report, Developer A.
[422] Response to Interim Report, Developer F.
[423] Response to Interim Report, Developer K.
[424] For example, Apple told us that [✂].

5.54 However, we note the many stakeholders (including [several browser vendors] and several technical experts and tech commentators) which pointed to and provided extensive lists of features and APIs that Apple has not implemented or has only implemented on WebKit significantly after other browser engines (ie Blink and Gecko) did so. This suggests that Apple's development has been slower, rather than differently prioritised.[425]

5.55 We have also reviewed the frequency with which Google and Apple commit updates to their browser engines (see Appendix F). While this is a simplistic measure of development effort and should be interpreted cautiously, it is consistent with a lower level of investment by Apple.

5.56 For some features there is a legitimate debate over privacy and security concerns. These include, in particular, access to hardware devices but also functionality such as the extent of support for push notifications and background synchronisation, both of which are APIs that extend service workers (scripts that browsers may use to respond to events related to a site, even if that site is not currently open in a foreground tab).[426] Apple has commented explicitly on some of these. For example, with respect to device APIs, Apple submitted that enabling access to these features presents well-known and substantial risks to privacy and security. Apple further submitted that it has publicly explained its reasoning for not implementing these features and that Mozilla has publicly registered similar concerns. We recognise that a cautious approach to implementing certain features may be reasonable; however, under the WebKit restriction, Apple's decision on the appropriate feature-set becomes the only approach permitted.

5.57 **Importantly, due to the WebKit restriction, Apple makes decisions on whether to support features not only for its own browser, but for all browsers on iOS. This not only restricts competition (as it materially limits the potential for rival browsers to differentiate themselves from Safari on factors such as speed and functionality) but also limits the capability of all browsers on iOS devices, potentially depriving iOS users of useful innovations they might otherwise benefit from.**

- *Effect of the WebKit restriction on web apps*

5.58 A key area in terms of limited feature support provided by WebKit appears to be web apps, and more specifically progressive web apps (PWAs): web apps

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[425] One group of technical experts further recommended a site called https://whatwebcando.today, which, for the browser with which the website is opened, indicates which features are available on that browser.
[426] Where features are enabled in WebKit and used by Safari, but disabled for other browsers, this clearly does not support Apple's privacy and security arguments (see below section on reserved features).

that create an experience that is much more comparable to a native app than more conventional web apps would offer.[427]

5.59 A large number of stakeholders submitted that WebKit provides more limited support for web apps by Apple either delaying the introduction of technical changes to WebKit that facilitate improved web app technologies or choosing not to implement them at all.[428] In particular, developers told us that:

- 'A lack of competition means a decreased incentive for Apple to improve their browser, fix bugs and support new features such as Progressive Web Apps';[429]
- 'The result of this practice is that as a web app developer I am often not able to serve the iOS app market which means that I either need to say this is impossible or requires a native iOS App – which comes with a huge price tag.'[430]
- Web apps are 'strangled' by Apple's approach.[431]

5.60 Even where features are introduced for Safari, as explained in further detail below, we have heard concerns that Apple does not provide support for these features to other browsers (for example, the ability to add the icon of a web app to the home screen).

5.61 We heard submissions on several key features that WebKit does not (fully) support that relate directly to web apps. We list some of the key gaps below:[432]

- No push notifications.[433]
- Missing full-screen functionality – the browser's UI remains visible in web apps in some contexts.[434,435]

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[427] Key features of PWAs for example include users being able to add the icon of a web app to the home screen, the PWA being able to send push notifications and faster loading.
[428] This included submissions from several browser vendors, app developers and technical experts.
[429] Response to interim report, Developer – Niels Leenheer.
[430] Response to interim report, Developer – Thomas Allmer.
[431] Response to interim report, Developer – Andy Cowan.
[432] This list is based on submissions from several browser vendors, app developers and a group of technical experts.
[433] Apple has announced it is now in the process of implementing push notifications in WebKit. See iOS 16 enables web push notifications with Safari update - 9to5Mac and iOS 16 Preview - New Features - Apple.
[434] Response to Interim Report, Open Web Advocacy. This feature is particularly relevant for mobile gaming and presentation sharing.
[435] Although for web apps pinned to the home screen (which is only possible on Safari but not on other browsers on iOS) users can turn off the browser's UI.

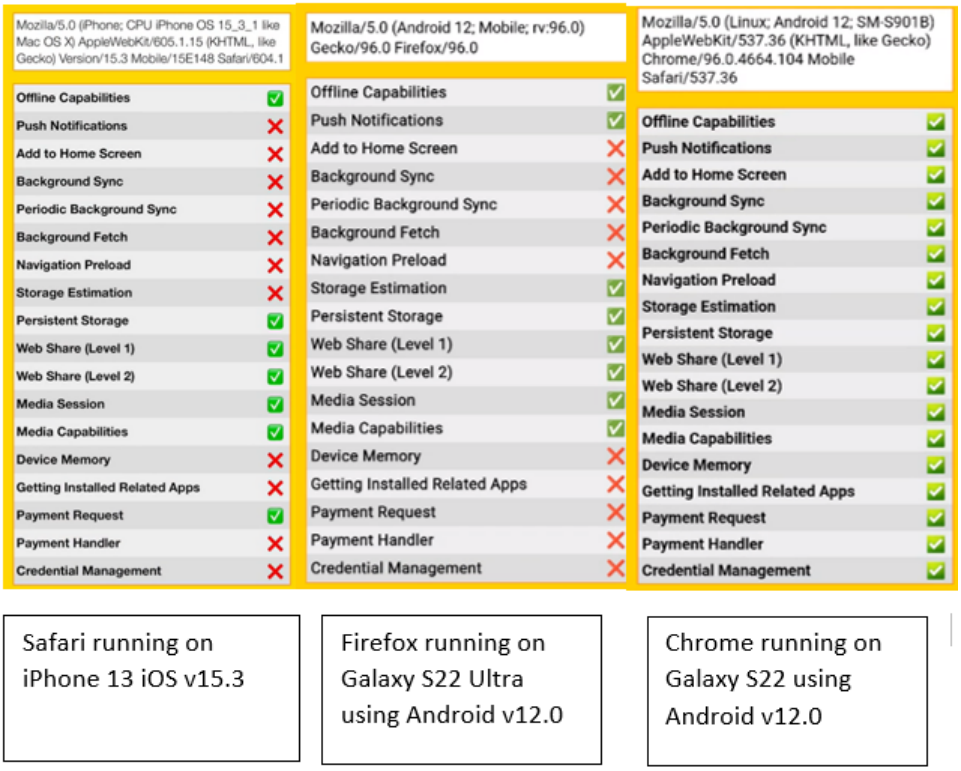
- Lack of lock-screen rotation.[436]
- Limited support for persistent storage – as a default, cache and sign-in data only stored for seven days on a web app.
- No access to Web-Bluetooth – meaning that web apps are incapable of connecting to devices such as printers and scanners, payment technology, or home automation and lighting and other 'Internet of Things' devices.[437]
- No access through voice assistants – web apps cannot be accessed by using a voice assistant (eg Siri).
- Worse integration with parental controls – eg ScreenTime; some features unavailable to web apps (tracking activity, limiting usage or content restrictions).
- Lack of access to hardware rendering – web apps have to rely on software-based, single-thread rendering, which means less efficient processing and results in greater battery drain.

5.62 In addition to these submissions, we were referred to a website (developed by a Chrome Developer Advocate at Google) which checks whether a given browser supports 18 features that, according to the technical expert, 'make web apps more powerful and keep users safer'.[438]

5.63 Figure 5.3 below shows one comparison in which Safari (based on WebKit) only supported seven of these features, while Chrome on Android (based on Blink) supported all. However, Firefox on Android (based on Gecko) also does not support many of the features that are not supported by Safari – although 'Push Notifications' and 'Storage Estimation' are supported by Firefox but not by Safari. While the list of selected features was developed by a Chrome Developer Advocate at Google and is therefore likely impacted by Google's view on what features are important, and Apple continues to roll out updates to its browser (including during the course of our market study), we still see it as relevant evidence complementing the submissions on feature support discussed above.

[436] This feature is particularly relevant for mobile gaming.
[437] We understand that while there are few web apps that required this API, those that do often have it as a core experience. For example, we understand that this is required to connect to certain printers.
[438] Progressive Web App Feature Detector (tomayac.github.io).

Figure 5.3: Progressive Web App Feature Detector: (left to right) Safari on iOS and Firefox and Chrome on Android



Source: Progressive Web App Feature Detector (tomayac.github.io). Screenshots taken on 6 April 2022.

5.64 The WebKit restriction appears to significantly limit the functionality of web apps, in particular PWAs, on iOS compared to native apps. Apple told us that it is continuing to update and develop the relevant features.

5.65 While we understand that it is, in principle, possible to use web apps with browsers that are based on WebKit, the limited support for web apps has important implications for app developers on iOS.

- Some app developers are likely to still offer web apps (eg because they particularly value offering a consistent cross-platform experience or because the web app features that are not supported on iOS are less essential to them). However, the functionality these app developers can practically offer will be more limited. We have heard concerns that this is not only the case on iOS, but also on Android (given that, as discussed in Chapter 4, web apps are used across operating systems).[439]

- Other app developers may not be able to offer the functionality they want to offer through a web app, and this may lead them to instead develop a native app for iOS. We heard concerns that this significantly increases development costs, as the efficiency saving from having to only develop

[439] [One browser vendor] told us that this reduces the functionality of web apps to the lowest common denominator.

one app (ie one web app as opposed to a native app for each operating system) is lost.[440] Higher development costs may feed through to higher costs for users and certain apps not being developed (either not at all or not for both iOS and Android).

5.66 Both of these implications suggest that **the WebKit restriction is likely to impede the more widespread adoption of web apps, on iOS specifically but also on Android, raising developers' costs and harming innovation.**

Reasons for Apple's WebKit restriction

5.67 We consider below (i) how weakening competition from competing browser vendors benefits Apple, and (ii) Apple's stated rationale for the WebKit restriction.

- *How weakening competition in browsers benefits Apple*

5.68 As described above, we have heard concerns that the WebKit restriction is hindering browser competition and slowing innovation in web apps. There are two main ways in which Apple benefits from the ways in which the WebKit restriction harms other browsers' ability to compete.

5.69 First, Apple receives significant revenue from Google by setting Google Search as the default search engine on Safari, and therefore benefits financially from high usage of Safari. Safari has a strong advantage on iOS over other browsers because it is pre-installed and set as the default browser. The WebKit restriction may help to entrench this position by limiting the scope for other browsers on iOS to differentiate themselves from Safari (for example being less able to accelerate the speed of page loading and not being able to display videos in formats not supported by WebKit). As a result, it is less likely that users will choose other browsers over Safari, which in turn secures Apple's revenues from Google.

5.70 Second, and as discussed in Chapter 4, Apple generates revenue through its App Store, both by charging developers for access to the App Store and by taking a commission for payments made via Apple IAP. Apple therefore benefits from higher usage of native apps on iOS. By requiring all browsers on iOS to use the WebKit browser engine, Apple is able to exert control over the maximum functionality of all browsers on iOS and, as a consequence, hold up the development and use of web apps. This limits the competitive constraint

[440] Open Web Advocacy, Response to the Interim Report.

that web apps pose on native apps, which in turn protects and benefits Apple's App Store revenues.

- *Apple's stated rationale for the WebKit restriction*

5.71 Apple told us that the WebKit restriction on iOS is motivated primarily by security considerations.[441] In particular, Apple told us that the web exposes devices to unknown and unvetted sources (unlike the App Store). Apple submitted that it has tightly integrated WebKit into iOS to protect users from malicious actors, providing key benefits including:

- better distribution of security updates;
- security features leveraging technical integration with the operating system and hardware.

5.72 Apple also told us that the WebKit restriction is important for privacy and performance, as integration with hardware and the OS enables improvements to the WebKit browser engine. However, we do not consider that such integrations are incompatible with competition between multiple browser engines on iOS. Users should be able to choose a browser which they consider offers the best combination of privacy and performance, as they can on Android.

5.73 We have spoken to a wide range of stakeholders to understand the role of browser engines in mobile devices' security. In addition to engaging with browser vendors and web developers, we consulted experts including RET2 (a computer security firm from which we commissioned advice). Further detail on browser engine security can be found in Appendix F, but in summary RET2 told us that:

- All three main browser engines are very secure for the average user. So long as a user is on the most updated version of the engine, the browser is rarely the source of security exploits affecting consumers on mobile devices. Malicious (or otherwise predatory) native apps, either sideloaded or installed through app stores, are the main route by which consumers are attacked.
- Apple's dedicated Safari sandbox and hardware-level security mitigations are not the only ways to secure a browser engine on Apple devices.

[441] Apple, response to Interim Report, paragraphs 87 and following, 7 February 2022. We discuss the submissions Apple made with respect to its rationale for the WebKit restriction in detail in Appendix F.

- Allowing the use of Blink and Gecko on iOS by dedicated browser apps is highly unlikely to materially worsen security.

5.74 We additionally provide evidence in Appendix F that Apple updates WebKit less frequently than Google updates Blink. We also note that Apple does not have a similar browser engine restriction on MacOS.

5.75 **Overall, the evidence that we have seen does not suggest that the WebKit restriction is justified by security concerns. We note that Apple benefits financially from weakening competition in browsers via the browser engine ban.**

Web compatibility

5.76 A further barrier to competition is web compatibility. This refers to the browser's ability to properly access and display the content on a particular web page, and primarily depends on the browser engine (ie although there may also be some differences between them, browsers with the same browser engine generally tend to perform similarly on web compatibility).

5.77 There are a series of open standards that should, in principle, address any concerns about web compatibility. However, in practice, compatibility issues remain. This appears to be due to (i) certain browsers releasing features without going through formal standards development organisations and processes (see Appendix F) and (ii) web developers not developing against standards but for a specific browser or set of browsers (see 'Microsoft's browser engine switch' below).

5.78 Web compatibility is influenced by indirect network effects: the more users a browser engine has, the more likely online content providers will develop their website in a way that ensures compatibility with the browser engine and thus the more likely are users to use a browser that is based on this browser engine.

5.79 These network effects mean that it is more difficult for smaller browser engines to compete effectively and for new browser engines to enter. It also means that browser vendors are less willing to substantially adjust their customised version of an open-source browser engine or fork from it. While browser developers can modify and distribute their own version of Blink on Android, there is a high cost to maintaining modified browser engine features which have not been adopted by the browser engine's steward, while avoiding worsening compatibility. This reduces the scope for differentiation and competition between browsers on Android, as the competing Blink-based browsers perform similarly in many ways.

5.80 This is consistent with the submissions we have received from browser vendors, regarding the motivations for discontinuing support for engines, and for opting for Blink. For example, Box 5.2 refers to the reasons why Microsoft made this transition.

Box 5.2: Microsoft's browser engine switch

Microsoft previously offered its own proprietary browser engines (Trident and Edge HTML) with its browsers Internet Explorer and Edge. However, in 2018, Microsoft announced the transition to Blink and shipped the updated version of Edge in 2020.

Microsoft provided us with the following reasons for this switch:

- The decision was made to improve website compatibility.
- In particular, Microsoft felt that it could not convince a sufficient percentage of developers to support the EdgeHTML version of Edge and test their sites against it, and this resulted in broken web experiences and users leaving Edge for Chrome.

Microsoft considered other engines but concluded that Blink likely offered the best website compatibility at the time.

- [✂]

5.81 Overall, this suggests that web compatibility is a key barrier to competition in browser engines in the following respects: (i) it limits the competitive constraint smaller browser engines pose on Blink and constrains their viability; and (ii) it limits the extent to which browser vendors using Blink are willing to make custom modifications to Blink.

Native apps using in-app browsers

5.82 Certain native apps have in-app browsers, meaning that, when clicking on a link to the website, the user remains in the native app and views the web content on an in-app browser. In-app browsers play an important role in allowing users to access the web. Data submitted to us suggests that the amount of traffic through in-app browsing is a substantial proportion of total browsing.[442]

[442] Data submitted by Google indicated that in-app browsing is significant, although Google told us that its estimate was potentially inaccurate. Additionally, data from a large app developer suggests close to 50% of users use in-app browsing when available.

5.83 The prevalence of in-app browsers reduces the effectiveness of consumer choice of browser, as the app developer decides how the in-app browser is implemented (and, in particular, which browser engine is used).[443] Apple and Google use in-app browsers to reinforce their positions in the following ways:[444]

- On iOS, in-app browsers have to be built on WebKit, such that similar concerns to those raised above also apply to in-app browsers (ie there is less differentiation and more limited feature support).
- On Android, there appears to be browser engine choice for in-app browsers, but default settings make it difficult to use a browser engine other than Blink, hence further strengthening the position of Blink.[445]

5.84 We are concerned that the ways in which in-app browsers are currently implemented on iOS and Android therefore reinforce the positions of WebKit and Blink, contributing to the advantages they have as the most popular browser engines.

5.85 In our interim report, we also expressed concerns that in-app browsers failed to respect user choice of default browser. While in principle we continue to consider that respecting user choice is important, we recognise that there are also advantages to allowing developers to choose the in-app browser implementation: app developers can include a custom browser engine which they have modified or can choose a specialised browser engine. It is therefore possible for developer choice of in-app browser engine to increase competition rather than lessen it.

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[443] One of the main reasons why app developers choose to rely on in-app browsers relates to being able to collect user information. For example, Mozilla told us that a benefit of in-app browsers for app developers is that the app will know which sites the user visited.
[444] See Appendix F for further detail.
[445] Google submitted that app developers are free to build their in-app browser on any Android-compatible browser engine of their choosing and would for example be able to build their in-app browser on GeckoView. However, we also understand that the default web view on Android is Android WebView (which is based on Blink). Mozilla told us that while app developers have a choice, it is more difficult for app developers to use a browser engine other than Blink, given that Blink is set as the default rendering engine in WebView on Android and using an alternative browser engine involves additional steps including having to install this alternative browser engine. Mozilla submitted that this results in less web page traffic going through alternative browser engines to Blink, creating further challenges to web compatibility. If this leads to additional web compatibility issues, then it can be expected to limit the competitive constraint that alternative browser engines exert on Blink, which in turn is likely to harm consumers.

Pre-installation and default settings

5.86 Most browser vendors highlighted the challenges of acquiring users, and in particular the role of pre-installation and default settings, as a key barrier to expansion.

5.87 We assess pre-installation and default settings for browsers in detail in Appendix G. Below, we summarise the key aspects with respect to the current agreements in place, the impact of pre-installation and default settings on consumer behaviour, as well as the barriers to users switching their browser.

Current agreements

5.88 On iOS devices, Safari is the only browser pre-installed and is set as the default browser.

5.89 Chrome is pre-installed on most Android devices and set as initial default browser on at least [10-20%] of Android devices (although it is not set as the initial default browser on Samsung mobile devices).[446] In principle, this outcome could result from an effective competitive process for pre-installations and default settings. There is scope for competition for pre-installation and default settings on Android devices, given that Google is typically not the device manufacturer[447] and given that – following the European Commission's *Google* Android decision – Google can no longer tie licencing GMS (which includes the Play Store) to the device manufacturer also installing Chrome.[448]

5.90 However, we are concerned that Google may be using its strong position in browsers or adjacent markets to ensure that Chrome is pre-installed on Android devices, thereby further entrenching its position in browsers. In particular, Google's agreements and payments are structured in a way that provides device manufacturers with strong incentives to pre-install Chrome on their devices:

- under Placement Agreements, Google pays device manufacturers which licence Chrome to pre-install the Chrome app and fulfil certain placement obligations on the user's device; and

[446] Google Chrome is required to be set as the initial default browser, under Revenue Share Agreements, on [40-50%] of non-Samsung devices).
[447] As set out in Chapter 3, most devices running the Android operating system are manufactured by third parties, such as Samsung, with Google's Pixel range of mobile devices accounting for a very small proportion of all mobile devices.
[448] See Appendix E.

- under Revenue Share Agreements, Google pays device manufacturers a share of ad revenue generated from specific search and assistant access points, in return for certain placement and promotion of Chrome (as well as other requirements).

5.91 We consider that it is difficult for other browser vendors to replicate these payments, in particular due to Google's market power in search advertising where it is highly profitable.

5.92 Consistent with this, we received several submissions from browser vendors on perceived difficulties of getting pre-installed on Android mobile devices because of Google. We also consider that trying to be pre-installed alongside Chrome on Android devices is likely to be unattractive:

- First, it would not be possible for browsers with search engines other than Google Search (eg Edge, which has Bing as its search engine default) to be installed in a prominent place. Google's Revenue Share Agreements with device manufacturers stipulate that Google Search is set as the default on all pre-installed browsers (other than Chrome, following the Android Decision) that are placed on the default home screen (unless in a folder) or the 'minus one' screen.

- Second, paying to be pre-installed next to Chrome may be costly, in particular relative to potentially limited gain for the browser vendor. In this regard, Brave submitted that being pre-installed in addition to the default browser is expensive. We also understand that Chrome may be more prominently placed than other browsers.[449]

Impact of pre-installation and default settings on user behaviour

5.93 The evidence we have reviewed indicates that pre-installation and default settings have a significant impact on consumer behaviour,[450] although there is also some evidence that suggests that users sometimes do change default mobile browsers when given the opportunity.

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[449] In particular, some device manufacturers that enter into a Revenue Share Agreement with Google choose, on a device-by-device basis, to earn an enhanced revenue share by meeting certain additional requirements, some of which relate to the placement of Chrome. Additionally, Brave submitted that non-default pre-installed browsers are often contractually precluded from appearing on the first screen and are relegated to more obscure screens that require several swipes for the user to access and are rarely opened by the user.

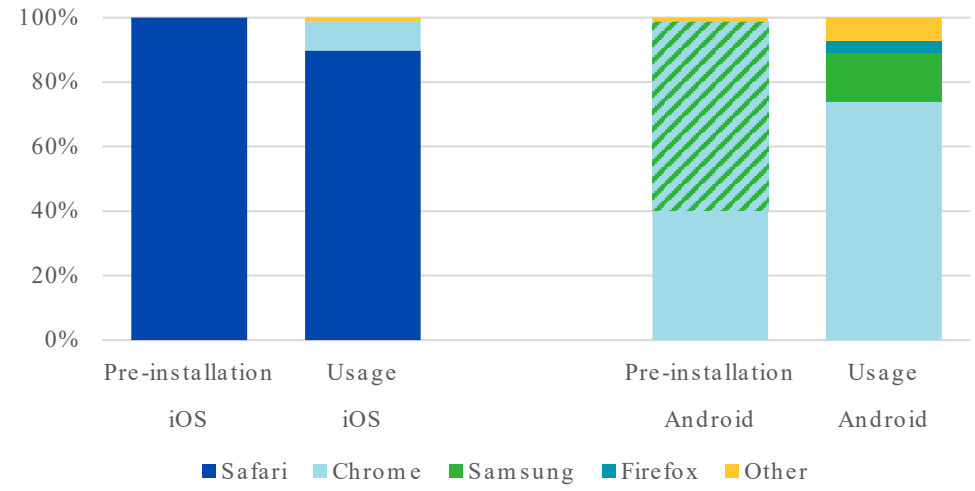
[450] In addition to evidence specific to browsers, there is considerable evidence in the behavioural economics literature supporting the strong impact of defaults on consumer behaviour across a wide range of settings. See Jachimowicz, J., Duncan, S., Weber, E., & Johnson, E. (2019). When and why defaults influence decisions: A meta-analysis of default effects. Behavioural Public Policy, 3(2), 159-186 for a meta-analysis of studies evaluating default effects, which shows the strong impact of default choices on decision-making.

5.94 First, and as can be seen from Figure 5.4, there is a strong correlation between the browsers that are pre-installed or set as defaults on mobile devices and their usage (as measured by their share of supply). In particular:

- Safari is the pre-installed default browser on all iOS mobile devices and its share of supply in iOS mobile browsers amounts to 90%;
- Chrome is pre-installed on most (and set as default on at least [10-20%] of) Android mobile devices and has a share of supply in Android mobile browsers of 74%; and

5.95 However, there is also evidence that consumers do change their default browser. For example, Samsung Internet is pre-installed (alongside Chrome) and set as default on 58% of Android mobile devices, but has a share of supply in Android mobile browsers of only 15%.

Figure 5.4: Pre-installation and share of supply of browsers on mobile devices in the UK, 2021



Source: CMA analysis using App Annie data, provided by a browser vendor
Note: Mobile devices refers to both smartphones and tablets. iOS data was only available for the first three quarters of 2021. Samsung pre-installs both Samsung Internet and Chrome and sets Samsung Internet as the default. Samsung's share of supply is based on number of activations.

5.96 An even starker pattern can be observed when comparing Samsung Internet browser usage on Samsung devices (where it is the pre-installed browser alongside Chrome and set as the default) to non-Samsung Android devices (where it is not). Most of the usage of the Samsung Internet browser is from devices where it is the pre-installed default browser and a very low proportion is from devices where it is not. Similarly, Edge's position on desktop (where it is pre-installed) is stronger than its position on mobile (where it is not).[451]

[451] For a more detailed discussion, see Appendix G.

5.97 Second, we have considered user research on browser usage in the context of pre-installation and default settings, including a consumer survey commissioned by the ACCC[452] and two user surveys conducted by [a browser vendor] on iOS users.[453] These indicate that there is a strong tendency among consumers to adhere to pre-installed and/or default browsers. There appear to be a number of reasons why users do not switch to a different browser: while the survey evidence indicates that users have a preference for maintaining the status quo with respect to browser choice,[454] it also shows that some users do not know how to change their default browser. Additionally, however, the survey evidence also indicates that users stick with the pre-installed and/or default browser because it is their preferred browser.

Complexity of changing the default browser

5.98 The ease of switching appears to play an important role in how significant the impact of pre-installation and default settings is for users' choice of browsers.[455]

5.99 Changing the default browser can be a complex process, and users can struggle to find the right settings.[456] Some browser vendors highlighted that users may not know how to change the default or that changing the browser is an involved process that requires a number of steps. In this context, users rarely switch their default unless given a simple opportunity to do so, for example through a browser choice screen or by being presented with alternative pre-installed browsers. Users on iOS are not presented with browser choice screens, and until 2020 could not change the default browser at all.

[452] Roy Morgan Research (2021), Consumer Views and Use of Web Browsers and Search Engines
[453] In particular, these user surveys are an online user survey conducted in November 2020 of iPhone users (including in the UK) and a brand tracking online survey conducted in November 2020 in the US.
[454] Status quo bias refers to an individual's tendency to do nothing or to maintain their current or previous decision. See Samuelson, W., & Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of Risk and Uncertainty*, 1, 7-59. In this context, users have a status quo bias towards the browser that is pre-installed and/or set as default.
[455] As noted in Appendix G, this was mentioned by several browser vendors, is supported by user research and is in line with the findings set out in the final report of the CMA's market study into online platforms and digital advertising.
[456] On iOS, changing the default browser typically takes six steps; on Android, it takes around seven steps (depending on device type and manufacturer).

5.100 Google offers a browser choice screen on Android in some contexts.[457,458] However, we have concerns that the choice architecture of this screen may limit its effectiveness (see Appendix G for further detail):[459]

- First, the choice screen does not allow users to change the default browser setting at the time they decide whether to download an additional browser.
- Second, the choice screen only allows for the installation of additional browsers and any pre-installed browsers are shown in the screen above the options for downloading a new browser.
- Third, the choice screen is shown once when the user first opens the Play Store. Users may be less open to exploring alternative browsers when they are in the process of setting up their phone, rendering the choice screen less effective.

5.101 While we consider that in general browser choice screens can be useful in facilitating browser choice and reducing the importance of pre-installation and default settings, we have concerns about the effectiveness of the current implementation of choice screens on Android.

5.102 We discuss barriers to switching between browsers (in the context of pre-installation and default settings) in detail in Appendix G. This includes an assessment of the key choice architecture elements that users encounter in their routes to switching and their impact on user behaviour.[460]

5.103 Overall, we are concerned that the complexity of changing the default browser limits switching on both Android and iOS, which weakens the extent of competition between browsers.

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[457] In April 2019, Google implemented a choice screen which is displayed the first time a user opens the Google Play store on EMADA devices (for further details on EMADA, see Appendix E) that preload the Google Search app and/or Chrome.
[458] Users of Android 11 and earlier versions can be prompted to change their default browser through a so-called 'disambiguation box'. However, on Android 12 (which was released in October 2021), installing a new browser does not remove the default browser setting. This means that when a user clicks on a link after installing a new browser, the user does not get shown the disambiguation box for browsers.
[459] A more detailed description of the behavioural considerations related to the Play choice screen for browsers is offered in Appendix G.
[460] There is substantial empirical evidence supporting the strong impact of choice architecture elements such as pre-set defaults and ordering of options on consumer decision-making. See Szaszi, B., Palinkas, A., Palfi, B., Szollosi, A., and Aczel, B. (2018) A Systematic Scoping Review of the Choice Architecture Movement: Toward Understanding When and Why Nudges Work. Journal of Behavioral Decision Making, 31: 355– 366 for a review of empirical evidence on choice architecture interventions. Also, see Appendix I which discusses choice architecture of data privacy choices and the implications for user behaviour.

Prompts displayed by browser operators and websites

5.104 On both iOS and Android, browser vendors as well as websites can display prompts asking the user if they want to switch their default browser. Examples of browser vendors that use or have at some point used such prompts include Google, Mozilla, Microsoft, Samsung and Brave.

5.105 The prompts can differ in terms of when they are displayed (eg we understand prompts are shown when the respective browser is in use, but some browsers appear to also be able to send notifications when not in use) and the information they display (they may include information on how to change the default browser, on the benefits from switching the default browser and/or display shortcuts for changing the default).

5.106 Prompts can be beneficial in terms of making it easier for users to switch their default browser and raising awareness about the process of switching. However, there are limitations to how effective they can be:[461]

- Browser vendors are only able to show prompts to a limited population of users (namely those that already have the respective browser installed on their device). Browser vendors may further not have visibility over whether their browser is set as the default, which restricts their ability to target users for which the browser is not set as the default. They also may not have access to the relevant API that allows them to launch shortcuts to changing the default browser settings.

- The choice architecture of these prompts must be well-designed. For instance, encountering these prompts repeatedly could enhance the burden on consumers and reduce their engagement with the prompt, rendering them less effective.

5.107 Overall, we consider that while prompts can facilitate switching between browsers and thereby play some part in reducing the importance of initial browser default settings, their effectiveness is likely to be limited, partly due to missing or inaccessible APIs. We are also concerned that Apple and, especially, Google may be able to use prompts more effectively than competing browser vendors, given their extensive web presence.

[461] A more detailed discussion of the limitations of browser prompts and concerns over their choice architecture is provided in Appendix G.

Restrictions on access to APIs and interoperability

5.108 Browsers, like other native apps, rely on APIs to be able to offer certain functionality. For example, on Android, APIs enable browsers to directly access the device's camera and microphone.

5.109 Apple's and Google's ownership or influence in respect of their respective operating system gives them control over important APIs and the functionality that their own and other competing browsers can access. Through this control, Apple and Google are able to restrict access to APIs and the extent to which browsers can interoperate with the respective operating system. More importantly, it allows Apple and Google to give their respective own browsers (ie Safari and Chrome) access to more APIs than other browsers have access to. This limits other browsers' functionality and, in turn, the competitive constraint they are able to impose on Safari and Chrome.

Apple

5.110 Most browser vendors told us that there are features used by Safari which are not available to other mobile browsers on iOS devices. Various stakeholders further commented on specific functionalities that Apple supports on Safari but restricts for other browsers on iOS. Below, we discuss some of the key examples.

- First, both Mozilla's and Microsoft's submissions pointed to extensive information on features used by Safari which are not available to other browsers on iOS relating to privacy and security.[462,463]

- Second, several browser vendors commented on browser extensions or add-ons that are available on Safari but other browsers on iOS do not have access to. Examples of such extensions include content blockers and password managers. Mozilla further noted that the capabilities to have extensions is very important for Firefox users.

- Third, several stakeholders submitted that there are device APIs that provide access to certain audio features and webcams which are

[462] Specific features mentioned by Mozilla include 'Process Separation' (which is a critical operating system feature that is needed for browser vendors for stability, quality and security reasons), restrictive implementation of Safebrowsing (which relates to the browser checking the website URL against lists of known websites and displays a warning if the URL the user is visiting is suspected of fraudulent conduct like phishing) and Apple removing existing functionality for features around data saving, cookie settings and multi-profiles.
[463] Specific features mentioned by Microsoft include Safari being the only browser that has direct access to certificates deployed through mobile device management systems (which are commonly used by enterprises for certificate-based authentication) and Apple's new Private Relay feature (which is a privacy enhancing tool introduced by Apple) being expected to only be available to Safari.

available on Safari but not enabled for other browsers on iOS.[464] We understand that these are necessary for building competitive video experiences, including messaging and videoconferencing.

- Fourth, many stakeholders commented on support for PWAs. While, as discussed above, support for PWAs is generally limited on iOS due to the WebKit restriction, we understand that there are certain features that, while enabled for Safari, other browsers on iOS do not have access to. Specific aspects mentioned include support for service workers (which enable capabilities such as push notifications and background synchronisation) and functionality that enables users to add the icon of a web app to the home screen. This functionality is a prerequisite for any web app experience to resemble that of a native app.

5.111 These submissions suggest that there are a large variety of functionalities that exist in Safari but that are not available to other browsers on iOS. We consider that at least some of them are significant in how they affect the functionality that other browsers are able to offer and may hence limit the ability of other browsers on iOS to compete effectively with Safari.

Google

5.112 The evidence we received on the extent to which Google engages in conduct that restricts other browsers' access to APIs (compared to the access it provides to Chrome) is mixed.

5.113 On the one hand, Samsung and Brave submitted that there are no major features that are available on Chrome which are not available to their own browsers on Android. Additionally, there were a number of browser vendors who did not raise any issues relating to API access in relation to Google.[465]

5.114 On the other hand, Microsoft, Yandex and Opera gave the following examples of interoperability being more restrictive for other browsers than for Chrome.

- Microsoft submitted that Android enables Chrome to install PWAs on Android in a way to make them appear more native, unlike other browsers, which limits integration with features of the operating system.

[464] The specific APIs that were mentioned are 'WebRTC' (which are real-time network protocols for enabling videoconferencing, desktop sharing and game streaming applications) and 'getUserMedia()' (which provides access to webcams).
[465] However, these browser vendors commented on issues relating to defaults and in-app browsers. We cover issues relating to defaults and in-app browsers in detail in previous sections.

- Yandex submitted that Google can prevent other browsers from using the technology which allows users to authorise on websites with biometrics.

- Opera submitted that there may be certain ecosystem advantages enjoyed by the platform's browser, giving as an example Chrome benefiting from a one-click login experience to the Google account associated with the device.

5.115 Two browser vendors further commented on interoperability issues with respect to web services offered by Google running on alternative browsers.

- Mozilla submitted that certain browsers receive a different Google Search experience.

- [One browser vendor] submitted that Google blocks other browsers from using Google Classroom and accessing Google's comprehensive education services.

5.116 Overall, there appear to be fewer concerns from rival browser vendors about access to APIs on Android compared to iOS. Nevertheless, we are concerned that the restrictions which exist may weaken competition from other browsers.

Revenue sharing agreements in search between Apple and Google

5.117 Google pays Apple a share of the search revenue it earns from browser traffic on iOS in the following contexts:

- in return for being the default search provider on Safari, Google pays Apple a share of revenue derived from Safari search traffic; and

- pursuant to various commercial arrangements, Google pays Apple a share of revenue derived from [✂] search traffic.

5.118 Under these agreements, Apple receives a significant share of revenue from Google Search traffic on Safari and [✂] on iOS devices. Google's estimated payments to Apple for search default status on Safari (£[1-1.5] billion total in 2021 for the UK) were substantially more than those made to its next largest partner, Samsung.[466] This high level of payment is likely to reflect Apple's strong positions in browsers (and other search access points) and browser engines (through the WebKit restriction).

[466] Converted from US dollars to British pounds sterling (Bank of England, series XUAAUSS, 31 December 2021).

5.119 Given this revenue share, when [✂] or Safari is successful in competing for an iOS user, rather than winning a full share of the search traffic revenue it only wins a partial share (ie the revenue to which it was not previously entitled). These revenue sharing arrangements therefore dampen incentives for competition between browsers on iOS.

Constraints from browsers and browser engines

5.120 We describe below the extent of competition between browsers and browser engines on iOS and Android, taking into account the above barriers to competition.

Competitive constraints on iOS

5.121 Safari is the most popular browser on iOS with a share of supply 90%, and Chrome has a share of supply of 9% (see Table 5.2). Collectively, other browsers account for only 1% of browsing on iOS.

5.122 Browsers other than Safari face extensive barriers:

- Safari is the only browser which is pre-installed on iOS;
- Safari has access to reserved features which are not made available to other browsers; and
- the WebKit restriction prevents competition in browser engines, degrading competitors' ability to differentiate their browsers from Apple's.

5.123 Competition between Apple and Google is further weakened by [✂].

5.124 Overall, Apple's Safari browser faces very weak competition from other browsers and browser engines on iOS, while Apple's WebKit browser engine faces no competition on iOS given the ban on alternatives.

Competitive constraints on Android

5.125 Chrome's share of supply on Android devices in the UK for 2021 (74%) is far higher than any other browser's, but there are a large number of competing browsers available on Android, including Samsung Internet (15%), Firefox (4%), DuckDuckGo (2%), Opera (2%), Brave (2%), Edge (0.7%) and Yandex

(<0.5%).[467] Chrome and Safari do not compete on Android, as Apple does not release a version of Safari for the Android operating system.

5.126 Many of the competitors faced by Chrome have tried to differentiate themselves with niche advantages:

- Microsoft markets Edge's business-focused features;[468]
- Brave and DuckDuckGo focus on improved privacy;[469] and
- Firefox's mobile extensions library is frequently highlighted as a strength by reviewers.[470]

5.127 However, these browser vendors have low shares of supply, and almost all Android browsers use the Blink browser engine, and therefore have limited scope for differentiation. We have also heard concerns that they do not have access to all of the features which Chrome has access to. Furthermore, only Samsung and Chrome are pre-installed in material volumes (see Figure 5.4); pre-installation appears to have been important in making Samsung the second most popular browser on Android.

5.128 The supply of browser engines is even more concentrated on Android than the supply of browsers; over 95% of browser vendors on Android (including Chrome, Samsung Internet, Edge, Opera, Brave and Vivaldi) use (a version of) Blink.[471] The key exception is Mozilla's use of the Gecko browser engine (which it stewards) in Firefox.[472]

5.129 Unlike on iOS, competition between browser engines is permitted on Android. One market feature which lowers the barrier to entry is the fact that the leading browser engines are open source, meaning that new entrants can, in principle, enter by forking existing browser engines' codebases. However, in practice Google's Blink benefits from network effects (reinforced by its incorporation in in-app browsers) which give it a significant advantage over competing browser engines, as online content providers primarily target web compatibility with it. Browser vendors explained that they choose Blink for its high web compatibility, as well as seeing Blink as more technologically advanced than its competitors and benefiting from a rapid rate of upgrades.

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[467] Share of supply figures produced using App Annie data, provided by a browser vendor.
[468] Microsoft consumer research (based on US and Indian users of desktop and/or mobile devices) found that Edge was a leader on features in 2019.
[469] ACCC study found that DDG users were more likely than other browser users to use it for 'privacy features' or prefer it for its 'data collection practices'.
[470] For example, see Tom's Guide, Best Android browsers in 2022 (retrieved 3 May 2022).
[471] See shares of supply.
[472] Safari is not available on Android.

5.130 Overall, Google's Chrome browser and Blink browser engine face weak competition from other browsers and browser engines on iOS.

Constraint from alternatives to mobile browsers

5.131 We considered whether any alternatives to mobile browsers for accessing content (such as desktop browsers or native apps) could provide a constraint on mobile browsers, but found that in practice these are not effective substitutes.

Desktop browsers

5.132 Both Apple and Google submitted that desktop browsers pose a competitive constraint on mobile browsers. Google submitted that it requires less investment to offer a mobile browser when the developer already has a desktop browser and that most browser vendors offer both desktop and mobile versions. Apple submitted that it promotes Safari as a web browser, not a mobile or desktop browser specifically, because users can switch between a mobile device and a personal computer and access web content on both.

5.133 In its Google Android investigation, the European Commission found that desktop browsers do not belong to the same product market as mobile browsers.[473]

5.134 We consider that, while desktop and mobile browsers provide similar functionality, there are important differences:

- from the perspective of users, they are significantly differentiated, as (i) they are available on different devices and consumers may not own both; and (ii) they are used in different contexts – eg a desktop cannot be used 'on-the-go'; and

- from the perspective of browser vendors, mobile and desktop browsers are less strongly differentiated, but require distinct support: large browser vendors tend to supply both desktop and mobile versions of their browser,

[473] European Commission's Google Android decision paragraphs 370-371. With respect to the demand side, it noted that desktop browsers and mobile browsers rely on different technology and provided examples of different browsing experiences between the two (eg greater processing power on desktops). With respect to the supply side, it found that switching between developing desktop and mobile browsers takes significant time and substantial investments.

but there are exceptions and the market share and feature set of a given browsers may differ substantially between desktop and mobile.[474]

5.135 In practice the ability to switch to desktop browsers would not substantially increase users' options, as Apple and Google have strong positions in desktop browsers. Similarly, there is little scope for new entry by desktop browsers on mobile devices, as all desktop browsers with a material market share are already present on mobile.

Native apps

5.136 Both Apple and Google submitted that the use of native apps which are accessed through proprietary app stores are an alternative to and pose a competitive constraint on the use of mobile browsers. Both parties submitted that, for a wide range of services, users have a choice of accessing content through either native apps or mobile browsers. Google further submitted that, in some cases, native apps provide a better experience due to their richer feature set compared to browser-based services.

5.137 In its Google Android investigation, the European Commission found that native apps do not belong to the same product market as mobile browsers.[475]

5.138 We consider that native apps can generally display the same content as web pages and offer similar functionality, although we note that native apps tend to offer additional functionalities.[476]

5.139 Despite similarity in functionality, there are also important differences between native apps and the use of web pages and web apps:

- Online content providers told us that they tend to see native apps and web pages as complements: web pages have greater reach than native apps and are the primary channel for reaching new audiences and growing the user base, while native apps retain existing users and increase their engagement. Several content providers submitted that

[474] Exceptions include Samsung (mobile only), BlackBerry (mobile only), HTC (mobile only) and Moonchild Productions (desktop only).
[475] European Commission decision of 18.07.2018 - Case AT.40099 - Google Android paragraphs 378-379. With respect to the demand side, the European Commission found that users do not want to download a native app for each web page they visit. With respect to the supply side, it commented on the high development cost of a mobile browser (which is more relevant for the constraint from browsers on native apps than the constraint from native apps on browsers which we are focusing on).
[476] For example, native apps can utilise the capabilities built into mobile devices (for example, the camera or push notifications), and many retailers provide native apps with additional in-store capabilities such as product scanning, mobile payments and embedded loyalty cards.

online advertising revenue is more limited on native apps compared to web pages.

- Native apps are more expensive to develop than web pages, as they typically have to be reproduced for each operating system.

5.140 Overall, while native apps are substitutes for some web apps, we consider that it is unlikely that the presence of native apps materially constrains Apple and Google in their supply of mobile browsers and browser engines – and in practice, the fact that Apple and Google control both gateways to users means that they can implement policies which push users to the use of one channel rather than the other.

Conclusion

5.141 Web browsers are a key way for users of mobile devices to access content over the internet and for online content providers to reach consumers.

5.142 Both Apple and Google have very high shares of supply in mobile browsers, and their positions in browser engines are even stronger. The competitive constraints faced by Apple and Google from other mobile browsers and browser engines, as well as from desktop browsers and native apps, are weak, and there are significant barriers to competition.

5.143 The key barrier to competition in browser engines is Apple's requirement that other browsers on iOS use Apple's WebKit browser engine. In addition, web compatibility limits browser engine competition on Android (where Google allows browser engine choice). These barriers also constitute a barrier to competition in mobile browsers, as they limit the extent of differentiation between browsers (given the importance of browser engines to browser functionality).

5.144 In addition, there are barriers to competition in browsers relating to:

- native apps' use of in-app browsers;
- Apple and Google influencing user behaviour through choice architecture, including through pre-installation and defaults;
- Apple and (to a lesser extent) Google, restricting competing browsers' access to APIs and interoperability; and
- revenue sharing agreements which dampen incentives for competition between browsers on iOS.

5.145 As described in Appendix J, Apple and Google may also be able to use their market power in mobile browsers and browser engines to reinforce or strengthen their position in advertising, for example through Privacy Sandbox and Intelligent Tracking Prevention.

5.146 **Apple's and Google's strong positions in mobile browsers and browser engines, enhanced by these barriers to competition, result in Apple and Google having substantial market power in the supply of browsers and browser engines.**

5.147 **Absent intervention, Apple and Google are highly likely to retain this market power within their respective ecosystems for the foreseeable future, raising developers' costs and hindering innovation.**

6. The role of Apple and Google in competition between app developers

Key findings

- Apple's and Google's control over their respective mobile ecosystems allows them to set the 'rules of the game' for app developers, who rely on their app stores to reach customers and have little or no ability to negotiate over terms.
- In many cases, Apple and Google have the ability and incentive to provide their own apps with a competitive advantage. We have heard significantly more concerns about Apple, though both are in a strong position:
  - Apple restricts potential competitors from accessing certain hardware functionality, such as contactless mobile payments technology (a significant and rapidly growing way to make payments), protecting its services from competition and potentially restricting innovation.
  - App review processes can be opaque and rules are inconsistently applied, particularly in the case of Apple. The resulting delays and uncertainty can add to development costs and hinder innovation.
  - Apple and Google can influence users' choice of apps through pre-installation, setting apps as defaults and design of their app stores.
  - Apple and Google have access to a range of commercially sensitive information from app developers, which could be used to gain a competitive advantage.
- Apple and Google require certain app developers to use their payment systems, through which they collect a commission of up to 30% on in-app purchases. In addition to concerns about high commission levels, the requirement to use their payment systems reduces developers' control over issues such as pricing and refunds, and advantages Apple's and Google's apps, which do not pay commissions.
- There is room for greater transparency and clarity of information in app stores in relation to the sale of subscription apps that automatically renew.
- Apple's App Tracking Transparency policy gives Apple device users greater control over their personal data, enhancing privacy and choice. However, the way it has been implemented (eg the design of prompts) may distort user choice, potentially tilting the playing field in Apple's favour in respect of app discovery and advertising services.
- Apple has blocked the emergence of cloud gaming on the App Store, which threatens its position in app distribution and could also reduce the importance of high-quality hardware included in Apple's devices.

Introduction

6.0 In this chapter, we consider the role of Apple and Google in competition between app developers, and the potentially damaging effects their conduct may have on competition.

6.1 As set out in Chapter 2, apps are a critical component of mobile ecosystems and are a key channel through which businesses can connect to consumers. The wide variety of apps available to consumers – millions of apps from hundreds of thousands of app developers – is one of the defining characteristics which sets modern mobile devices apart from earlier mobile phones. It is therefore important for these markets to work well for consumers, and that effective competition in these markets is not undermined by Apple's and Google's roles as gatekeepers.

6.2 Apple and Google, through control of their respective operating systems and the two main app stores, can influence competition in downstream app markets in a number of different ways. This influence can be felt throughout the entire process of app development and distribution, in the following stages:

- **App development:** Apple and Google determine the functionality available to developers when developing apps.
- **App distribution**: Apple and Google set the terms of access to their app stores which must be followed in order for app developers to be able to access consumers through the App Store or Play Store. Apple and Google unilaterally set and interpret terms and conditions and enforce these through their app review processes.
- **App discovery**: Apple and Google can influence the apps which consumers discover, download and use through the way they present choices to users (referred to as 'choice architecture').
- **Apps in use**: Apple and Google may use insights and data gathered through their gatekeeper role in the development of their own apps (and associated hardware or software).

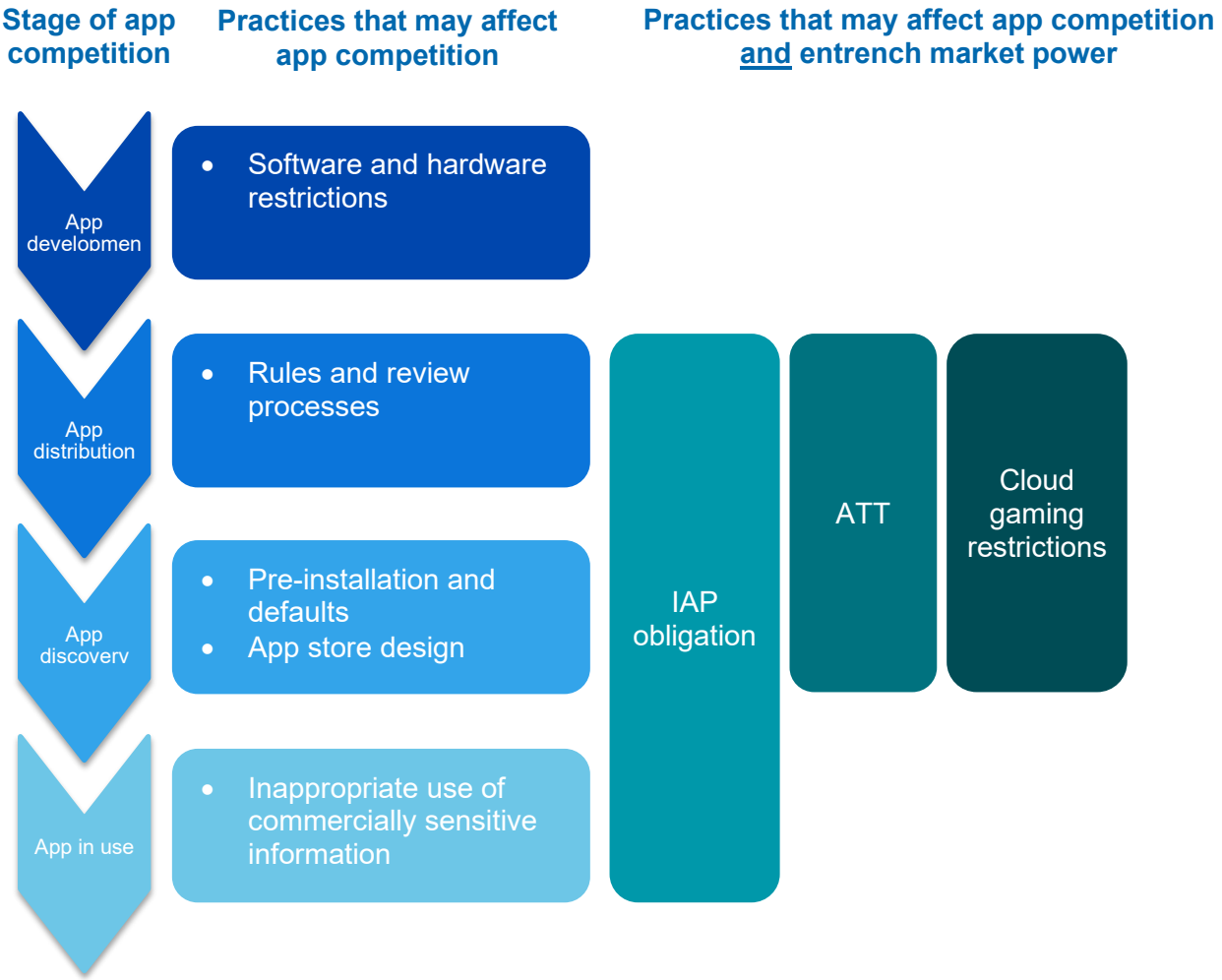
6.3 In the first half of the chapter, we assess how practices by Apple and Google in each of these stages may serve to preference their own apps or distort competition between third parties. In the second half of the chapter, we consider in more detail three potentially harmful practices, which could not only impact app developer competition but also entrench Apple's or Google's market power upstream. These are:

- Apple's and Google's app store payment systems; which includes their requirements to use these for in-app purchases of digital content and consumer issues relating to subscriptions, cancellations and refunds;
- recent Apple changes to how app developers can collect and use data for mobile advertising on iOS (App Tracking Transparency, or ATT); and
- Apple's restrictions on cloud gaming services.

6.4 Further detail on each is set out in Appendices H, J and I respectively.

6.5 Figure 6.1 below summarises the practices we have assessed in this chapter and how they relate to the stages of app competition.

Figure 6.1: Apple and Google's role in app competition



Overview of concerns

6.6 The broad concern that we assess in this chapter is that Apple's and Google's market power in app distribution and operating systems (and in Apple's case, devices) allows them to set the rules of competition for native apps. Apple's and Google's use of this ability could serve to:

- self-preference their own apps or services in a way that harms competition and consumers;
- distort competition between third parties;
- entrench their market power upstream; and
- directly exploit consumers.

6.7 Apple and Google have both emphasised to us that they are incentivised to ensure that users have access to a choice of high-quality apps through their respective app stores. Apple told us that the purpose of its App Store 'is to add value to the iPhone', and that its incentives are 'to give consumers choice, while ensuring that its consumers are not exploited'. Similarly, Google told us that 'Android users want a variety of high-quality apps, while Google and developers benefit when more users are happy with the Android experience'.

6.8 We recognise that the App Store and Play Store add significant value to Apple's and Google's respective mobile ecosystems, and so they have a general interest in maintaining choice and quality in their app stores. However, this does not necessarily mean that their incentives will always be fully aligned with those of their users. As discussed in Chapter 4, consumers do not fully take into account the value they will gain from the app store and app markets when choosing a mobile ecosystem, meaning they are unlikely to change their choice in response to a reduction in that value (or indeed in response to that value failing to improve as much as it could over time).

6.9 In the following subsections we explain how we have approached the consideration of self-preferencing and the distortion of competition between third parties, as these are more general concerns that apply to a range of practices we have considered.

Self-preferencing

6.10 The potential for self-preferencing arises in mobile ecosystems because Apple and Google have a dual role and a potential conflict of interest: as well as operating the app stores and operating systems within their respective

ecosystems, they directly compete with app developers who use those app stores to reach consumers. This creates the possibility for Apple and Google to give their own apps or services a competitive advantage over rivals.

6.11 The main ways in which Apple and Google may be able to self-preference their own apps or services are:

- biasing consumer choice: using choice architecture to make consumers more likely to choose their products;
- giving their own products a non-replicable quality advantage: either by degrading rivals' quality or by improving their own products in ways that are not accessible to rivals (eg better integration with the platform);
- raising rivals' costs: through the fees charged for use of their platforms (which they don't pay themselves) or through making it more costly in other ways to access the platform compared to their own products; and
- using information gained from app developers by virtue of their positions as gatekeepers: which may in the long run harm third-party developers' incentives to innovate.

6.12 We are mindful that some of these practices could bring about benefits to consumers in the short term. For example, they could result in the creation of higher-quality apps and services by Apple or Google, or may increase the competitive pressure faced by third-party developers to improve their own product offerings.

6.13 However, our concern is that self-preferencing reduces the competitive pressure on Apple or Google to offer an attractive product offering to consumers, as they can instead rely on advantages they gain by virtue of controlling their platforms. This concern is particularly acute given the significant market power held by these platforms.

6.14 Also, over the longer term, some forms of self-preferencing are likely to harm competition by reducing incentives for Apple and Google or their rivals to invest in innovation, or by entirely foreclosing competition in certain markets. It may also directly harm consumers by reducing the quality or increasing the price of the products available to them, or by causing them to use Apple's or Google's products when competitor products might be better value.

Distorting competition between third parties

6.15 Certain aspects of the way in which Apple and Google operate their app stores may also distort competition more broadly, even where it does not

result in an advantage to their own apps. We have considered two types of concerning practices by Apple and Google:

- those which may systematically advantage certain types of app, or apps that follow particular business models, creating an uneven 'playing field'; and
- those which may more generally be harmful to the ability of app developers to develop apps, compete and innovate.

6.16 In the first case, Apple and Google may be motivated to do this if they benefit more from the success of certain types of app. For example, they might have an incentive to give an advantage to apps from which they earn commission, or those which contribute to consumer 'lock-in' to their mobile ecosystem. This could mean consumers missing out or making the wrong choices.

6.17 Second, as set out in Chapter 4, both Apple and Google have substantial market power in relation to native app distribution. This allows them to impose costs, set unfair terms, and create significant disruption to the businesses of app developers. Such conduct could deter entry and innovation by developers, and ultimately result in higher prices, lower quality or less choice for consumers.

How Apple and Google influence app competition

6.18 In this section we discuss each of the following areas:

- restrictions on access to hardware and software functionality;
- the review processes used to allow apps onto the App Store and Play Store;
- pre-installation and default-setting of certain apps;
- app discovery through the App Store and Play Store; and
- collection and use by Apple and Google of commercially sensitive information and other data from app developers.

Access to device hardware and software

6.19 Modern mobile devices have a range of built-in pieces of hardware and software which equip them with extensive functionality. The control Apple and Google exert over their respective ecosystems means that they can control

developers' access to device hardware and software and to any associated functionality.

6.20 As highlighted in Chapter 2, Apple and Google have general incentives to provide third-party developers with access to hardware and software as they benefit from the existence of good apps in their ecosystem and apps, in turn, benefit from this access. Nevertheless, we have heard numerous concerns about Apple restricting access to hardware and software, though more limited concerns in relation to Google. Apple's justifications for restricting access to hardware and software centre around privacy, security, and user experience.

6.21 In this section, we focus on a specific piece of hardware that Apple restricts access to, the Near Field Communication (NFC) chip. A key application of this chip is in enabling contactless mobile payments which is an important and growing market, though it also has applications in other markets.

NFC technology and Apple's restriction

6.22 NFC is a close-range wireless communication technology which allows two NFC-enabled devices to transfer information between each other. NFC is a standards-based technology – ie it is not proprietary to any one company. The short-range nature of NFC technology makes it ideal for use in security sensitive applications where ensuring proximity is valuable. Contactless credit and debit cards and other smart cards utilise this technology.

6.23 NFC technology is integrated into most modern mobile devices. NFC chips in these devices allow them to perform two main functions. Firstly, they enable them to read and write data from and to NFC tags, which are small passive chips that function similarly to a QR code. Secondly, they allow them to transmit data to be read by other NFC devices. This second ability is known as 'card emulation' since it allows the device to stand in for an NFC-enabled smart card and is the mode that is commonly utilised to enable mobile payments.

6.24 Through its control of its operating system, Apple determines how app developers on iOS can make use of NFC technology. Apple's development framework for NFC which is openly available to app developers is called Core NFC.[477] Core NFC includes the ability to make use of the NFC chip's read and write ability. It does not, however, include card emulation, meaning that developers cannot make use of this ability through their own apps and the only service that can is the Apple Wallet. This is in contrast to the Android

[477] Core NFC, Apple Developer Documentation.

ecosystem where third parties can and do make use of card emulation for purposes including mobile payments.

6.25 While we have focused on payments, the applications of card emulation mode are much wider, including for example smart access control (eg opening hotel rooms or car doors) and identification (eg driver's licences). Apple is actively developing solutions for these other applications[478] and its internal documents show that it sees significant potential in them. For example, Apple's internal documents show that it believes [✂] to be a global $[✂] opportunity.

Potential harm to competition

6.26 As set out in Box 6.1, contactless mobile payments are a significant and rapidly growing means for consumers in the UK to make payments.

6.27 Since Apple Wallet is the only service that can be used for card emulation, any party wishing to enable its customers to make NFC contactless payments on Apple devices must accept Apple's terms. The service that Apple provides for third parties to enable this is called Apple Pay and this sits within the Apple Wallet.

6.28 Apple's restriction prevents card issuers or alternative mobile wallets from offering NFC mobile payments through their own apps. Since NFC mobile payments are the most widely accepted form of contactless mobile payments this gives Apple Pay a decisive advantage over competing mobile wallets.[479]

[478] See, eg, Add your car key to Apple Wallet on your iPhone or Apple Watch – Apple Support (UK) and Add your driver's license or state ID to Apple Wallet - Apple Support

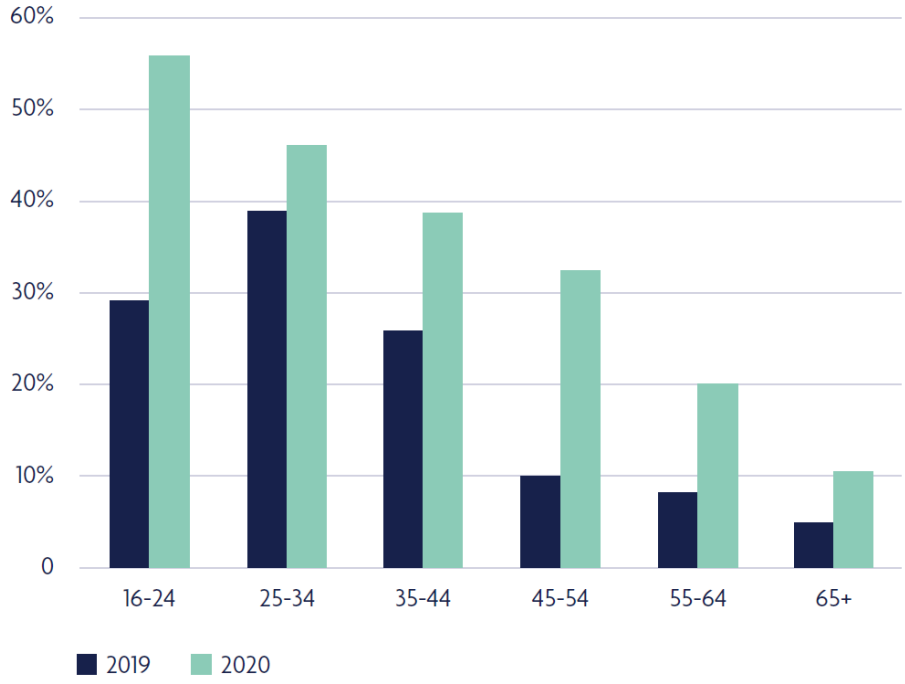
[479] Apple argues that alternative contactless technologies are available to third-party wallets to enable CMPs on iOS devices through their own apps. These technologies include QR codes, Bluetooth, and Scan and Go. NFC based solutions, however, benefit from ease of use and the pre-existing infrastructure for contactless cards.

Box 6.1: Contactless Mobile Payments in the UK

Contactless payments have become increasingly popular in recent years and now account for the majority of consumer card payments. In 2020, there were over 9 billion contactless card payments made in the UK, with 83% of the adult population making at least one contactless card payment.

These payments are increasingly being made on mobile devices. 17 million people, or 32% of the UK adult population, were registered for mobile payments in 2020, an increase of 75% over the previous year.

Percentage of registered mobile payment users in each age group, 2019 vs 2020



Source: UK Finance, UK Payments Markets 2021

UK users of Apple Pay made almost [2.5-3] billion contactless mobile payments in 2021, with a total payments value of £[35-40] billion. This represented more than twice as many transactions and more than three times the total payments value compared to figures from two years earlier.

6.29 Apple charges card issuers a fee for making their cards available through Apple Pay. For point-of-sale transactions, this amounts to a fee equivalent to [✂] of the transaction value for debit card payments and [✂] for credit card payments. Since there are no alternative mobile wallets on iOS that are capable of making NFC mobile payments, card issuers must either pay this fee or be denied access to the technology. Conversely, Google Pay, which is the most popular mobile wallet in the UK on Android devices where third parties can more freely make use of NFC technology, does not charge card issuers a fee for making their cards available through it.

6.30 As mobile payments become increasingly important and consumers forgo their physical contactless cards for virtual ones, card issuers are likely to become increasingly reliant on Apple. This would give Apple a strong position which they could leverage in other parts of the payments ecosystem.

6.31 On top of enabling consumers to store all their cards in one place, mobile wallets facilitate in-store payments and offer consumers a number of benefits, such as rewards programmes and buyer protection. A healthy ecosystem of competing mobile wallets on iOS devices would also likely lead to innovations in the in-store payment experience and to wallets offering incentives to encourage users to sign up to their service.

6.32 We also have concerns that Apple may be able to utilise its control of the Apple Wallet to advantage its first-party services that sit within the wallet. For example, the Apple Card is a Credit Card created by Apple and issued by Goldman Sachs which is currently only available in the United States.[480] The Apple Card sits in the Apple Wallet and offers a number of features not available to other cards.[481]

Apple's justifications

6.33 Apple justifies restricting third-parties' access to card emulation mode on user experience and security grounds.

6.34 Apple argues that Apple Wallet allows multiple payment cards from multiple issuers to be stored in one place, making them easily accessible and meaning that users don't have to open a separate app or change any settings on the device each time they want to use a different service. While these are clearly benefits of a mobile wallet, it is unclear why only Apple Wallet would offer these advantages.

6.35 Card emulation mode is often used for security sensitive functionalities. These functionalities often involve users identifying themselves using secure credentials. If malicious actors got hold of these credentials, they could imitate the user. To guard against this, manufacturers store these details in secure environments. There are two approaches to doing this:

- Apple uses an approach where a physical chip in the device called a Secure Element (SE) stores payment credentials. When a user makes a

[480] Apple Card, Features, Apple.
[481] For example, Apple Card users can see their spending history, their categories of spending and the geographical location of transactions.

payment, these credentials are transmitted directly to the payment terminal via the device's NFC chip, bypassing the rest of the device.

- The other approach is called host-card emulation (HCE) and relies on payment credentials being stored on the server of the wallet provider. When a user makes a payment, these credentials are passed through the user's device to the payment terminal via NFC. This approach is enabled on Android devices (often alongside a SE).

6.36 In order to open up access to card emulation mode, Apple would need to either give third parties access to the SE or allow the use of HCE on iOS devices. Apple argues that doing either of these would increase the 'attack surface' of iOS and could give unauthorised third parties the ability to compromise details stored in the SE. It also argues that if it allowed the use of HCE specifically, the secure details to be transmitted via NFC could be compromised whilst they are being passed through the device.

6.37 We have not been able to comprehensively assess these justifications within this study. However, based on the evidence we have gathered, we consider that Apple has overstated the security risks of opening up NFC access, particularly through the use of HCE, for a number of reasons:

- HCE is widely used in Android devices and has been accepted by the payments industry to offer a sufficient level of security. For example, Barclays told us that both Apple Pay and Google Pay utilise the same scheme-specific and industry-standard tokenisation services to enable contactless mobile payments, and therefore in this regard there is no clear security reason to prefer one or the other.[482] Furthermore, we have not seen evidence that there are higher rates of fraud on Android than on iOS.

- Apple argues that third-party mobile wallet providers have access to alternative technology to make contactless payments on iOS devices, such as Bluetooth. If Apple's concern with HCE is that sensitive details are passed through the device, then it is not clear why they would allow them to pass through it for other purposes.

- A competitor told us that allowing third parties to make use of the NFC antenna does not mean that they will be able to access sensitive payment data stored in a SE. Indeed, on Android devices, multiple parties do have access to the NFC antenna, and we have not seen any evidence to

[482] Similarly, a white paper by UL (a cybersecurity company) found 'no indication of actual risk differential between the different types of mobile payment systems.' Card and Mobile Payment Threat Models | UL.

suggest this automatically gives them access to the phone's secure location.

- A competitor also told us that SEs can accommodate multiple service providers, each of them can be given their own sealed-off 'enclave' to use and that they would only be able to store and retrieve their own users' payment data. They also told us that a range of third parties are already provided with their own sealed-off areas within the SE.

Other access restrictions

6.38 While we have focused on Apple's NFC restriction as a particularly significant example of how control over access to hardware and software can affect competition, there are also a number of other such examples:

- Ultra-wideband (UWB) is a short-range wireless communication protocol which allows electronic devices to communicate with each other at short distances and can be used to locate other devices. Apple has included a UWB chip in its iPhones since 2019 and uses this technology for its AirTag products launched in 2021. Tile, which produces a competing product, told us that since 2019 it had made repeated requests to Apple to make use of the UWB chip and that Apple repeatedly denied these requests until September 2021. Tile told us that this considerably delayed the launch of its UWB trackers. Whilst access has now been given, this only came after Apple released its own product, meaning that it may have benefited from having this technology first.

- Apple granted certain third parties privileged access to an API that allows iPad apps that make use of the camera, such as video-conferencing apps, to do so while the user is in multitasking mode. In May 2021, it was reported by an app developer[483] that Zoom was given access to this functionality and that it appeared to be the only meeting app that was. Apple told us that 'Apple provides early access to hardware or software to limited groups of developers in order to test new features and technology'. While we accept the need to test new features, this kind of practice has the potential to distort competition between app developers if access is not granted in a consistent manner.

- We have heard concerns that Apple and Google limit the ability of third-party voice assistants to access device functionality, relative to their own voice assistants. For example, neither Apple nor Google allow access to

[483] Jeremy Provost, iPad Camera Multitasking.

functionality that would allow third-party voice assistants to be activated through the use of a 'wake word', as is possible with their own voice assistants.

Conclusions

6.39 Apple blocks developers from making direct use of the iPhone's card emulation ability for any purposes. A particularly important application of card emulation mode is in enabling contactless mobile payments – a significant and rapidly growing means for consumers in the UK to make payments. However Apple's restriction gives its own mobile wallet a decisive advantage over third-party alternatives. In this regard, we note that the European Commission has sent a Statement of Objections to Apple expressing its preliminary view that Apple has abused its dominant position in the market for mobile wallets on iOS by reserving access to NFC technology to Apple Pay.[484]

6.40 Apple justifies the restriction on the grounds that card emulation is often used for security sensitive purposes and allowing third parties to freely use it would undermine the security of the solution Apple has developed. However, the evidence we have seen does not suggest that security concerns are likely to justify a blanket ban on third-party use of card emulation.

6.41 More generally, this example demonstrates how restrictions placed by Apple or Google on developers' access to hardware or software can give an advantage to their own services and impact competition. We are concerned this has also occurred in a number of other areas and that these restrictions could become more important over time as devices include more functionality.

App review processes

6.42 Before developers can distribute their apps to consumers through Apple's App Store or Google's Play Store, they must submit their apps for review. Each store has a set of rules that apps must comply with in order to be accepted – the App Store Review Guidelines or the Google Play Developer Program Policies. Every app or app update is reviewed for compliance with these rules before it can be distributed via the app store.

6.43 Aspects of these rules of access seek to promote and maintain the quality and safety of apps available in the respective app stores. For example, they include requirements about the content of apps; privacy (including the way in

[484] Antitrust: Commission sends Statement of Objections to Apple (europa.eu)

which apps collect customer data); and security. App review is an important opportunity for Apple and Google to identify and address potential concerns with apps, and these processes help to protect users from malicious or harmful apps.

6.44 On the other hand, the existence of these app review processes means that Apple and Google effectively dictate the terms that third-party app developers must agree to in order to access their app stores. We have heard concerns from app developers about the inconsistent interpretation and application of terms and conditions and about the transparency or quality of communication experienced during the app review process, and the difficulties this can cause developers.

6.45 If an app is found to violate one or more of the rules, the app (or app update) is not uploaded to the app store, and the developer is given an explanation of the rejection and may revise their app to bring it into compliance before resubmitting it. Both stores also offer an appeal process that a developer can use if they believe their app was mistakenly rejected. These processes result in other reviewers at Apple or Google re-evaluating an app and either confirming or overturning the decision to reject it. In the case of Apple, developers may also use this process to suggest changes to the guidelines.

6.46 While both Apple and Google publish the rules for admission to their app stores, Apple in particular gives itself wide discretion to reject apps for new reasons not covered by the existing rules – arguing that 'new apps presenting new questions may result in new rules at any time', as well as saying more broadly that 'We will reject apps for any content or behavior that we believe is over the line. What line, you ask? Well, as a Supreme Court Justice once said, "I'll know it when I see it". And we think that you will also know it when you cross it.'[485]

Developer concerns

6.47 The majority of developers that we requested information from had negative experiences with Apple's app review process.[486] Developers variously described the process as 'obscure', 'arbitrary', 'capricious' and 'Kafkaesque'. These developers raised a large number of concerns about the issues App Store review had caused for their businesses, and we heard similar concerns

[485] App Store Review Guidelines, introduction.
[486] We requested information from 45 of the largest app developers and received responses from 34 of these developers.

from developers who responded to our online questionnaire or to our Interim Report. Developers' concerns fell into three main categories.

6.48 First, many developers complained that the explanation they receive for the rejection of an app or update often does not provide them with enough information on Apple's reasoning. This means that they do not understand how to address Apple's concern and make their app compliant.[487] For example, one app developer stated, 'Apple's feedback is cryptic, forcing developers to determine for themselves the actions they must take to satisfy Apple's requirements'.

6.49 Second, developers raised the issue of inconsistency in the interpretation of the App Store Review Guidelines. Developers provided examples where:

- their app was rejected for something that had not caused rejections in previous versions of the app;
- they were provided with contradictory interpretations from Apple employees of whether parts of their apps were in violation of the rules; and
- Apple changed its requirements (either changing the guidelines or its interpretation of particular guidelines) with limited or no notice, requiring the developer to make rapid changes to their app in order for updates to be accepted.

6.50 Third, many developers were concerned that their apps had been rejected for things that Apple appeared to permit in other apps, or even in its own services. Raising these inconsistencies with Apple did not necessarily help developers' attempts to get onto the store – developers reported Apple telling them that its decisions regarding other apps were 'irrelevant' or that they should not compare their app functionality to other apps.

6.51 Where developers had concerns with the app review process, they did not tend to view the appeal process as providing a solution to those concerns. While some developers had used the appeal process successfully to gain a better understanding of the reasons and in some cases ultimately to gain approval for their apps, others found that the appeals process was similarly opaque to the initial review.

[487] Several developers said that Apple only provides them with a reference to which guideline their app was seen to be violating, without a clear explanation of why the app was in violation of the guideline or any guidance as to what changes needed to be made to the app for it to comply with the guidelines.

6.52 Concerns were also raised about:

- the objectivity of the process, given that the appeal review is conducted by another team of Apple employees;[488]
- the risk of leaving a proposed app release 'in limbo' for a long period of time when using the formal appeals process;[489] and
- the lack of documentation provided by Apple in the app review process, making it difficult for developers to create a 'paper trail' of Apple's rulings.[490]

6.53 In general, app developers appear to have faced fewer issues with Google's app review process for the Play Store. Many developers told us that Google's app review process is less onerous than Apple's, with Google providing more clarity on reasons for rejection and being more willing to engage with developers to resolve any issues identified.

6.54 However, some app developers said that they faced at least some similar issues with Google's app review as with Apple's, including unclear reasons for rejection, changing enforcement of rules, and rules being open to interpretation. There were also concerns that Google's review process could become more like Apple's given it holds the same position of power.

Potential harm to competition

6.55 There are a number of ways in which the app review process could allow Apple or Google to advantage their own apps over those of rivals:

- First, Apple or Google could advantage their own apps by delaying rivals' app updates or making these updates more difficult. In this regard, Spotify alleged that Apple has 'constantly sought opportunities to re-interpret [the guidelines'] meaning to restrict its rivals' conduct' and that since May 2016 it has 'rejected the Spotify iOS app for newly invented, pretextual reasons at the start of nearly every promotional campaign season'.

[488] Figures provided by Apple show that [10-20]% of appeals resulted in Apple changing its original decision, based on appeals since 1 January 2016. Apple upheld its original decision in [60-70]% of cases, and closed the remaining [20-30]% of appeals for other reasons such as the issue being resolved before a decision was made.
[489] A number of large developers referred to escalating issues outside of the formal app review and appeal process – a recourse to which smaller developers would not necessarily have access.
[490] Apple confirmed to us that after a new version of an app is approved, previous correspondence is removed as 'all issues have been resolved', although it noted that developers can retain copies of correspondence by taking screenshots. It also told us that changes in October 2021 to its App Store submission process would result in correspondence being visible for a longer period of time

- Second, it creates general uncertainty and delay for all third-party apps going through the app review process – Apple's and Google's apps have an advantage in that they do not face this. One developer explained that 'Delays, or even the risk of delays, upsets our planning processes, can have revenue implications to our business and is detrimental to our users.'

- Finally, the review process may give Apple and Google advance notice of new features being developed by their competitors. This is a concern raised by [an app developer who competes with Apple], that told us that it was 'concerned about the level of information provided to Apple in the app review process' and that 'Apple could use the app review process to create a competitive disadvantage to [the developer] by delaying release of the app or copying [the app's] new features'. This is discussed further in the section on collection and use of commercially sensitive data below.

6.56 Further, issues with the app review process could hinder innovation by app developers more broadly. For example, ambiguity in the guidelines, inconsistent enforcement, and the delays created by the review process, create the risk that development work on new features for apps could be wasted. This has the direct effect of preventing consumers access to potentially valuable features that are discarded in order to pass the app review process, as well as the indirect effect of deterring development of these features in the first place.

Conclusions

6.57 Apple's operation of the app review process for the App Store, in particular its inconsistent interpretation of rules and lack of clear explanation of reasons for rejections, creates uncertainty, costs and delays for app developers. This in turn is liable to hinder innovation and may be used to the advantage of Apple's own apps. While the app review process is a necessary tool for ensuring quality and security, we consider that it could achieve those aims without giving rise to such concerns, as discussed further in Chapter 8. It does not appear that Google's operation of the app review process for the Play Store currently gives rise to the same level of concerns, but we note the concerns by some developers that Google has the ability to act in the same way.

Pre-installation and defaults

6.58 As discussed in Chapter 4, Apple and Android devices come with a number of 'pre-installed' apps, which means that a device can be used 'straight out of the box' with a set of core software and functionalities. Pre-installed apps are

also sometimes set as default apps, which means that users can activate that app when they instigate a particular functionality on their device.[491]

6.59 Below we examine how the pre-installation of Apple's and Google's first-party apps and, in some circumstances, setting these apps as default apps may affect user behaviour, thus influencing competition between different apps.[492]

Pre-installation and defaults on iOS and Android

6.60 Apple pre-installs a number of its own apps on iOS devices. The number of pre-installed apps, including the App Store, on Apple's iPhones has increased significantly from 14 in 2007 to up to 40 in 2021. Apple does not pre-install third-party apps.

6.61 At present, Apple allows a user to change the default setting for the web browser (ie from Safari to another browser) and the email client (ie from Apple Mail to another mail client) only.[493]

6.62 As discussed in more detail in Chapter 3 and Appendix E, a collection of some of Google's most popular proprietary apps and APIs is made available for Android device manufacturers through the GMS suite, which is licensed in the UK under the EMADA.[494] Manufacturers who enter into the EMADA are required to pre-install the full suite of apps on their devices. The minimum number of Google apps required to be pre-installed as part of the GMS suite in the UK has varied over time and saw a net increase from eight apps in 2009[495] to nine in 2021. In addition, manufacturers that optionally pre-install further two apps, Google Chrome and Google Search, under separate licence agreements, can earn payments from Google by entering into separate placement agreements and complying with certain placement requirements.[496] Android device manufacturers remain free to preload their

[491] Eg, clicking on an address will automatically open the default navigation app. If users were unable to change the default navigation app, they would need to manually input the address into their preferred navigation app instead of simply clicking on it.
[492] The effects of these practices on competition between browsers and search engines have been discussed in more detail in Chapter 5.
[493] Apple also allows changing the default search engine on its Safari web browser, which is not examined further in this section. [✂].
[494] See Android – Google Mobile Services.
[495] Google told us that, given how long ago it entered into the relevant agreements, it had to provide estimated dates on which apps become mandatory. In addition, Google told us that its estimates were limited to user-facing apps in the GMS suite.
[496] Google Chrome and the Google Search app are licensed under separate agreements. In the EEA and UK, the Chrome and Google Search apps were removed from the GMS suite following the EC's Android decision in 2018. As discussed in Appendix E, Google offers manufacturers the possibility to enter into Placement Agreements in relation to the Google Search and Chrome apps, and as a result manufacturers have a financial incentive to pre-install Google Search and Google Chrome on their devices.

own apps, including app stores, as well as other third-party apps, such as Facebook or Twitter.[497]

6.63 Google told us that it does not require manufacturers under the terms of the EMADA to set any of its apps distributed under EMADA as defaults.[498] Nor does Google require the default status for Google Search or Chrome, which are licensed under separate agreements. This means that unlike iOS users, Android users can choose which app they will use as a default app for app categories other than web browsers and email clients.[499] However, OEMs can also enter into separate RSAs with Google (as explained in more detail in Chapter 3 and Appendix E), where Google shares a proportion of its revenues with manufacturers if they meet certain [promotional requirements (eg default settings)].[500]

Potential harm from pre-installation and default settings

6.64 Apple and Google submitted that users expect their phones to provide certain functionalities. We recognise that pre-installation allows them to deliver fully functioning devices straight out of the box and also differentiate their devices from other competitors. Similarly, defaults allow users to experience a seamless, uninterrupted integration of different apps and services. On the other hand, we have heard concerns from a number of app developers that pre-installation and setting first-party apps as the default may hinder the adoption of third-party apps, in particular, in the case of iOS devices.

6.65 Pre-installation makes Apple's and Google's own apps more easily discoverable and may shelter them from competition from third-party apps, which users need to actively search for and download. In particular, pre-installation may reduce user willingness to search for alternative third-party apps, particularly if the pre-installed app is functioning well.[501] This may be less of an issue for well-known apps but represent a greater barrier to lesser-known apps which rely more heavily on search to be discovered.

6.66 The choice architecture designed into operating systems is also relevant. As discussed in more detail in Chapter 5, pre-set defaults have been shown to

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[497] A Google internal document shows OEMs pre-installing a wide range of third-party apps, which can vary significantly across providers.
[498] [This is subject to certain exceptions, which are essential for device out-of-the-box functionality but does not extend to the Google Search app or Chrome].
[499] Eg, Android users are also able to choose a default navigation, photo gallery or mobile wallet app. This choice also extends to other app categories, including digital assistants, home apps, phone and SMS apps.
[500] Separately, manufacturers who also enter into Placement agreements with Google receive payments from Google if they meet [certain placement obligations].
[501] For instance, a [survey we received of iPhone users in November 2020, including 1001 UK adult (18+) iPhone users], found that following the release of iOS 14 users were more likely to switch away from Safari following a negative experience, eg if they were dissatisfied with the app or if they experienced compatibility issues.

have a significant impact on user behaviour, influencing decision making across a range of behaviours. Default settings may exacerbate the negative effects of pre-installation, particularly where default settings cannot be changed or changing them is difficult. In such cases, default settings can confer additional functionalities to pre-installed apps, such as integrating them with other apps or voice assistant. This can make default apps technically superior to third-party apps without access to such functionalities in a similar way that APIs confer additional functionalities to apps with access to them (see the section above on access to device hardware and software for more detail).

6.67 We have seen that, even where default apps can be changed on Apple and Android devices, changing them involves multiple steps which require downloading and installing an alternative app, finding the relevant option on device settings and navigating to choose the preferred app. In addition, Android users that have installed several apps with the same functionality can also choose which app to use or set as the default using disambiguation boxes, which provides a simplified way for setting a default (see Chapter 5 for more detail) and will also be prompted to revisit certain choices if they have not used a particular app in a certain period of time.

6.68 As discussed in more detail in Appendix B, our analysis comparing annual average monthly active users in 2021 of the same apps across iOS and Android devices has shown the following:

- Generally, first-party apps pre-installed on iOS and Android devices benefited from significantly greater usage than third-party apps which had to be downloaded. This has been the case for cloud storage, ebook reader, email, music, navigation, news, podcast and video streaming apps. For instance, Apple News had [10-20] times more average monthly active users on iOS throughout 2021 than BBC News, the next most popular news app.

- Certain first-party apps available on both iOS and Android devices benefited from considerably greater app usage on devices where they have been pre-installed than on devices where they had to be downloaded. For instance, Apple Music had [40-50] times more average monthly active users throughout 2021 on iOS devices, on which it comes pre-installed, than on Android devices. Similarly, Google Play Music which came pre-installed on Android devices had [60-70] times more monthly active users on Android devices than on iOS devices. Gmail, Google Duo, Google Drive and Google Maps were also associated with greater usage on Android devices, on which they come pre-installed, than on iOS devices.

- Additionally, with respect to app categories where only Apple but not Google has first-party apps pre-installed (ie ebook reader, news and podcasts apps), we consider higher usage of third-party apps on Android than on iOS devices to be consistent with pre-installation having a negative effect on the usage of competing third-party apps.[502] We have seen that this was generally the case across all three app categories mentioned above, where third-party apps generally had more average monthly active users throughout 2021 on Android than iOS devices.

6.69 We have not been able to distinguish between the direct effect of pre-installation and other reasons contributing to the success of a particular app, such as app popularity and brand loyalty, and are therefore unable to quantify the precise effect of pre-installation on app usage.[503] Notwithstanding this, our view is that the evidence described above is consistent with pre-installation leading to greater usage of pre-loaded apps. While the above-mentioned effects differed across app categories and between more and less popular apps, we could still see at least some indications, although of a different scale, of positive effects of pre-installation in all app categories in our assessment.

6.70 On iOS devices, the higher usage figures of pre-installed first-party apps are also likely to capture the positive effect of first-party apps being set as default apps, without users being able to change these settings.[504]

6.71 Responses from certain third-party app developers who have entered in pre-installation agreements with OEMs, suggest that while pre-installation agreements generally had some positive effect on app usage or new sign-ups, the effect often was somewhat modest and not a credible alternative to app stores.[505]

6.72 This shows us that the effect of pre-installation and defaults can differ across app categories. In principle, we expect the negative effects to be stronger for those app categories where users exhibit greater stickiness to pre-installed apps (eg due to brand loyalty) or where the alternatives are lesser-known apps which rely more heavily on app store search to be discovered. Pre-installation and defaults may have particularly strong impact on user

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[502] We have not been able to scale usage figures on iOS and Android devices based on the number of users on each operating system. However, given there are more iOS than Android users in the UK we would expect average MAUs figures for third-party apps throughout the year to be slightly higher on iOS than on Android devices, all else being equal.
[503] For example, Apple stated that the higher usage of Apple Music can also be explained by iOS users' preferences for Apple's products, increased marketing effort for Apple Music on iOS and earlier entry of Apple Music on iOS.
[504] As mentioned above, Apple only allows changing default for its web browser and email client apps.
[505] One developer mentioned that the effect of pre-installation would depend on multiple factors, such as where exactly the app was placed on the device, and whether additional functionalities are integrated.

behaviour where they lead to pre-loaded apps having greater integration with the device's operating system or being more easily accessible to users (eg on iOS pre-installed Apple News app can be accessed via a 'right-swipe'). We are also likely to be more concerned about pre-installation and setting as a default of first-party apps offering paid content, in which case, pre-installation may also limit the extent of price competition between first-party and third-party apps, leading to customers having to pay a higher price.

6.73 By contrast, we consider the positive effects of pre-installation and defaults are likely to outweigh the negative effects on app competition where it concerns more frequently used apps viewed as 'core' apps by users, or apps offering simple functionalities (such as a clock app) where there is little scope for differentiation between different app providers.

Conclusions

6.74 The convenience associated with pre-installation and defaults can bring real benefits which are valued by the users of mobile devices and users have grown to expect these features. It is likely that these benefits may be the greatest particularly in the case of core and frequently used apps and for those users that are less technologically savvy and would struggle to find and install apps which would allow them to achieve their mobile device's full potential. On Android, pre-installation may also act as an additional distribution channel for some larger apps (see Chapter 4 for more detail).

6.75 On the other hand, pre-installation and defaults can also distort consumer choice and lessen the competitive constraint faced by Apple and Google from third-party apps, although the extent of the negative effects, including the scope for exploitative abuse, will vary across different app categories.

6.76 The negative effects on competition are likely to be more widespread on Apple iOS devices, as users are only allowed to change defaults for two of all the Apple apps that come pre-installed on iOS devices.

6.77 Even where Google does not require manufacturers to pre-install or set its apps as defaults, its agreements providing financial incentives to manufacturers to pre-install and set certain apps as defaults may nevertheless affect third-party apps' ability to compete with Google's first-party apps, by reducing device manufacturers' incentives to pre-install or set as default competing apps.

App discovery through the App Store and Play Store

Importance of different app acquisition channels

6.78 As discussed in more detail below (see also Chapter 4), discovery through Apple's and Google's app stores is the most important user acquisition channel for app developers. We have therefore examined whether Apple and Google have an ability and incentive to prioritise first-party or certain third-party apps leading to app store users' detriment.

6.79 Within the App Store and Play Store, apps can be discovered in multiple ways:

- Users can search for apps using **app store search**[506] functions. Both Apple and Google have developed their own app store search algorithms, which rank and display apps in response to a user's search query – these are widely referred to as 'organic' results. Search queries can be further split into **categorical** queries, which are searches for a generic type or category of app, eg 'music', and **navigational** queries, which are searches for a specific app, eg 'Spotify'. As seen from Table 6.1 below, our analysis based on data provided to us by Apple and Google has shown that search is by far the most significant driver of app downloads leading to [60-70]% of all app downloads on the Apple's App Store and [50-60]% of all app downloads on Google's Play store in the UK.

- Apps can also be discovered by browsing various **app store sections** which group apps depending on their category and through apps being featured in prominently displayed **editorial sections,** eg 'Today' (Apple) and 'Editor's choice' (Google) which showcase apps selected by Apple's and Google's editorial teams, although these channels led to a significantly lower proportion of downloads than app store search. Clicks from browsing the 'Games' and 'Apps' sections of the Apple's App Store and the editorial 'Today' section have led to [0-5]%, [0-5]% and [0-5]% of downloads, respectively. On Google's Play Store, browsing Play Store led to [20-30]% of downloads.

[506] In this report, we use the terms 'app store search' and 'organic app store search' interchangeably. This refers to a situation when results in response to a search query are strictly determined by the search algorithm and are not affected by any advertiser payments. Search results may also include paid advertisements, which tend to be prominently displayed and marked as ads, and as shown in Table 6.1 below account for a far smaller proportion of downloads than organic search.

Table 6.1: Source of downloads on Apple' App Store and Google's Play Store in the UK

Apple's UK App Store downloads*		Google's UK Play Store downloads†	
Download source	Proportion of all UK App Store downloads	Download source	Proportion of all UK Play Store downloads
Organic search	[60-70]%	Organic search	[50-60]%‡
App referral	[20-30]%	Third-party referrals	[20-30]%
Web referral	[10-20]%	Play Store Explore	[20-30]%
Search ads	[0-5]%		
App Store Browse – Games section	[0-5]%		
App Store browse – 'Today' section	[0-5]%		
App Store browse – Apps section	[0-5]%		
App clip	[0-5]%		

Source: CMA analysis using Apple's and Google's data.
* Based on Apple's UK App Store downloads between 1 September 2020 and 31 August 2021.
† Based on Google's UK Play Store downloads between 1 January 2021 and 31 December 2021.
‡ Also includes search ads. Based on 2020 data provided by Google, search ads accounted for [0-10]% of all app store downloads with recorded source information.

6.80 Our analysis has shown that the majority of organic search app store downloads resulted from navigational search queries, which accounted for [60-70]% of Apple's App Store and [70-80]% of Google's Play Store organic search downloads.[507,508] In other words, in most cases, users searching in the app stores generally knew which app they were looking for from the outset. This was broadly consistent across all app categories, although some categories tended to have a lower (eg 'games') or higher (eg, 'food, shopping, travel') than average proportion of navigational searches on both Apple's and Google's app stores.

6.81 Unsurprisingly, categorical search was less important for the least and most popular apps. It accounted for less than [0-10]% of organic downloads for the bottom 100,000 apps by download, on both Apple's and Google's app stores and for [20-30]% and [10-20]% of the top 100 apps by download on App Store and Play Store[509], respectively. However, for the remaining apps, the importance of categorical queries was significantly greater, resulting in [30-40]% and [20-30]% of organic downloads on App Store and Play Store, respectively. We note, that that the latter two figures relate to a large proportion of all apps and will still include some more and less popular apps, which, as seen above, are likely to be primarily discovered through

[507] Based on Apple's UK App Store downloads between 1 September 2020 and 31 August 2021 and Google's UK Play Store downloads between 1 January 2021 and 31 December 2021, excluding downloads where search terms have been removed by Google due to GDPR obligations, which accounted for around [20-30]% of search installations within the Play Store.
[508] These figures are also consistent with Apple's own submissions. However, Google told us that it calculated a lower figure for the proportion of Play Store search downloads that comes from navigational queries, at [50-60]%. The CMA discussed this discrepancy with Google and it was agreed that the difference is likely mostly due to search query data redacted by Google for GDPR considerations. These redacted search queries are more likely to be categorical and therefore the CMA's analysis of Play Store search is likely to overestimate the importance of navigational search. For more discussion on this issue and the method used in this analysis, please refer to Appendix B.
[509] Google's internal figures also suggest that [10-20]% of organic search downloads for the top 100 apps were categorical. Google was unable to replicate the other figures in this paragraph.

navigational searches as well as other apps to whom discovery though categorical searches will likely represent the main user acquisition channel.

6.82 A significant proportion of app downloads also came from outside Apple's and Google's respective app stores. For Apple, app referrals (ie clicks from other apps, such as Facebook, Instagram and WhatsApp) accounted for [20-30]% of downloads on the App Store and web referrals (ie clicks from the web, such as clicks from Google's search engine) accounted for [10-20]%.[510] Similarly, for Google, referrals from Facebook, Google and other sources together accounted for [20-30]% of Play Store downloads.[511]

App store rankings: potential harm to competition

6.83 Apple and Google told us that an app's ranking in organic app store search results is determined by their search algorithms, which apply equally to all apps and take similar parameters into account, including text relevance of search queries, user engagement with search results, and app popularity and quality.

6.84 Both Apple and Google publish certain information on their search algorithms to assist developers.[512] They also occasionally update their search algorithms and adjust the weighting of different factors taken into account. While Google publishes periodical updates on its developer blog which discuss different parameters affecting an app's ranking as well as some changes to Play Store search algorithm, Apple told us it does not usually publish any details of the changes to its search algorithms.[513]

6.85 As discussed above, organic search, through categorical or navigational queries, is the most important customer acquisition channel for app developers.[514] We understand that high app store search ranking is generally more important in the earlier stages of an app's life cycle, following an app's

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[510] These figures relate mostly to the period before Apple's ATT privacy framework was rolled out, as the data covers the period from 1 September 2020 to 31 August 2021, while ATT was rolled out gradually beginning in late April 2021. As discussed below in our assessment of the effects of ATT on competition, the ATT framework is likely to undermine the ability of app developers to acquire users through advertising, which may be expected to reduce these figures in future.
[511] Unlike Apple's data, Google's data does not allow to clearly distinguish between app and web referrals.
[512] See eg Search Optimization - App Store - Apple Developer and Discovery on the App Store and Mac App Store - App Store - Apple Developer, Apple Developer Program License Agreement and App Discovery and Ranking - Play Console Help (google.com).
[513] See eg Android Developers Blog: Improved app quality and discovery on Google Play (googleblog.com) and Android Developers Blog: Improving discovery of quality apps and games on the Play Store (googleblog.com).
[514] The importance of high search ranking is also supported by behavioural science research, see eg CMA (2017), Online search: Consumer and firm behaviour - A review of the existing literature, Fletcher, A (2019). The EU Google decisions: Extreme enforcement or the tip of the behavioural iceberg? and Feenberg, D., Ganguli, I., Gaulé, P., & Gruber, J. (2017). It's Good to Be First: Order Bias in Reading and Citing NBER Working Papers. The Review of Economics and Statistics, 99(1).

launch, or for lesser-known apps, for whom organic downloads are often likely to be driven by categorical rather than navigational queries.

6.86 Given the importance of app store search to the discoverability of apps, we have considered whether Apple and Google have an ability and incentive to run their respective app stores in a way that would allow them to: (i) self-preference first-party apps; and/or (ii) promote discoverability of apps which follow a specific business model, such as those using Apple and Google's proprietary in-app payment systems (and thus generate ongoing commission income for them).

6.87 Both Apple and Google submitted that they do not self-preference first-party apps and that all apps are ranked and displayed according to the same principles. However, in the past, independent investigations by the New York Times and the Wall Street Journal reported that Apple's App Store could have systematically ranked its own apps more favourably than competing apps.[515]

6.88 In response to these allegations, Apple submitted that its apps have been ranked higher inadvertently, due to the combination of high text relevance, user behaviour data and the use of a search feature called 'Same Developer Boost' which was intended to highlight apps by the same developer and applied equally to Apple's own apps and third-party apps.[516] In addition, Apple used a 'cold start boost' to manually surface its own apps above other apps. Apple explained that the 'cold start boost' applied to all apps with no user engagement data, including new third-party apps and Apple's first-party apps, to make them more easily discoverable, as otherwise they could only be found through navigational searches.[517]

6.89 Google submitted that an app's monetisation model does not influence its ranking in organic search results and that apps using Google's in-app payment systems are treated the same as other apps when determining their ranking in search results. Apple submitted that [✂]. Notwithstanding this, as third-party transactions processed through Apple's and Google's in-app payment systems are subject to an average commission of [between 25% and 30%] in both cases, **Apple and Google do, in our view, have the ability and financial incentive to increase the discoverability of third-party apps on their app stores from which they extract commission.**

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[515] How Apple's Apps Topped Rivals in the App Store It Controls - The New York Times (nytimes.com) and Apple Dominates App Store Search Results, Thwarting Competitors - WSJ.
[516] 'Same Developer Boost' has since been disabled.
[517] The 'cold start boost' does expire and the app will fall in the rankings if customers do not download the app.

6.90 As shown by the ACCC's Digital platform services inquiry, changes in the app store search algorithms can significantly affect an app's ranking.[518] Our own analysis has also confirmed that the changes to Apple's App Store search algorithm can in some cases have a significant effect, either negative or positive, on apps' ranking, thus influencing their discoverability. No similar effect was noticeable in relation to Apple's first-party apps.[519] Conversely, we found no similar consistently discernible effects with respect to changes to Google's Play Store search algorithm, where fluctuations in search rankings were generally much more common. This may also be a result of more frequent but less radical changes to the Play Store search algorithm.

6.91 Regardless of search rankings, the vast majority of developers that we have gathered evidence from thought that they were not provided with sufficient and clear information about how an app's ranking is determined by Apple's and Google's search algorithms.[520] Nor were they provided with any advance notice of changes to the search algorithms by Apple and Google.[521]

6.92 Both Apple and Google told us that their internal app development teams are not given any unique information or insights into the search algorithm that could advantage Apple's and Google's apps in organic search results and that they have certain internal policies in place which limit access to the information concerning app store search algorithms to those with genuine business needs and, in the case of Apple, [✂]. As this information only came to light during the latter stages of our study, we have not been able to establish how actively this separation is monitored and enforced, however the evidence above suggests that, at least with respect to Apple's App Store, the changes in search algorithm may not affect first-party and third-party apps equally.

Editorial content: potential harm to competition

6.93 Apps can also be discovered by being featured in different tabs as well as being showcased in dedicated editorial sections, such as 'Editor's choice' (Google) and 'Today' (Apple). Apple's and Google's editorial teams hand-select apps to be featured under different categories which they consider to

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[518] ACCC Digital platform services inquiry, March 2021 interim report, pages 89 – 91.
[519] CMA analysis of rankings of certain reader, music, email and news apps with respect to specific keywords using data from Sensor Tower and AppTweak during the period between 1 January 2019 and 13 April 2022.
[520] Some developers mentioned that while they were updated about the most significant changes, they still felt they lacked information about more minor changes to the search algorithms.
[521] Providing, through the platform's terms and conditions, advance notice to businesses of the main parameters used to determine search rankings, their relative importance as well as any action businesses can take to influence the ranking is a requirement of the P2B Regulation, discussed above. As changing those main parameters necessarily involves amending the platform's terms and conditions, such changes must also be notified to businesses at least 15 days before they take effect.

provide users with the best experience, focusing, in particular, on high-quality apps, new apps and apps with significant updates.[522]

6.94 Most developers that we have gathered evidence from thought they were not provided with sufficient and clear information about how apps were chosen to be featured, despite having had their apps featured as part of editorial content.

6.95 While the developers' views on the importance of being featured in editorial content were somewhat mixed, their responses generally suggest that there is at least some positive effect of being featured by way of increased downloads immediately following the feature, although the long-term effects from being featured were unclear. Similarly, some independent attempts to measure the importance of being featured also show a significant increase in downloads following the feature.[523]

6.96 We have seen Apple's and Google's first-party apps and game subscription services[524] being featured in their editorial and other app store sections and one developer expressed a concern that Apple was not featuring its apps in editorial sections as they were directly competing with Apple Pay. However, we do not currently have evidence that Apple or Google self-preference first-party apps when selecting which apps to feature.

6.97 However, certain apps, particularly those choosing not to use Apple's and Google's proprietary payment systems, may find it more difficult to be featured in Apple's and Google's editorial content.[525] The ACCC's digital platform services inquiry found that apps using Apple's IAP were selected more than proportionately for promotion on Apple's editorial 'Today' section and 'Apps' and 'Games' sections.[526] We have also seen examples of Apple and Google removing such apps from their editorial features or rejecting from featuring them altogether.[527]

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[522] See eg Discovery on the App Store and Mac App Store - App Store - Apple Developer and Find great apps and games on Google Play with the Editors' Choice update (blog.google).
[523] Eg, feature – eg, being featured on Apple's App Store 'Today' tab can, in certain cases, boost app downloads by up to 800% during the week following the feature, although this could vary significantly depending on the section in which the app was featured, see iOS 11's App Store Increases Downloads of Featured Apps up to 800% (sensortower.com). See also Just How Impactful is Being Featured on the App Store? - Phiture - Mobile Growth Consultancy and Agency
[524] Eg, Google Play Pass and Apple Arcade.
[525] [✂].
[526] Eg, ACCC found that 88% of apps that had at least one feature on the Australian App Store in 2020 had in-app payments. By contrast, only 16% of apps of the App Store had business models that required the use of IAP, see ACCC digital platform services inquiry, March 2021 interim report, page 97.
[527] For instance, Apple discussed using 'punitive measures' against Netflix and 'pulling all marketing for them', including removing all editorial features, in response to Netflix stopping using IAP, which was followed by an immediate and noticeable reduction in the number of Netflix's features on Apple's App Store, see Emails reveal

Conclusions

6.98 High and consistent organic search rankings can be important to an app's success, and unforeseen changes in app store search algorithms can significantly affect an app's ranking, which can be disruptive to app developers. This is particularly the case for new and lesser-known apps which rely more on categorical searches or to whom such short-term boosts in visibility are likely to be more important. While less significant in their relative importance, features in editorial or other app store sections can also have a positive effect on an app's discoverability.

6.99 Apple and Google have an incentive to prioritise first-party apps, especially those that are monetised, or third-party apps which use Apple's and Google's proprietary in-app payment systems, as the increased use of these apps would lead to a direct financial gain. We have also seen examples of Apple's and, less so, Google's search algorithms or editorial content giving apparent priority to such apps, which is consistent with them having an ability to advantage certain apps.

6.100 The lack of transparency around Apple's and Google's app store search algorithms, including about upcoming changes, and how apps are selected to be featured in editorial content are key to Apple's and Google's ability to control which apps are shown to users. The lack of transparency may also reduce app developers' confidence and trust in app store search algorithms, which, in turn, can have negative implications for markets working well. However, as explained by Google, disclosing full information about certain parameters of its search algorithm, in particular, proxy signals that determine specifically how an app scores against a particular parameter, could risk developers optimising their apps to 'game the system'. We consider this trade-off in our assessment of remedies.

6.101 Apple's and Google's ability and incentive to prioritise certain apps means there is a risk users may be shown apps on the basis that they have been developed by the app store owner or offer paid content (which uses Apple or Google's in-app payment system), rather than other objective factors discussed above. Ultimately, this may incentivise developers to pursue certain business models, eg include in-app purchases to make their apps more easily

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Apple's attempts to stop Netflix from dropping App Store In-App Purchase support - 9to5Mac and The best emails from the Apple vs. Epic trial (theverge.com) and ACCC digital platform services inquiry, March 2021 interim report, pages 97 – 98. Another developer told us it was informed by Google that its apps could not be included in Google's editorial content unless it switched to Google Play's billing system from its own payment system.

discoverable, and may lead to higher prices for consumers and discourage innovation across apps overall.

Collection and use of commercially sensitive information

6.102 By virtue of their positions, both Apple and Google have access to large volumes of commercially sensitive information on the businesses of the app developers that create apps for their respective ecosystems. We have considered whether their access to this information, and the use they might make of it, may be harmful to competition.

Types of information accessible to Apple and Google

6.103 Apple and Google each have access to a variety of non-public sources of potentially commercially sensitive information on third-party app developers:

- Through the app review process, Apple and Google can gain early information on new app features before they are introduced. We have heard concerns that they may also be able to use the process to require developers to provide sensitive information.
- Because certain app developers are required to use Apple's and Google's payment systems for in-app purchases, Apple and Google have access to transactional-level sales data in relation to such transactions.
- Through their operation of app stores, Apple and Google also have access to data on downloads and usage of all apps. Some of this information is made public, but more detail is available to Apple and Google, for example the amount of time users spend on individual apps.

6.104 In addition, Apple's MFi Program – through which Apple licenses certain technologies that allow accessories to connect to Apple devices – gives Apple access to additional information on manufacturers who produce these accessories (who may also be app developers, offering apps that interoperate with their products).[528]

6.105 The collection of some or all of this information may be necessary for Apple and Google to operate their app stores (and in Apple's case its MFi Program) effectively. However, Apple's and Google's agreements with developers do not include any express restrictions on how Apple and Google may use the

[528] Apple's MFi Program covers third-party hardware accessories that use Apple's MFi licensed technology to connect electronically to Apple devices. These technologies include the Lightning connectors that are required for any accessory that needs to by 'plugged in' to an iPhone, but exclude Bluetooth connections. FAQs for Apple's MFi Program.

information they gather from developers. **Apple's Developer Licence Agreement even explicitly disclaims any confidentiality obligations over information that Apple collects from developers and gives Apple permission to use this information on an 'unrestricted basis'.**[529]

Potential harm to competition

6.106 Apple and Google could in principle use the information received through the above processes to inform the development of their own apps. For example, they could use app store data to identify fast-growing or successful apps; use their positions managing their app stores (including app review processes) to gain detailed information on how these products work; and use insights from transactional data to determine pricing models for new products. Alternatively, they might be able to use this information to advantage their own apps in markets where they are already active. In particular, Apple and Google may be able to use rivals' data to optimise their own pricing and marketing strategies and to target customers.

6.107 We recognise that there are benefits to consumers in the short term of Apple and Google developing products which compete in downstream markets, as this may bring about more choice or higher quality products. However, if app developers believe that Apple or Google will use their confidential information to compete against them, this could undermine their incentives to invest in developing new services or trial new pricing or marketing strategies and could have a general chilling effect on innovation. App developers' incentives to innovate would be particularly affected if other practices by Apple or Google make it harder for them to benefit from their innovations:

- if Apple or Google self-preference after entry, this could significantly reduce the original innovative app developer's ability to continue to make profits from their innovation; and

- Apple's and Google's power over app developers may allow them to require developers to relinquish or weaken their intellectual property rights as a pre-condition for launching their products.

Apple's use of information

6.108 A number of app developers and respondents to our statement of scope raised concerns about Apple in particular using its privileged access to information to imitate other successful products. These respondents indicated

[529] Apple DPLA, 9.3.

that this was a common practice by Apple which had affected a large number of third-party app developers. Several referred to reports in the Washington Post which included statements by Philip Shoemaker, Apple's former director of App Store review, that data on which kinds of apps are successful was shared widely among Apple leaders and could be used to inform product development.[530]

6.109 Masimo and Tile, both companies which produce products which are compatible with Apple devices as well as iOS apps to interact with those products, claimed that Apple has access to their commercially sensitive information and can use it to develop competing products. These claims are discussed further in Chapter 7.

6.110 Both developers raised concerns about Apple's MFi agreement, which includes terms which:

- allow Apple to use any information submitted by licensees to develop its own competing products;
- require licensees to agree that they have no knowledge of any Apple product infringing on any of their patents; and
- allows Apple to terminate the agreement (forcing the licensee to stop selling their products which incorporate technology licensed from Apple under the MFi Program) if the licensee commences intellectual property or patent infringement proceedings against Apple.

6.111 Apple submitted that the purpose of this language was to shield against frivolous lawsuits whenever Apple happened to release a product bearing some similarity to a licensee's licensed product, and not as a means to steal licensee information. As noted above, we consider that if developers' intellectual property rights are undermined by agreements with Apple or Google, this would be particularly damaging to developers' incentives to innovate.

6.112 A number of developers that compete directly with Apple's first-party apps also raised concerns about the potential for Apple to use its access to their data to provide its own products with an advantage. Spotify stated that it cannot be excluded that Apple might be able to use IAP data to inform its own commercial decisions about Apple Music, [one gaming app developer] told us that Apple could use its unique access to data to shape its competing Apple

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[530] Apple has copied some of the most popular apps in the App Store for its iPhone, iPad and other software updates - The Washington Post.

Arcade service, and Proton Mail said it was concerned Apple could be using commercial data it receives through IAP to gain a competitive advantage for its own products.

6.113 Apple told us that it does not use information from the App Store to drive its decisions on what apps to develop. It acknowledged that it, like developers, has access to 'de-identified analytics data' from users who opt-in to providing this data, but told us that this data is only collected and used to help developers improve their apps. Apple also stated that App Store data is not shared with anyone outside of the App Store business team, including Apple's services business, and that confidential information used by the App Store Review team is not shared with any other business units – and that in both cases, safeguards are in place to prevent unauthorised access.[531] With regards to the statements by Mr. Shoemaker referred to above, Apple challenged the veracity of these claims and indicated that Mr. Shoemaker was never involved in the development of any Apple apps or services.

6.114 Apple also questioned the value of the information it has access to for developing new products. It told us that App Store information 'would be of limited value in guiding Apple's product development decisions' as iOS (and the App Store) represents a small share of the overall mobile market, and there is publicly available information on the most downloaded or highest revenue generating apps.[532]

Google's use of information

6.115 We have not heard similar concerns from developers regarding Google's use of sensitive information to develop new products or to give its existing products a competitive advantage. However, in principle the same potential issues arise given Google's similar access to sensitive commercial information and the apparent lack of contractual restrictions on its use of this information.

6.116 One respondent referred to reported concerns about Google's use of data on how users interact with third-party apps (from a program known as 'Android Lockbox') to help advance its own apps.[533] This reporting suggested that Google used this data when planning the rollout of a YouTube feature rivalling

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[531] Specifically, Apple's policies require [✂], and it has systems in place to ensure no one may obtain unauthorized access, including allowing audit of access by users.
[532] In addition, Apple claimed that any advance information gained through the app review process was 'practically of no significance to the development of competing apps', because the app review process lasts at most just a few days, after which the app would be released and made publicly available. We note that the experience of many app developers has been that app review can be a more protracted process if Apple has reasons to reject an app, as discussed in the section on app review processes above.
[533] Hausfeld & Co LLP response to Statement of Scope

TikTok, and more broadly used it to track how Google services were performing compared to rivals.[534]

6.117 Google told us that:

- it 'does not use non-public information on the success of certain types of apps in Play to make decisions about app development';
- information gathered 'through third-party app developers' interactions with Play (eg, during the app review process)' is not made available to Google's own app development teams; and
- it uses the app usage data it collects mainly to improve Android and Play features, and may also use this data for business analysis purposes to inform product developments and improvements, for example to develop the Adaptive Battery feature in Android 9.0. It has in the past used this data in an aggregated form, under a robust access policy to ensure it is used carefully, to understand 'what is and is not working' for users of its products.

6.118 Google also stated that it has formal internal policies in place that prohibit the sharing of identifiable data gathered by Google Play about third-party apps with other parts of the company to unfairly advantage first-party apps, or for purposes other than for the benefit of the Play ecosystem.[535]

Conclusions

6.119 Through the operation of their app stores, Apple and Google have access to confidential information about rival apps that has the potential to give rise to competition concerns. Developers will have reduced incentives to invest and innovate if they believe that Apple or Google could use their confidential information to compete against them. This may be particularly concerning when combined with other forms of self-preferencing, or with contractual terms that undermine rival app developers' intellectual property rights. Developers' concerns predominantly focused on Apple's access to such information, and we did not hear any comparable concerns about Google's use of information. However, the same potential issues arise in principle for Google as well.

[534] The Information, Internal Google Program Taps Data on Rival Android Apps, July 23, 2020.
[535] For example, Google uses this data to build anti-abuse products, such as a tools to detect payment fraud.

Practices with broader competitive implications

6.120 In this second half of the chapter, we discuss three practices that have broader effects, either in terms of entrenching the market position of Apple and Google in app distribution, or in other markets where Apple or Google carry out related activities. The practices we consider are:

- Apple's and Google's app store payment systems; which includes their requirements to use these for in-app purchases of digital content and consumer issues relating to subscriptions, cancellations and refunds;
- Apple's introduction of restrictions on how app developers may collect and use certain user data through its App Tracking Transparency (ATT) policy; and
- Apple's restrictions on cloud gaming services.

Apple and Google's app store payment systems

6.121 The main way in which both Apple and Google monetise their app stores directly is through requirements on certain developers to use their proprietary payment systems to process in-app purchases made by users, such as paid-for apps, features or content within an app, or subscriptions. Apple and Google charge a commission of up to 30% for these transactions, and in Chapter 4 above we considered concerns about the level of these commissions. We have also heard several complaints from developers about other effects of having to use Apple's and Google's payment systems, which we consider in this section and in more detail in Appendix H. The same concerns are also being separately considered by the CMA in the context of our competition enforcement case into Apple's App Store under the Competition Act 1998.[536]

Apple's and Google's in-app payment system rules

6.122 Both the App Store and Play Store require that certain in-app payments must be made using Apple IAP and Google Play's billing system respectively. For transactions which are handled by Apple IAP or Google Play's billing system,

[536] Investigation into Apple AppStore. This investigation is ongoing and no decision has yet been made as to whether Apple has acted unlawfully. Competition Act investigations are based on different legal tests and standards of proof than the CMA's market studies. As such, while the market features and practices being considered are similar, any findings in this market study are without prejudice to the CMA's assessment under the Competition Act.

Apple and Google effectively act as the seller of the relevant in-app purchase and have the contractual link to the consumer.

6.123 Both Apple's rules[537] and Google's rules[538] require that apps which offer 'digital' content must exclusively use Apple's and Google's own systems ('Apple IAP' and 'Google Play's billing system' respectively) for in-app payments. Conversely, apps which provide physical goods and services outside of the app cannot use these payment systems and are able to use payment service providers (PSPs), such as Paypal or (on iOS) Apple Pay. Most of the payments made using both Apple's and Google's systems are subject to a 30% commission.[539]

6.124 Certain types of app offering digital content are not required to use Apple's or Google's payment systems. Most notably, some apps are permitted to disable these systems and provide users with access to previously purchased content or subscriptions on a 'read-only' or 'consumption only' basis.[540] However, these apps are still subject to anti-steering rules, which in Apple's case restrict developers from referring within the app to other ways a user could pay for digital content, such as through a website[541] and in Google's case prevent app developers from providing users, within an app, with a direct link to a webpage containing an alternate payment method. They do not prevent app developers from using other means (such as email communications) to tell users about alternative payment options, although this was prohibited by Apple's rules until October 2021.

6.125 In some respects, Google's rules have become more closely aligned with Apple over time. From 1 June 2022 all developers selling digital goods in their apps are required to solely use Google Play's billing system (and pay a service fee from a percentage of the purchase). Google has warned that any app developers not compliant by this date will be removed from the Play Store.[542] The fact that certain app developers were using their own payment solutions to accept payments within their apps listed on the Play Store prior to

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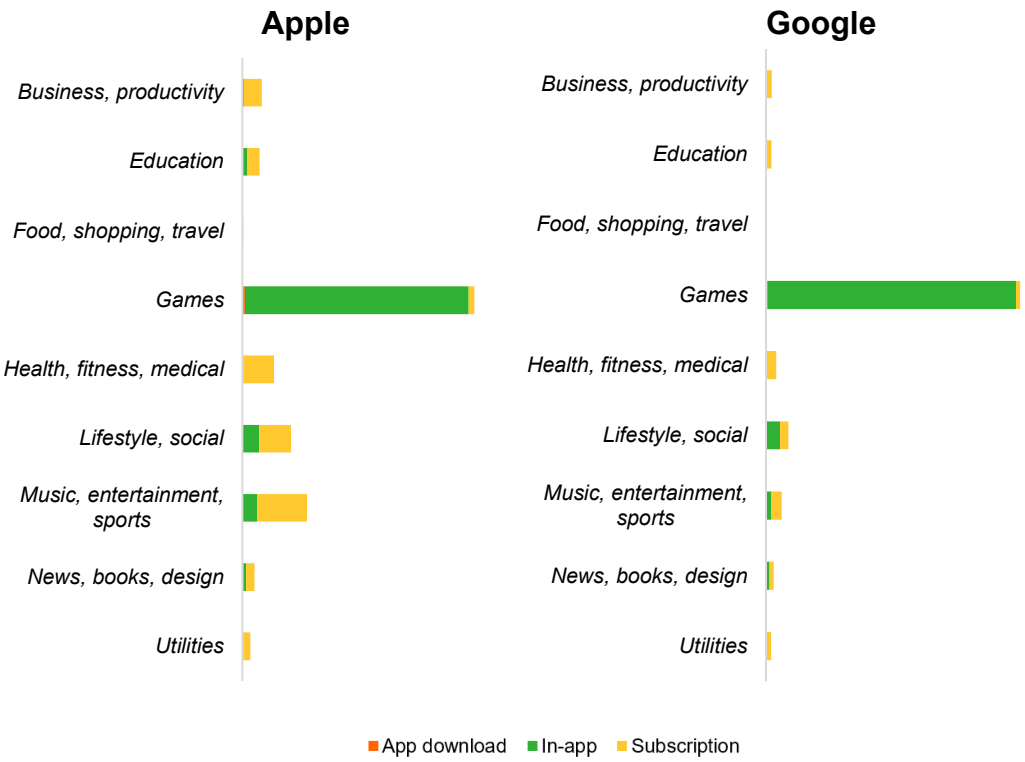
[537] Publicly available on Apple's website App Store Review Guidelines - Apple Developer. Last accessed 11 May 2022.
[538] Payments - Play Console Help (google.com). See also Monetisation and ads - Play Console Help (google.com).
[539] Each of Apple and Google apply a lower commission of 15% in certain limited circumstances, as described further in Appendix H.
[540] Apple permits a closed group of certain types of apps referred to as 'reader apps' to use this exemption, as well as allowing apps which offer services that work across multiple platforms to sell content on other platforms that can be accessed via their iOS apps. Google permits any app to be 'consumption-only' and allow access to content paid for elsewhere.
[541] Following enforcement action by Japan's Fair Trade Commission, Apple announced that it has changed its rules for "reader" apps. From 30 March 2022, reader apps can apply for an External Link Account Entitlement permitting developers to include an in-app link to an external website for account creation and management purposes. Update on "reader" app distribution - Latest News - Apple Developer
[542] Android Developers Blog: Listening to Developer Feedback to Improve Google Play (googleblog.com); See also Understanding Google Play's Payments policy - Play Console Help last accessed on 10 May 2021.

this may explain why fewer app developers in general have to date complained about Google's payment rules.

6.126 Apple's and Google's app store revenues are derived from a small proportion of apps. To assess revenue concentration, we considered the proportion of apps that accounted for 90% of the commissions received by Apple. This was [less than 10%] in the UK in 2021. Similarly, in the same period, [less than 10%] of the apps using Google Play's billing system accounted for 90% of the total service fee revenue on apps (including Play pass) received by Google.

6.127 Figure 6.2 shows the distribution of Apple's and Google's app store net revenues[543] across category of app.

Figure 6.2: Apple IAP net revenue and Google Play's service fee revenue by app category in the UK 2021



Source: CMA analysis of Apple's and Google's data.[544] Bars for Apple and for Google are not on the same scale so cannot be compared directly.

6.128 App store revenues are concentrated in mobile gaming, which, in the UK in 2021, accounted for [over half] of Apple IAP net revenues and [over half] of Google Play's billing system revenues on apps (including Play pass). The majority of Apple's and Google's app store revenues are derived from

[543] That is, the revenue that Apple/Google retain from transactions made through their payments systems in the UK.
[544] Categories have been grouped by the CMA for illustrative purposes.

payments for one-off in-app features or content, such as a particular item purchased within a game experience, rather than for ongoing subscriptions. For the UK in 2021, [over half] of Apple IAP and Google Play's service fee revenues came from these one-off in-app payments, which are largely used in mobile gaming. The remaining app distribution revenues are derived largely from subscriptions.

Apple's and Google's rationale for app store payment rules

Collection of commission

6.129 Both Apple and Google argue that the obligation to use their payment systems is necessary for them to collect commission for the sales that developers make as a result of distributing apps through their app stores. They state that this is the most efficient way for them to charge a commission and recoup the investments they have made in relation to their app stores, due to the difficulties in tracking or requiring third parties to report transactions which are not made through Apple's and Google's payment systems.

6.130 However, we have been told that there are viable alternative methods, which would enable the app store provider to obtain fair compensation.[545] Indeed, in response to recent legislative changes in South Korea both Apple and Google have announced plans to allow developers to provide alternative in-app payment mechanisms in their apps in that storefront, while continuing to collect a (reduced) commission on payments made through different payment options.[546]

6.131 As noted in Chapter 4, a requirement to use a platform's payment system for in-app purchases for some digital goods is not unique to Apple and Google, although some other platforms do not implement such restrictions. However, a simple comparison of requirements against other platforms is not necessarily informative. First, the rules of some platform owners are stricter than others in terms of the extent to which their payment systems are required to be used. Further and in any event, the lack of competition faced by Apple's and Google's app stores means that their restrictions on the use of alternative

[545] For example, it has been argued that Apple or Google could allow developers to use their own payment solutions and then report transactions made through these payment systems at regular intervals. Alternatively, or in addition, the app store provider could be notified whenever a transaction takes place via a third-party payment system through the use of an API.
[546] Furthermore, Apple has recently submitted proposals in the Netherlands which will allow dating apps to use alternative payment systems, collecting a reduced commission which is passed on to Apple. See Apple's public statements: Update on StoreKit External Entitlement for dating apps - Latest News - Apple Developer

payment options are of particular concern, for the reasons set out further below.

User benefits

6.132 Both Apple and Google argue that use of their payment systems also results in user benefits, in that they provide users with a convenient and secure way of buying and managing digital content from third-party developers. Apple's and Google's app store payment systems may be uniquely well-placed to deliver some of these benefits, particularly those which are connected to overall usage of the mobile device.[547]

6.133 However, as noted further below, many user benefits can also be provided by alternative payment solutions. We note that non-digital apps are prohibited from using Apple's and Google's payment systems and are able to nevertheless process in-app transactions with little apparent negative consequence. Further, the evidence from app developers discussed below suggests that alternative payment systems could offer greater flexibility in the pricing structures and payment methods offered to consumers; allow for greater tailoring of products to users; and allow app developers to manage billings issues directly with customers.

Potential harm to competition

6.134 As set out in Chapter 4, Apple and Google have market power in relation to native app distribution. This market power allows Apple and Google to unilaterally set rules for their app stores, including requirements for certain app transactions to be processed through their own payment systems, and their ability to refer to payment options outside of the app, as referred to above.

6.135 App developers have raised several concerns about how they are affected by this. Many expressed concerns about the level of the commissions, which we considered in Chapter 4. In this section we have considered a number of further possible harms arising from the payment system rules.[548] Our

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[547] The convenience of being able to use a single set of payment details and deal with a single trusted point of contact for payments appears to be an important benefit on which certain users may place significant value. In addition, app developers are also likely to indirectly benefit from users having greater confidence in placing transactions through Apple's and Google's app stores.

[548] Our assessment in this section focuses primarily on Apple IAP, as we have received most complaints about Apple's rules in relation to the use of Apple IAP. This may reflect the fact that certain app developers have been giving Android users alternative payment options for in-app purchases in addition to Google Play's billing system, as explained above. We have also considered and sought evidence from app developers on how these issues apply to Google Play's billing system and have highlighted the similarities and differences. In addition, Apple's and Google's payment system rules are developing and several changes have been announced at various points

concerns are summarised below, and set out in further detail in Appendix H.[549]

6.136 First, apps which are required to use Apple's and Google's in-app payment systems do not have the benefit of competition between providers of payment systems. Based on the evidence we have seen, it appears that in the absence of the requirement to use Apple's and Google's systems, app developers would be able to choose, often bespoke, payment solutions that better meet their needs and those of their users, and that there would be a greater incentive for PSPs to innovate in payment solutions specifically designed for in-app payments.

6.137 Second, Apple and Google act as the direct seller in relation to Apple IAP and Google Play's billing system's transactions. This means they are responsible for key aspects of the sales process such as processing customer payments, refunds, and subscription cancellations. The evidence we have received from app developers suggests that Apple's in-app purchase rules have certain drawbacks, including: (i) it is harder for app developers to interact directly with customers in relation to refund/billings queries or complaints; (ii) developers do not have access to user-level transaction data and this may prevent app developers from tailoring prices or promotions, or carrying out certain checks on users; (iii) app developers may be limited in the specific pricing, promotion or product bundles available to users because they are using Apple's sales system. Google Play's payment system may also have similar effects, especially as more app developers are required to use Google Play Billing exclusively from June 2022.

6.138 Third, the requirements to use Apple's and Google's payment systems (and pay the associated commission) for in-app payments on apps that compete downstream with Apple and Google may raise additional concerns. This is because Apple's and Google's own apps do not pay a commission on equivalent in-app payments and this has the potential to raise the costs of rival apps and create a potential competitive disadvantage. In this regard, we note that the European Commission has sent a Statement of Objections to Apple expressing its preliminary view that Apple's rules distort competition in

over the course of this market study. Consequently, the evidence and views from app developers are likely to reflect this evolving picture.

[549] As discussed in Chapter 3 and Appendix D, we also considered whether the requirement to use Apple's and Google's payment systems may cause users to have to repurchase or resubscribe to paid-for apps and in-app content after switching, which could increase barriers to switching. The evidence we have gathered suggests that users do not perceive managing subscriptions across devices after switching operating system as a barrier to switching – though this may be because only a small proportion of users currently have subscriptions.

the market for music streaming services by raising the costs of competing music streaming app developers.[550]

Conclusions

6.139 We have identified a number of potential harms from Apple's and Google's requirements on certain developers to use their proprietary payment systems to process in-app purchases for digital content, which could be avoided if app developers were able to choose their own payments service providers and transact directly with users. **We consider that there would be viable alternative methods for Apple and Google to collect a commission for their app stores, while also allowing developers to choose alternative in-app payment mechanisms,** which do not give rise to the potential harms to competition outlined above.[551] It is not clear that these alternatives would be prohibitively costly or challenging to implement and it would appear that both Apple and Google have the ability to effectively enforce against any requirements that they impose through the use of their app review processes.

Consumer issues relating to in-app subscriptions, cancellations and refunds

6.140 We looked at the potential for consumer harm resulting from the sale of subscriptions in Apple's and Google's app stores. Many apps allow consumers to access content and services on a paid subscription basis. These subscriptions are entered into and managed through the app stores on a consumer's mobile device.

6.141 As noted in the section above, these transactions must be processed through Apple's and Google's payment systems. Some aspects of the process are designed or managed by developers and some by Apple and Google, and there may also be some overlap in roles and responsibilities.

6.142 Subscriptions sold through both the App Store and Play Store are generally sold on an auto-renewing basis, meaning consumers will continue to be charged indefinitely until they take action to end their contract. Although auto-renewing contracts can provide convenience for consumers, the danger is that consumers may find themselves locked into contracts they no longer want or need. The CMA has taken consumer enforcement action in relation to auto-renewing contracts in the anti-virus software[552] and online video gaming

[550] Antitrust: Commission sends Statement of Objections to Apple on App Store rules for music streaming providers.
[551] For example, this may include reporting obligations (accompanied by audit rights) or the use of an API that notifies Apple and Google of transactions in real time.
[552] Anti-virus software - GOV.UK.

sectors.[553] The government has also announced proposals aimed at tackling subscription traps.[554]

6.143 There are various ways in which the CMA considers consumers can be protected from being locked into unwanted contracts. For example, the CMA secured remedies from firms in the anti-virus software and online console gaming sectors to address various concerns and has also produced Compliance Principles for anti-virus software firms[555] that use auto-renewing contracts in the UK. The CMA has also published two papers[556] which discuss the ways in which online choice architecture can affect consumer decision-making.

6.144 As part of this study, we have looked at the process of signing up to and managing subscriptions, as well as when consumers want a cancellation or refund. We have identified various areas where we consider that Apple and Google should review their current practices carefully and, where necessary, change them to help ensure they are treating consumers fairly and complying with consumer protection law. These are set out in more detail in Appendix K. It should be noted that our concerns would apply equally if subscriptions were sold directly by third-party app developers using their own payment systems.

Purchasing subscription apps

6.145 As noted above, subscriptions purchased through the App Store and Play Store are generally sold on an auto-renewing basis – though the subscription length and cost are decided by the app developer and can vary widely.

6.146 Many subscription purchases are initially incentivised or initiated by an introductory offer – most commonly a free trial. We purchased a range of the most popular apps from the App Store and Play Store to understand what consumers see when they take out free trials, purchase subscriptions after an initial trial period and manage those subscriptions after purchase.

6.147 As detailed in Appendix K, we saw a range of practices and online choice architecture[557] design characteristics which could cumulatively result in some consumers purchasing subscriptions they did not expect or want. Some of these occur in screens which the app developers provide (but over which Apple and Google have influence through the store guidelines they require app developers to adhere to). Others occur in screens a consumer sees

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[553] CMA welcomes Sony and Nintendo's gaming subscription improvements - GOV.UK.
[554] Reforming competition and consumer policy: government response - GOV.UK, 22 April 2022
[555] Compliance Principles for anti-virus software firms - GOV.UK.
[556] See CMA (2022), Online Choice Architecture: How digital design can harm competition and consumers
[557] See CMA (2022), Online Choice Architecture: How digital design can harm competition and consumers.

which are directly provided by Apple or Google. We identified the following concerns (some of which apply to both ecosystems, others to just one of them):

- The absence of the upfront option to purchase a subscription or take a free trial which does not automatically renew or convert to a paid subscription.

- Use of online choice architecture practices such as visual manipulation, defaults and framing. For example, providing important information, such as details of the auto-renewing policy or when a free trial must be cancelled to avoid a charge, in smaller fonts, in less prominent or salient parts of the screen or buried in blocks of text; preselecting options or making popularity claims to try and steer consumer choices.

- Presenting information in such a way that it could confuse consumers, for example:

  - presenting (hypothetical) monthly costs for an annual subscription with equal prominence to the actual annual cost (this has the potential to confuse consumers about the nature of the subscription, ie whether monthly or annual);

  - suggesting consumers can cancel ‘at any time’ when in fact cancellation means that the contract will not renew again rather than immediately coming to an end and automatically providing the consumer with some form of refund; and

  - stating that consumers make ‘no commitment’ by entering a free trial, without further explanation, when they will actually be committed to an auto-renewing contract if they take no further action.

- The potential for reminders to be missed if there is a lack of communication between app store and developer; and

- Confusing messaging around the requirement to cancel 24 hours before the stated end of a free trial to avoid being rolled into an auto-renewing subscription.

6.148 We have greater concerns about the potential for consumer confusion in the Apple ecosystem. There are two main reasons for this:

- Google’s Play Store provides a clearer final pre-purchase screen with details of the plan, the auto-renewal policy and the last date for cancellation. This clearly presented information might mitigate against

potential consumer confusion from information provided earlier in the process; and

- Google itself sends email reminders to consumers two days before a free trial ends. This gives the consumer a timely prompt to take action if they do not wish to purchase the app. Apple does not itself send a reminder email unless the free trial exceeds 3 months (and we did not find any examples of apps with trials this long) or where the subscription period is longer than a month.

Cancelling subscriptions

6.149 We examined how easily a consumer can cancel a subscription. It should be at least as easy to exit a subscription/contract as it was to sign up, including being able to easily stop the renewal at any time, exit in the same way as it was signed up to and a cancellation right after renewal that is easy to exercise.

6.150 In both ecosystems, what the term 'cancelling' actually means and what some consumers may expect it to mean could differ. Cancelling a subscription simply means giving notice not to renew at the next renewal point. It does not mean terminating the contract early, nor is the consumer given a contractual right to a pro-rata refund for the period of the subscription which remains (although store owners argued a refund may be available to the consumer should they request it).

6.151 Both Apple and Google allow multiple routes for cancellation, such as allowing consumers to initiate cancellation from a cancellation email or via settings (iOS) or Play Store (Android) which are relatively straightforward. However, we think it is important to keep the consumer journey for cancellation under review, for example through user testing, to ensure they are not creating any unnecessary barriers.

6.152 It is also important that consumers' experiences of a cancellation process accord with what they were told when they made a purchase. On this point, we observe that statements that consumers can cancel at any time, which we saw in both ecosystems, could create some confusion: it could imply that a consumer can exit the contract when they wish and be refunded for any unused period remaining, whereas in reality the practical effect of cancelling is simply to give notice to not renew the subscription at its pre-defined end date, with no change to the timing of the contract end and no refund unless specifically requested. We also had some concerns about the way consumers' statutory cooling-off rights are presented.

Requesting refunds

6.153 We also looked at what happens when an app that has been paid for (that is, not during a free trial period), does not meet a consumer's expectations and they request a refund. In particular, we looked at information provided to a consumer about the circumstances in which a refund would be provided and how requests for refunds were handled.

6.154 Apple does not provide consumers with a separate refund policy. Instead, it includes several short references to refunds within its overall terms and conditions, in effect reserving its right to deny a refund request where it suspects fraud, abuse, or unlawful or other manipulative behaviour. We are concerned that a lack of clarity about when consumers can and cannot request a refund and whether there are any particular limitations or requirements, could make it difficult for consumers to rely on such rights or even to know that they can make a claim.

6.155 Data that Apple shared with us does, however, confirm that Apple grants significant numbers of refunds**.**

6.156 Google provides a specific refund policy to consumers for purchases made on the Play Store, but it is brief and also does not indicate how requests are considered or which will be accepted. It directs consumers to request a refund from Google if the subscription purchase was made less than 48 hours prior, and after this time it requires the consumer to liaise directly with the app developer. Although Google has provided us with some data on the numbers of refunds requested and those accepted, it is still unclear how the policy is applied and in particular under what circumstances requests from consumers are refused and the ease with which a consumer can obtain their money back.

6.157 We also observe that in the case of both the App Store and the Play Store, locating refund policies either before signing up to an app or afterwards is not as easy as it could be.

Conclusions and recommendations on consumer issues

6.158 We have identified some potential areas of concern, and outlined steps which Apple, Google and app developers should take to address these concerns to help ensure positive outcomes for consumers and compliance with consumer protection law.

6.159 In particular Apple, Google and app developers should review their practices carefully against the requirements of consumer protection law, having regard to the enforcement outcomes and guidance produced by the CMA through its work in relation to auto-renewal. They should also consider the potential

negative impacts of online choice architecture on users when designing their processes. We have found that there are some positives features of the way information is displayed to consumers before they make a purchase, particularly in the case of Google. These are set out more fully in Appendix K.

6.160 Some of the practices we have seen both at the pre-purchase stage and at the point a consumer wants to cancel a subscription and/or request a refund, could be improved through increased transparency and clarity of information presented to consumers. Whilst the individual effects of the various issues might appear moderate taken individually, the cumulative effect on consumer choice across the purchase journey could be more substantive. The potential harm to consumers is more significant where longer or more expensive subscription plans are sold.

6.161 Some particular areas which we think app stores and app developers should consider improving are:

- Offering the option to purchase a subscription on a non-auto-renewing basis. The CMA's overarching concerns about auto-renewal are generally greater where it is the default or only option. We have noted in our previous work that we think it is important for customers to be given a clear, genuine and free-standing choice about whether to purchase on an auto-renewing basis. Doing so is more likely to address a number of our concerns about auto-renewal. A lack of choice between renewing and non-renewing subscriptions also increases the relevance of other practices, for example upfront transparency, reminders and rights to end a subscription and obtain a pro-rata refund.

- Avoiding the use of choice architecture practices which lead to information about auto-renewal being less prominent or which nudge consumers towards specific subscription plans – so that consumers can take a clear, genuine and fully informed choice.

- Ensuring that choices for consumers are not misleadingly framed: for example, we were concerned to see amongst our test purchase apps a 12-month subscription plan where a monthly breakdown of price was being presented with equal prominence to the annual lump sum cost. Any monthly breakdowns for subscription being sold on an annual subscription should not have greater or equal prominence over the actual annual cost, because this presentation might create the impression that consumers are purchasing a monthly subscription when in fact they would be committing to 12 months.

- Avoiding misleading information on key aspects of the subscription and cancellation process, such as: describing a free trial as being 'no commitment' without any further explanation, when in fact a free trial will automatically convert to a paid subscription, thus creating a commitment if the consumer takes no action.

- Stating that consumers can 'cancel at any time' when in fact cancellation simply means giving notice to not renew and does not mean the cancellation is effective immediately.

- Ensuring that timely reminders are sent in line with any statements made during the pre-purchase process.

- Clearly and prominently explaining the process for preventing free trials from automatically converting to paid subscriptions, especially where there are particular time limits for doing so, to avoid creating confusion about the point at which a consumer must act to avoid a subscription.

6.162 In relation to refunds, we consider that it is important to give consumers clear information about their rights to immediately end a subscription and request a refund, in addition to information which is already provided about how to make such a request. Consumers should be able to understand their statutory cooling-off rights, their contractual rights or whether refunds are made pursuant to some form of discretionary policy. Consumers should be clear when they can and cannot request a refund and whether there are any particular limitations or requirements. Apple in particular should review its terms and conditions to ensure that consumers statutory withdrawal rights are clear and sufficiently drawn to their attention.

The effect of Apple's new privacy framework on competition

6.163 This section examines the competitive effects of Apple's new privacy framework for apps, which is called 'App Tracking Transparency' (ATT).[558] It is clear that there are privacy benefits associated with the introduction of ATT as it enhances users' privacy and control over their personal data and significantly improves developers' compliance with data protection law, which requires developers to have user or subscriber consent to access information from their device.

[558] In October 2020, the French competition authority (Autorité de la concurrence) received a request for interim measures by players of the online advertising sector contesting the ATT implementation. Although it rejected such request in March 2021, it continues the investigation into the merits of the case, to verify whether the implementation of ATT may amount to discrimination or self-preferencing.

6.164 However, here we assess whether and to what extent ATT undermines the current model of advertising to users of mobile devices, and discuss how its implementation may benefit Apple's own advertising services and reinforce its position in app distribution. In particular, we assess whether, by undermining user acquisition by app developers via mobile advertising, ATT is reinforcing the role of the App Store as a source of discoverability for apps on iOS. More detail of our assessment is included in Appendix J, where we also examine some other policies that Apple and Google have implemented or announced in recent years aimed at protecting user privacy within their mobile ecosystems.

Mobile advertising landscape and changes from ATT

6.165 On mobile devices, advertisers can reach users with a variety of types of advertising through browsers, app stores and apps. For app developers, mobile advertising serves two broad purposes:

- they can buy **app install advertising** to reach potential users and encourage app downloads; and
- they can sell **in-app advertising** within their apps to generate revenues (instead of or in addition to monetising through in-app purchases).

6.166 These are not mutually exclusive – one developer may sell in-app advertising space in the form of app install advertising for another developer.

6.167 Before the introduction of ATT, app developers on iOS could technically access (without requesting user consent) a unique device identifier for each user that could be shared with advertising networks and used to match the same user across multiple apps – the ID for Advertisers (IDFA), albeit doing so without user consent would still have been a breach of data protection law.[559,560]

[559] In previous versions of iOS, users could opt out of allowing app developers to access their IDFA by turning on an option to 'Limit Ad Tracking' in the centralised iOS settings.
[560] Before the introduction of ATT, user consent to access the IDFA would still have been a legal requirement under the Privacy and Electronic Communications Regulations 2003 (PECR). PECR requires subscriber or user consent, of the standard laid out in the GDPR, to set any cookies (or similar technology) except when they are strictly necessary to provide a service the subscriber or user has requested.

6.168 Mobile advertising makes use of the ability to follow users and their activity across multiple apps and websites, in particular for the purposes of:

- **targeting**: advertisers can use information on a user's activity to target the ads served to them; and
- **attribution**: in order to measure the effectiveness of ads, advertisers link users who click on an ad with actions that user carries out afterwards (such as downloading an app or making a purchase within an app).

Apple's advertising services

6.169 While, as Apple told us, it 'is not an advertising-based company', it does have some advertising business which it described as 'extremely limited'. This business, which generated 2021 revenues of approximately £[2.5-3] billion globally and £[150-200] million in the UK, up from £[1-1.5] billion globally and £[100-150] in the UK in 2020, is primarily made up of search ads that are served along with organic search results when users search in the App Store.[561,562] This Apple Search Ads (ASA) service is offered exclusively to developers of apps in the App Store – in other words, Apple's search ads are a form of app install advertising for developers distributing via the App Store.

6.170 Apple makes use of its users' personal data for targeting its search ads. Apple told us that its advertising platform has been 'carefully designed to adhere to Apple's own high privacy standards' and that its ASA offering relies on a 'privacy-by-design' on device solution that only uses a limited amount of first-party data to group users into segments of at least 5,000 users before ads can be displayed to them in the App Store. To group users this way, Apple uses data such as account information (eg birth year, gender, location), app and content downloads and purchases and the types of news stories they read on Apple News.[563] We understand that this includes data on downloads, purchases and in-app purchases for all third-party apps, segmented by App Store category.

6.171 Apple enables attribution for advertisers through its Apple Search Ads Attribution API. This allows advertisers purchasing search advertising from

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[561] Apple also offers display advertising in its News and Stocks apps, which typically takes the form of ads that appear around or within news articles or other content accessed through those apps, but [over 90%] of Apple's advertising revenue in the UK and worldwide came from search ads.
[562] We note that Apple also makes money from advertising indirectly, which is not reflected in this amount. In particular, Google paid Apple approximately £[1-1.5] billion in ad revenue in the UK in 2021 for being the default on the Safari browser.
[563] Apple told us that ads on the App Store do not access consumer data from other Apple services like Apple Pay, Maps, Siri, iMessage, and iCloud or data from devices through services and functions such as the Health app, HomeKit, email, contacts, or call history.

Apple to measure the number of app installs for the App Store and attribute them to Search Ads campaigns.

Changes introduced by ATT

6.172 ATT is Apple's new privacy framework released in April 2021. ATT is similar in its objectives to the ITP policy discussed in Appendix J, but it is applied to apps as opposed to websites. As noted in the Information Commissioner's Opinion on the data protection and privacy expectations for online advertising proposals, ATT is one of a number of initiatives that seek to address the privacy risks that online advertising poses and shift towards less intrusive tracking and profiling practices.[564]

6.173 The ATT framework requires apps to show a specific prompt (the ATT prompt) to request users' permission for the app to 'track' them. Without consumers opting into this prompt, developers cannot access their IDFA which as noted above is typically used to monitor users' activity across apps.[565] Apple's App Review Guidelines also state that app developers should not engage in any other form of 'tracking' if users do not opt in when shown the ATT prompt.[566]

6.174 While Apple does not surface the ATT prompt for its own apps, in September 2021, with the release of iOS 15, Apple introduced the Personalised Ads prompt that is presented to new users (and to existing users whose device is set to Personalised Ads On) upon launch of the App Store and proactively asks users to choose between allowing personalised advertising by Apple or not. Apple told us that the main reason for introducing this was to increase transparency and provide users with control over how their data is used and that Apple is 'leading the industry, by expressly obtaining user permission to use first-party data to deliver Personalised Ads'.

6.175 Apple has provided a replacement for IDFA-based attribution and measurement in the form of SKAdNetwork, a free tool Apple makes available to developers and ad networks. Apple told us that SKAdNetwork APIs hold advertising data on-device separate from apps, 'allowing advertising conversion measurement to be reported without users being tracked.' However, we have heard concerns from app developers, ad networks and industry commentators that SKAdNetwork is an inferior alternative not only to IDFA-based attribution and measurement but also in comparison to the Apple

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[564] ICO (2021), Data protection and privacy expectations for online advertising proposals.
[565] As mentioned above, PECR requires that app developers have the user's GDPR standard consent to access the IDFA.
[566] App Store Review Guidelines, 5.1.2 (i)-(iii).

Ads Attribution API Apple makes available to users of its own advertising services, as it gives developers less granular data and sends them information on conversions with a delay.

6.176 Apple offered the following definition of 'tracking' which it said was consistent with that of the World Wide Web Consortium (W3C): 'Tracking refers to the act of linking user or device data collected from your app with user or device data collected from other companies' apps, websites, or offline properties for targeted advertising or advertising measurement purposes. Tracking also refers to sharing user or device data with data brokers.'[567] As detailed in Appendix J, Apple does not consider the processing activities it undertakes in terms of personalised advertising (ie use of first-party data from different Apple apps and services) as 'tracking', particularly as it does not link information collected by apps from different companies, and therefore its apps are not required to show the ATT prompt. This is factually correct, given that, as detailed above, Apple uses data it collects from its own services which it operates under a single corporate ownership for personalised advertising purposes.[568]

6.177 However, as further discussed in Appendix J, based on our consideration of the ICO's definition of online tracking,[569] which does not distinguish between first-party and third-party data, we consider Apple's own use of its users' personal data no less consistent with this description of 'tracking' than that of third-party developers.[570]

Apple's stated rationale for ATT

6.178 Apple told us that 'the goal of ATT is to empower consumers by giving them greater transparency and ability to control the sharing of their own data' and that this policy strengthens this ability by giving users the choice, on a developer-by-developer basis, of whether to allow developers to 'track' them across other companies' apps, websites, or offline properties using users'

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[567] The W3C defined tracking as 'the collection of data regarding a particular user's activity across multiple distinct contexts and the retention, use, or sharing of data derived from that activity outside the context in which it occurred. A context is a set of resources that are controlled by the same party or jointly controlled by a set of parties'.
[568] As described above and in Appendix J, what Apple considers as 'first party data' for personalised advertising purposes includes data on App Store downloads, purchases and in-app purchases for all third-party apps, segmented by App Store category.
[569] The opinion says that, in principle, online tracking can be considered as 'processing activities involving the monitoring of individuals' actions, especially over a period of time (including the behaviour, location or movements of individuals and their devices)' with specific reference to this being for the purpose of offering goods and services to them, evaluating the effectiveness of services they use, and analysing or predict their personal preferences, behaviours and attitudes. See ICO (2021), Data protection and privacy expectations for online advertising proposals, page 14.
[570] As detailed in Appendix J, concerns over Apple's differentiation between first-party and third-party data collection have been expressed in response to our interim report.

IDFA. Apple also mentioned several stakeholders, including consumer protection associations and privacy advocates, which welcomed ATT as a positive development for the industry.[571] Our engagement with the ICO on ATT through the course of our study has confirmed that such privacy benefits need not be compromised in order to promote a more level playing field for competitors. Box 6.2 states the points on which the CMA and ICO are aligned.

Box 6.2: Engagement with the ICO on ATT

We have engaged with the ICO on ATT over the course of our market study, with our discussions highlighting that we and the ICO are aligned on the following:

- **The privacy benefits of ATT**: ATT enhances user privacy and control over personal data, while improving compliance with privacy law by app developers. Any future changes to the implementation of ATT should protect or enhance these benefits.
- **Choice architecture:** the choice architecture of user prompts should be balanced and designed in a way that maximises user control and effective decision making. The objectives of any interventions relating to prompt design should be outcome neutral.
- **User comprehension and testing:** the design of choice architecture is best informed through testing of user comprehension and experience. Such testing in future by Apple on the ATT prompt and its personalised advertising prompt could reveal whether the current choice architecture is optimised.
- **Use of the term tracking:** while data protection law does not provide a legal definition of tracking, the CMA and ICO consider that Apple is conducting processing activities that can be characterised as tracking as described in the ICO Commissioner's Opinion on online advertising expectations. However, rather than focusing too much on specific terminology, the objective of any interventions should be to optimise user comprehension across both the ATT and Apple's Personalised Ads prompts.
- **Incentives:** the offering of incentives in return for a user's consent to the processing of their personal data is not in principle in contravention of data protection law. However, this approach needs to be pursued with caution so that the consumers that do not consent are not – or do not appear to be – penalised for doing so.[572] The data controller is ultimately responsible for assessing this risk, which would be best assessed on a case-by-case basis.

[571] These stakeholders include Amnesty International, Human Rights Watch, Electronic Frontier Foundation, Privacy International, The Center for Democracy and Technology and Mozilla.
[572] The ICO's consent guidance states that 'it may still be possible to incentivise consent to some extent. There will usually be some benefit to consenting to processing. For example, if joining the retailer's loyalty scheme

6.179 We share the view of the ICO that developments that empower individuals and enable them to have meaningful control over the use of their personal data can bring about positive change, both for consumers and competition more broadly. ATT has clearly introduced a greater degree of choice and control to users than they were afforded previously over whether and how their personal data is used for personalised advertising. To this extent ATT has benefits to consumers with regard to their privacy.

6.180 We also recognise that strong data protection and privacy is a key measure of a healthy market in the digital sector, and we have been working in close partnership with the ICO in recent years to ensure that our regulatory approaches work together to benefit the UK. As part of this, we both want to ensure that:

- people are empowered and have effective choice over the service or products they prefer, with a clear understanding of how and by whom their data will be used; and

- businesses compete on an equal footing to attract customers, with transparency in the way they operate and the provision of meaningful choice across the market.

6.181 However, we do not consider that either of these conditions have been fully satisfied by the design and implementation of ATT. In particular, we are concerned that Apple has chosen a choice architecture for the ATT prompt, without conducting any user testing of the design, that may not maximise user comprehension and thus could unduly influence some of them to opt out from data sharing. We are also concerned that Apple is not applying the same standards to itself as to third parties when it comes to seeking opt in from consumers for personalised advertising.

6.182 Further, although the ATT framework offers significant privacy benefits to users by offering them greater control over whether and how their personal data is used for personalised advertising, we heard concerns that some companies may continue to engage in tracking in other ways, as discussed in more detail in Appendix J.[573]

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comes with access to money-off vouchers, there is clearly some incentive to consent to marketing. The fact that this benefit is unavailable to those who don't sign up does not amount to a detriment for refusal. However, you must be careful not to cross the line and unfairly penalise those who refuse consent'. See What is valid consent? | ICO.

[573] For instance, as detailed in Appendix J, studies submitted to us found evidence of a number of apps that seemed to continue to engage in third-party tracking when users opted out from the ATT prompt and, while ATT prevented the collection of IDFA, the number of tracking libraries, on average, remained the same for a number of studied apps. Further, Apple confirmed that they have limited visibility over whether developers engage in 'fingerprinting' and can only perform own research and rely on public information to detect those who do.

Potential harm to competition

6.183 In this section we assess how Apple has designed the ATT framework, whether and how the ATT prompt's design may be influencing consumers' choice, and the framework's effects on developers using mobile advertising for their app monetisation and user acquisition.

6.184 We then consider various ways in which the changes brought about by ATT may harm competition and consumers. In particular, we consider whether ATT may be unfairly advantaging Apple's own advertising services, and particularly its search advertising business on the App Store; increasing barriers to entry for app developers by making it more difficult to use advertising to acquire users; making it harder for developers to monetise via advertising; and protecting Apple's market power in app distribution by undermining the use of mobile advertising as a means for app discovery.

Impact of choice architecture on users' choices to opt-in

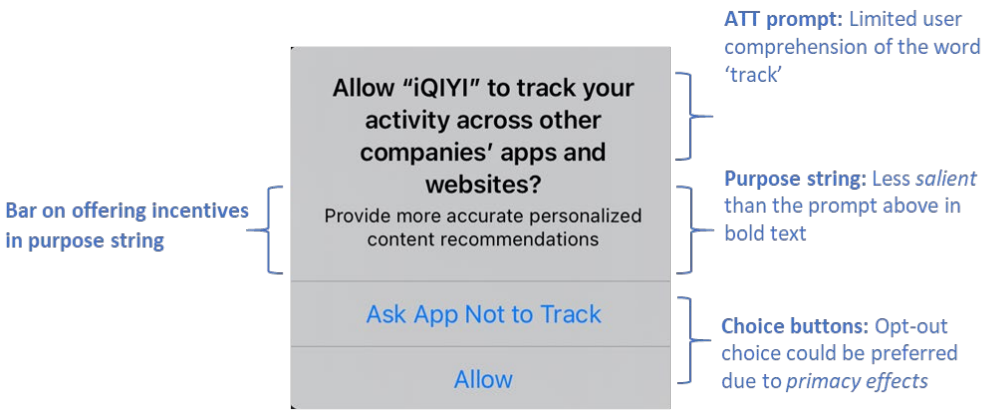
6.185 We consider the choice architecture of the ATT choice screen to be very important because it influences consumer decision making and thereby opt-in rates to personalised advertising. Apple told us that there was no user testing of the prompt, but that it had gathered feedback on the prompt from app developers and that this feedback fed into the final decision on the design of the prompt.

6.186 We are concerned that several aspects of the choice architecture, combined with the bar on developers from being able to offer incentives[574] to opt into the ATT prompt, could unduly influence users to withhold consent. Figure 6.3 below displays an example of the ATT prompt and illustrates the key choice architecture features. As detailed in Appendix J, we are particularly concerned that the framing of the prompt could result in limited user comprehension while the ordering of the choice buttons could lead to users favouring the opt-out choice ('Ask App Not to Track'), which is presented vertically above the opt-in choice ('Allow'), due to primacy effects (ie a preference for the option presented first). This, as further discussed below, contrasts with the ordering of choice buttons in the in the Personalised Ads prompt for Apple's own apps, where the opt-in button is placed vertically above the opt-out button. Overall, given the lack of user testing by Apple, we are concerned that the choice

[574] App Store Review Guidelines, 3.2.2 (vi).

architecture of the ATT prompt could result in limited user comprehension, and prevent users from making unbiased and effective choices.[575]

Figure 6.3: Choice architecture of the ATT prompt



Note: Screenshot taken on iPhone XR running iOS 15.1 in November 2021.

6.187 We are also concerned about the inability of developers to offer any incentive for users to opt in to sharing their data. Apple told us that the reason for this restriction was that 'gating' functionality in this way could be seen as contradicting various privacy guidance around the world.[576] From a UK data protection law perspective, we note that the ICO's guidance on valid consent does not preclude the possibility that parties might lawfully incentivise consent, so long as this does not unfairly penalise those who refuse.[577]

6.188 Given that developers benefit from users opting in as it increases the effectiveness of their user acquisition and monetisation, allowing them to offer incentives would enable them to share some of that value with users. This would potentially benefit both users and developers, while maintaining user choice.

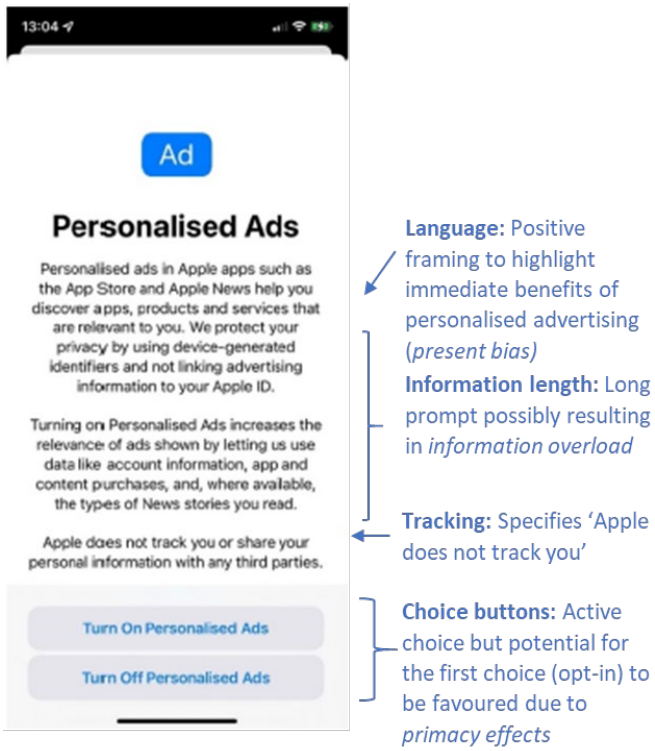
6.189 As discussed above, Apple has introduced a Personalised Ads prompt asking for consumers to opt into sharing data to allow personalised advertising within Apple's own apps. This prompt employs a different choice architecture compared to the ATT prompt. While we welcome Apple's introduction of the personalised ads prompt as a way to empower users to make choices on data privacy, we are concerned that its choice architecture may have features that

[575] In Appendix J, we also discuss 'pre-prompt' screens that apps can surface before showing the ATT prompt. We note that while these can provide useful information to users to help them make effective decisions, they could also potentially be used to highlight the immediate benefits of opting in by using unduly positive language. However, evidence from developers shows that Apple has the final say over the pre-prompt screen content, which limits developers' customisation abilities.
[576] Apple cited in particular European Data Protection Board guidance on GDPR and a statement by the Dutch data protection agency on 'cookie walls'.
[577] See (ICO) – What is valid consent?

seek to strongly influence users to opt into data sharing, particularly relative to the ATT prompt. This may mean users are less empowered to make effective choices.

6.190 Figure 6.4 below displays the Personalised Ads prompt and illustrates the key choice architecture features.

Figure 6.4: Choice architecture of Apple's Personalised Ads prompt



Source: Apple, CMA analysis

6.191 A more detailed discussion and comparison of the choice architecture of the two prompts is provided in Appendix J. Our key area of concern is that due to primacy effects, some users might favour the choice button presented first, which is the opt-out choice for the ATT prompt ('Ask App Not to Track') and the opt-in choice for the Personalised Ads prompt ('Turn on Personalised Apps'). In addition, the Personalised Ads prompt explicitly states that 'Apple does not track you'. However, as discussed above, in fact the processing activities underlying Apple's use of data for Personalised Ads could be characterised as tracking as described in the ICO Commissioner's Opinion on online advertising expectations. Therefore, the basis for Apple's differentiation between the language used to describe its own data processing in the Personalised Ads prompt and that used to describe the data processing controlled by the ATT prompt is unclear to us.

6.192 We recognise that prompting users for permission to enable personalised advertising for both third-party as well as Apple owned apps, enhances user control over their data on Apple devices. However, **the choice architecture**

of the ATT prompt is potentially problematic as the language and ordering of choices, combined with the bar on developers being able to offer incentives to users in any circumstances, may unduly influence some users to opt-out of sharing their data with third-party app developers.

6.193 **The Personalised Ads prompt for Apple apps, on the other hand, employs substantially different choice architecture features than the ATT prompt, which – based on the relevant literature in behavioural sciences and evidence received from third parties – may result in higher opt-in rates on a like-for-like basis.** We are concerned by the apparent lack of research and user testing conducted by Apple either prior to or following the implementation of both prompt screens – this type of testing is important in assessing user understanding of these prompts and their design and making sure they are optimised for their comprehension.

- *Opt-in figures*

6.194 We have received a wide range of estimates for opt-in rates for the ATT prompt from Apple, ad networks and app developers. In general, these estimates suggest that 20-30% of users have opted in (ie selected 'Allow') when shown the ATT prompt.[578]

6.195 Regardless of the precise percentage, it is clear that ATT has resulted in a substantial proportion of users of Apple devices to opt out of this form of personalised advertising.[579] In addition to our concerns regarding the choice architecture of the prompt, we also recognise that this outcome will to some extent reflect views among many consumers regarding the collection and use of their personal data.

6.196 In terms of how the ATT opt-in rates compare to the opt-in rates for Apple's own Personalised Ads prompt, Apple reported that for users with versions of iOS 15.0 or later, where the Personalised Ads prompt was shown, the opt-in rate for the prompt was [10-20]% in January 2022 in the UK. Apple argued this is comparable to (or even lower than) the average ATT opt-in rates and that this is inconsistent with the notion that the two prompts are having a

[578] Apple's internal assessment suggested a higher opt-in rate than most of the estimates we received from third parties. However, as discussed in Appendix J, we consider that Apple's estimates may overstate the actual opt-in rate.
[579] Moreover, we note that IDFA-based advertising relies on users opting in for ATT across multiple apps in order for targeting and attribution to take place, and so each developer's estimate of their users' opt-in rate is likely higher than the actual proportion of their users for which they can use the IDFA for advertising.

distortionary effect on users' choices in a way that disadvantages third-party developers over Apple.

6.197 As discussed in more detail in Appendix J, this estimate does suggest that the differences in choice architecture between the ATT prompt and the Personalised Ads prompt have not thus far resulted in a significant difference in opt-in rates. However, methodological issues with the calculation of this rate limits the direct comparability with the opt-in rates for the ATT prompt discussed above. In particular, the counterfactual is highly uncertain – in other words, we cannot know for sure how the two opt-in rates would compare if identical prompts were to be shown.

Impact of ATT on developers

6.198 The ATT framework is likely to impact app developers engaging in mobile advertising in two main ways:

- by undermining developers' ability to acquire users through **buying app install advertising**; and
- by undermining developers' ability to monetise their app through **selling in-app advertising**.

6.199 This is as a result of the reduced capabilities for targeting and attribution when advertisers cannot track users' activity across apps. These restrictions mean that ad inventory is less valuable and so generates less revenue, and advertisers are unable to optimise their ad spend by measuring effectiveness of their campaigns.

6.200 We note that some of these reduced capabilities may be the result of users' preferences with respect to whether and how they want their data to be used for advertising purposes. However, we have concerns with Apple's implementation of ATT and its resulting impact on app developers aside from our concerns on choice architecture, which is untested and applied inconsistently. These concerns include limited engagement with industry participants by Apple, for instance on SKAdNetwork, the replacement tool it makes available to third parties for ad attribution, and sudden changes to it. This is further detailed in Appendix J.

6.201 Evidence from developers confirms that both their app install advertising and their in-app advertising has become less effective since the introduction ATT:

- Several developers told us that they have seen a negative impact on advertising performance on iOS and that this has diminished the effectiveness of their user acquisition. A number of these developers had

reduced their spending on ads on iOS as a result of the poor performance.

- Despite the recent introduction of the ATT framework meaning that it may be too soon to estimate its impact on developers and ad platforms revenue, a number of developers provided initial estimates showing significant reductions in their revenues from advertising.

6.202 In summary, although it may still be too early to quantify the exact impacts of ATT on app developers in terms of revenue loss, the impacts seem to be material, particularly for developers which rely heavily on mobile advertising for user acquisition and monetisation. Although some of that impact may be the result of users' preferences, we are concerned by Apple's approach to choice architecture design and its limited engagement with the industry. Furthermore, the impacts seem likely to persist at least in the immediate term and to require significant investment from developers to adjust their processes and technology to the changes brought about by ATT and mitigate its effects.[580]

Self-preferencing of Apple's advertising services

6.203 We have heard concerns that, through the way ATT has been implemented Apple might be favouring its own advertising services over third parties', by giving its services advantages in terms of both targeting and attribution.

6.204 With regards to targeting, Apple's advertising services are advantaged by the distinction made between first-party and third-party data sharing in the ATT framework which gives Apple licence to use a wide range of data that it treats as 'first-party', potentially coming from a range of Apple's different apps and services as well as from user activity within third-party apps. Moreover, the differences between the ATT prompt and the Personalised Ads prompt discussed above make it in principle easier for Apple to be able to access user data to target its ads, relative to third parties. Although an early estimate by Apple of its opt-in rate (as discussed above) suggests that these differences have not thus far resulted in a significant difference in opt-in rates as expected, we note that this an early figure and there are limitations in Apple's methodology to calculate it.[581]

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[580] This is in part due to concerns around the extent to which SKAdNetwork is an adequate substitute to IDFA-based attribution, as explained in more detail in the 'Self-preferencing of Apple's advertising' section below and in Appendix J.

[581] As detailed in Appendix J, Apple's methodology to calculate this figure limits its direct comparability to the estimates of opt-in rates provided to us by app developers. This is because the latter are user-level, meaning that

6.205 With regards to measurement and attribution, Apple's advertising services are advantaged by being able to use the Apple Ads Attribution API while third parties must use SKAdNetwork. Evidence we have seen suggests versions of SKAdNetwork to date offer more limited functionality compared to Apple Search Ads Attribution API given they give access to less granular app install attribution data.[582] Furthermore, SKAdNetwork appears to be undergoing frequent changes and updates by Apple, and is thus a less mature API compared to Apple Search Ads Attribution API, which may be creating uncertainty for advertisers using it.[583]

6.206 To inform whether and to what extent Apple's own advertising may be benefitting from the introduction of ATT, we have considered evidence from developers on the budget they were allocating to advertising services directly provided by Apple. In general, we have seen evidence from developers showing that a few have increased their marketing budget allocated to Apple's search advertising services as a result of ATT. However, a few others either told us they are still considering their advertising strategy post-ATT or that they have not materially changed their approach to ASA, with one saying that they decreased the budget instead. The fact that ATT has pushed companies to spend more of their budget on App Store search ads instead of other products is consistent with recent public reports.[584]

6.207 Apple submitted that [evidence from its advertising business in the UK was inconsistent with ATT leading to benefits to its advertising services]. However, as discussed in more detail in Appendix J, we consider that the evidence from Apple's data on the increasing prices for its advertising services in the UK following the introduction of ATT is consistent with ATT resulting in increased demand for Apple's advertising services. This is consistent with reports on significant cost per tap (CPT) rises for ASA internationally.[585] We further note

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they show the proportion of individual users who, when shown the ATT prompt, opted into it, while Apple's figure is based on the proportion of searches on the App Store coming from users which have opted into the Personalised Ads prompt, with multiple searches potentially coming from the same user.

[582] In particular, compared to SKAdNetwork, Apple Search Ads Attribution API includes the date of the ad click and more detailed information about the specific ad format that led to a conversion. This information is key to optimising ad campaigns and selecting the most effective ad format for a given group of users. For further detail on how SKAdNetwork and Apple Search Ads Attribution API compare, see Appendix J.

[583] Since the ATT roll-out and in the space of a few months, multiple versions of SKAdNetwork have been released by Apple with sudden changes implemented between those. This relates in particular to the so-called "privacy thresholds" rule, based on which Apple hides the conversion values when the number of conversions sharing certain characteristics is too low. We understand that Apple does not disclose the rules governing "privacy thresholds" (eg the characteristics it considers or the threshold that must be reached to be able to see conversion values) to other market participants and these appeared to have suddenly changed, creating data losses and uncertainty for advertisers. For further detail on this, see Appendix J.

[584] Apple's Eddy Cue Is Shaking up Its Services Business (businessinsider.com).

[585] Apple Search Ads Conversion Price Skyrockets In Q4 2021 03/31/2022 (mediapost.com).

that other media reports also suggest that ATT has had a significant positive impact on Apple's advertising business globally.[586]

6.208 Furthermore, we also note that, despite Apple's advertising business being currently relatively small compared to other Apple's revenue streams and, according to Apple, 'a very limited part of its overall business' it appears to be expanding and the revenue they are earning from it is sizeable and growing very fast. In particular:

- In May 2021, ASA introduced a second non-search advertising placement in addition to the search result one, which appears under the 'Suggested' section of the App Store Search tab.[587]
- In June 2021, Apple expanded ASA to China.
- Financial data submitted by Apple shows that Apple's advertising revenues in the UK more than tripled between 2018 and 2021.[588]
- Analysts' estimates suggest that Apple's advertising business could reach $20 billion in revenue by 2025.[589]
- Media reports suggest that Apple is considering restructuring its services business to redirect more attention to advertising and refer to an analysis estimating its global ad business grew by 238% to $3.7 billion in 2021 when compared to 2020 and will earn $5.5 billion in ads alone this year.[590]

6.209 Documents submitted by Apple show that there was some internal disagreement between Apple's staff on the extent to which Apple should expand its advertising offering. They also show that at a similar time to when Apple was considering introducing the ATT framework, it was also considering expanding its advertising services to third parties. In particular, Apple's plan for the fiscal year 2021 includes several expansion proposals for its advertising services, including [✂]. Further, as detailed in Appendix J, Apple's

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[586] According to estimates by the mobile measurement company Branch, Apple's Search Ads were responsible for 58% of all iPhone app downloads that result from clicking on an advert in late 2021, up from 17% a year earlier. This more than threefold increase in Apple's share of app install advertising came at the expenses of rivals and particularly Facebook and Snapchat. See Apple's privacy changes create windfall for its own advertising business | Financial Times (ft.com).
[587] Differently from the traditional ASA which are served in response to a user's query, this new category of ads appears on the App Store Search Tab, prior to the user executing a search query.
[588] Further, Apple told us that, as of February 2022, the forecast for FY2022 ASA revenue is £[3-3.5] billion worldwide and £[200-250] million for UK while the forecast for Apple News & Stocks ads is £[50-100] million for worldwide and £[0-10] million for UK.
[589] See This could be Apple's next $20 billion business. We understand that this estimate excludes the payments Apple gets from Google for setting Google Search as default search engine, including on Apple's browser Safari, which was reported to amount to up to $12bn by the Department of Justice. See Justice Department Sues Monopolist Google For Violating Antitrust Laws | OPA | Department of Justice.
[590] Eddy Cue reportedly has bigger plans for Apple's billion-dollar streaming and ads business - The Verge.

plan for the fiscal year 2022 includes forecasts outlining a strong growth path with projected ad revenue reaching £[5-6] billion globally in 2026 and plans for further product development and optimisation.

6.210 In summary, based on the evidence we have seen, we consider that ATT has given Apple's advertising services a competitive advantage over rival app install advertising services, and that this has likely contributed to Apple's advertising revenues being higher than they would otherwise have been.

Competitive effects in app distribution

6.211 In this section we explore potential wider competitive effects as a result of ATT, including around concerns that Apple might be using ATT to reinforce its market power in app distribution and that ATT may cause developers to change their business models by shifting to monetisation models where Apple charges a commission.

- *ATT might reinforce Apple's market power in app distribution*

6.212 One impact of ATT may be that by undermining the value of app install advertising to app developers seeking to attract new users to their apps, Apple may be further strengthening the App Store's role as a distribution channel and source of discoverability for apps, and therefore increase developers' reliance on it as a means for acquiring users.

6.213 Although a majority of app downloads on iOS comes from App Store search results, downloads from app referrals (where a user arrives at the App Store page of an app by clicking a link in another app) appear to be a significant source of discoverability, accounting for approximately [20-30]% of downloads.[591]

6.214 While using app install advertising does not allow developers to bypass the App Store, it does make the App Store less important for app discovery.[592] As discussed above in the section on app discovery through the App Store, Apple has the ability through its design of choice architecture in the App Store to influence which apps are successful. However, if developers can find users

[591] While these figures are indicative of the scale of app install advertising, they may also include other (non-advertising) cases where apps included a link to an App Store page. For example, a developer may include links in one app to its other apps' App Store pages, or a user of a social media app might post a link to an app on the App Store. Conversely, some downloads that directly resulted from navigational searches may be linked to app install advertising, as users may view or click an app install ad without immediately downloading the app but return to the App Store later and search for the app to download it.
[592] It has been suggested that Apple's role as discovery channel for apps has been weakened by app install advertising and that the App Store has become a "frictional, annoying moment between clicking an ad and installing an app." See An Interview with Eric Seufert about Apple, Facebook, and Mobile Advertising – Stratechery by Ben Thompson.

outside the App Store, that ability is diminished. Therefore, by undermining alternative discovery channels through ATT, Apple strengthens its market power in app distribution.

6.215 Consistent with this and as set out in the section on the impact on developers above, evidence from app developers we have seen supports the view that app install advertising has been undermined as a result of ATT.[593]

- *ATT might cause a shift in the way that app developers monetise apps*

6.216 As described above, ATT reduces the revenues that developers can earn from in-app advertising. This means that the ad-funded business model for apps will likely generate less revenue for app developers compared to pre-ATT. As a result, developers might turn to alternative ways to monetise apps, charging users for content instead of providing it for free. Given that Apple charges a 30% commission on most in-app purchases of digital content through IAP, Apple has an incentive to encourage such a shift by developers.

6.217 Media reports suggest that app developers are already implementing changes in their monetisation model as a result of ATT, with some ad-funded games introducing in-app purchases.[594] Moreover, a recent academic paper found that ATT is accelerating the industry trend towards increased reliance on in-app payments by developers and reversing the preceding negative trend for the presence of paid apps, which are now increasing.[595]

6.218 As mentioned above, some developers told us that they might change their monetisation strategy as a result of ATT and we have heard concerns from developers operating in the publishing industry over the impact of ATT on the viability of the ad-funded business model.[596] However, most of the developers we have heard from are still considering what (if any) changes they will implement. While we have not seen a considerable shift in the way that app developers monetise their apps at this stage, we note that this is a change which may materialise in the longer term.

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[593] As discussed further in Appendix J, we do not agree with Apple's argument that the fact that total downloads in the App Store have not decreased since the implementation of ATT implies that ATT has not impacted discoverability for developers.
[594] Apple's IDFA changes are already changing game design and monetization | VentureBeat.
[595] The paper is based on web-scraped data on over 580,000 apps and uses Google Play Store as a control group. Although the impact it shows is small on average, which the paper notes may also be due to circumventions of the ATT policy, it is more prevalent for apps only present on the App Store as well as for apps that employ user tracking. See The Impact of Apple's App Tracking Transparency on App Monetization.
[596] See DMG Media's response to our Interim Report.

Conclusions

6.219 We consider that more competitive markets will deliver the outcomes that consumers care about most, which increasingly include enhanced privacy and greater control over personal data. We recognise that ATT is a positive step towards delivering these outcomes. However, **we are concerned that Apple's current implementation of ATT is likely to result in harm to competition, make it harder for app developers to find customers and to monetise their apps, and ultimately harm consumers** by increasing the prices or reducing the quality and variety of apps available to them. As discussed in Chapter 8, we consider that there are a number of ways in which the potential competition harms of ATT could be mitigated while retaining the benefits in terms of user choice and privacy. **We will continue to engage with the ICO and Apple on the implications of Apple's ATT changes, as well as any other market developments that have implications for the processing of personal data.**

Apple's restrictions on cloud gaming services

6.220 The following section examines how Apple has used its control over app distribution on iOS to block the emergence of cloud gaming apps on its App Store. We examine the impact of its actions on cloud gaming users and providers as well as whether Apple's motivation to obstruct these services was influenced by its incentive to protect its: (i) position in app distribution via the App Store; or (ii) revenue from mobile device hardware. More detail of our assessment is set out in Appendix I.

6.221 Microsoft, NVIDIA, Meta, Google, and Amazon are some of the main providers of cloud gaming services. Apple's restrictions on cloud gaming have blocked these providers from offering cloud gaming via native apps on the App Store (whereas these are allowed on Google's Play Store).[597] We have sought evidence from these providers, other cloud gaming service providers, and digital store operators to understand the issues faced in delivering cloud gaming to the App Store.

6.222 Cloud gaming services provide mobile device users access to high-quality games which would otherwise only be available on other platforms (eg on consoles or computers). They achieve this by using the processing power of the cloud, instead of the user's device, to run games. Previously, consumers of mobile gaming were restricted in the range and type of games which they could play by their device's processing and storage capabilities. Although they

[597] Their respective apps are named Xbox Game Pass Ultimate, NVIDIA GeForce Now, Facebook Gaming, Google Stadia, and Amazon Luna.

are currently in a nascent stage of development, cloud gaming services remove that restriction and consequently have the potential to reduce the importance of the hardware capabilities of mobile devices for mobile gaming.

6.223 Cloud gaming service providers were very positive about the prospects of cloud gaming technology in the gaming industry and believed that it could provide benefits to consumers and developers, as well as increasing the level of competition between operating systems. For instance, it may allow consumers to discover and try different games on any of their devices and removes the need to download and update each game or purchase and upgrade expensive hardware.

6.224 To understand the current popularity of these services, we collected data on the number of monthly active users from cloud gaming providers. In January 2022, across the providers who we contacted, there were a total of around 800,000 monthly active users in the UK and over 10 million worldwide. Indeed, Microsoft alone says that its service has now streamed games to over 10 million people.[598]

6.225 Further, the cloud gaming industry has been experiencing rapid growth. For instance, a report in 2020 submitted by Apple estimated that cloud gaming revenue would experience a CAGR of c.65% between 2019 and 2024, representing an absolute growth of around $8 billion over that period. Another report in 2019 also submitted by Apple estimated that potential users of cloud gaming services would grow to around 125 million by this year.[599] As detailed below, this is consistent with the user data we have gathered on Android, but not so for iOS, which has seen relatively slow growth until now.

Apple has obstructed the development of cloud gaming services on iOS

6.226 Apple's App Store Review Guidelines include various policies which restrict how cloud gaming apps can function as native apps from the App Store. Although game streaming is currently allowed in principle,[600] Apple's exception for streaming games includes caveats which prevent cloud gaming apps from being feasible to develop for the App Store in practice.

6.227 Under these Guidelines, an app which offers access to a catalogue of games is not permitted on the App Store. Each game must be individually submitted to the App Store such that it can be approved by Apple, has a product page, appears in charts and search, has user ratings and review, and can be

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[598] Microsoft says more than 10 million people have streamed games on Xbox Cloud Gaming - The Verge
[599] Appendix I sets out further evidence we have gathered on the size and rate of growth of the cloud gaming industry.
[600] After Apple introduced an exception for streaming games in September 2020.

managed with parental controls. This means that each game must be individually downloaded to the user's device, such that multiple games cannot be streamed from one app. Cloud gaming service providers may only create a catalogue app insofar that it links to the individual App Store product pages for each game.[601]

6.228 All cloud gaming service providers we heard from had negative views on the effects these guidelines have upon the feasibility of delivering cloud gaming apps on the App Store, with one noting that downloading each game contradicted the unique selling point of game streaming as users would lose the ability to try out and move between games quickly. Some providers also pointed to technical barriers faced by both developers and cloud gaming service providers due to the need to build and maintain many separate iOS apps.

6.229 Further, [one cloud gaming service provider] submitted to Apple that its App Store policies presented significant challenges to cloud gaming services accessing the App Store. This provider submitted to Apple that its policies would:

- Result in a poor user experience:[✂].
- Present challenges for game developers:[✂].
- Present operational and business challenges to streaming platforms themselves: [✂].

6.230 Apple's internal documents demonstrate [some awareness that its policies would result in a deteriorated user experience of cloud gaming services]. [✂]

6.231 A range of other policies used to block or obstruct cloud gaming on the App Store to a lesser degree were also raised by cloud gaming service providers. These are examined further in Appendix I.

Direct impact on providers and consumers

6.232 Apple's restrictions appear to have pushed cloud gaming service providers to offer their services through web apps on iOS rather than as native apps on the App Store. By contrast, most of these providers have developed native apps for Android.

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[601] App Store Review Guidelines - Apple Developer 4.9.

6.233 While we were told there are some benefits to using web apps, such as being less costly to develop and users not having to download an app, evidence from cloud gaming service providers highlighted two areas of concern:

- First, providers may struggle to acquire and retain users, and users may be unaware of the choices available to them or find it difficult to access a provider's services since web apps are not currently discoverable on, or distributed by, the App Store, which is how users are accustomed to discovering apps. Additionally, as discussed in Chapter 5, unlike native apps, web apps on iOS are not automatically added to the user's home screen to aid future engagement with the app, nor are they able to send push notifications to re-engage previous users.

- Second, providers are forced to offer a lower-quality service, and users suffer from a deteriorated gaming experience on Apple devices since web apps (i) cannot offer full-screen mode, (ii) drain battery at a faster rate, (iii) lack support for persistent storage, (iv) are not able to use Bluetooth to connect game controllers, and (v) cannot access mouse movement data. A key reason for this is due to Apple's restriction that browsers on iOS must use Apple's WebKit browser engine. As discussed in Chapter 5, WebKit lags behind other browser engines in functionality, in particular with respect to support for web apps.

6.234 These views are consistent with evidence from user data submitted by cloud gaming providers. Data on monthly active users from the cloud gaming providers we contacted show that the adoption of cloud gaming services on iOS has been far slower than on Android, and even when consumers have a choice between web apps and native apps, they appear to opt for native apps. In January 2022:

- There were around 10 times as many monthly active users of cloud gaming services on Android phones than on iOS worldwide. In the UK there were around 7 times as many.

- Both worldwide and in the UK, where users had a choice between a provider's native or web app on Android around 99% of users used the native app, with 1% using either the web app or a combination of the web and native app.

6.235 Moreover, as shown in Figure 6.5 below, the rate of growth of the user base of cloud gaming services has been faster on Android than on iOS, even though both were in similar positions less than two years ago in July 2020.[602]

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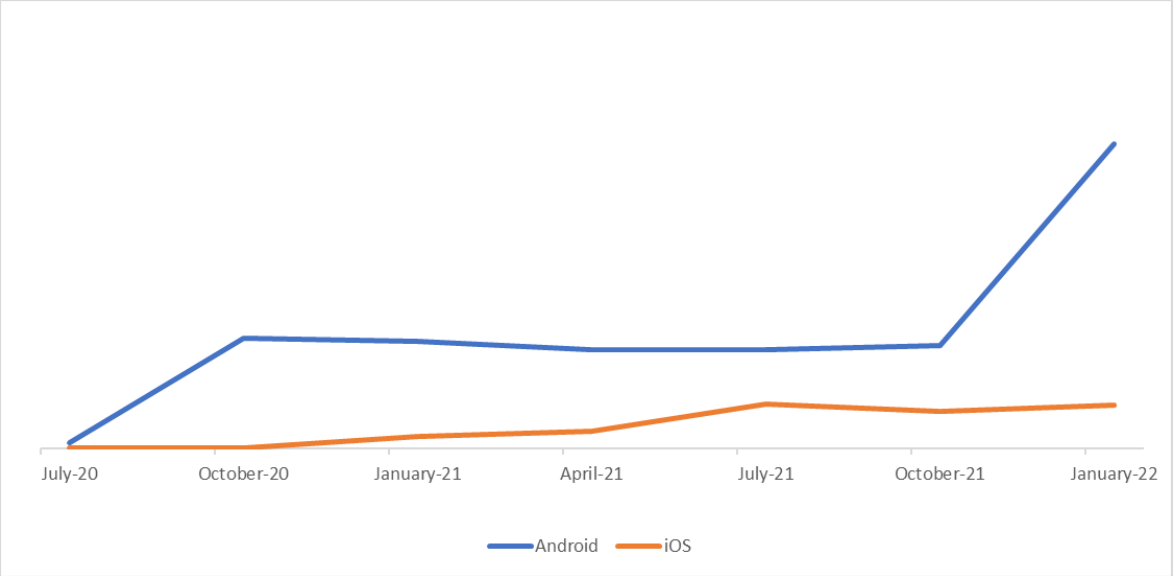
[602] The worldwide figures show a similar trend and can be found in Appendix I.

The upwards shift in the trend of Android users from October 2021 onwards is partly due to the beta and full releases of a provider's services.

Figure 6.5: Monthly active users of cloud gaming services on Android and iOS in the UK since July 2020.



Source: CMA analysis of user data from cloud gaming providers.

Potential harm to competition

6.236 We have considered Apple's incentives for imposing restrictions on cloud gaming services; in terms of:

- protecting Apple's control over how apps can be discovered and accessed on iOS devices; and
- protecting the importance of Apple's hardware.

6.237 We also considered whether giving Apple's own gaming service, Apple Arcade, a competitive advantage over competing services could have motivated Apple to restrict cloud gaming. Overall, based on the evidence seen to date, this appears to be less important to Apple's incentives to restrict cloud gaming on the App Store. Our assessment of Apple's incentives relating to Apple Arcade is set out in Appendix I.

Effects of Apple's restrictions upon its position in app distribution on iOS

6.238 Apps which contain a catalogue of games such as cloud gaming services act as a distribution mechanism, which over time may reduce the reliance of iOS users on the App Store for the discovery of and access to games. Additionally, game distribution apps which can also be accessed on other platforms can further reduce the reliance of iOS users upon the App Store as

users may not discover or pay for the initial subscription service on the App Store at all.

6.239 Some cloud gaming service providers submitted that cloud gaming services and gaming platforms overall can undermine the App Store as a channel for accessing or discovering games.

6.240 Apple earned a net revenue around £[400-600] million from digital content App Store billings in the UK in calendar year 2021, representing roughly [0-5]% of its total net revenue generated (excluding any advertising revenue). Gaming apps are a particularly key source of revenue from Apple, representing over half of Apple IAP revenues in the UK.[603]

6.241 Some cloud gaming service providers submitted that they view Apple's incentive to protect its position in app distribution, particularly with respect to the lucrative gaming market, as one of the reasons why it has restricted the emergence of cloud gaming services on its App Store. One commented that by foreclosing game subscription services, Apple prevents others from challenging Apple's position in game distribution and circumventing its lucrative gatekeeping role.

6.242 Apple's internal documents also show that they are aware of the threat which store-like services such as those provided by cloud gaming developers could pose to the position of the App Store. One internal document we received from Apple discussing issues around Microsoft's cloud gaming service said 'It is about literally everything it means to be an App Store - agreements with developers, app review, age ratings, product pages, ratings and reviews, search (the #1 source of app discovery), charts, top lists, editorial, etc - none of this works if the games are not submitted and on our store just like all other apps.'

6.243 We are mindful of the point that by prompting cloud gaming service providers to offer their services via web apps instead of native apps, Apple may have provided an additional incentive for these developers to invest in web apps, and have set out detail on this point in Appendix I.

6.244 Overall, our view is that if users were to begin to turn to cloud gaming services to find new games rather than the App Store, this could pose a significant threat to an important revenue stream for Apple. Given the limitations of web

[603] We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.

apps on iOS as discussed in Chapter 5, the potential threat from cloud gaming services through web apps seems likely to be much more limited.

6.245 The impact of the development of streaming services on music distribution may be an instructive example for the possible impact of cloud gaming on app (and specifically game) distribution. In 2010, revenues from music downloads outstripped music streaming revenues by a ratio of almost 10:1, but by 2020 this had reversed.[604] Apple, which had made a significant majority of music download sales through its iTunes store, has by contrast only a 16% share in music streaming through Apple Music.[605] If Apple expected cloud gaming services to have a similar impact on game distribution, this would likely provide a strong incentive to obstruct the emergence of such services.

Effects of Apple's restrictions upon its hardware revenues

6.246 We examine below how the emergence of cloud gaming services on the App Store may reduce the revenue that Apple generates via device sales by:

- reducing the importance of premium hardware on Apple iPhones for users' experience of gaming apps; and
- reducing switching costs between devices by offering platform-agnostic services.

6.247 Cloud gaming service providers considered that cloud gaming services on iOS may have the ability to reduce switching costs between devices by providing platform-agnostic services and reducing the reliance of consumers upon Apple iPhone hardware, with one noting that the opportunity cost of switching devices is lessened if users are no longer limited to games written only for their chosen device's OS.

6.248 Apple earned a net revenue of around £[5.5-6] billion from iPhone device sales in calendar year 2021, representing roughly [50-60]% of its total net revenue generated in the UK. This increases to around £[6.5-7] billion, and [60-70]% of its net revenue, when factoring in the iPad.[606]

6.249 Apple's internal documents show that supporting the differentiating hardware factors of the iPhone was a relevant factor whilst discussing whether to allow

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[604] IFPI Global Music Report 2021. In 2010 digital music download revenues were $3.9 billion while music streaming revenues were $0.4 billion. In 2020, digital music download revenues were $1.2 billion while music streaming revenues were $13.4 billion.
[605] NPD estimates gave Apple a 70% share of US digital music downloads in 2010. Statista estimated that Apple Music had a 16% share of music streaming subscribers worldwide in the first quarter of 2021.
[606] We used Bank of England data to convert from US Dollars into Great British Pounds, this was done using the yearly data from XUAAUSS | Bank of England | Database.

Microsoft's cloud gaming service on the App Store. In an internal document (email) in 2020, a senior Apple employee commented that [Apple has a strategic interest in supporting high-quality content that leverages the differentiated capabilities of Apple devices]. In a different context, as revealed in court documents in the *Epic* litigation, Apple's senior Vice President of Software Engineering, Craig Federighi, explained to an Apple employee who suggested that Apple acquire a cloud streaming company that cloud streaming apps would make 'little sense for Apple (given our strength of providing high performance local compute)', and that they would be 'counter to our overall customer value proposition'.[607]

6.250 Some cloud gaming service providers considered that protecting the position of the Apple iPhone, iOS operating system and Apple's hardware revenue from iPhone sales were influencing factors in Apple's decisions around the restrictions on cloud gaming on iOS. One argued that Apple is the only manufacturer of mobile devices that can sell premium phones on a large scale, and that a transition to cloud-based services will reduce the need for high-end devices thereby threatening Apple's hardware business.

6.251 There is an inherent cost to Apple of preventing new and high-quality services such as cloud gaming from gaining access to the App Store, particularly given that they are available on the Google Play Store; users who wish to access cloud gaming may become more likely to switch to an Android device if they cannot access cloud gaming apps on their iOS devices.

6.252 However, we consider that, overall, Apple may believe that the threat posed to its device revenue by cloud gaming services outweighs these costs at present and this provides an incentive to obstruct the emergence of these services. Currently, cloud gaming services are in a nascent stage of development – if, by blocking them from the App Store, Apple can hinder their development more broadly, it would be able to better maintain the current prevailing situation, where users who want to play high-quality games need high-quality devices to do so, and so help protect its market position.

Apple's stated rationale for restrictions on cloud gaming

6.253 Apple has provided various justifications for its App Store policies on cloud gaming. Apple claims that its policies around cloud gaming are justified on the grounds of security and privacy, as well as user experience and expectations. It submitted that the differing treatment of cloud gaming platforms compared to other media streaming platforms can be explained by the distinction

[607] Exhibit PX-0464 in Apple/Epic.

between games and other types of content – such as their interactive nature. We set out the detail of its concerns in Appendix I.

6.254 Our view is that the reasons cited by Apple do not provide a compelling justification for its restrictions on cloud gaming apps.

6.255 First, the privacy and security protections for games distributed through the App Store could be replicated for games within cloud gaming apps. These protections could be implemented through a mixture of Apple applying them to the cloud gaming app as a whole (given that that app would itself be distributed through the App Store) and cloud gaming service providers applying equivalent protections within their apps (a number of which are already in place).[608]

6.256 Second, contrary to Apple's view, user and market research evidence we have received suggests that users expect to be able to instantly access all of the games in a cloud gaming service without needing to find and download additional applications.[609] Further, users' expectations may change over time because of innovation. Before streaming music became common, users may have expected to download individual songs from iTunes – this would not have been a good reason for Apple to prohibit music streaming apps.

6.257 Finally, it is clear from Apple's submissions as well as comments by cloud gaming service providers, that other types of streaming content also demonstrate interactive features. For example, 'creator content' in apps such as Roblox can include a wide catalogue of user-generated games in a single app, while even 'traditional media' streaming platforms can contain interactive content – [one cloud gaming developer] highlighted interactive Netflix content such as 'Black Mirror: Bandersnatch' or 'You vs Wild'.

6.258 Indeed, Apple's treatment of these other types of app provides a model for how it could allow cloud gaming apps on the App Store without compromising users' safety or experience. For example:

- Video streaming apps such as Netflix or Disney+ present age ratings for individual pieces of content within their apps and allow users to set parental controls.

- As noted by Apple, it does not need to review individual pieces of content within 'creator apps' even when they can access data or ask for payment,

[608] For further details on the protections offered by cloud gaming providers, see Appendix I.
[609] For further details on the evidence we have received on user expectations relating to discovering and accessing games, see Appendix I.

because this takes place within the confines of the already-reviewed creator app.

6.259 The fact that Google allows cloud gaming apps to be distributed through the Play Store, without any indication that this has compromised user safety, also indicates that cloud gaming services can be offered in a way that is compatible with privacy and security considerations.

Conclusion

6.260 We have found that Apple's and Google's control over their respective mobile ecosystems allows them to influence competition in downstream app markets throughout the entire process of app development and distribution. Both effectively set the 'rules of the game' for competition between app developers.

6.261 We have identified concerns that Apple's use of this influence in a number of areas may be harmful to competition, either by self-preferencing their own apps or services or by distorting competition between third parties. In general, while Google's similar position of power creates the potential to raise similar issues, we found fewer concerns about Google's practices. In particular:

- Apple and Google can determine the functionality available to apps through control of access to APIs. Apple in particular has reserved access to certain hardware functionality, such as the technology that enables contactless mobile payments, protecting its own services from competition and potentially restricting innovation.

- We found that Apple's app review process can be opaque and its rules appear to be inconsistently applied. The resulting delays and uncertainty can add to development costs and hinder innovation by app developers.

- Apple and Google can influence users' choice of apps through pre-installation, setting certain apps as defaults, and through the design of their app stores. This allows them to favour their own apps and means that they can cause significant disruption to developers' businesses by making changes to app store search algorithms with little explanation or notice.

- Apple and Google have access to a range of commercially sensitive information from app developers. We have heard concerns in particular about Apple's ability to use this information to develop products, enter new markets or gain a competitive advantage against third-party developers.

6.262 We have also considered three particular practices which, as well as influencing competition in app markets, have broader competitive implications, such as by entrenching market power in app distribution and exploiting this market position: Apple's and Google's app store payment systems which include their rules relating to payments for in-app purchases and consumer issues relating to subscriptions, cancellations and refunds, Apple's ATT policy, and Apple's restrictions on cloud gaming.

6.263 Both Apple and Google require certain app developers to use their payment systems, through which they collect a 30% commission on most in-app purchases of digital content. In addition to complaints about commission levels, we have heard concerns that the requirement to use these payment systems may reduce developers' control over pricing and refunds and distort competition between Apple's and Google's own apps (which do not have to pay commission) and third-party apps (which do). We also found that some aspects of the way information is provided to consumers including information about cancellations and the provision of refunds may be misleading or unclear.

6.264 Apple's ATT framework aims to give consumers greater control of their data – creating consumer benefits by enhancing privacy and user control over the way their personal data is used for advertising. We are supportive of market developments that promote greater control and choice for consumers in a way that is competitively neutral. However, we are concerned that Apple may not be applying the same standards to itself as to third parties, and the design and implementation of the ATT prompt to users may be distorting consumer choices. Ultimately this could further entrench the App Store's position as the main way of users discovering apps, advantage Apple's own advertising services and drive app developers to begin charging for previously free, ad-funded apps.

6.265 Apple has blocked the emergence of cloud gaming on iOS (which Google allows on Android). Cloud gaming poses a threat to Apple's position in app distribution since it offers an alternative method of game discovery and distribution. Apple's policy also protects its competitive position in mobile devices and operating systems, as if developed and popularised further cloud gaming services could reduce the importance of high-quality hardware.

7. Harm to consumers from weak competition

Key findings

- With mobile devices playing an increasingly key role in people's lives, it is essential that these markets are working well and in the interests of consumers. While customer satisfaction with smartphones is generally high, our findings suggest that consumers could be getting a better deal, and that many small UK businesses are facing unnecessary costs.
- Weak competition in mobile ecosystems is acting as a brake on innovation across the sector, reducing incentives for Apple, Google, and potential competitors to invest. This harm is by its nature difficult to identify or measure.
- We have also found specific examples of potentially disruptive innovations (such as cloud gaming) being held back by the restrictions imposed by Apple, as well as hearing other concerns about practices that could reduce incentives to invest in improving products and developing new ones.
- In combination, our findings on Apple's and Google's market power and financial performance indicate that there is room for greater and more effective competition. In the case of Apple's mobile devices, both firms' app stores, and Google's search advertising services, the prices charged are all above a competitive rate.
- Our illustrative analysis suggests that between them, Apple and Google were able to earn more than £4 billion of profits in the 2021 from their mobile businesses in the UK over and above what was required to sufficiently reward investors with a fair return. This suggests that there is significant scope for competition to lower prices and drive greater innovation through increased investment – with huge implications for UK consumers.
- There are also several areas within mobile ecosystems where user experiences are degraded as a result of weak competition. For example, we have heard numerous concerns about how Apple's WebKit restriction limits the potential quality of all browsers and availability of new features.
- Apple and Google each play an important and valued role as stewards of their respective ecosystems, helping to protect their user's privacy, security, and safety online. The evidence we have gathered suggests that carefully designed interventions to promote competition need not undermine (and in some cases may strengthen) these benefits.
- Weak competition in mobile ecosystems is also harming business users of the platforms, such as those providing online content through a native app or the open web, through unnecessary costs and uncertainty. Many of these costs will be passed on to consumers, whether through higher prices or because innovative new services or features may be abandoned. Addressing these issues would help to make the UK a more attractive place to set up and invest in a tech start-up.

Introduction

7.1 We have significant concerns that both Apple and Google are not facing effective competition to or within their respective mobile ecosystems. This is causing harm to consumers and businesses in the UK, as well as potentially to the economy and society more broadly. These harms are important, even if not always immediately obvious to consumers.

7.2 Competitive dynamics in mobile ecosystems are complex and interconnected, with links to many other parts of the economy that are increasingly involving some form of activity online. This means that the way mobile ecosystems function can have wide ranging ripple effects, now and over the longer term. We have examined these impacts in this chapter.

7.3 We start by highlighting some of the ways in which Apple's and Google's stewardship of their respective ecosystems has delivered benefits for their users. We then examine the different ways in which greater competition to Apple and Google could affect consumers and their business users in the following four areas:

- innovation;
- user experience;
- prices; and
- privacy, security, and online safety.

Benefits from Apple's and Google's ecosystem stewardship

7.4 It is important to recognise the valuable role that mobile devices play in people's lives, and that, generally, reported consumer satisfaction levels are high. This is in part due to substantial investment by Apple and Google and other device manufacturers over the years in bringing forward new features and updates to their products and services. This, in turn, has been enhanced by the wide range of innovative and complementary products and services from the large number of third parties within Apple's and Google's mobile ecosystems.

7.5 It is the very fact that mobile devices play such a key role across so many aspects of our lives, and that consumers are willing to pay significant sums of money to purchase them, that demonstrates why it is so important that these markets are working well and in the interests of consumers. For instance, smartphones are the most commonly used device for going online (used by

85% of internet users),[610] and more than a quarter of UK adult internet users do not have access to a desktop or laptop computer – this rises to 42% for those on lower incomes.[611] In addition, the total value of smartphones and tablets shipped to the UK in 2021 was £13.4 billion, equivalent to almost £500 per household.[612] While high satisfaction levels are a useful indicator of consumer experiences, we are also mindful that many of the potential harms from weak competition in technology markets may not be visible to consumers, particularly where they relate to missing out on new products and services that never make it to market, or where they are imposed more directly on business users.

7.6 We are equally mindful of the potential unintended consequences that could come from intervening in digital markets, which have been drawn to our attention through the course of this market study into mobile ecosystems. We recognise that mobile ecosystems deliver and contribute to many positive outcomes across various public policy areas. There are, for instance, numerous benefits for consumers and businesses alike that come from the investment by Apple and Google into their products and services, and from the ongoing stewardship roles that they play within their respective ecosystems.

7.7 From a user perspective, this stewardship can mean protection from bad actors online for example through a combination of security-enhancing technology and human-led app review processes. It can also facilitate the introduction of positive developments that enhance user privacy and control of their personal data when interacting with their services and those of third parties within their ecosystems. This helps to build consumer confidence and trust, which is vital for small start-ups and unknown brands looking to get a foothold in a market.

7.8 Users also stand to benefit from the ways in which ecosystem stewardship supports business users more directly. For example, by providing and maintaining app stores with relatively low costs of entry for the majority of developers, Apple and Google enable new businesses to come forward that otherwise may not be viable. We have also heard from some stakeholders

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[610] Online Nation 2021 report.
[611] Ibid. See Figure 1.14.
[612] Value of mobile devices shipped to the UK based on CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA". Number of households (27.8 million) taken from Families and households in the UK - Office for National Statistics. We note that the resulting figure of £482 will be an upper bound for household spend as it includes devices sold to businesses. That said, we expect such costs would be passed, at least in part, to consumers.

that having the two stable, secure, and trusted platforms help to create the conditions that are needed to encourage wider investment.

7.9 While ecosystem stewardship is essential, there are clear risks that this rule-setting and oversight role oversteps the mark. Where private companies such as Apple and Google adopt a quasi-regulatory role, for example in relation to data protection law, there are risks that these companies face conflicts of interests, as their own profit-driven incentives may not always be fully aligned with those of their users.

7.10 The harms that we can expect and are able to observe from weak competition in mobile ecosystems mean that there is scope for substantial benefits from interventions that either protect users or promote greater competition. Yet the importance of ecosystem stewardship highlights that if such interventions were poorly designed, then this could lead to a range of unintended consequences, such as in relation to privacy, security or safety online. This has guided the balanced and holistic approach we have taken to this market study, and our evidence-based approach to assessing potential interventions and their full range of possible impacts set out in Chapter 8.

Innovation

7.11 Innovation in digital markets is key to unlocking new products and services that can radically transform and enhance the way we live our lives. There are numerous examples since the turn of the century of companies using emerging digital technology to improve upon or disrupt an established business model by offering a cheaper, more advanced, or more convenient alternative.

7.12 Apple's iPhone, first released in 2007, and Google's search engine, launched in 1998, are good illustrations of the transformative innovation we have seen, as they have since inspired and evolved into each firms' mobile ecosystems that are relied upon globally by billions of people.

7.13 The various devices that have remained popular over this period, such as laptop computers, mobile phones, cameras, watches, speakers, and headphones have also significantly improved over the years, with faster processing, greater storage, sharper screens and sound, and an expanding range of features and functionality.

7.14 Weak competition in a particular digital market does not necessarily mean this kind of innovation will stop entirely. Instead, the most damaging impact of sustained weak competition in key digital markets is the brake that this applies to the pace of innovation and progress over time. This can be hard to

measure, but this market study has highlighted several real-world examples of potentially disruptive new technology and business models being held back. There are likely to be other advancements that have been forgone or delayed which by their nature cannot be easily identified, and we would expect this to continue if Apple's and Google's market power persists unchecked.

7.15 We discuss below some of the ways that more effective competition in mobile ecosystems could unlock greater innovation.

Innovation by Apple and Google

7.16 The range of products and services offered by Apple and Google has expanded over time and clearly continued to improve in quality.

7.17 For example, Apple has told us that it has invested in many enhancements of the hardware and software of its mobile and connected devices in recent years, improving their processing speed, functionality and quality through innovations in chips, haptics and materials such as its Ceramic Shield Glass. Google highlighted software innovations aimed at improving performance, battery, memory, and user experience. Both firms have also pointed to their investments in privacy and security features.

7.18 Some of these new features will have involved incorporating general advancements in technology over this period into their products, and others may have been enabled by the acquisition of other innovative companies. In addition, both Apple and Google have invested heavily in research and development – investing around £16 billion and £23 billion respectively in 2021[613] – and have undoubtedly contributed to broader technological progress. For instance, Apple told us that when it launched the A14 version of its Bionic multi-core system-on-a-chip (SoC) – the processor that powers the iPhone – it 'was very likely the fastest chip on the planet' at the time.

7.19 We are not seeking to diminish the achievements of Apple and Google in this report, nor imply that their products and services are of low quality. However, if each firm were to face stronger and uninhibited competition from each other, or a more plausible threat of being squeezed or replaced by another rival or new entrant, they would each have stronger incentives to invest and innovate in this way.

[613] Apple Inc and Alphabet Inc 2021 10-K reports.

Holding back disruptive innovation

7.20 If companies can improve on an existing service, or offer it more cheaply, it is essential they are not inhibited from bringing such developments to market. However, potentially even more important in the context of digital markets is the opportunity for disruptive innovation to break through.

7.21 We have seen in recent years that some of the biggest leaps have come when digital disruptors have developed a different way of doing things. For example, when Netflix launched its online DVD rental service in the late 1990s – around a decade before launching its streaming service – the high street video rental chain Blockbuster was still growing and several years from its peak. Similarly, rapid and widespread adoption of Apple's iPod in conjunction with the arrival of the iTunes store revolutionised the way that consumers purchased and listened to music. Yet the model of iTunes itself was subsequently disrupted, with Spotify enabling its users to stream individual songs legally, without needing to purchase and download them.

7.22 What is telling about these examples is that the innovations were not solving an obvious problem from a consumer perspective at the time. Consumers were used to renting videos and then DVDs from the local high street store, and to purchasing albums to include in their personal music library (whether that was stored on a shelf or on an iPod). This shows that if innovation is being held back in some way, it may well not be apparent to consumers that they are missing out. As such, reports from consumers of being satisfied are not necessarily evidence that markets are delivering the best possible outcomes.

7.23 In the context of mobile ecosystems, the incentives for digital start-ups to invest and innovate will be dampened if Apple and Google demonstrate an ability and willingness to obstruct the development of disruptive business models that threaten to challenge their position.

7.24 We have identified some circumstances where decisions taken by Apple and implemented through its App Store rules appear to be having the effect of holding up new ways of providing services to consumers online.

7.25 The first of these is progressive web apps, which are web apps that create an experience that is much more comparable to a native app than more conventional web pages would offer. Web apps have the advantage over native apps that a developer only has to develop one app for all operating systems. Thus, web app support can lead to savings for developers which may be passed on to consumers in the form of higher quality apps or lower

prices. Box 7.1 highlights the example of the game Wordle, to illustrate the value that web apps can deliver.

7.26 As discussed in Chapter 5, support for progressive web apps is limited on iOS, which in turn holds back the development and uptake of web apps across all devices. As one web developer responding to our interim report described, web apps are 'strangled' by Apple's approach,[614] yet we have not identified compelling evidence that suggests Apple's restrictions are justified on security grounds.

Box 7.1: Wordle – an example of a popular web app

Wordle is a popular word game that was developed by British software engineer Josh Wardle. The game was built as a free-to-play web app that could be accessed through a browser. After rapidly growing in popularity, the game was purchased by the New York Times in January 2022 and is now hosted on the company's website.

We discussed with Josh his experience of developing the app for the web, and he highlighted two challenges that can be directly attributed to restrictions imposed by Apple:

- **Pinning a web app to the home screen** is not as well-supported on WebKit as on Google's Blink or Mozilla's Gecko browser engines. The limitations of Apple's support for this feature meant that Josh chose not to develop it for any browser.
- **Adding push notifications** to the game would have enabled users to get a daily reminder on their phones (if they wanted it) to play the new game made available each day. This would have aided discovery and usage of the game, as well as enhancing user experience. As Apple does not support push notifications for browsers on its devices, this was not possible.

Wordle is just one example of the potential for creative and popular apps such as games to be developed for the web, demonstrating the potential for web apps to offer an alternative distribution channel to native apps. However, it also serves to highlight the impact of Apple's unnecessary restrictions – while Wordle has been highly successful, we cannot know how many others have failed for this reason.

7.27 Second, Apple effectively prevents cloud gaming services from joining the App Store (as explained in Chapter 6). Cloud gaming services allow users to access games via the cloud, which means that users can access high-powered (eg Xbox or PC) games on their mobile devices. While they are

[614] Response to interim report, Developer – Andy Cowan.

allowed in principle, Apple's provisions make it infeasible for providers to offer a native cloud gaming app to iOS users. Cloud gaming has the potential to provide benefits to consumers such as the ability to try, and move between, games quickly, as well as removing the need to download or update software or buy and upgrade expensive high-spec mobile devices and other devices like consoles. Due to Apple's restrictions, these benefits are not currently being realised by Apple users. Apple justifies its restrictions on the grounds of user safety and privacy, as well as user expectations. However, we do not find these justifications compelling given that Apple allows other similar streaming services onto the App Store without these restrictions, and that cloud gaming services are present on the Google Play Store with no such concerns.

7.28 Third, Apple bans app developers from offering users any form of direct incentives or rewards for opting into certain kinds of sharing and processing of their personal data for the purposes of serving targeted advertising. As we have set out in Chapter 6, such incentives are not in principle prohibited by UK data protection law, so long as consumers that do not consent are not penalised for doing so. While the approach to offering rewards ought to be considered carefully on a case-by-case basis, we consider this alternative business model could lead to mutually beneficial outcomes for developers and their users, as developers could potentially generate higher advertising revenues, while users could have the option of receiving a greater share in the value of their personal data.

Fear of innovations being copied

7.29 Many developers are concerned that Apple and Google have the ability and incentive to exploit their access to commercially sensitive information from their app stores in order to enter and advantage themselves in new markets. This expectation could discourage investment in new products and services that complement the existing ecosystems. For example, as set out in more detail in Chapter 6, we have heard some concerns from app developers that Apple has used their commercially sensitive information to develop competing products. Box 7.2 provides two examples of concerns raised by Masimo and Tile.

7.30 While such practices by either Apple or Google could bring some benefits to consumers in the short term, they would be harmful for competition and innovation in those individual markets over the longer term.

7.31 In addition, regardless of whether or not access to commercially sensitive data is being exploited in practice, a significant chilling effect on innovation and investment in this context can come from an expectation that this might

happen. It is likely that this harmful lack of trust will persist, given that: Apple or Google each have a conflict of interest; both firms provide minimal transparency over how particular information or data is used; and in Apple's case it explicitly states in its terms that Apple has permission to use this information on an 'unrestricted basis'.[615]

Box 7.2: Apple's access to commercially sensitive information – case studies

Tile

Tile makes trackers that allow users to find lost items with the Tile app. It also developed a 'finding network' so that anyone with the Tile app installed and the required permissions given can help other users find lost Tile trackers even when these are outside of Bluetooth range of the owner's device. Apple developed its own finding network in 2019 (initially only for finding Apple devices) and started selling trackers in 2021. Tile told us that:

- Apple had access to a wide range of sensitive information on Tile's products, through the App Store but also from previous partnerships between Apple and Tile, such as a collaboration on a Siri voice assistant integration for Tile.
- Since launching its competing products Apple had, in Tile's view, engaged in self-preferencing, including enforcing a complex and confusing process for users to grant Tile the necessary permissions, as well as the hardware restrictions discussed above.
- Apple offers access to its Find My network to third parties, but only through the MFi agreement which contains restrictive terms which would prevent Tile from competing effectively with Apple.

Masimo

Masimo is a medical device company which offers pulse oximetry monitors that interact with users through smartphone apps, including on iOS. In 2020, Apple began offering similar pulse oximetry functionality in its Apple Watch devices. Masimo told us that:

- Prior to introducing this functionality, Apple had hired several Masimo employees, including Masimo's Chief Medical Officer and a Chief Technology Officer from a Masimo spin-off company after a meeting with Masimo.
- [✂]
- Apple's MFi Agreement [gives Apple the ability to take advantage of innovations made by those companies required to agree to it, such as Masimo].

[615] Apple DPLA, 9.3.

7.32 Furthermore, any perceived threat of having innovations copied or exploited by Apple or Google can be expected to feed directly into assessments made by angel investors and venture capitalists as to the potential risks and reward from investing in new products and services. This kind of investment plays an important role in bringing innovative new ideas to market and it could be being held back by these perceived concerns.

Restrictions on new ideas and features

7.33 In addition to disruptive innovation, there is also a whole range of complementary innovation that could enhance mobile ecosystems.

7.34 As more technology and functionality is added to the hardware and software within a mobile device, it opens up the potential to enhance existing services or create brand new ones. For example, the inclusion of the NFC chip in smartphones enables the device to perform a wide range of additional tasks, including making contactless payments, unlocking doors, presenting a ticket for an event or when travelling, and connecting to devices. Its potential use is significant as demonstrated by the fact than in 2020, 17 million people, or 32% of the UK adult population, were registered for mobile payments and it has been growing very rapidly.[616]

7.35 Developers of apps or connected devices can in principle make use of this kind of hardware through APIs, enabling them to bring forward new services that the device user could access. However, permission for third parties to access features such as the NFC chip is granted at the discretion of the device manufacturer or operating system provider, depending on the circumstances. If access is restricted, as is the case for the NFC chip on Apple devices for making contactless payments, then the potential for new ideas and features to be brought forward by third parties (eg other payment or wallet providers) is reduced, and consumers lose out as a consequence.

7.36 Our assessment of the NFC example in Chapter 6 suggests that the security justifications made by Apple are overstated, and that the extent of the current restriction does not appear to be justified. If Apple's and Google's control over their ecosystems is left unchecked, similar circumstances could occur as further features and technology are added.

7.37 Other issues discussed in Chapter 6, such as the high rate of commission charged to certain app developers and the concerns regarding app review

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[616] UK Finance, UK Payment Markets Summary 2021.

processes, may also serve to hold up or prevent some new apps or services from making it onto the platform. For example, ambiguity in the guidelines for the app review process, inconsistent enforcement, and the delays created by the review process, create the risk that development work on new features for apps could be wasted or significantly delayed. This has the direct effect of preventing consumers from accessing potentially valuable features that are discarded in order to pass the app review process, as well as the indirect effect of deterring development of these features in the first place.

User experience

7.38 As noted above, mobile devices are highly valued by consumers, and in most cases satisfaction levels are high. Our consumer survey, for example, shows that, when asked 'how satisfied are you with your current smartphone', on a 0 to 10 scale, 74% of iOS users and 69% of Android indicate their degree of satisfaction is between 8 and 10.[617] When considering the main manufacturers, we find that satisfaction for Samsung phones is almost identical to satisfaction with iPhones.[618] We also find that, for users that switched smartphone brand, satisfaction is significantly higher with their current smartphone compared to previous smartphone (72% 8-10 for current device compared to 41% for previous device).[619]

7.39 However, as discussed above, this does not mean that all elements of the ecosystem are working as well as they could, and we can expect the quality of users' experiences within their chosen mobile ecosystem to be negatively affected by a lack of competitive constraint on Apple and Google.

7.40 We consider some examples in this section of how this harm can materialise for consumers and business users within mobile ecosystems.

Lower quality products

7.41 We have heard concerns from stakeholders that Apple has been investing less effectively in its browser and browser engine relative to Google and Mozilla for a number of years – this appears to be supported by our analysis set out in Appendix F. We have heard comparisons from some web developers between this situation and Microsoft's Internet Explorer in the mid-

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[617] Accent Report 'Research into consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated April 2022, Figure 11.
[618] On a 0 to 10 scale, 51% of Samsung owners indicated a degree of satisfaction between 9 and 10 and 73%, 8 to 10 – the equivalent figures are 52% and 74% for Apple users. Accent Report 'Research into consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated April 2022, Page 25.
[619] See Accent Report 'Research into consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated April 2022, Figure 14.

2000s, when it lost its majority share in the market to Firefox and Chrome reportedly due to underdevelopment. However, in the case of Safari and WebKit, Apple faces limited threat of users switching for this reason, as all browsers on Apple devices are forced to use the same underlying technology that Apple controls – WebKit.

7.42 This slower pace of development of WebKit results in a worse experience for users accessing content on the web. For example, browsers on Apple devices are unable to:

- add push notifications for web apps;
- utilise features on web apps that require Web-Bluetooth (eg, for making payments or connecting to printers); and
- experience a quality gaming experience through web apps due to the lack of lock-screen rotation, full screen, and other missing features.

7.43 In the case of web push notifications, introduced on Blink in 2015, Apple has recently announced that they will be supported in 2023 with a planned feature update to iOS 16,[620] 8 years later than Blink and well over a decade after being implemented for native apps on iOS. This is despite our understanding that Apple has received numerous requests from web developers over this period to support this feature. The fact that web push notifications are now being implemented after so many years strongly suggests that this was a case of slow development of WebKit by Apple, rather than the feature being inherently problematic on grounds such as security or user privacy.

7.44 The quality of all browsers on Apple devices are limited by this slower pace of development, not just Safari. This issue directly affects more than half of mobile and tablet users in the UK and 30% of users globally yet it is very difficult in practice for users to observe that they are missing out, and if they could there is little they can do other than switching to using an Android device.[621]

Limits on user choice and control

7.45 Consumers can be expected to lose out where they are not able to exercise meaningful and informed choice or control over issues that matter to them. There are a number of elements of Apple's and Google's mobile ecosystems

[620] iOS 16 enables web push notifications with Safari update - 9to5Mac, June 2022.
[621] Mobile & Tablet Operating System Market Share United Kingdom | Statcounter Global Stats

where it appears that user choices are limited, potentially confusing or presented in an unbalanced manner.

7.46 For instance, as discussed in Chapter 5, users can choose between alternative browsers on Apple devices, but in practice the underlying technology that drives performance and determines the key functionality is the same as that of Apple's Safari. This situation – which is not replicated on Android, nor on desktop browsers including Apple's Mac computer – gives users the impression of greater choice than is made available in practice.

7.47 Our assessment of Apple's ATT prompt illustrates how choices are sometimes presented in a way that could steer user decision making or mean that they make decisions on a less informed basis. As discussed in Chapter 6 and Appendix J, while the ATT prompt is a positive step in providing greater control to users over how their data is used for personalised advertising, the choice architecture of the prompt (particularly the language used and the ordering of choice buttons), may influence some users to opt-out of sharing their data with third-party app developers.

7.48 The security warnings that Google displays to Android users considering downloading an app from the web (sideloading) offer a similar example. The evidence we have gathered suggests that some warnings may be appropriate, but the severity of these warnings can be expected to put many users off from proceeding, and are likely to be disproportionate in instances where developers could demonstrate that their apps are safe for users.

Lack of direct customer-supplier relationships

7.49 As discussed in Chapter 6, through their requirements regarding in-app payments, Apple and Google limit the extent to which their users have a direct customer relationship with the provider of certain types of app.

7.50 As Apple and Google act as the direct seller in relation to Apple IAP and Google Play's billing system's transactions, they are responsible for key aspects of the sales process such as processing customer payments, considering refund requests, and subscription cancellations. Some app developers have told us that Apple's in-app purchase rules may make it harder for them to interact directly with their customers and receive valuable data necessary to improve their services. Google Play's payment system may have also have similar effects, especially as more app developers are required to use Google Play Billing exclusively from June 2022.

7.51 Also, in relation to reader apps which have disabled Apple IAP, we have heard concerns from some app developers that Apple's anti-steering rules

have the effect of introducing unnecessary user friction. Users of such apps (eg Netflix and Spotify) may reach a 'dead end' as they are not able to complete transactions inside the iOS app and developers are prohibited from informing them about where they can complete transactions. While we recognise that anti-steering rules may be justified in some circumstances, to the extent that they prevent the circumvention of commission by app developers at the point of purchase, they may be harmful where they restrict developers' communications with customers outside of their apps.

Harms to business users

7.52 It is often the case that when there is weak competition in a two-sided platform market that links businesses with consumers, the most direct harms are observed on the business side of the platform, while consumers may appear at face value to be getting a good deal. We have been told of a number of instances where business users of mobile ecosystems are facing harm directly but have little choice but to accept it. Even where these harms or challenges are absorbed by businesses such as app developers and other online content providers, this can ultimately have negative knock-on effects for consumers.

7.53 In our assessment in Chapter 6, we have identified several examples of concerns raised by app developers regarding each of the different stages of app distribution. For example, we have heard that app review processes can be opaque and uncertain with ambiguous guidelines, inconsistent enforcement, and sometimes lengthy delays in being listed in the stores. In addition to potentially holding back innovative new ideas as discussed above, these challenges introduce costs onto developers that either have to be absorbed or passed on to their customers.

7.54 As mentioned in Chapter 5, concerns surrounding browsers and browser engines on mobile devices appear to have had a negative effect on developers and software engineers. For example, we have heard concerns that new features are delayed or cancelled due to interoperability issues arising from the WebKit restriction.[622] Several have highlighted the additional costs of having to rely on native apps compared to web apps and how this particularly harms small businesses, while others have suggested that working with bugs and glitches that are inherent in WebKit costs them time and money. Ultimately these costs are likely to result in harm to consumers in the form of less choice and lower quality web content.

622 See for example: Jack Peterson's response to the CMA's interim report.

7.55 Submissions from developers, such as those examples highlighted in Box.7.3, suggest these issues can often interrelate.[623]

Box 7.3: Examples of the concerns raised by businesses

- 'From my experience developing medical applications for my employer I can say that we have been forced into making native apps because of the lack of capability of the browsing engines in the past, particularly mobile Safari as continues to be the case…Despite this, in the case of one quarter billion dollar revenue product the native app was eventually abandoned because of the restrictions that both Apple and Google place on monetization within the app and their prohibitively high share of that income.'
- 'More specialised agencies do not have the money and resources to invest in the huge costs of native app development, meaning when a client requires an 'app like' experience we cannot offer it affordably. Were Apple devices to have progressive web app functionality on the level of Windows or Android then we could use web apps where possible to provide these services. The lack of many of these features costs us business and limits the scope of the market we can offer.'
- 'I am a UK resident who performs two roles as a Technical Lead of a large technology consultancy and as a CTO of a start-up....In both roles, Apple's monopolistic and anti-competitive approach to their platform fundamentally harms the businesses I work for and the clients I serve.'
- 'Safari being the only browser option killed my startup…I was building a web app, because building the same app, three times, concurrently doesn't make sense for an early startup. I knew it'd be an uphill battle, but apple was insufferable.'
- 'As a developer, Apple's treatment of the web on iPhones and iPads costs my business extra manhours, and effectively forces me into Apple's pay-to-play ecosystem. My apps could largely exist exclusively on the Web if Apple wasn't putting its thumb on the scale.'

7.56 We also have concerns that in some instances, Apple and Google may implement changes to their ecosystems that, while having benefits to their users in terms of increased privacy, are also implemented in a way that provides them with a competitive advantage in respect of digital advertising. This was a key part of the CMA's concerns regarding Google's Privacy Sandbox proposals prior to accepting legally binding commitments and is something we have highlighted in this report in relation to Apple's ATT framework. In circumstances where large digital platforms – with substantial access to 'first-party' data – are given an advantage, other businesses that

[623] See Mobile Ecosystems case page for published consultation responses.

rely on advertising revenues such as online newspapers are likely to suffer. As the CMA explained in its market study into online platforms and digital advertising, this can be expected to lead to adverse effects on the sustainability of quality journalism in the UK, with detrimental effects on the functioning of our democracy and the accountability of those in positions of power, at both a regional and national level.

7.57 The UK government is committed to making the UK one of the most attractive places in the world to start and grow a digital business.[624] The evidence we have found in this study – such as through our interaction with a large number of independent web developers – illustrates that more can be done to ensure that these businesses can flourish.

Prices

7.58 In markets with weak competition, we can expect to observe higher prices for a given product than we would if competition was fierce. The evidence we have gathered suggests that in the case of Apple and Google, this theory is borne out in practice.

7.59 The evidence demonstrates that in the areas where Apple and Google generate the vast majority of their revenues from their mobile ecosystems, there is room for greater and more effective price competition. In the case of Apple's mobile devices, both firms' app stores, and Google's search advertising services, the evidence strongly suggests the prices charged are above a competitive rate – although in each case the 'competitive rate' would be challenging to define precisely. Consumers would get a better deal if Apple and Google faced more robust competition, either from each other or from third parties.

7.60 We recognise that the revenue earned in these areas cross-subsidises the provision of other valued services for free to consumers, including the app stores, browsers and their underlying engines, and many other useful apps that may be taken for granted. However, even where the costs of providing these other services are taken into account, the profits earned by Apple and Google are still notably high. For instance, when we look at the businesses of Apple and Google as a whole, we see that the operating margin for both firms is above 30%.

7.61 The findings of our analysis of Apple's and Google's financial performance – as presented in Appendix C – illustrate that both companies have consistently

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[624] DCMS, Our 10 Tech Priorities.

been highly profitable for well over a decade, and the core source of these profits has remained the same. While we might expect some of the profitability of these firms' core services to be competed away over time, we have actually observed (with increases in revenue for Apple and Google in the UK of around [10-20]% and [30-40]% respectively in 2020-2021 alone) while profit margins have remained consistently high.[625]

Apple device prices

7.62 We have concluded that Apple is not facing effective price competition in relation to its mobile devices, and in particular the iPhone. As a result, we consider that Apple is able to charge higher prices than it otherwise would if it faced more effective constraints from rivals.

7.63 This conclusion is supported by the following findings:

- We have found that Apple has market power in its supply of mobile devices and operating systems. This finding is in part based on material perceived barriers to switching, which can have the effect of locking consumers into its mobile ecosystem.
- While there are a relatively large number of smartphone manufacturers, Apple achieved a 75% share of the overall value of new smartphones that were shipped in 2021.[626]
- The majority of Apple smartphones are sold at much higher prices than the majority of Android smartphones. All of Apple's iPhones were sold for more than £300 in 2021 – in this segment of the market 77% of smartphone sales were iPhones. In contrast, 65% of Android phones were sold at £300 or less in 2021 – there were no iPhones sold in this price bracket.[627]
- The gross margins that Apple earns for its devices are persistently high, at over 40% in 2021.
- Apple makes substantial revenues and profits from device sales, which have been growing for over a decade. Even when taking our most

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[625] The increase in revenue has been calculated using only a subset of Google's revenue categories, ie Play Store (advertising and non-advertising), in-app advertising, display advertising, search advertising, YouTube (advertising and non-advertising), operating systems, Google maps, Gmail, and browsers. This does not cover all Google Services revenue, as reported in Google's 10K. Google notes that in compiling this data, several finance and engineering data systems had to be used which are not ordinarily used for financial reporting purposes. The revenue data does not include accounting adjustments (such as exchange rate impacts and discounts), is not US GAAP compliant, and may differ from publicly reported revenue.
[626] CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA".
[627] CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA".

cautious set of assumptions, our analysis suggests that Apple's return on capital employed for devices was above 80% in 2021 – this is above any normal benchmark for return on capital.

7.64 In combination, these findings provide a compelling case that consumers are paying more for iPhones and other Apple devices than they would if Apple faced stronger competitive threats.

In-app purchase commission

7.65 We have concluded that both Apple and Google have market power in the distribution of native apps in their respective ecosystems, and that they are not effectively constrained in the rate of commission they are able to charge app developers (see Chapter 4).

7.66 This conclusion is supported by the following combination of findings:

- Apple's App Store and Google's Play Store face a limited constraint from each other, or from within their respective ecosystems.
- In circumstances where either firm charges a commission to app developers, this is generally up to 30%. As outlined in Chapter 4, despite announcements regarding widely applicable discounts to their rates in various circumstances,[628] Apple's and Google's average effective rates of commission remain at [25-30]% and [25-30]% respectively.
- We observe a wider range of commission rates below 30% in PC games distribution where users have access to multiple stores and have the option to download directly from the game developers' website. We also note some players have reacted to entry by lowering commission rates.
- Contrary to expectations for a competitive market, we have not seen evidence to date to indicate that the commission rates are set based on the costs associated with operating app stores. This is consistent with an internal Google document from 2019 which stated that the '[✂]'.
- In 2021, Apple generated £[400-600] million from the App Store (up 25% from the year before), while Google earned £[200-400] million from the Play Store. As highlighted in Appendix C, app store revenues for both firms have shown strong growth.

[628] For example, Apple announced its App Store Small Business Program in November 2020, and Google announced it was announced it was decreasing its service fee on subscriptions to 15% for all developers in October 2021.

- Gross margins for each firm's app stores have been notably high in recent years, at [75-100]% for Apple on average between 2018 and 2021[629] [50-75]% for Google in 2021. While there is some debate about the appropriateness of estimating profitability of the individual app stores on a standalone basis, we find the scale and persistence of margins to be a useful indicator of profitability.

7.67 Our analysis suggests there is scope for downward pressure on app store commission rates while maintaining healthy profit margins. For instance, even if, hypothetically, Apple and Google were to apply their discounted rate of 15% to all relevant payments, their app stores would continue to be profitable.

7.68 Consumers might benefit in a range of ways if the level of commission was lower. While some of the savings might be retained by app developers as additional profit, we would expect a material proportion of the savings to either be re-invested, passed through as a saving to consumers in the form of lower prices, or enable an expansion in the range of available apps. Given the growth we have observed in Apple's and Google's revenues in this area, we can expect the value of these potential savings to grow over time.

Google search

7.69 Search advertising is the primary source of Google's revenue on mobile and all other devices. In 2021, it generated [more than £8 billion] in revenue from search advertising in the UK, with growth of around [30-40%] from the year before. With an operating margin of [50-75]%, Google Search is highly profitable.[630]

7.70 Google is able to achieve above a competitive rate for digital advertising, in particular search advertising, which will be passed through to consumers in the prices of goods and services across the economy. Apple takes a substantial share of this profit in return for Google search being set as the primary default on Safari.[631] In its 2020 market study into online platforms and digital advertising, the CMA found that Google had significant market power in search advertising, and that on a like-for-like basis, its prices for search advertising on mobile were 30-40% higher than those of its closest rival, Bing.

7.71 As outlined in Chapter 2, a primary driver behind Google's investment in mobile services is to direct traffic to its search engine, which helps to protect these revenues. This relationship is mutually reinforcing – Google is able to

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[629] See Appendix C for our detailed analysis of each firms' financial performance.
[630] Throughout this report, we have used Bank of England data to convert from US Dollars into Great British Pounds, using the yearly data from XUAAUSS | Bank of England | Database.
[631] Final report (publishing.service.gov.uk)

use its market power in search and search advertising in order to protect its position in mobile operating systems, in turn allowing it to reinforce its position in search and search advertising. We therefore conclude that the market power that Google holds in respect of its mobile ecosystem contributes to its ability to achieve above a competitive rate for search advertising.

Box 7.4: illustrating the value of consumer harm

- This chapter explains, with examples gathered through this market study, the different ways that consumers could benefit from greater competition in mobile ecosystems. These are uncertain and naturally difficult to measure or quantify. However, one broad indication of the value that could currently be shared to a greater extent with consumers across the economy – whether through lower prices for devices, apps, and other goods and services relying on digital advertising, or through increases in quality, innovation and choice – is the high profits being earned by Apple and Google as a result of their market power.
- As shown by our analysis in Appendix C, Apple and Google are consistently earning profits materially above what is required to reward investors with a fair return. We have demonstrated this by comparing our estimates for their return on capital employed (ROCE) – their actual profitability – with a reasonable benchmark for their weighted average costs of capital (WACC).
- Apple continues to make high profit margins and returns on capital invested in its Devices business, the largest proportion of which relates to the iPhone. This is in addition to large and growing profits from the Services segment of its business, of which the largest amounts relate to mobile (App Store commissions and the search default position on Safari). Analysis using our most cautious set of assumptions suggests that, in the UK, Apple earned at least £2bn more profit in 2021 than the benchmark level of profits required to cover the costs of investment in its business.
- As discussed in our previous study, Google makes profits well above a normal return on the investments it makes in its search advertising business, where it has around 99% market share in mobile search. Search advertising is Google's largest source of profits in its mobile business, though profits from the Play Store (commission and advertising) are growing. We estimate that Google's comparable figure for profits earned above the required level to cover the costs of investment in its business, would also be at least £2bn in the UK in 2021.[632]
- Our analysis therefore suggests that between them, Apple and Google were able to earn at least £4 billion of profits in 2021 from their mobile businesses over and above what was required to sufficiently reward investors with a fair return. These profits would be expected to decrease if the platforms faced greater competition, either through lower prices or through investment in new and better-quality alternatives. This suggests that there is significant scope for competition to drive greater innovation through increased investment, with significant benefits for UK consumers.[633]

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[632] The CMA produced an illustrative figure for Google in its market study into online platforms and digital advertising, and the estimate for mobile search is based on an assumption of following the same methodology.
[633] We would not necessarily expect the market leaders in technology markets such as mobile ecosystems to consistently have a ROCE equal to their WACC, even if faced with more competition or more credible threat of

Privacy, security, and safety online

7.72 Greater competition can generally be expected to result in Apple and Google taking decisions that are more closely aligned with the interests of consumers. However, there are some aspects of the quality of mobile ecosystems that we have heard in some cases might be harmed by greater competition within the market.

7.73 Through the design choices that they make, through their individual practices, and through the rules and restrictions that they place on other market participants, Apple and Google are often in the position of acting in a quasi-regulatory capacity in relation to users' security, privacy, and online safety. In many cases they opt to make decisions on behalf of consumers, with the stated aim of protecting them from bad actors or harmful consequences online.

7.74 However, it is not always clear if these numerous choices are made fully in the interests of consumers in all cases, for example where users' security and privacy are the justification for decisions that also serve to harm competition or limit consumer choice. This was one of the CMA's concerns when it opened its case into Google's Privacy Sandbox Proposals in January 2021.[634] It is also the reason why we have examined in some detail various policies and restrictions implemented by Apple, including its restriction on alternative browser engines on iOS and also in relation to its ATT framework.[635]

7.75 For many of the interventions that we have considered in this market study, in particular those intended to open up markets or give consumers greater choice, we have been warned by certain stakeholders of potential trade-offs between allowing greater competition and choice within mobile ecosystems and upholding consumer security, privacy, and online safety.

7.76 The evidence we have gathered through the course of this study suggests that many of these risks of unintended consequences highlighted to us by Apple in particular are likely to be overstated. In particular, with respect to browsers, the expert advice we have received suggests Apple's ban on the use of alternative browser engines is not necessary in order to provide secure browsing. In fact, contrary to the justifications we have received from Apple, we have heard that enabling additional browser engines onto Apple devices

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entry. However, we note that this analysis was based on our most cautious set of assumptions, and in practice the value may be an underestimate.

[634] The CMA accepted a revised offer from Google of commitments relating to its proposed removal of third-party cookies from the Chrome browser (known as the Privacy Sandbox proposals).

[635] Released in April 2021, the ATT framework introduced new rules for how app developers can collect and process users' personal data for mobile advertising on iOS. We discuss ATT in more detail in Chapter 6 and Appendix J.

could enhance device security rather than diminishing it, as it would move away from having a single point of failure.

7.77 In relation to privacy, our close cooperation with the ICO gives us confidence that our overlapping objectives regarding competition and data protection in the context of the digital economy are strongly aligned and complementary. We share the view that any areas of perceived tension between competition and data protection can be overcome through careful consideration of the issues on a case-by-case basis, with consistent and appropriate application of competition and data protection law, and through close cooperation between our two organisations.[636]

7.78 There are strong parallels between our cooperation with the ICO over the last few years on the synergies between our remits, and our more recent engagement with Ofcom on the relationship between competition and online safety. In addition to security and privacy, Apple has in some circumstances pointed to online safety as a justification for restrictions that it imposes.

7.79 For example, in the case of its restrictions on cloud gaming services, it has stated that each individual game must be listed separately in the App Store so that the age rating, privacy information, and other product information are displayed separately. Apple has also suggested that it is unable to apply its parental controls to individual cloud-streamed games, such as setting time-limit controls or the requirement for parental approval to access games, which it explains impacts user safety. As with several security-based justifications, we do not find these justifications on online safety grounds to be compelling. We are currently working with Ofcom to develop a joint understanding of the potential relationships between competition and safety online on cases like these, so we can find ways to work together in addressing them once Ofcom takes on its new role as the online safety regulator.[637]

7.80 Although Apple and Google undoubtedly have an important role to play through stewardship of their ecosystems, we have concluded that if interventions to promote greater competition are well thought out and designed carefully, they need not necessarily lead to compromises for users in the form of degraded privacy, security, or safety.

[636] Competition and data protection in digital markets joint statement (publishing.service.gov.uk)
[637] Digital Regulation Cooperation Forum: Plan of work for 2022 to 2023 - GOV.UK (www.gov.uk)

Conclusion

7.81 Weak competition within and between Apple's and Google's mobile ecosystems is harming consumers, and will do to a greater degree in future absent intervention.

7.82 Most importantly, we are concerned that consumers will miss out on innovative new features or transformative new products and services that are held back or discouraged by the power that Apple and Google wield over their respective ecosystems. Cloud gaming and web apps are both key examples where restrictions are constraining innovation – impacting the services that consumers can access and businesses offering these services.

7.83 Consumers will also lose out as they face higher prices for mobile devices, in-app purchases and subscriptions, and for other goods and services that rely heavily on search advertising. This matters – the total value of smartphones and tablets shipped to the UK in 2021 was £13.4 billion, equivalent to almost £500 per household.[638] This excludes the spending that is conducted using mobile devices, such as payments made within apps.

7.84 As set out in Box 7.4, our analysis suggests that between them, Apple and Google were able to earn at least £4 billion of profits in 2021 from their mobile businesses over and above what was required to sufficiently reward investors with a fair return. These profits would be expected to decrease if the platforms faced greater competition, either through lower prices or through investment in new and better-quality alternatives. This suggests that there is significant scope for competition to drive greater innovation through increased investment, with significant benefits for UK consumers.

7.85 Consumers may lose out indirectly even in cases where it appears on the surface as though they are getting a good deal. For example, additional costs to companies developing apps or content for the web – including many small UK businesses – will ultimately not be in consumers' interests, as it could mean missing out on valued content or facing higher prices as a result.

7.86 The ability of Apple and Google to protect their users' privacy, security, and safety online is an important element of the quality of their ecosystems. However, this does not give either firm an automatic right to block competition or restrict user choice. Nor does it necessarily mean that well designed

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[638] Value of mobile devices shipped to the UK based on CMA analysis of IDC data from "IDC Mobile Phone Tracker_FinalHistoricalPivot_2021Q4_CMA". Number of households (27.8 million) taken from Families and households in the UK - Office for National Statistics. We note that the resulting figure of £482 may be an upper bound for household spend as it includes devices sold to businesses, the costs of which we would expect to be passed, at least in part, to consumers.

interventions cannot be introduced to promote greater competition – as discussed further in the next chapter.

8. Potential interventions

Key findings

- Given the wide range of ways in which Apple and Google are able to exercise market power in their ecosystems, there is a strong case for interventions to open up competition and address the harms. These problems will persist and could worsen, if left unchecked.
- We have identified a number of potential changes which could enhance competition within mobile ecosystems. These include measures to:
  - increase competition to Apple and Google, in particular through opening up greater choice in markets for native app distribution and browsers (eg allowing sideloading/alternative app stores and alternatives to Apple's browser engine), and making it easier for users to switch ecosystems.
  - allow third parties more equal access to parts of the mobile ecosystem which are currently reserved for Apple (and to a lesser extent Google) – such as certain APIs and hardware.
  - prevent Apple and Google gaining an unfair advantage over rival app developers through operation of their app stores. These include requiring a fair and transparent app review process, requirements not to share data between the app review and development parts of their businesses, and improvements to Apple's ATT privacy framework.
  - directly address concerns over the level and structure of the commission charged by Apple and Google to some app developers that have no realistic alternatives to reach consumers (eg fair pricing rules).
- We heard from many stakeholders, including app and web developers, about the wide-ranging benefits which would come from these market opening measures, the removal of unnecessary restrictions (mostly relating to Apple) and the introduction of certain safeguards.
- Apple often justifies its restrictions on security, privacy and user safety grounds – which are all important factors to be taken into account. However, the evidence we have gathered to date suggests there is scope for removing many of these without compromising people's safety and security.
- There is a strong case for interventions across a number of different areas in this study, and many of these are well suited to the anticipated new pro-competition regulatory regime for digital markets in the UK. We will continue to support the government in establishing the regime as it proceeds with the necessary legislation.
- In parallel, we will continue to make effective and targeted use of our existing tools where they are best suited. This includes through enforcement action – such as our ongoing competition case relating to certain App Store terms and conditions imposed by Apple and a proposed market investigation into mobile browsers and cloud gaming. More generally we will keep our growing portfolio of digital cases under active review.

Introduction

8.1 In Chapters 3 to 5 we set out our findings that Apple and Google have control over each of the three key gateways within their ecosystems, each having market power in respect of their operating systems, native app distribution, and mobile browsers and browser engines. In Chapter 6, we identified a number of ways that this control may be distorting downstream competition between app developers.

8.2 We have therefore considered potential interventions that could address these concerns and remedy, mitigate or prevent the effects which are adverse to the interest of consumers; through changes that are designed to open up competition within and between these ecosystems and protect against the effects of their market power.

8.3 This chapter provides an assessment of the potential interventions in broad terms, summarising the evidence and views we have gathered on the potential benefits and likely effectiveness of the changes, and the potential costs and unintended consequences. Having considered a range of potential interventions, we set out our current views on the package of measures which we consider would result in greatest benefit to competition and consumers.

8.4 As the CMA does not have the power to implement such interventions through its market study tool, we have not at this stage reached any final views or sought to carry out detailed remedy design and a full assessment. Instead, at the end of this chapter, we have considered which current or potential future tools may be the most appropriate mechanism for taking them forward.

8.5 This assessment will need to be kept under review and has been informed by recent developments regarding the government's intention to introduce a new regulatory regime for digital markets and international developments such as the European Commission's proposals for the Digital Markets Act.[639] A number of the proposals outlined below for interventions are consistent with changes which we expect would be required to bring the relevant activities in the mobile ecosystem in line with the requirements of the DMA. These include requirements about sideloading, third-party app stores, and the ability of app developers to access app stores on fair and reasonable terms.

[639]Introduced by the European Commission on 15 December 2020, COM(2020) 842. The European Parliament and Council of the European Union agreed a provisional political position on 24 March 2022, which was reflected in a revised text and published on 11 May 2022 (Proposed Digital Markets Act). The text will be put to a final vote in the European Parliament in July 2022.

Types of intervention under consideration

8.6 In this chapter, we set out our assessment of potential interventions that could contribute towards the following high-level objectives:

- addressing the sources of Apple's and Google's market power, by opening up the core markets in the mobile ecosystem to greater competition; and
- addressing harms to competition and consumers resulting from Apple's and Google's market power.

Addressing the sources of Apple's and Google's market power

8.7 We have considered a range of interventions aimed at reducing barriers to effective competition in activities where Apple and Google hold a position of market power; namely mobile operating systems,[640] native app distribution, mobile browsers and browser engines. These interventions have the potential to drive greater competition both within and between Apple's and Google's respective mobile ecosystems.

8.8 We have found that there are a number of aspects of the mobile ecosystem where Apple and Google have a gatekeeper role. This means they can determine on what basis, if at all, third parties can access certain activities or functionality within their mobile ecosystems. We found that they sometimes do so in a way that has the ability to restrict competition. This could be addressed through **requirements on Apple and Google to provide access for third parties to their mobile ecosystems**, in particular requiring more choice for specific parts of mobile ecosystems where currently no choice is given or where choice is limited. This could include removing or amending existing restrictions from using third-party app stores, or third-party browser engines. These interventions would increase competitive pressure on Apple's and Google's mobile ecosystems. If effective, these interventions would increase incentives to invest and innovate by competitors, which could in turn put pressure on Apple and Google to improve quality and reduce charges to businesses – ultimately benefitting consumers.

8.9 We have also considered **demand-side interventions targeted at empowering consumers to make meaningful and informed choices,** which in many cases would make it easier for users to choose alternatives to Apple and Google should they wish to do so. Currently Apple's and Google's

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[640] For Apple, we consider its position for operating systems together with its devices, given Apple's vertically integrated model.

ecosystems are heavily integrated and, even where there is in theory a choice, many consumers use the services that are set as a default on their device, including Apple's and Google's own browsers and Google's Play Store, which is pre-installed on Android devices. The effectiveness of these types of remedies is often dependent on detailed design and implementation issues, including testing and trialling of options to make it easier for consumers to make effective choices.

Addressing harms resulting from Apple's and Google's market power

8.10 As set out in Chapters 3 to 6 of this report, we have identified a number of ways in which the market power of Apple and Google may currently be resulting in harm to competition and consumers. We have therefore also considered a range of interventions aimed at directly addressing that harm or preventing the harm from arising.

8.11 First, since Apple and Google have a conflict of interest in being both rule setters and also active competitors in many mobile app markets, they may be able to leverage their market power in a way that favours their own businesses. This could be addressed through a number of **measures to address self-preferencing within the mobile ecosystem,** with particular focus on the ability of third parties to access functionality that Apple and Google use in their own apps and services in a comparable way. Examples include requiring more consistent access to hardware and the operating system through APIs or by removing unreasonable restrictions on third parties from offering certain services at all within Apple's and Google's ecosystems.

8.12 In addition to ensuring that users and third parties can effectively access Apple's and Google's mobile ecosystems, we have also considered **measures to improve the confidence and trust that other market participants have in Apple's and Google's decision-making**. This includes, for example, requirements to provide clear, relevant, accurate and accessible information to app developers as part of the app review process, consistent with the broader principle that large digital firms should provide appropriate transparency to users.

8.13 Given the broad spectrum of interconnected products and services that are incorporated within Apple's and Google's mobile ecosystems, we have also considered the potential role of **separation remedies** that would require Apple and Google to operate certain lines of business independently. Separation would be intended to overcome the conflicts of interest that can arise from operating multiple businesses within a mobile ecosystem, though is generally a very intrusive intervention.

8.14 Finally, we received submissions which called on us to consider interventions targeted at the high commission fees charged by Apple's and Google's for in-app purchases. This could include a requirement that the **commission fee charged by Apple and Google in relation to in-app transactions on their app stores be set at a fair level**. This could be considered as a complement or as an alternative to measures which would be intended to address the lack of choice for developers to use alternative distribution models, which could in turn put greater competitive pressure on Apple's and Google's commission fees.

Potential benefits and costs from intervention

8.15 We have assessed the benefits and costs of a range of potential interventions, which include some new proposals brought to our attention in response to our interim report.

8.16 As set out in Chapter 7, the potential benefits from stronger competition in mobile ecosystems could include:

- **greater innovation:** resulting from stronger incentives for Apple and Google to invest, greater freedoms for disruptive and complementary innovation to break through and deliver new and innovative services to users, and increased confidence for potential investors, which may result in greater investment by current and potential competitors;
- **better user experience**: as better-quality products are made available, and user choice is enhanced or streamlined;
- **lower prices to consumers:** such as from lower priced devices, reduced rates for app subscriptions or digital in-app purchases.

8.17 We also recognise that there are a number of potential costs and unintended consequences from interventions in the mobile ecosystems to be taken into account in our assessment. Many of these have been highlighted by Apple and Google but also by other stakeholders who may be affected. These include:

- **Implementation costs:** Both Apple and Google highlighted the significant potential costs of implementing some of the changes which would be required to give effect to our proposed interventions. These costs come in two forms. First, there may be costs directly associated with making changes to the operating systems, for example to support new forms of access or interoperability. Second, there may be costs associated with mitigating any security risks that arise as a result.

- **Risk of unintended consequences:** the importance of mobile ecosystem stewardship means that poorly designed interventions could lead to a range of potentially harmful unintended consequences. These include:

- **Potential increased security threats:** we have heard concerns (primarily from Apple and in some cases from Google) that allowing more choice or competition within mobile ecosystems could result in weaker protection for the security of users' mobile devices. We have gathered further evidence including expert technical advice to test the validity of these concerns.

- **Potential reduction in privacy protection:** through control of their operating systems, app stores, and browsers, Apple and Google are able to introduce and enforce rules that enhance their users' privacy and give them increased control over their data. It has been put to us that greater competition – and with it potentially reduced control by Apple and Google – could risk undermining these benefits.

- **Potential degradation of user experience:** users greatly value the products and services accessed through their mobile devices. We have heard that measures aimed at creating a more level playing field (eg by introducing more active consumer choice) could add friction to the user experience.

- **Potential redistributive effects:** benefits or savings to some market participants may lead to additional costs being imposed on others. For example, consumers may benefit from increased competition from additional operating system providers, but this could increase costs to app developers.

- **Potential reduction in incentives to innovate:** there is a risk that interventions that seek to open markets by sharing the benefits of innovations in the mobile ecosystem with third parties, for example through mandated interoperability, could risk degrading the quality of the products for existing users or have some implications regarding the underlying incentives to innovate.

8.18 We highlight our views on these points as relevant in relation to the potential interventions below, using the evidence we have seen in this study. Based on this analysis of the benefits and costs, we set out our assessment of the potential interventions that have been identified in the study – identifying those that, based on the current market circumstances, we consider to have

the strongest case for intervention. We have also highlighted where we believe that the costs would currently be likely to outweigh the benefits.

Interventions in mobile operating systems

8.19 In this section, we provide our assessment of a number of potential interventions relating to Theme 1 of this market study, which seek to promote competition in mobile devices and operating systems. We consider these in respect of two objectives:

- to make it easier for consumers to switch operating system, by supporting interoperability between iOS and Android; and
- to make it easier for rivals to develop new operating systems, by reducing barriers to investment in competing systems and by addressing Google's ability to leverage market power from search into operating systems.

8.20 We consider the case for these two groups of interventions in turn below.

Making switching easier

8.21 As explained in Chapter 3, we considered four categories of potential barriers to switching between mobile devices with different operating systems:

- learning costs associated with switching mobile ecosystems;
- transferring data and apps across devices;
- managing subscriptions across devices; and
- the availability and characteristics of Apple's and Google's first-party (ie developed and operated by Apple and Google) apps, services and other devices.

8.22 In our survey,[641] a significant proportion of users identified at least one of these barriers to switching as a reason for not switching, with iOS Marginal Users[642] being more likely than Android Marginal Users to mention at least one barrier to switching as a reason for not changing operating system.[643]

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[641] See Accent Report 'Research into consumer purchasing behaviour in the UK smartphone market for the CMA's Mobile Ecosystems Market Study', dated April 2022.
[642] Marginal Users are defined as users that considered switching when purchasing a new smartphone but ultimately did not.
[643] Considering iOS and Android Marginal Users separately, 79% and 45% mentioned at least one of the barriers to switching identified as a reason for not switching – see Chapter 3.

8.23 As set out in Chapter 3, actual barriers faced by those that reported switching ('Switchers') were lower than the perceived barriers among users that did not switch between operating systems when purchasing a new smartphone ('Non-Switchers').[644] However, 35% of Switchers were dissatisfied with at least one aspect of the switching journey, implying barriers to switching impose at least some cost on users switching.

Potential benefits and effectiveness

8.24 In this section, we summarise the evidence we have gathered regarding the potential benefits and likely effectiveness of the following interventions which could address these actual or perceived barriers to switching:

- requiring Apple to provide necessary APIs to enable iOS users to migrate their apps and data to Android devices more easily.
- requiring Apple and Google to allow users to transfer subscriptions between iOS and Android devices, rather than needing to cancel and re-subscribe after switching.
- enhancing the level of interoperability of Apple's first-party products or services, such as:
  - increasing the availability of Apple's first-party apps and services on Android devices; or
  - requiring Apple's first-party apps (eg iMessage) and connected devices (eg the Apple Watch) to interoperate fully with equivalent features of Android devices.

Transferring data, apps and app content across devices

8.25 As described in Chapter 3, a significant number of users appear to be concerned that it may be difficult or impossible to transfer data such as contacts, messages, and passwords, as well as apps, to a new device. Our survey data indicates that iOS users in particular perceive that switching could impose such costs which deters these users from switching operating system. We found there were fewer concerns among Android users.

8.26 Google told us that it supports remedies aimed at reducing barriers to switching from iOS to Android and that it already makes necessary features

[644] Non-Switchers include both Marginal Users and Non-Considerers (ie users that did not consider switching operating system when intending to buy a new smartphone). 11% of all Switchers (in either direction) found the switching experience difficult or very difficult and only 5% were dissatisfied with the overall switching journey.

and functionalities available to aid user switching.[645] Apple told us that transferring data and apps across ecosystems is already possible and easy, both from Android to iOS and vice versa. Apple pointed to tools offered by major device manufacturers and third-party providers which enable the seamless transfer of content from Apple to Android devices.[646]

8.27 We reviewed the data and app transfer functionalities currently made available to iOS users by Android device manufacturers, such as Samsung and Google, and we found that some technology, such as cable options,[647] allows for a relatively comprehensive data and apps transfer post-switching. However, there remain some limitations in this data transfer technology, and in particular to the data that can be transferred via wifi and cloud options, which may create barriers for some users against switching.

8.28 Given the importance of this functionality to users, there is a good case that there should be a requirement for Apple and Google to provide necessary APIs to enable users to migrate their apps and data to devices in each other's' ecosystem. We have not seen any concerns about the current process for users to migrate from Android to iOS. In respect of switching from iOS to Android, Apple may already be largely compliant, but this requirement would address any residual concerns about the effectiveness of existing data and app transfer functionalities. Furthermore, if these technical concerns were addressed, we would expect Android device manufacturers to have a greater incentive to inform users about the ease of switching which could address any perceived concerns amongst marginal users.

Managing subscriptions across devices

8.29 We collected survey evidence which shows that only a limited proportion of Apple and Android users were concerned about losing paid-for subscriptions and content in apps after switching. Similarly, the survey evidence also suggests that a relatively low proportion of users were dissatisfied with managing subscriptions after switching. This survey evidence should be seen in the context of the total proportion of users with subscriptions. As described in Appendix D, as of December 2021, only [10-20]% of iOS users had at least one subscription to a third-party app, and this figure has been growing over time. As a result, this might be a greater actual concern for the subset of users with a subscription.

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[645] Google's response to our interim report, para 83.
[646] See Apple's response to our interim report, para 18.
[647] See Appendix D.

8.30 Examples of the switching process in other markets (eg switching a current account between banks) suggests the transfer of this kind of payment information may be feasible. Since the proportion of total mobile device users that it would help is currently relatively low, the case for intervention is less clear at this stage. However, an intervention to enable users to transfer subscriptions between iOS and Android devices more easily could become a greater priority if the number of users with at least one subscription continues to grow.

The availability and characteristics of Apple's and Google's first-party apps, services and other devices

8.31 Google told us that it supported remedies aimed at increasing the availability of Apple's apps on Android devices or requiring Apple to enable its apps (eg. iMessage) and connected devices (eg Apple Watch) to interoperate fully with equivalent features on Android devices.[648] In particular, Google told us that Apple could quickly and easily enable interoperability between messages on Apple and non-Apple devices through implementation of the RCS protocol in iMessage, which would reduce barriers to switching.

8.32 As described in Chapter 3 and Appendix D, our survey results showed that the risk of losing access to first-party apps is not often referred to by consumers as a consideration in whether to switch. Although this finding only applies to UK users and some of these services are more widely used in other countries,[649] it is consistent with Apple's view that alternative services, including third-party messaging services, are available and commonly used in the UK on Android and iOS.

8.33 One suggestion that we have considered is that there may be wider benefits to the particular case of mandating interoperability between the messaging services used by iMessage and the RCS standard used by Android. The change could bring benefits to users of Android and iOS services by allowing better messaging services between devices. It should be achievable at modest cost, as an open messaging standard already exists, and there would still be the potential for Apple to innovate and offer additional features within its messaging functionality for iOS users only. Therefore, there may be an alternative case for further assessment of the net benefits of this form of interoperability between messaging services. Nonetheless, our survey findings do not suggest that there is a clear case for Apple to be required to

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[648] Google's response to our interim report, para 83.
[649] We note that an Apple executive had previously suggest that making iMessage interoperable with other messaging services would "make it easier for someone to switch away from our platforms", see: Apple won't put iMessage on Android in order to keep users locked-in, court documents reveal | The Independent

increase the availability of Apple's first-party apps and services on Android devices for the purpose of supporting switching between mobile devices and operating systems.

8.34 With regards to the availability and characteristics of other connected devices, our survey results show that this factor poses more significant barriers to switching, particularly for users switching from iOS to Android, with 44% of iOS Marginal Users stating that having other devices linked to their mobile device and operating system was a reason for not switching.[650] This suggests that there is a good case that a requirement to maintain comparable interoperability between Apple's devices (eg the Apple Watch) and Android could bring significant benefits through making competition more effective and limiting the effect of ecosystem lock-in.

8.35 Apple told us that its connected devices are operable on a standalone basis and offer interoperability with third-party devices and services to the extent possible. However, Apple acknowledged that it does not always offer full interoperability with third-party products. It justified these differences on the basis of technical constraints, particularly where the functionality relies on the use of proprietary technologies. The likely effectiveness of such interoperability requirements would therefore require further consideration of any potential technical constraints on a case-by-case basis.

Potential costs and unintended consequences

8.36 We are mindful that interventions to mandate any degree of interoperability between different products and services – such as between the Apple Watch and Android mobile devices – could risk degrading the quality of the products for existing users or have some implications regarding the underlying incentives to innovate. At present, we observe an asymmetric level of interoperability between Apple and Android devices. For instance, the Apple Watch has full interoperability with Apple mobile devices, whereas it cannot be 'paired' with Android devices via Bluetooth,[651] which limits the range of features and functionalities that can be accessed.

8.37 By contrast, there is full and extensive interoperability between other smart watches and the iPhone which facilitates switching to Apple's mobile ecosystem. Furthermore, given that Apple's connected devices are generally sold to users at a profit, increasing their availability and attractiveness to Android users should not fundamentally undermine Apple's incentives to invest in such complementary products in the future. As such, there appears

[650] See Chapter 3. This is also the most important reason for 20% of all iOS users – see Appendix D.
[651] Can You Use an Apple Watch With an Android Phone? MOU, 2022.

to be substantial scope for improvements in this area while managing the aforementioned risks to quality or innovation.

Conclusions on interventions to make switching easier

8.38 As identified in Chapter 3, users rarely switch from iOS to Android devices and vice-versa. The evidence suggests that this is at least in part due to the material perceived barriers to switching we have identified. The perceived and actual barriers to switching are also higher among iOS users than Android users, as set out in Appendix D. In this section, we have considered which interventions could be most appropriate to address barriers to switching and consider that:

- There is a good case that Apple and Google should be required to provide sufficient APIs to support effective switching between iOS and Android devices, and that there are some improvements that could be required to reduce the cost of switching.

- There is evidence that having other devices linked to their mobile device and operating system poses significant perceived barriers to switching, particularly for users switching from iOS to Android. There is therefore a good case for mandating greater interoperability to increase ease of switching, and that this may be achievable at proportionate cost.

- At the moment, the evidence on barriers to switching from Android to iOS does not suggest that additional interoperability is required. For example, there is limited evidence of connected devices linked only to Android creating a barrier to switching.

8.39 The case for intervening to facilitate the transfer of subscriptions appears to be less clear at this stage, although it could become a greater priority if the number of users with at least one subscription continues to grow. Our survey results also suggested that the case is less clear for Apple to be required to increase the availability of Apple's first-party apps and services on Android devices for the purpose of supporting switching from iOS and Android.

Lowering barriers for new operating systems

8.40 In addition to limiting effective competition between Apple and Google, the material perceived barriers to users switching away from their current mobile ecosystems is likely to deter new entry by mobile operating system providers. Furthermore, new operating systems face a significant barrier: the need to achieve a critical mass of both users and app developers to succeed (ie indirect network effects), as reflected in the exit or failed entry in smartphones

of well-resourced companies such as Microsoft and Amazon. The presence of barriers to competition is also shown by the difficulties faced by those using versions of Android without Google Mobile Services – for example, Huawei's share of new sales declined materially after it could no longer access Google's apps and services, including Google Mobile Services.

8.41 Web apps and cross-platform development tools could mitigate the impact of indirect network effects, since they would allow developers to make their content available across operating systems without developing multiple native apps. However, at present, app developers do not generally regard web apps as being a viable alternative to the development of native apps. Furthermore, cross-platform tools are currently limited in scope and would only facilitate entry if they widened their product offering to include new operating systems.

8.42 We have not identified any market opening remedies that are likely to be effective in promoting new, independent third-party operating systems to compete with iOS and Android. However, we note that the availability of Android on an open-source basis has, in principle, provided a successful route into the market for new operating system providers. Yet, as described in Chapter 3, the experience of Amazon's Fire OS, which runs on a forked version of Android and is only available on Amazon Fire tablets, serves to illustrate some of the practical challenges associated with entry using a fork of Android.

8.43 In this section, we consider three types of interventions designed to promote entry and expansion of alternative operating systems based on Android (ie Android forks):

- widening access to Google's APIs that deliver core Android features or functionalities, such as basic 'push notifications';
- making (i) Google's collection of popular apps, and (ii) Google's placement and revenue sharing agreements associated with its Chrome and Google search products available on forked versions of Android; and
- separating Android from Google.

Access to Google's APIs

Potential benefits and effectiveness

8.44 As described above, in principle, the availability of Android on an open-source basis should lower barriers to entry for new operating system providers. Google told us that its compatibility requirements benefit developers, device

manufacturers and users. It told us that the minimum compatibility guaranteed by the Compatibility Definition Document (CDD) allows app developers to 'write once, run anywhere', such that any Android app will run correctly on any compatible Android device without material adaptation.

8.45 However, we understand that Android apps often rely upon Google Play Services, which is housed within Google Mobile Services ('GMS'), a set of proprietary features, functionalities, and APIs that can be included in apps developed for devices using GMS. The importance of Google Play Services means that many Android apps would not work properly on versions of Android not using GMS. As set out in Chapter 3, Google estimated that, as of April 2022, [70-80]% of apps available on the Play Store use at least one Google Play Services API.[652] Amazon told us that it has sought to develop its APIs in a way that reduces switching costs for developers, however many developers continue to use Google's GMS APIs, as developing code that is portable to Android forks is not a priority. This raises significant barriers for alternative operating system providers based on Android forks.

8.46 A potential solution could involve requiring Google to ensure that core features or functionalities, such as basic 'push notifications', are available within the open-source version of Android. Alternatively, we have been told that this problem could be addressed by Google making GMS (including the APIs) accessible to apps developed for Android forks. This outcome would lower barriers because it would be easier for developers to make their apps compatible with multiple versions of Android platforms.

Potential costs and unintended consequences

8.47 Whilst these interventions could be effective at promoting competition in the short term, Google provided several reasons for including APIs in GMS rather than the open-source Android code. As detailed in Appendix E, Google told us that this approach means that Android devices have the most up to date version of these APIs, ensuring that apps work on all Android devices with GMS, even when the manufacturer does not update the underlying Android operating system version.

8.48 Furthermore, these interventions could give rise to risks associated with reduced innovation and therefore worse user experience. Whilst access to these APIs could promote entry by operating system providers, these operating systems would not be differentiated and as such, would not

[652] Google told us that while many third-party Android apps use at least one Google Play Services API, this is not a good indication of the effort/costs a developer would need to incur to port their app to an Android device that does not include Google Play Services.

constitute genuine new entry. It would effectively be 're-badging' Google's Android, which could be seen as further extending Google's market share.

8.49 We therefore have concerns that a wide-ranging requirement on Google to allow access to all its APIs might not deliver significant benefits for users, and that this may come at a cost of reduced innovation.

Access to Google's apps and search products

Potential benefits and effectiveness

8.50 As explained in Chapter 3, we found that Google's agreements with, and payments to, device manufacturers mean that any new entrant looking to attract manufacturers would have to financially compensate manufacturers for the missed payments from Google and offer them a range of attractive alternative options to Google's first-party apps and services.

8.51 We therefore considered whether the following interventions could improve competition between devices using different mobile operating systems, making: (i) Google's collection of popular apps; and (ii) Google's placement and revenue sharing agreements associated with its Chrome and Google search products available on forked versions of Android. These interventions could improve the quality of mobile operating systems provided by new entrants and lower barriers to attract device manufacturers.

Potential costs and unintended consequences

8.52 Google defended its decision to make the availability of its collection of apps and revenue share agreements conditional upon device manufacturers using a compatible version of Android and entering the EMADA. Google told us that widening their availability would be self-defeating because it would be unable to guarantee that its apps and services would function on Android forks without breaking. Google argued that breakages would reduce the competitiveness of the Android fork and the Android platform as a whole by creating user confusion and frustration and damaging developer and user confidence. Furthermore, Google argued that this obligation could affect its incentives to innovate.[653]

8.53 We recognise that Google's apps may act as a competitive differentiator and, in theory, widening access to all its apps and services, especially those provided to users for free, could dampen Google's incentive to innovate (in a

[653] Google's response to our interim report, paragraph 84.

similar way to Apple and its first-party apps, as described earlier). However, we note that Google already makes many of its apps and services available on other operating systems, such as iOS.

8.54 Therefore, whilst we recognise that Google may need to reconfigure its apps to rely on different APIs or technology, it seems to us that Google should be able to ensure that its apps function effectively on other operating systems, particularly those which comply with its minimum compatibility requirements on Android but do not have access to GMS.

8.55 Furthermore, Google's search products remain highly profitable, and Google continues to have a strong incentive to broaden the use of Google products to the extent that this ultimately increases the use of its search engine. For this reason, we consider that removing Google's requirement to license the EMADA in order to license Chrome and Google Search and enter into these revenue share agreements would lower barriers to entry for other operating systems and would be unlikely to come at a significant cost to Google.

8.56 At the same time, we recognise that, as with the previous intervention, the incentives to innovate by third-party operating systems could be weaker, the more that they are able to replicate Google's own Android offer. However, in our view, this should be less of a concern for Google's apps, not least because these apps are generally already offered beyond Android.

Android separation remedies

Potential benefits and effectiveness

8.57 Finally, as an alternative to the interventions discussed above, it has been suggested that a separation remedy which prevents providers of operating systems from operating app stores would address conflicts of interest and deliver additional benefits, such as preventing Apple and Google from exerting full control over their ecosystems, allowing multiple app stores to exist and helping third parties to develop and distribute competing apps.[654]

8.58 The link between mobile operating systems and app stores is also recognised in a different separation remedy that was proposed to us during the course of this market study. Oracle suggested that an ownership separation remedy between Google and Android, including the Play Store, would limit Google's dominant position in mobile ecosystems and enhance competition and

[654] See Tile's response to our statement of scope, and Dr Greig Paul and Dr James Irvine's response to our statement of scope.

consumer choice across markets.[655] A recent academic paper also advocated for this intervention,[656] justifying it on the basis that separation would ensure competition takes place on a level playing field and mitigates the risk of circumvention.

8.59 In effect, a separation remedy of that kind would address concerns about self-preferencing aimed at protecting Google's position upstream (ie mobile operating systems and native app distribution) and extending the upstream market power downstream (ie in browsers, advertising and mobile applications).

Potential costs and unintended consequences

8.60 We do not currently consider that a separation remedy which prevents providers of operating systems from operating app stores would, in itself, significantly change the competitive dynamics between providers of mobile operating systems.

8.61 At present, most developers only create apps that are compatible with iOS and Google's version of Android and other operating systems struggle to attract app developers. Separating the app store from the operating system would not necessarily support the ability of other operating systems to attract these developers. App developers would continue to face development costs associated with making their apps compatible with new operating systems and it would not address the concern that rival providers of operating systems already suffer from a lack of critical mass of developers and users, which is a key barrier to expansion.

8.62 The proposal we received to separate Android (including the Play Store) from Google also included a suggestion that the newly separated Android should be governed as a neutral non-profit entity that maintains the Android ecosystem as open-source and licenses its products under fair, reasonable and non-discriminatory terms. This proposed governance arrangement reflects the fact that this remedy would not address the source of Android's market power, as developers would still face significant costs when switching to a new operating system. Furthermore, requiring full ownership separation of Android from Google would introduce potentially very significant costs and could introduce inefficiencies in the running of the business. As such, at this stage, we consider that less intrusive remedies would be more proportionate and could seek to deliver similar benefits.

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[655] See Oracle's response to our statement of scope.
[656] More Competitive Search Through Regulation, Yale Tobin Centre for Economic Policy, 2021.

Conclusions on interventions to lower barriers for new operating systems

8.63 We have found that those interventions which are designed to support entry within the Android ecosystem in competition with Google may not deliver long term benefits for users and developers and could have unintended consequences. Android is offered at low cost to manufacturers, and therefore supports entry in the device markets by manufacturers offering low-cost devices. We also found that any requirement to share access to its GMS APIs with third parties would not necessarily support genuinely new entry. It would effectively be 're-badging' Google Android, which could be seen as further extending Google's market share.

8.64 Our assessment suggests that of these potential interventions, the strongest case is for a requirement on Google to remove the restriction on Google's apps, which are currently only licensed under the EMADA to manufacturers that offer Google's version of Android. This intervention would reduce one of the existing barriers to Android fork competition, and the costs associated with this remedy could be relatively low.

8.65 However, we also recognise that this is only one barrier to Android fork competition, and therefore is unlikely to materially change the current market position, whereby, although Android is open source, Google is by far the largest provider of Android on smartphones.

8.66 Any form of separation remedy at the operating system level would come with substantial costs and risks, while the benefits for competition and consumers are unclear. We have therefore not established a compelling case for such separation remedies at this time.

Interventions in native app distribution

Unlocking competition to the App Store and the Play Store

8.67 In this section, we provide our assessment of interventions aimed at promoting competition in native app distribution and further detail on these interventions is set out in Appendix N. As described in Chapter 4:

- Apple prohibits all alternatives to the App Store for native app distribution on iOS devices; and
- while Google allows alternative distribution channels on Android devices, a combination of: (i) barriers to competition that are inherent in the market (eg indirect network effects); and (ii) Google's agreements and policies have harmed their effectiveness.

8.68 The two key potential sources of competition in the distribution of native apps to users are alternative app stores and sideloading.[657] We have considered whether the three following interventions could support these alternative app distribution models, with a view to increasing the competitive constraint on Apple's App Store and Google's Play Store:

- requiring Apple to allow users to access alternative app stores, subject to those app stores meeting reasonable conditions to ensure sufficient security for users;
- requiring Apple to allow 'sideloading' of apps, ie to remove the restriction on downloading of apps direct from third parties via browsers, assuming certain security requirements are met; and
- requiring Google (and Apple, subject to the above interventions being implemented) not to impose unreasonable additional costs on users that wish to use these alternative means of native app distribution.

Potential benefits and effectiveness

8.69 In this section we assess the potential benefits from requiring these alternative sources of native app distribution to be available, as well as considering how effective they are likely to be in practice.

Alternative app stores

8.70 There are a range of potential benefits that greater competition between app stores could deliver. Greater competition to attract users could lead to greater investment in quality and user experience. App stores could innovate to provide better 'matchmaking' between users and developers and there could be pressure to reduce the level of advertising that users currently face. We heard from several developers and third-party app stores that it could incentivise innovation and improve outcomes on privacy and security features.

8.71 We would expect that if competition by alternative app stores was more effective, it would also result in entry by specialist app stores, in particular in respect of gaming. Such app stores are a common source for consumers seeking access to games on PCs and we were told by Epic Games that their app store would also operate on mobile devices without the current restrictions.

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[657] Another potential source of competition in app distribution is web apps, which is discussed further within the 'Interventions in mobile browsers' section below.

8.72 Interventions that resulted in increased competition by alternative app stores could also potentially address concerns about Apple's and Google's restrictive terms and exert downward pressure on commission fees. Any cost savings for developers could also result in a reduction in prices for users, and deliver non-price benefits, if developers had a greater ability to invest in developing more innovative apps.

8.73 However, requiring Apple to allow alternative app stores to operate on its iOS would be unlikely to resolve the concerns expressed by developers. The Play Store faces limited competition on Android devices, despite Google not imposing outright prohibitions on alternative app stores. We have therefore considered what additional measures might need to be introduced to support this intervention below.

8.74 Furthermore, opening up app stores to competition will only address these concerns where the terms of access to the operating system for competing app store providers are fair and reasonable. For example, we would not expect alternative app stores to face additional fees associated with access to Apple's and Google's ecosystems that are not incurred by Apple's and Google's own app stores. The exception would be if such fees reflect incremental costs incurred by Apple and Google in connection with developing and operating functionality, such as APIs that allow third-party app stores to access users on the operating system.

Sideloading

8.75 Sideloading is not allowed on iOS. This intervention would therefore require Apple to remove this restriction, subject to appropriate safeguards.

8.76 As set out in Chapter 6, at least a fifth of app downloads were directed to Apple's and Google's respective app stores from web browsers or other apps. This suggests that if sideloading was adopted by developers and was more easily available for users, its take-up could be high since users would be able to download apps directly from the developers' website, rather than having to be directed to an app store. In principle, this could provide for a more efficient and seamless user experience. In turn, this constraint could put greater competitive pressure on app stores to improve their service to attract users and improve their terms of access for developers.

8.77 However, the current experience of sideloading on Android, where it is permitted, indicates that removing restrictions on iOS may not be sufficient on its own to promote this source of competition. Many app developers told us that they did not make their apps available through sideloading due to the protracted process that users would have to go through on Android devices.

As a result, ensuring that users can make use of this distribution channel without undue friction will be essential for sideloading to be an effective constraint. The next section considers interventions that would need to be put in place alongside obligations to allow alternative native app distribution channels.

Supporting effective user choice

8.78 Chapter 4 identifies that on Android devices, where third-party app stores and sideloading can operate, the Play Store nevertheless retains a very high market share in native app distribution. We have therefore considered what steps would be required to improve access to alternative native app distribution channels, including the extent to which it would be appropriate to devise a package of remedies to deliver the potential benefits described above. Whilst the considerations set out below are focused on Android, the same principles would apply to iOS if alternative app stores and sideloading were permitted.

- *Google's agreements and policies*

8.79 Several stakeholders told us that Google's agreements and policies with manufacturers make it more difficult for alternative app stores to succeed. In particular, our analysis found that Google's decision to license its first-party apps and proprietary APIs and make significant payments to device manufacturers conditional upon the preinstallation and prominent placement of the Play Store creates a material barrier for rival providers of app stores.[658]

8.80 Google told us that the Play Store is also responsible for updating Google and third-party apps, as well as the APIs housed within Google Play Services. Given that, as of April 2022, [70-80]% of apps available on the Play Store use at least one Google Play Services API, the presence of the Play Store is currently necessary to deliver the proper functioning of, and updates associated with, many native Android apps on its platform.[659]

8.81 Further investigation would be required to understand whether the use of the Play Store is the most appropriate mechanism to deliver these updates. While Google has provided us with some reasons for this, Google has not set out

[658] Further, as explained in Chapter 4 and Appendix E, some revenue sharing agreements Google has in place with manufacturers include a requirement to set the Play Store as the default app store and not preload similar services to the Play Store, such as alternative app stores, launchers and apps not available on the Play Store, on their device. We consider this to potentially affect the take up of alternative native app distribution channels.
[659] Google told us that while many third-party Android apps use at least one Google Play Services API, this is not a good indication of the effort/costs a developer would need to incur to port their app to an Android device that does not include Google Play Services because, among other reasons, that would depend on the number and complexity of the APIs the developer uses its app.

why such Google source should necessarily be an app store.[660] In any case, an intervention which prevented Google from making its search advertising revenue share payments and its licensing of its first-party apps and proprietary APIs conditional upon the 'prominent display' of the Play Store, could improve access opportunities for rival app stores without giving rise to concerns regarding the proper functioning of these apps.

8.82 Nonetheless, the challenges faced by alternative app stores on Android devices in attracting sufficient user base – which as we note in Chapter 4 may be exacerbated by Google's initiatives such as Project Hug – may be difficult to overcome. For this reason, we were told that sideloading had a greater prospect of imposing a competitive constraint on the Play Store than alternative app stores, particularly if the Play Store were to remain a necessary feature of devices using GMS. As discussed above, many users start the process of accessing native apps using web browsers or other apps. In these circumstances, users and app developers would be able to bypass the app store, if this were a more viable option.

- *The sideloading process*

8.83 As discussed in more detail in Chapter 4, the user experience of sideloading on Android devices involves navigating a number of warnings and undertaking various steps to complete this process. Google described its warnings as modest and necessary to safeguard against security risks.[661] However, Basecamp and Match submitted that the success of sideloading was dependent upon the removal of friction or restrictions imposed by Apple and Google which currently dissuade users from using this distribution channel.[662] We were also told that Google should be required to facilitate a streamlined sideloading process for trustworthy apps, using certification, notarisation or similar processes to identify such apps.

8.84 We would expect that, if the sideloading process was streamlined, more users would choose to access native apps directly from the developer, as is the case on desktop devices. It would also mean that developers may be more inclined to make their apps available to sideload and promote them with their users. However, we accept that sideloading gives rise to increased security

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[660] Google told us that: "Updating Google software through proprietary app stores ensures swift, secure, and verified updating, which benefits consumers"; "Google has invested significantly in tuning its middleware update process through the Play Store to optimise between pushing timely updates and minimising the impact on the user"; and "Google has also combined its proprietary installation and update technology and infrastructure for first party and third party apps and [Google Play Services] through the Play Store because they share certain basic needs".
[661] Google's response to our interim report, paragraphs 42-44.
[662] Basecamp's response to our interim report, page 5.

concerns and as a result, we have considered whether potential safeguards could be introduced to mitigate these risks in the section below.

Potential costs and unintended consequences

Potential risks to security and privacy

8.85 We received a range of contrasting views on the scale of the security concerns and impact of any interventions. Apple[663] told us that the potential interventions highlighted in our report would fundamentally change the iPhone and have huge implications for consumers and the terms of Apple's 'industry-leading privacy and security standards'.

8.86 Apple also argued that these interventions would jeopardise its holistic approach to security, which it told us was significantly more effective than Android.[664] Apple has also published a paper which found that mobile malware and the resulting security and privacy threats are increasingly common and predominantly present on platforms that allow sideloading.[665] ACT | The App Association[666] also told us that allowing users to download apps through sideloading or alternative app stores carries several significant security risks.

8.87 However, whilst several app developers accepted that a framework should be put in place to ensure the security of users and the integrity of the device, they also told us that, in their view, Apple overstated the nature and scale of the security risks that new app distribution models would introduce. Furthermore, these stakeholders argued that a range of alternative safeguards could be implemented to mitigate any increased security risks associated with widening the distribution channels through which native apps could be accessed.

8.88 As described further within Appendix N, the Department for Digital, Culture, Media and Sport ('DCMS') in the UK published a Call for Views in May 2022, inviting responses on app security and privacy interventions, following a review into the app store ecosystem.[667] Whilst the report recognised the leadership of Apple and Google in defining current best practice, it also raised concerns regarding their engagement with developers and identified

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[663] Apple's response to our interim report, page 1.
[664] Apple referred to Nokia's 2020 Threat Intelligence Report finds that devices that run on Android had 15 times more infections from malicious software than the iPhone, see Report - Threat Intelligence Report 2020 (nokia.com).
[665] Building a Trusted Ecosystem for Millions of Apps, A threat analysis of sideloading. October 2021
[666] ACT | The App Association's response to our interim report, page 5.
[667] App Security and Privacy Interventions, Department for Digital Culture, Media and Sport, May 2022.

examples of malicious apps being made available to download across app stores, including the App Store and Play Store.

8.89 After exploring various options to address these challenges, DCMS has initially proposed a voluntary Code of Practice for all app store operators and developers as the most effective means of protecting users from malicious and insecure apps. Compliance with such a Code of Practice could provide an objective route through which alternative app stores could meet the requisite security standards and processes to operate on the iOS or Android platforms.

8.90 A range of app developers, some of whom also operate their own app stores, suggested that Apple could be allowed to impose security standards or requirements on alternative app stores being made available on iOS or through the App Store to satisfy themselves that developers were complying with a minimum set of requirements. However, these stakeholders also cautioned against this process being used to introduce unnecessary and burdensome obligations which harm alternative app stores from competing effectively.

8.91 Several stakeholders also pointed to alternative safeguards currently implemented on other operating systems, including Apple's. In particular, several references were made to the notarisation process on MacOS, which scans apps for malicious content, to demonstrate that apps can be scanned for security purposes by Apple outside of the App Review process.[668]

8.92 These examples suggest that a range of options are available to mitigate the risk that the introduction of alternative app distribution models would compromise the security of users' devices. Our understanding, informed by advice from an external technical expert,[669] is that security checks could be carried out by an approved reviewing party, such as the operating system owner, or a certification body which digitally signs apps that have passed a review process. In these circumstances, the operating system could check that apps which have been downloaded from the web have the appropriate signature. In other words, sideloaded apps could be required to meet the same security standards, and follow the same or a directly comparable app review process, as apps currently being made available to users through the App Store and Play Store.

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[668] After an app has been notarised, Apple provides a "ticket" for developers to staple their software and places descriptive information in the initial launch dialog to help the user make an informed choice about whether to launch the app. Notarizing macOS Software Before Distribution | Apple Developer Documentation

[669] This assessment has been informed by an independent expert, Alastair Beresford, Professor of Computer Security at University of Cambridge.

8.93 Further technical information regarding the nature of the security risks on mobile operating systems is set out within Appendix N, which also describes additional security safeguards that are currently in place, or available, across iOS and Android devices. Based on our review, these concerns do not appear to be insurmountable. Although we recognise that further investigation on this subject is required, there appear to be several safeguards available that could enable greater competition in native app distribution whilst preserving the safety and security of users' devices. These measures could allow for a streamlined sideloading process and obviate the need for Google's existing warnings on Android devices.

Implementation costs

8.94 We understand that Apple and Google may have to undertake technical adjustments to their operating systems to support alternative app distribution models in a way which allows users to make effective choice. Implementing these adjustments, as well as any new security safeguards, could result in additional costs being borne by these platforms. However, we consider that these additional costs would be likely to be more than offset by the potential benefits that these interventions could deliver for consumers.

8.95 We also understand that app developers may need to reconfigure certain features of their apps to ensure that they function effectively when distributed through other channels. As described in Appendix N, APIs housed within GMS can be accessed irrespective of how an app is installed onto a device using GMS. However, developers can also make use of APIs which are specific to the Play Store and as such, may need to remove or replace these functionalities using different APIs if they wanted to make their apps available outside of the Play Store.

8.96 We have reviewed the functionalities covered by these Play Store APIs, and they appear to be targeted at features which are specific to app stores and would benefit from being opened up to competition, such as payment processing and app ratings. Therefore, whilst replacing or adopting substitute APIs could increase costs to developers, it also invites differentiation and competition on a number of key features that could deliver benefits for developers and users.

Potential impact on Apple's incentives

8.97 Free riding is another risk raised by Apple with respect to interventions aimed at promoting the use of alternative app stores and sideloading.[670] Apple strongly defended its existing terms of access and argued that its charges compensate Apple for providing the tools, technology, distribution, and other services which allow developers to leverage iOS, in addition to the cost associated with running the App Store.[671]

8.98 However, several app developers strongly challenged Apple's position and argued that Apple already derives significant value from app developers' investments in their products and software. These investments lead to higher quality apps being made available on iOS which contributes to the success of the iPhone. Contrary to Apple's view, these stakeholders also argued that competition would likely lead to greater incentives for Apple to invest and innovate.

8.99 Whilst we consider that, in principle, free riding is a potential concern, there are several reasons to suggest that Apple would retain incentives to innovate, even if its restrictions on alternative app stores and sideloading are removed. For instance:

- Our profitability analysis of Apple's App Store suggests that Apple will be strongly incentivised to remain active in app distribution and will be incentivised to compete with rivals to retain and attract users.
- It is accepted that app developers contribute to Apple's ecosystem, which Apple is able to monetise through its sale of devices. Our analysis of Apple's financial performance suggests that Apple earns very high returns on its investments into its mobile ecosystem, including its devices. As a result, Apple would continue to have incentives to innovate as it has in the past in order to maintain its market position in devices.
- Google and Microsoft have continued to invest in their respective operating systems and app stores without imposing outright prohibitions on the presence of alternative app distribution models.

8.100 As such, we consider that Apple would be likely to retain its incentives to invest in iOS and the App Store in a situation where alternative app distribution models were permitted. In fact, these incentives may become

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[670] Apple also argued that the commission it charges in relation to in-app payments and subscriptions generates an incremental revenue flow which gives it an incentive to lower the price and increase the quality of its devices. This is described as a waterbed effect and we address this argument within Appendix N.
[671] Apple's response to our interim report, page 2.

even stronger if it needs to compete to attract users and developers that are able to use alternatives.

Interventions relating to the level of app store commissions

8.101 We also received submissions raising concerns about the absolute level of the commission paid by those apps which rely on in-app payments for some or all of their revenue, including concerns that this commission raises costs for apps in direct competition with Apple and Google. Some submissions highlighted recent changes to terms by Google in South Korea, and more recently Apple in the Netherlands, which illustrate an intention on the part of Apple and Google to collect a (reduced) commission, even where users are permitted to use alternative billing systems.

8.102 We have outlined above potential ways to use other distribution models outside Apple's and Google's app stores which would allow app developers to access users and put downward pressure on Apple and Google's commission rates. However, it is not clear at this stage whether or how quickly these alternative distribution models would become sufficiently widely used such that they are able to impose a strong competitive constraint on the level of the app commission.

8.103 If app developers continue to be reliant on Apple's and Google's app stores as the primary means of accessing customers, there would be a case, potentially under the proposed new regulatory regime for digital markets, to introduce a requirement for the commission to be set at fair and reasonable levels for all users. Given our analysis of the returns made by Apple and Google from both their app stores and wider businesses which is outlined in Appendix C, it seems clear to us that, at least in the aggregate across app developers, the level of commission is currently set well above any relevant cost measure, and higher than would be expected under effective competitive conditions.

8.104 Furthermore, many app developers that list on Apple's and Google's app stores (for example, apps offering physical goods and services or apps that are not funded in ways other than through in-app payments, such as advertising) are able to access the same benefits of the app store for no commission.

8.105 Overall, our view is that, alongside an assessment of the interventions above which are designed to promote competition in native app distribution, there should also be an assessment of the case for a fair pricing requirement. This combined assessment would be able to conclude on the most effective way to address the concerns raised about the current level and structure of the

commission charged by the app stores. A fair pricing requirement would be more likely to be appropriate as part of a package of measures where the assessment finds that there is limited prospect of alternatives to the app store placing a competitive constraint on the level of the commission.

Conclusions on interventions in native app distribution

8.106 We have assessed the benefits and costs associated with potential interventions aimed at promoting greater competition in native app distribution and consider that they could deliver significant benefits for users and developers.

8.107 In summary, there is a good case that the potential benefits from opening up competition through requiring sideloading to be supported on iOS, and addressing some of the barriers that currently impede sideloading on Android devices, could outweigh the costs, as:

- potential take-up would be high since developers would no longer have to direct users towards the App Store or Play Store to download their native app;
- this would provide more flexibility to users and put competitive pressures on existing app stores;
- while there could be some risks associated with allowing access to the operating system for sideloaded apps, this could be sufficiently addressed by appropriate safeguards;
- the implementation costs of these interventions should not be disproportionately high and there should be scope to design them in a manner that does not harm their effectiveness.

8.108 There is also a good case that the benefits from opening up competition through requiring alternative app stores to be supported on iOS, and addressing some of the barriers that currently impede their effectiveness on Android devices, could outweigh the costs, as:

- third-party app stores could provide alternative ways for users to identify, download and update apps and also put increased competitive pressure on Apple's app store;
- while there could be some risks associated with allowing third-party stores, and their associated apps, access to the operating system, this could potentially be addressed by appropriate safeguards, and the implementation costs should not be disproportionately high;

- although some challenges to the success of alternative app stores, such as indirect network effects, would not be addressed by these interventions, these challenges may be less of a barrier to specialised app stores focused on a segment of apps and developers, such as gaming.

8.109 One form of safeguard that should in principle address any security risks to a satisfactory degree would be the replication of the current app review process for apps downloaded directly or through alternative app stores. However, this approach has a number of downsides, including offering more limited potential for differentiation and improvements both in security and in apps themselves. We would expect that any further assessment would need to consider what degree of safeguards are appropriate, and whether the costs associated with implementation, together with any increased risk, would justify the benefits.

8.110 The broader terms on which users interact with sideloading or alternative app stores would also be relevant to their success. We therefore consider that the following interventions would need to be considered on Android, with the same principles applied to iOS if it were opened up to greater competition in app distribution:

- restrictions on the format of warning messages to users, either generally or where apps are able to demonstrate appropriate security safeguards; and

- changes to the terms on which Google is able to give its own Play Store a prominent position, to make it easier for alternative app stores to access users.

8.111 Finally, as discussed above, there is a risk that through their control of access to iOS and Android, Apple and Google could seek to impose terms of access on apps and app stores which restrict their ability to compete effectively in app distribution. The reasonableness of any terms and conditions applied by Apple or Google, including requirements to protect against security risks, should form part of the broader remedy design and implementation assessment. If the proposed terms were unduly onerous and effectively led to the self-preferencing of Apple and Google's own app stores, this should be addressed as part of the implementation.

8.112 Taken together, we have concluded that these interventions have the potential to put competitive pressure on Apple's and Google's app stores. However, we recognise that they would take time to implement, and that some uncertainty would remain regarding their likely effectiveness, given the limited take up currently of both sideloading and alternative app stores on Android.

8.113 We therefore expect that, even if such remedies were implemented, Apple and Google could retain market power in app distribution for the foreseeable future. Consideration should be given to whether a fair pricing requirement would more promptly address the harm to app developers and consumers from the current level and structure of the commissions charged by the app stores. We give further consideration to remedies aimed at addressing this market power in the section below that discusses 'interventions in competition between app developers'.

Interventions in mobile browsers

8.114 In this section we set out our assessment of the following interventions relating to competition in mobile browsers and browser engines:

- enabling competition between browser engines on iOS;
- requiring that all browsers have access on a consistent basis to up-to-date functionality, where that is reasonably required to meet the needs of users; and
- promoting more active consumer choice.

Enabling competition between browser engines on iOS

8.115 Apple does not permit the use of third-party browser engines within its mobile ecosystem – all browsers are required to use its browser engine, WebKit, which is harming competition between browsers on iOS.

8.116 We have therefore considered the case for a requirement for Apple to allow alternative browser engines on iOS. This could be implemented by requiring Apple to permit dedicated browser apps which use third-party browser engines to be used on its iOS operating system, on condition that those browser engines meet appropriate security standards. This would be likely to result in a limited group of third-party browser engines being available via browser apps on iOS.

Potential benefits and effectiveness

8.117 Aside from Apple, we received widespread support for allowing competing browser engines on iOS as a means to promoting greater competition with Apple. This support came primarily from the following sources:

8.118 **Other browser vendors and browser engine stewards:** Several browser engines were supportive of the potential to open iOS to third-party browser

engines. Mozilla, which operates the Gecko browser engine, has indicated that they would look to take up the opportunity to develop their browser engines for iOS, despite the potential costs to them of doing so.[672] Mozilla also highlighted that for the intervention to be effective, Apple would also need to provide third-party browser engines and browsers with the necessary accesses and privileges on iOS, suitable public documentation and support channels. Another third-party browser recommended that appropriately vetted third-party browser engines and browsers should ideally be granted access to the same APIs as WebKit and Safari.

- **Web developers and software engineers:** we have received strong support for the removal of the WebKit restriction from a large number of individual web developers, many of which are operating small businesses in the UK. Their representations have been focused on two core concerns:

  - Persistent underinvestment in WebKit by Apple results in bugs and glitches that add burdens and costs for web developers and reduce the quality of their content on Apple devices. For example, one web developer told us that 'lack of engine diversity means Safari does not have to prioritise fixing bugs and addressing issues developers have', directly increasing the cost of each project they undertake.[673] Sometimes this leads to the cancellation or failure of an entire product.[674]

  - Lack of support for a range of specific features and functionality that would support development of web apps. We have heard this is holding back the potential for web apps across both ecosystems. For example, one developer told us that the WebKit restriction is 'holding up the entire web development world, as often developers have to limit their web apps "minimum common denominator" of features, and usually Safari is way behind on features, and a better browser can't be installed'.[675]

8.119 The evidence we have received from web developers in particular suggests that the WebKit restriction is currently resulting in avoidable direct costs being imposed on businesses. As discussed in Chapter 7, we would expect this to filter through as harm to consumers, either through higher prices or lower quality web content.

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[672] Mozilla's response to Interim Report
[673] Alistair Shepherd response to Interim Report.
[674] Developer E response to Interim Report.
[675] Developer D response to Interim Report.

8.120 We have also received views that wider proliferation of feature-rich web apps could have several positive knock-on effects. Firstly, that web apps could serve as a competitive constraint on native apps, placing downward pressure on app store commission rates. Secondly, if the availability of functionality was improved, for example with full-screen functionality, access to persistent storage and Bluetooth connectivity, then the impact of Apple's restrictions on cloud gaming services may be reduced (we also consider separate interventions on cloud gaming below). Thirdly, as web apps only need to be developed once for all operating systems (unlike apps that are 'native' to a particular system) they are not so strongly affected by network effects, so in time could support further entry into the operating system and app store markets. These additional potential effects are uncertain, but in combination serve to strengthen the case for removing Apple's restriction.

8.121 On this basis, the evidence we have gathered suggests that removal of the WebKit restriction has the potential to deliver strong benefits to competition, consumers, and digital businesses in the UK.

Potential costs and unintended consequences

8.122 Apple strongly disagreed with the potential interventions that we highlighted in our interim report. It said that there were a number of security benefits associated with its integrated approach to the ecosystem, including the requirement for all browsers to use Apple's own browser engine, and that these could not be replicated if it were to be required to 'disintegrate' the ecosystem by introducing third-party browser engines. As an example, Apple referred to its ability to push out security patches and updates immediately across any app that shows a webpage, when it becomes aware of security threats.[676] In response to a request for further clarification, Apple said it would need to completely redesign the current iOS security, privacy, and performance model, which would mean massive costs for Apple and third parties. Apple referred to a number of elements of functionality that it said offset security risks and could not be replicated for third-party browser engines.

8.123 We recognise that there are a range of complex technical issues that would need to be resolved, and this is acknowledged by all parties, including competing browser engine developers. However, the evidence we have received suggests that the costs may be more manageable than is indicated

[676] Apple's response to our interim report.

in Apple's submissions. The advice we have received does not support some of Apple's claims, and experts[677] have told us:

- Allowing Blink and Gecko on iOS for dedicated browser apps is highly unlikely to materially worsen security. This is because having multiple browser engines installed would not in itself affect the security on a device, and therefore allowing unrestricted access to a small set of dedicated browser engines with appropriate technical standards and safeguards should not materially affect the security of the device.

- Apple's dedicated Safari sandbox and hardware integration are not the only ways to secure a browser engine on Apple devices:

    - A common way browser engines protect against attacks is by adding layers of defence in the form of sandboxes.

    - Even without hardware integration a browser engine such as Blink can provide a high level of security.

- The costs from enabling and securing alternative browser engines is uncertain and will depend on the approach taken, and a significant part of the costs would fall on the alternative browser engine vendors, rather than Apple.

8.124 As a result, it should be possible for Apple to provide support to a small number of approved third-party browser engines without significantly increasing security risks, at a scale of implementation costs which appears to be lower than suggested by Apple's submissions. These browser engines would be available to dedicated browser apps.

Conclusions on enabling competition between browser engines on iOS

8.125 There is a strong case that the benefits from opening up competition through allowing other browser engines on iOS would outweigh the costs, as:

- Allowing alternative browser engines on iOS has the potential to deliver substantial benefits to competition, consumers, and digital businesses in the UK. There could be significant benefits from enhancing the capability of browsers and therefore of web content and web apps. This could over time increase competitive pressure on the distribution of native apps.

- There would be some implementation costs for Apple and some additional safeguards would be required such as minimum standards for browser or

[677] We consulted experts including RET2 (a computer security firm from which we commissioned advice). For other information on the advice received regarding browser security see Chapter 5 and Appendix F.

browser engine security. However, based on the evidence we have received, these costs would be manageable and the risks could be mitigated by appropriate safeguards.

- If these safeguards can be implemented effectively, supporting third-party browser engines such as Blink or Gecko should not create any material increase in risk to the privacy and security of users.

- In the longer-term, more competition should also provide stronger incentives to improve Apple's own browser.

8.126 On that basis, there appears to be a strong case for Apple to be required to support third-party browser engines on iOS. However, some uncertainties remain regarding how Apple would make the changes required to implement the intervention, the ultimate scale of costs which might result, and the extent to which these would fall on Apple or on stewards of the other browser engines, such as Google and Mozilla. We propose that these are considered further as part of our proposed market investigation explained further in the next chapter.

Mandated standards for browser functionality

8.127 We have considered whether Apple should be required to provide enhanced functionality on WebKit, to allow web developers more comparable access to the technology of the iPhone as native app developers. In the case of some functionality, this might be viewed as a necessary complement to removing Apple's WebKit restriction, but in others it could be viewed as a substitute.

8.128 We have also considered requirements relating to consistent API access to ensure that third-party browsers compete on a level playing field with Apple and Google in their respective ecosystems.

Potential benefits and effectiveness

8.129 Open Web Advocacy[678] suggested to us that in principle, all the functionalities open to native apps could be made available to web apps, which would resolve issues relating to unfair competition between native apps and web apps.

8.130 However, Open Web Advocacy also highlighted that there were risks to the effectiveness of any intervention focussed on mandating web functionality. Its submission suggested this would be hard to apply in practice as new

[678] See Open Web Advocacy's response to our Interim Report.

functionality becomes available. In its view, the regulator would be required to resolve a number of issues where there is ambiguity, including around bug fixes, and this would be difficult to manage effectively.

8.131 Browser vendors[679] have told us that Apple restricts third-party access to browser APIs and that there are features used by Safari which are not available to other mobile browsers on iOS devices. For example, several browser vendors commented on browser extensions or add-ons that are available on Safari but other browsers on iOS do not have access to, examples of which included content blockers and password managers. Several stakeholders said that more equitable API access would be a necessary pre-condition for the effectiveness of more direct interventions promoting competition for browsers and web apps.

8.132 Google told us that it does not impose restrictions, except in limited circumstances which it said were to address security and privacy risks, as well as to manage the consumption of its service infrastructure. There is also competition on Android, from Mozilla's Gecko, although Google's Blink has around 90% market share. In this study, we have not identified examples where there would be material benefits should Google be required provide to additional functionality to third-party browsers or browser engines. However, as a general principle, we would expect that if obligations to provide functionality were placed on Apple, and examples were identified where Google did not provide comparable functionality, then the same requirements could apply.

Potential costs and unintended consequences

8.133 Based on the submissions from Apple, the main implementation costs associated with additional API access for browsers are likely to be the technical costs of supporting interoperability between the operating system and third-party browsers. Apple's submissions do not suggest that these implementation costs are likely in themselves to be disproportionate.

8.134 Apple[680] and Google[681] have in some cases said that restricting access to APIs is justified where these APIs govern access to privacy and security sensitive functions, and we appreciate that in some cases there may be legitimate reasons why third parties should not be allowed access. As with the other interventions above, the assessment would need to ensure that any

[679] See also Chapter 6.
[680] Apple's response to Interim Report.
[681] Google's response to Interim Report.

additional risks, or implementation costs associated with managing risks, were not disproportionate.

8.135 In respect of enhanced functionality that would support web apps, Apple said that it already has the incentive to introduce new features where it can find a way to do so which preserves privacy and security. It identified a number of examples where it was considering introducing the functionality highlighted in stakeholder responses, or reasons why it did not consider that this would be justified on security grounds.

Conclusions on interventions for browser functionality requirements

8.136 There is a strong case for requiring a level playing field between Apple's browser (Safari) and third-party browser apps, regardless of whether the WebKit restriction is removed. We would therefore expect that there should be comparable API access between Safari and other browsers using WebKit. As discussed in Chapter 5, there appear to be some examples where this is not the case and we have not seen any compelling reasons to justify this.

8.137 There is also a strong general case for a level playing field between the functionality availability to native app developers and web app developers. Following the removal of the WebKit restriction, competition may help to drive up standards on iOS, but there may continue to be some features that would continue to be restricted within iOS or Android, and in some cases there may be a good case for requiring parity with the treatment of native apps.

8.138 However, there is a risk of becoming overly prescriptive in such a technical market. A principles-led approach could be implemented that would require the mobile ecosystems to give reasonable access by browsers to device functionality that is available to native apps, where that can be achieved at proportionate cost. This requirement, combined with competition on browser engines, should be able to assess questions about whether particular aspects of native app functionality should also be available to web app developers through dedicated browser apps. As with other interventions relating to mobile browsers, we will further consider these interventions as part of our proposed market investigation.

Interventions to promote more active consumer choice

8.139 We have also considered the following interventions which could promote competition between mobile browsers through more active consumer choice:

- requirements that make it more straightforward for users to change the default browser within their device settings; and

- mandate certain forms of choice screens to be displayed to users, or other requirements relating to the way choices are displayed.

8.140 We do not consider that outright restrictions on pre-installation of browsers are likely to be necessary, as users expect some form of pre-installation, and we have found that the competitive advantages to Apple and Google that arise as a result of pre-installation would be better addressed through rules around defaults and effective choice architecture. We have summarised the potential benefits and costs of these interventions below.

Potential benefits and effectiveness

8.141 One way that Apple and Google can potentially empower users to make effective choices is by making it easier for users to change the default browser. This could reduce friction for consumers and make it easier to make effective choices. Google offers some choice screens, including those implemented following the imposition of a requirement to do so by the European Commission, but Apple always sets Safari as the default, and does not make browser choice straightforward for users (see Appendix G).

8.142 The choice architecture within Apple's and Google's respective ecosystems may therefore be used to influence consumer behaviour in a way that preferences Apple and Google. This includes through defaults and pre-installation of browsers, and, where there is choice, how browser choice is designed and presented to users.

8.143 As discussed in Appendix G, while some users make a deliberate choice, pre-installation and defaults can be powerful forms of choice architecture which strongly influence browser choice. We recognise the role of choice screens and measures to reduce friction while switching defaults, as potential ways to empower users to make effective choices. However, we have not at this stage undertaken detailed analysis of how this would work and the impact it would have.

Potential costs and unintended consequences

8.144 A mandated requirement to introduce a new form of choice architecture would result in changes to Apple's and Google's mobile ecosystems, which would result in implementation costs. We would expect that some of these measures, such as making it easier to change the default, should have low implementation costs. The introduction of new forms of choice screens would have a greater implementation cost, and therefore this would need to be assessed against the likely effectiveness of such changes.

8.145 We are aware that pre-installation and default settings can benefit consumers, as they can help to streamline the user experience and deliver efficiencies. Introducing mandatory requirements on users to make choices may therefore impact the user experience. Google also acknowledged the importance of active user choice with respect to browsers, but raises concerns about risk of added friction, decision fatigue and choice overload. Apple has also stressed the benefits of a consistent 'out-of-the-box' user experience.[682]

8.146 These costs can be assessed and potentially can be mitigated through testing and trialling of any interventions. This would also help identify both the effectiveness of choice screens, and the effect on the overall burdens on consumers, including whether any potential issues of fatigue are likely to result in reduced engagement with choice screens.

Conclusions on interventions to promote more active consumer choice

8.147 At this stage, we do not have strong evidence to say whether or not users would find it difficult to switch to alternative browsers which were offering a better user experience and whether choice screens and other measures to reduce friction would an effective way to tackle this. We will also consider further the need for targeted interventions, for example where it is easier to switch back to the pre-installed and default browser than to a third-party browser. We will consider this in more detail as part of our proposed market investigation, to support our understanding of the likely effectiveness of the interventions described above.

Interventions in competition between app developers

8.148 In this section we set out our assessment of potential interventions to address concerns in relation to Apple's and Google's role in competition between app developers as set out in Chapter 6. We have considered the following interventions:

- Requirements on Apple and Google to follow transparent processes for their app store reviews.
- Requirements on Apple and Google to operate their app store in a way that does not unreasonably favour their own businesses (ie ensuring a level playing field), or in some cases also distort competition between third parties. Within this, we have considered potential interventions for

[682] Apple's response to Interim Report.

the particular concerns discussed in Chapter 6 relating to access to the NFC chip, in-app payment mechanisms, ATT, and the treatment of cloud gaming services.

- Separation remedies such as data or operational separation. Separation is a more intrusive intervention designed to prevent conflicts of interest, arising in this case between Apple's and Google's app store operation on the one hand and their development of apps on the other.

8.149 Our concerns about the app store review processes focus on the ability of Apple and Google, as gatekeepers of their mobile ecosystems, to impose unfair trading requirements on app developers, including potentially discriminating between app developers. This includes concerns about a lack of transparency in the process, which cannot be addressed by competition as app developers cannot in practice switch to an alternative app store without losing out. Our concerns about the app store operations largely focus on self-preferencing of Apple's and Google's own apps and services. Interventions to address these issues would be well suited to the SMS Conduct Requirements anticipated in the proposed new pro-competition regime for digital markets in the UK. In previous publications on this topic, the CMA has referred collectively to such requirements as 'codes of conduct' – following the government's decision in its response to its consultation to refer to 'conduct requirements' instead, we have sought to apply that updated terminology in this report.[683]

8.150 Based on details of the proposed new regime set out by the government to date,[684] we understand that it will include powers for the DMU to impose specific conduct requirements to achieve the objectives of 'fair trading', 'open choices' and 'trust and transparency'.

8.151 Given our assessment in this market study that both Apple and Google would meet the criteria for SMS designation[685] in the activity of native app distribution, we expect that the SMS Conduct Requirements would apply to both Apple's and Google's app stores. As a result, the App Store and the Play Store would face requirements to trade fairly and not to favour Apple's and Google's own proprietary apps. The sets of conduct requirements would apply to Apple or Google on an ongoing basis and would be largely principles-based, meaning they will not set out long prescriptive lists stating which of

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[683] A new pro-competition regime for digital markets - government response to consultation.
[684] A new pro-competition regime for digital markets – Consultation document (August 2021) and A new pro-competition regime for digital markets - government response to consultation
[685] This assessment has been based on the government's latest proposals for the SMS test. It is not the formal designation assessment for the regime, which would be conducted by the Digital Markets Unit once it has been established on a statutory basis.

Apple's and Google's terms and conditions are or are not acceptable. The DMU would be able to enforce the specific conduct requirements and require changes to Apple's or Google's terms, where it found that there was an ongoing breach of the code objectives, which had not been resolved by Apple or Google.

Enhancing the app store review process

8.152 The app review process enables Apple and Google to identify and address potential concerns with apps, such as user safety, inclusion of potentially harmful content and reliable app functionality. Given the pivotal role of this process in managing access to Apple's and Google's mobile ecosystems for millions of native app developers, we would expect it to be governed by clear and transparent guidelines and review processes. As described in Chapter 6, the evidence we have received in this study suggests that this is not always the case. The majority of concerns we have heard related to Apple's app review process, but similar principles should apply to the processes in both Apple's and Google's ecosystems.

8.153 In that context, we have considered the following three linked requirements for Apple and Google, when operating an app review process:

- The app review process should be transparent. For example, there should be reasonable expectations about the outcome of the app review process (including the reasons for any rejection or requirement to make changes as a condition of approval), clarity on timing and procedure, and an appropriate dispute resolution mechanism;[686]
- The app review process should be fair and non-discriminatory.
- The app review process should not be designed in a way which results in Apple's and Google's own apps having a competitive advantage over third-party apps.

Potential benefits and effectiveness

8.154 We received strong and widespread support from app developers for a clear, fair, and transparent app review process, in some cases supported by examples of first-hand experiences of difficulties with the app review processes, mainly in relation to Apple. App developers gave a number of

[686] Some of these requirements might also be in the scope of the platform-to-business regulations, which are explained further in Appendix A. However, we consider that the Conduct Requirements would also be likely to be an appropriate mechanism for enforcing such requirements on firms with SMS, including the ability to prepare guidance on compliance by SMS firms.

examples of changes which, in their view, would make the app review process fairer and more transparent. These are discussed in more detail in Appendix M.[687]

8.155 Apple told us that it views its app review process as an integral part of Apple's multi-layered approach to security. It also drew our attention to recent changes to its App Store submission process in October 2021, which it suggested addressed certain complaints including those made by Basecamp.[688]

8.156 Google's submitted that several of our concerns regarding potential self-preferencing do not apply to the Play Store, and that we have found no evidence of concerning practices with respect to its app review processes.[689]

8.157 In our view, a requirement on Apple and Google to provide greater transparency and a more objective description of the working of the app review process could deliver a wide range of benefits, both in terms of addressing genuine problems, and also any perceived issues which may deter app developers from investments and innovation. The benefits would include:

- Addressing Apple's and Google's ability to apply a more unspecified app review process in a way that favoured their own businesses. Both firms may have the incentive to do so, either where they offer competing apps or by favouring apps or types of apps that make greater use of their services, such as in-app payment systems or advertising services, owned by Apple and Google.

- Supporting a more level playing field between apps, by addressing the risk that certain apps may have higher costs or lower quality services due to inconsistency or ineffectiveness in the app review process. Providing confidence to app developers that the app review process cannot be used to adversely affect app developers that make complaints or otherwise take commercial steps against Apple's and Google's interests.

8.158 As described in Chapter 6, the majority of concerns and examples raised with us related to Apple, and our review of the evidence from this study indicates that Apple's process is unnecessarily opaque and this increases costs to app

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[687] Appendix M illustrates how the envisaged framework of the SMS Conduct Requirements which have been proposed by government as part of the new regulatory regime for digital markets might be used to address the potential harms to competition and consumers identified in this study. It also sets out a number of examples of behaviours where specific conduct requirements would be well placed to address a number of the concerns we have found in this market study and make these markets work better.
[688] Apple's response to Interim Report.
[689] Google's response to Interim Report.

developers. Consumers could lose out where beneficial apps or updates are rejected or delayed unnecessarily. Greater transparency should generate efficiency benefits, including reducing the potential for unnecessary delays in approvals for both new apps and upgrades and providing consumers with more timely access to greater quality products and services. Delays, or even risks of delays, can also adversely impact business planning processes, launch dates, revenue generation, and ultimately investment decisions.

Potential costs and unintended consequences

8.159 While this intervention would require Apple (and likely also Google) to make changes to both their existing guidelines and processes, we expect the cost of this to be relatively limited. In Appendix M, we discuss in further detail what specific requirements could be included in a conduct requirement to provide an effective app review process, including:

- transparency on how information provided in the app review process can be used by Apple and Google;
- fair warning of changes to the standards for app review process which may have a material effect on users;
- requiring certain procedures and/or service metrics to be set out explicitly in the review process;
- well-defined processes for how problems identified by the app review process are communicated, including clarification of what remedies are required;
- requiring an effective complaints handling and dispute resolution process; and
- reporting on the process, including the effectiveness of dispute resolution processes.

8.160 To the extent that this requires investment to improve performance, our current view is that this would be proportionate, given Apple's and Google's gatekeeper role and the scale of profits earned by the app stores from apps subject to the app review process. It should also bring benefits to Apple and Google, given the importance of the app ecosystem to their own businesses.

Conclusions on enhancing app store review processes

8.161 Based on this assessment, our view is that there is a strong case for **a requirement for Apple and Google to maintain a fair and transparent app**

review process. This could be implemented at moderate cost, for example through guidance to Apple and Google on what an effective app review process should include. Both firms could take this guidance into consideration in documenting the current process and updating it where necessary.

Ensuring a level playing field

8.162 In this section, we set out a number of interventions that are directly targeted at addressing the ways in which Apple and Google are able to reduce the effectiveness of competition in app distribution. These are discussed in more detail below, but are focussed on requiring Apple and Google to provide reasonable and non-discriminatory access to the functionality of their mobile ecosystems**.**

8.163 Our main focus has been on areas where the functionality available to third-party apps differs to that for Apple's and Google's own apps, or where Apple and Google unreasonably require app developers to use their own services, rather than those potentially offered by competitors. We have also considered examples where Apple in particular applies restrictions using its gatekeeper role, which are likely to have an adverse effect on users.

8.164 The concerns we have heard are discussed in more detail in Chapter 6, and in our view would be addressed by requirements, which we discuss in more detail below, that Apple and Google:

- support and not unreasonably restrict third-party access to hardware, software and functionality. As an example, there are limitations on the use of the NFC chip in iOS;
- not unreasonably favour their own apps through the use of pre-installation and defaults;
- provide transparency of app store discovery processes (algorithms and search) to allow third-party app developers reasonable access to users;
- not share data between the app review process and their app development businesses;
- not impose unreasonable restrictions on access to the app store, in particular through requiring use by certain apps of their own in-app purchasing systems, or Apple's restrictions on cloud gaming; and
- not self-preference their own digital advertising businesses through the operation of the app store, including through the approach to privacy –

this would include our concerns over how Apple has implemented its ATT framework.

8.165 A range of app developers supported these requirements. The greatest focus of responses was that Apple and Google should be required to allow app developers to use third-party in-app payment systems. Some developers also gave targeted examples of differences in treatment of their own apps. For example, we received submissions from news publishers which highlighted the difference in treatment of their apps to Apple's News app, and also their challenges in monetising through digital advertising given Apple's ATT framework. We also received submissions alleging preferential treatment by Apple and Google of other first-party apps, including music, health, and mail apps.

8.166 Google told us that it seeks to treat all apps fairly and equitably, regardless of whether they are third-party apps or its own. Google also told us it was broadly supportive of a Code of Conduct based on high level principles.[690]

8.167 Apple told us that, while it strives to open features and functionality to third-party developers, it is necessary also to guard against any risks to security, user privacy, and device performance.

8.168 As with other interventions in this section, any interventions would need to take these potential costs into consideration as part of the overall assessment. However, we found a number of examples where there are likely to be less restrictive ways for Apple, and in some cases Google, to ensure appropriate levels of privacy and security on users' devices without restricting competition. We have provided below a summary of our findings on these examples.[691]

Third-party access to hardware, software and functionality.

8.169 Third-party native app developers have highlighted that their ability to compete effectively is constrained by a lack of necessary access to APIs, functionality and interoperability with Apple's and Google's respective mobile operating systems. To address this, Apple and Google could be subject to a requirement to provide equitable access to functionality and APIs for third-party app developers competing with Apple and Google's own products and services within their respective mobile ecosystems. We envisage that, within the pro-competitive regime, there could be an enforceable conduct

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[690] Google response to Interim Report.
[691] Appendix M illustrates how these interventions could fit within the envisaged framework of the SMS Conduct Requirements which have been proposed by government as part of the new regulatory regime for digital markets.

requirement to provide reasonable access to functionality of the mobile ecosystem. Apple or Google would then be required to provide this functionality on reasonable request unless they are able to demonstrate that any restriction is objectively justified.

8.170 Box 8.1 illustrates how this could be applied to the NFC chip, which was discussed in detail in Chapter 6.

Box 8.1: Requirements to allow access to the NFC chip

The Near Field Communication (NFC) chip is a specific piece of hardware that Apple restricts access to within its mobile ecosystem. A key application of NFC is in making contactless mobile payments which is an important and growing market (and it also has wider applications in other markets).

Contactless payments are increasingly popular with consumers and by preventing rival mobile wallets from being able to offer such payments, Apple gives itself a clear competitive advantage.

Under the pro-competitive regime, specific conduct requirements to provide more equitable third-party access to functionality such as the NFC could include requiring SMS firms not to unreasonably restrict interoperability between the operating system and third-party native apps.

In assessing compliance with this requirement, Apple would be able to present objective justifications such as security concerns for not letting third-party wallets access the NFC chip for payments.

A breach investigation could assess whether Apple's restrictions are justified or whether a less restrictive approach would be available that would bring benefits to users. We would expect potential competitors to be required to provide detail on how they could be provided access to the NFC while protecting customers from any additional risk.

If the current restriction was not justified, it would be found to be a breach of the conduct requirement. If so, Apple would be required to make sufficient changes to address the breach, such as supporting third parties that were able to demonstrate that they were compliant with appropriate safeguards.

8.171 Under this requirement, Apple and Google should be generally obliged to allow third-party apps access to the same aspects of device functionality as their own apps.

Use of pre-installation and defaults

8.172 Apple and Google are able to provide their own apps with a competitive advantage through pre-installation and being set as the default option. Where

there is a default applied, consumers should be free to make the decision to set third-party services as the default, and this should not be unreasonably difficult.

8.173 This would require action by Apple and Google, where there is currently no straightforward way to set third-party apps as a default. This could be through a requirement on Apple and Google not to influence competitive processes or outcomes in a way that unduly favours Apple's and Google's own services over those of rivals, and to ensure that choices and defaults in how to use services provided by the platform are presented in a way that facilitates effective customer choice. For example, to promote competition in music or navigation apps, there should be a straightforward way to set third-party apps as the default, where users wish to choose alternatives to Apple's and Google's apps.

8.174 We have received stakeholder support also for the introduction of choice screens for some categories of apps such as email or news services. Choice screens would be to some extent a more intrusive intervention, which would seek to address the ability to use pre-installation and default to self-preference by ensuring that consumers are required to make an active decisions on setting or changing defaults. As discussed in the context of browsers, while there are potential benefits to consumers from introducing mandatory requirements on users to make choices, we also recognise that pre-installation and default settings can benefit consumers, as they can help to streamline the user experience and deliver efficiencies. Any assessment of whether choice screens were a proportionate response to the pre-installation and default setting of first-party apps by Apple and Google would therefore need to assess the benefits from active choice against the potential costs to users (which includes the additional friction and burden from encountering frequent choice screens).

Transparency of app store discovery processes (algorithms and search)

8.175 Apple and Google control the means by which many app developers access users, through the algorithms associated with the app store discovery process. Many developers (both small independent apps and well-established developers) have expressed concern about the opacity of Apple and Google's app store discovery processes, and have expressed concerns about risk to their discoverability and therefore their business models from unexpected changes to Apple and Google's algorithms.

8.176 Changes to Apple's and Google's algorithms can have a material impact on the flows of user traffic to download different apps and so are important commercially to the many businesses. The uncertainty over potential changes

can harm business users. An opaque app discovery process could also be used to favour Apple and Google's own apps, although we were told by Apple and Google that the algorithms are designed to treat first-party and third-party apps consistently, and that Apple and Google both have certain internal policies in place limiting their internal app development teams' access to information concerning app store search algorithms.

8.177 We therefore consider that there is a case for additional transparency requirements on Apple and Google, to address the harm caused by unexpected changes to the algorithms which determine app discovery. These requirements could include greater clarity over the factors that influence app discovery, as well as any material changes that are planned. In some cases, this transparency may be in the form of reporting requirements, rather than additional transparency to users. We discuss how these requirements could work in practice in Appendix M.

Sharing data between the app review process and development businesses

8.178 Apple and Google may, through their positions in operating systems and app distribution, be able to provide their own apps with a competitive advantage through sharing of commercially sensitive data about competitors' businesses and strategies. This includes from the app review process (eg timing of future releases and changes), in-app payment systems (access to transaction level sales data), and their operation of app stores (access to data on download and usage of apps).

8.179 Both Apple and Google have told us that this should not happen in practice. As discussed in Chapter 7, some app developers have provided examples that they argue suggest that Apple may have used data from this process in developing its own apps. These examples indicate that even if such data sharing is not occurring in practice, there is a credible concern by potential competitors that it may happen when they put forward a new app for review. This could discourage investment.

8.180 This concern could be addressed through a revised and transparent app review process as discussed above, which would include a formal requirement not to share confidential data gathered as a condition of the app review process, as well as requirements to use data from customers and business users only in ways which are reasonably linked to the provision of the services for which the data was obtained. This should be a straightforward intervention, and at little or no cost if Apple and Google already have mechanisms in place to ensure data is not shared from the app review process to their own app development business at present.

Access to the app store – Apple's and Google's rules on in-app purchases

8.181 In Chapter 6, we considered concerns arising from the requirement for app developers to use Apple's and Google's payment systems for in-app transactions involving digital content.

8.182 Based on the evidence gathered to date, it appears that many of these potential harms could be avoided if app developers were able to choose their own payments service provider (PSP) and transact directly with users. There would be viable alternative methods for Apple and Google to collect a commission for their app stores, while also allowing developers to handle payments directly which do not give rise to the potential harms to competition outlined above.[692] It is not clear that these alternatives would be prohibitively costly or challenging to implement and it would appear that both Apple and Google have the ability to effectively enforce against any requirements that they impose through the use of their app review processes.

8.183 Some users may value being able to transact with Apple and Google via their payment systems. However, it would be beneficial for users to be offered meaningful choice between use of Apple's and Google's payment systems and alternative payment solutions**.** This would allow developers and users to make choices that can drive competition and innovation between payment solutions. Such an outcome would, however, only be effective if app developers that choose to use third-party PSPs would not incur unnecessary costs or difficulties when doing so.

Access to the app store – Apple's restrictions on cloud gaming

8.184 Through their gatekeeper roles, Apple and Google are able to determine the apps that can use the app store. In Chapter 6, we discuss that Apple's terms include a restriction on cloud gaming services, although it allows certain other types of apps with broadly comparable functionality (eg apps that offer streaming media content, or apps that include a wide catalogue of games in a single app).[693] Google does not apply a similar restriction on Android.

8.185 Apple's restriction on cloud gaming services could be addressed through a requirement that app store operators should not impose unreasonable restrictions on certain classes of apps where there is a less restrictive alternative that would benefit users. This would be a targeted example of the broader principle that firms with a gatekeeper role should not unreasonably

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[692] For example, this may include reporting obligations (accompanied by audit rights) or the use of an API that notifies Apple and Google of transactions in real time.
[693] Further detail on the impact of Apple's restriction on cloud gaming services is set out in Appendix I.

discriminate against certain users. Apple would need to amend the way it currently imposes restrictions specifically on cloud gaming apps, to comply with this requirement.

8.186 Based on submissions to this study, our current view is that there should be limited implementation costs or additional security risks, if Apple were to make this change. Cloud gaming is already supported on Android, and other cloud-hosted apps are supported on iOS. We intend to consider these issues further through our proposed market investigation into mobile browsers and cloud gaming.

Self-preferencing through the approach to privacy

8.187 Both Apple and Google continue to evolve the way in which users make choices about privacy, and what data they share with app developers.

8.188 As discussed in Chapter 6,[694] Apple has introduced privacy initiatives (ITP and ATT) which are intended to enhance users' privacy through providing greater control over the use of their personal data, which we recognise bring privacy benefits. However, we have concerns that there are differences between the approach to privacy in respect of Apple's own apps such that it is not applying the same standards to itself as to third parties, and that consumers may not be making fully informed choices.[695] In the case of ATT, our concerns include that Apple has implemented a measure which requires third-party apps to implement a single one-off choice box for their users requesting permission for the app to 'track' them, while showing a different prompt to get consent to personalised advertising on its own apps.

8.189 A requirement not to self-preference could be met by Apple in a number of ways. For example:

- Apple could apply a consistent set of design principles (ideally informed by user testing) to all user prompts on its platform that seek users' consent for the processing of their personal data for the purpose of serving targeted adverts. This would lead to greater alignment in relation to language and choice architecture between the ATT prompt and Apple's personalised ads prompt.

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[694] With further detail in Appendix J.
[695] We also recently conducted an investigation into Google's Privacy Sandbox Proposals, under which Google has offered commitments that are designed to ensure consistent use of data by Google's digital advertising businesses and third parties. Google has indicated its intention to introduce Android Privacy Sandbox proposals in due course, which we would expect to include comparable safeguards to support privacy without self-preferencing Google's digital advertising businesses.

- Apple could offer equivalent or more similar functionality via SKAdNetwork, the tool it offers for privacy-preserving ad attribution for third parties subject to ATT, as it offers via Apple Ads Attribution API, the tool it offers for attribution to users of its own advertising services, including in terms of granularity of the data developers can access under each tool and timing for receiving such data.

- Apple could allow developers additional flexibility in sharing some of the value they get from users opting in to sharing data with the users, for instance by offering incentives to users for opting into the ATT prompt, as long as doing so does complies with data protection law on obtaining valid consent, as described in ICO guidance.[696]

8.190 Related to the above, there are other things that Apple could do which would improve the effectiveness of ATT. In particular, and as an important foundation for any further changes, we consider that it would be beneficial for Apple to conduct appropriate user testing to better understand user comprehension of the current prompts for ATT and its own prompt. This would enable Apple to identify whether user comprehension could be improved across both prompts, while also ensuring that users are making effective and informed decisions that are not influenced by the presentation of the choice.

8.191 We would also encourage Apple to engage with a broad set of industry participants in advance of introducing any changes to the ATT framework – or before implementing similar policies in future – given the potential impact it can have on their businesses.

8.192 Finally, we would expect Apple to support and engage with industry efforts to develop new standards for privacy preserving functionalities that support a thriving ad ecosystem. This is consistent with what we expect from Google as part of the commitments accepted on Privacy Sandbox.

8.193 We intend to continue to engage with Apple on these issues, in partnership with the ICO, now that this market study has concluded.

Conclusions on interventions to ensure a level playing field for app developers

8.194 In summary, we consider that **interventions designed to require a level playing field for app developers** could result in significant benefits to consumers through enhanced innovation and more intense competition in app development. More equitable access to the functionality of the operating system would address concerns in current app markets and also increase

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[696] See What is valid consent? | ICO the section titled 'What is 'freely given'?'

incentives for app developers to identify new apps which would benefit from such additional functionality.

8.195 As is discussed above, these interventions would be particularly well suited to being implemented through the powers to impose specific conduct requirements which we understand will be available to the DMU under the government's proposed pro-competitive regime. Where current terms, such as restrictions on third-party access to the functionality of the operating system, are found to be in breach of specific conduct requirements imposed under the regime, Apple and Google would need to amend their terms to come into compliance and address the breach. Apple and Google could do this either by removing restrictions on third parties or by removing their own preferential access. The DMU would be able to assess whether any changes proposed by Apple and Google were sufficient and where necessary could specify conditions associated with the implementation of such changes.

8.196 We expect the costs of adapting to such requirements to address the types of practices identified in this section should be proportionate. The requirements would apply to functionality which is already available to Apple's and Google's first-party apps and services, and where that functionality could be applied to third-parties apps and services at proportionate cost. The ability to impose specific conduct requirements, with associated guidance, would bring additional benefits over and above a case-by-case assessment under the CMA's existing powers, as it would provide more certainty for competitors as well as for Apple and Google, by setting out how firms are expected to behave in respect of activities in which they are designated with Strategic Market Status. This should support investment in app development as well as more effective competition between app developers.

Separation remedies

8.197 We have identified the risk of a number of potential conflicts of interest for Apple and Google in the operation of their app stores. In many cases they are both the rule maker and the referee for app markets in which they themselves compete, and we share some of the concerns raised by app developers that Apple and Google have the ability and incentive to provide an unfair advantage to their own apps. We have considered the case for three forms of separation: data separation; operational separation; and structural separation.

Potential benefits and effectiveness

8.198 We have identified the following forms of separation which might bring benefits by addressing conflicts of interest for Apple and Google:

- **Data separation**: which would focus on the ability of Apple and Google to share potentially commercially sensitive data internally and potentially build it into their own technical design or commercial arrangements. As discussed above, we consider that a requirement not to share certain types of data could be appropriate in any case and some constraints on sharing of data may already be in place, but a form of data separation would impose specific barriers to sharing of certain classes of data.

- **Operational separation**: which would require Apple and Google to run their app development processes independently of their mobile ecosystem, and for the mobile ecosystem to treat all apps consistently as part of that process. This form of separation could bring greater benefits, as it would remove a number of the ways in which Apple and Google are perceived to impose fewer restrictions and costs on their own apps. However, this would involve significant costs and be potentially disruptive.

- **Structural separation**: which would be comparable to operational separation in terms of the businesses being separated, but which would require formal legal separation and/or divestment of the app development businesses. Structural separation can potentially reduce not only the ability but also the incentive to self-preference. However, it is also a particularly intrusive, costly and potentially disruptive form of intervention.

8.199 Several respondents supported operational remedies to help address risk of conflicts of interest, and some considered operational separation would be more effective than data separation, due to enforcement/monitoring challenges. Others have recommended that these forms of separation should also be extended to other areas where there is particular risk of consumer harm from self-preferencing behaviour, such as privacy services and use of data.

Potential costs and unintended consequences

8.200 Apple considered operational separation is unnecessary given the safeguards already in place,[697] and a disproportionate response which could require 'significant systemic changes across its business',[698] and have negative effects on innovation and consumer welfare.[699] It also emphasised the benefits of the cross functional structure which Apple employs, where different

[697] Apple's response to Interim Report.
[698] Ibid.
[699] Ibid.

functions work together and operational business units are shared across multiple business groups.

8.201 Google, which also has a cross-functional operating structure, explained that that it already has formal policies in place to prohibit company-wide sharing of identifiable data about third-party apps, and suggested that operational separation would be disproportionate to resolve CMA concerns that third-party app developers might be disadvantaged by Google's first-party app developers potentially accessing data gathered by Google Play. It also stated that operational separation should be considered only if less intrusive remedies, 'such as principles in the proposed code of conduct, have been shown to be insufficient.'[700]

8.202 Google also warned of risks of unintended consequences of any requirement to totally restrict access by its first-party developers to information gathered by Google Play, such as limiting its ability to keep the Play Store secure, or hampering the development of features designed to improve the ecosystem for users and developers.

Conclusions on separation remedies

8.203 In terms of data separation, responses highlighted that the main priority for intervention was the sharing of data between the app review process and the app development business. We agree that this particular form of data separation is appropriate, and should come at a low cost, since Apple and Google have said they have processes in place to ensure such data separation.

8.204 We recognise that an additional requirement of operational separation would come with significant costs, both in terms of additional obligations on the mobile ecosystems to build in the management processes required to support the relevant forms of separation, and potentially some lost efficiencies. Operational separation is an intrusive intervention, particularly where it does not reflect how a business is run today. Both Apple and Google gave us evidence to illustrate that their current organisation is set up differently to the model envisaged by operational separation. There would therefore be likely to be significant costs, and risks to the effectiveness of a requirement to run these businesses separately.

8.205 Structural separation comes with higher costs still, and to the extent that it resulted in mobile ecosystem providers being unable to design and offer

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[700] Google's response to Interim Report.

integrated apps, could significantly change the user experience of mobile devices.

8.206 Given the significant costs, business disruptions, and risks of unintended consequences associated with these forms of intervention, we consider there are alternatives available with the potential to deliver many of the benefits with significantly lower cost and risks. In particular, we envisage that at this stage the interventions proposed above to level the playing field between Apple's and Google's own apps and third parties, would have the potential to deliver many of the benefits with comparably lower costs.

8.207 However, should Apple and Google act against consumers interests by making it unreasonably difficult for competing apps to successfully enter and expand, then separation could be reconsidered as an alternative which directly addresses their incentives to favour their own businesses.

The new pro-competitive regime and use of our existing powers

8.208 In May 2022, the government confirmed its intention to introduce a new pro-competition regime for digital markets in the UK,[701] following its consultation on these proposals in July 2021.[702] The proposed regime will proactively shape the behaviour of digital firms with significant and far-reaching market power, by making clear how they are expected to behave. The government expects the regime to boost competition and innovation by tackling the sources of existing and future strategic market power, described as Strategic Market Status (SMS), while protecting smaller businesses, consumers and competition by governing the relationship between users and key digital firms. The new regime will be implemented and enforced by a dedicated Digital Markets Unit (DMU), which was established on a non-statutory basis within the CMA in April 2021.

8.209 The government announced in the Queen's Speech on 10 May that the Draft Digital Markets, Competition and Consumer Bill will be published in this parliamentary session.[703] The final Bill to implement the reforms will be brought forward when parliamentary time allows. As we set out at the start of our study, the conclusions we have reached here will contribute to the process of establishing and operationalising this new pro-competition regime. We expect the findings of this market study to be an input into any DMU assessment of whether Apple and Google should be designated with SMS in particular activities. The study will also inform the appropriate range and

[701] Government response to the consultation on a new pro-competition regime for digital markets.
[702] A new pro-competition regime for digital markets.
[703] Queen's Speech 2022 - GOV.UK.

design of potential interventions that the DMU could put in place, were it to find either Apple or Google to have SMS. It will help ensure that, once legislation is passed to empower the DMU to perform its functions, there is a strong evidential foundation from which to undertake its own assessment of these issues and, where it considers it necessary, introduce any interventions promptly.

8.210 As discussed in Appendix L,[704] our expectation based on the findings in this study and the evidence to date, is that Apple and Google would meet the criteria (as currently outlined in the government's consultation response) to be found to have SMS in respect of the following activities within their ecosystems; mobile operating systems (and for Apple, together with the mobile device on which it is installed, to the extent these are inextricably linked), native app distribution, and mobile browsers and browser engines. As a result, we expect that the interventions which we have considered in this study would generally be in scope of the new regime.

8.211 The new regime would give the DMU two complementary tools to address the adverse effects of the market power that leads to SMS. These are:

- **SMS Conduct Requirements:** as currently proposed, the government envisages that all firms designated with SMS will be subject to a set of specific conduct requirements designed to address the ability to exploit market power, with common objectives across SMS activities of fair trading, open choices and trust and transparency. In this chapter we have highlighted how such requirements might be applied to mobile ecosystems, including through examples of the practices that we anticipate could be addressed.

- **Pro-competitive interventions (PCIs):** the government's proposals envisage PCIs to be a more powerful tool designed to address the sources of market power by tackling barriers to competition, and therefore to undermine that market power over time. A number of the potential interventions discussed earlier in the chapter could in principle be implemented as PCIs (such as sideloading and alternative app stores).

8.212 In this chapter, we have set out our views on the different potential interventions and, where appropriate, indicated how these could be implemented using the powers of the new regime. Overall, we consider that the new powers set out in the latest proposals in the government's

[704] Appendix L sets out our assessment of whether, based on the evidence we have gathered to date, Apple and Google would presently meet the proposed test for being brought within the new regime (based on the currently proposed test for SMS designation as set out in the government's consultation response)

consultation response would be effective in addressing many of the competition concerns identified in this report.

8.213 The SMS Conduct Requirements would be capable of introducing various specific measures to prevent the exploitation of market power in the activities within the scope of this study as set out above. However, there will be challenges in tackling the potentially numerous ways that market power could be exploited across the mobile ecosystem, and which are likely to change over time. As a result, we consider that alongside the SMS Conduct Requirements, PCIs could be aimed at reducing market power in the ecosystems, for example through certain interventions aimed opening up competition in app distribution and in browsers.

8.214 As described above, we would expect that the SMS Conduct Requirements would be best placed to address the adverse effects on competition that result from market power in app distribution after the formal commencement of the DMU's powers. However, if the DMU is able to promote competition to Apple's and Google's mobile ecosystems at source through PCIs, this could result in sufficient weakening in market power that some or all of the activities could be de-designated, which would mean that the Conduct Requirements are no longer necessary.

8.215 At this time, we need to strike a balance between preparing for the DMU and taking action using our existing powers where appropriate. Now that we have a clearer view of the timing of the digital markets legislation, we are revisiting that balance, as is discussed in more detail in Chapters 9 and 10.[705] That is why we are taking targeted action by:

- Consulting on the launch of a market investigation into mobile browsers and cloud gaming, which will further examine Apple and Google's control over the supply of browsers and browser engines, and the restrictions that Apple imposes on the distribution of cloud gaming services through its app stores. We plan to look at these concerns in greater depth, and intervene where appropriate. Our rationale for this decision is summarised in Chapter 9, and set out separately in more detail in the consultation document published alongside this report.

- Continuing to pursue enforcement action on specific concerns, including the current competition law investigation into Apple's terms and conditions to its app store, and will be looking at taking forward other cases relating

[705] In Chapter 9, we discuss the use of MIRs to focus on specific and discrete issues relating to browsers and cloud gaming. In Chapter 10 we discuss use of the CMA's current powers to take targeted action in order to tackle problems more immediately wherever possible, as well as working closely with other UK regulators and with policy makers

to these and other digital markets over the coming months. Alongside this we also have a number of other digital enforcement cases, including two recently launched cases relating to Google's position in ad tech which was one of the activities considered in our previous market study into online platforms and digital advertising. We also have a number of other ongoing cases in digital markets.

8.216 The next steps the CMA is taking following the conclusion of this market study, including taking direct action as well as working with concurrent regulators and our international counterparts, are discussed further in Chapter 10.

International developments

8.217 These markets are an important focus for many competition authorities internationally, as well as antitrust litigation cases which are seeking changes in response to alleged anti-competitive behaviour. Our ongoing work programme will also be considered alongside these other international developments in these markets.

8.218 Many countries are implementing legislation targeted at making competition more effective in digital markets. Alongside the UK government's proposals for a pro-competition regime for digital markets, there is digital markets legislation in other jurisdictions either under development, including the proposed Digital Markets Act in the EU and Open App Markets Act bill in the US; or already enacted, such as the recent amendment to the South Korean Telecommunications Business Act earlier this year.

8.219 The EU's Digital Markets Act includes measures to regulate large online platforms that meet the criteria for designation as 'gatekeepers', which is expected to include both Apple and Google. Gatekeepers will be required to comply with certain obligations in the running of their daily operations. It includes a wide range of obligations including measures discussed in this section to: improve equal access to, and interoperability with, hardware and software features; improve users' ability to remove default apps and software; allow sideloading of apps and app stores; provide access to app stores on fair and non-discriminatory conditions; restrict the tying of services to platforms (eg in-app payment systems); and restrict self-preferencing (in terms of access, data and rankings).

8.220 The DMA does not specify exactly how these requirements should be met by individual firms. However, we expect that there will be further developments over time, and that the DMA will be one starting point for Apple and Google when deciding how to address these international competition concerns,

many of which are similar to ours. As a result, Apple and Google may make changes to the mobile ecosystem that will address some of the current restrictions on effective competition on a global basis, which could resolve the competition concerns that have been raised in a number of jurisdictions, including the UK.

8.221 As referred to in Chapter 1, there are also a number of competition investigations and litigation (brought both by governments and private parties) ongoing which target some of the markets within this study. These include, among others, cases in the US, the EU, Japan, South Korea, and the UK. For further details, please see Appendix A.

8.222 The interventions identified in this study should be broadly complementary to those which are likely to result from these international developments. The prioritisation of further action by the CMA will continue to be assessed in the light of any changes that result from action in these other jurisdictions.

Conclusion

8.223 In this chapter we have considered a number of potential interventions to address the sources of market power that we have found in the different parts of the mobile ecosystem in Chapters 3-6. We have identified a number of changes which could address this market power, and therefore reduced the effects of the consumer harms discussed in Chapter 7. In some cases, these interventions will be complementary. In other cases, successful interventions that address the ability to exercise market power may reduce the need for other interventions targeted at the adverse effects of market power.

8.224 As discussed above, the government has consulted on the introduction of a pro-competitive regime for digital markets, which will deliver significant benefits to users in the markets in the scope of this study. To achieve this substantial package of reform, the necessary next step is for the government to pass legislation. However, there are also a number of areas where we can and will be using our existing powers to take effective and timely action. This is summarised in Table 8.1, which illustrates the package of interventions, and our intended approach to the work programme towards the implementation of these measures.

Table 8.1: Our proposed package of interventions

Market under review	Potential intervention[706]	Tool for further work
Mobile operating systems (Theme 1)	APIs to support switching (focus on iOS to Android). Interoperability with connected devices (eg Apple Watch) Licensing of Google's mobile apps	DMU: PCIs and Conduct Requirements
Native app distribution (Theme 2)	Requirements to allow third-party app stores and sideloading, subject to appropriate safeguards, without disproportionate costs or warnings to users. Fair pricing requirements for app store commission where necessary to protect users	DMU: PCIs and Conduct Requirements
Browsers (Theme 3)	Requirements to allow access by third-party browser engines, subject to appropriate safeguards Requirements to allow access to device functionality and APIs by third-party browser apps, subject to appropriate safeguards Effective choice architecture	Market Investigation
App development (Theme 4)	Requirement to have a fair, transparent and effective app review process Removing restrictions to cloud gaming on iOS. Level playing field between first-party and third-party apps (access to APIs, device functionality, self-preferencing transparency)	DMU: Conduct Requirements Market Investigation DMU: Conduct Requirements Enforcement[707]

[706] This is based on our current assessment of the likely benefits and potential costs of the different interventions we have identified and explained in this chapter. These priorities may change in response to other market, legislative or other developments. Were the CMA – or, in future, the DMU – to come to consider any such interventions in these markets, that assessment would be based on an independent assessment by the relevant decision maker (for example, a CMA Senior Responsible Officer in a Competition Act investigation, or an Inquiry Group in a Market Investigation Reference) of the circumstances as they pertain at that time. That decision will be taken based on the laws applicable to the tool under which the conduct is being investigation.
[707] The CMA has an ongoing enforcement case relating to in-app payments and will keep potential other cases under review. Other authorities have ongoing cases: for example, the EU Commission has a case into the restrictions on use of the NFC chip.

8.225 Based on our findings in this study, it is highly likely that Apple and Google would have strategic market status in the markets in the scope of this study. As highlighted in Table 8.1, we have outlined a number of potential interventions to address the harmful effects of market power and the sources of market power, many of which we consider the DMU would be best placed to take forward through enforceable Conduct Requirements and PCIs.

8.226 This regime would be able to address harms occurring now and look at harms that may arise in the future – addressing these pro-actively by setting rules and guidance upfront with key firms. It will also work alongside other international initiatives designed to address comparable competition concerns.

8.227 We are consulting on opening a market investigation into mobile browsers and cloud gaming, as discussed in more detail in the next chapter. We are also continuing to take enforcement action where we consider that the concerns identified represent a breach of the Competition Act. We are also looking at other areas where we can take further enforcement in relation to the concerns raised in this study and other digital-related concerns, either through a CMA investigation or working with DRCF partners.

9. Proposal for a market investigation reference in mobile browsers and cloud gaming

Introduction

9.0 This chapter explains our decision to consult on a market investigation reference (MIR) into the supply of mobile browsers and mobile browser engines, and the distribution of cloud gaming services through app stores on mobile devices (referred to as 'mobile browsers and cloud gaming' throughout our report).

9.1 Further detail on the proposed reference and consultation is set out in the draft Terms of Reference and consultation document, published alongside our final report.[708]

9.2 This chapter outlines:

- the legal framework for the CMA to make an MIR;
- our decision not to make an MIR at the interim report stage;
- our updated decision to consult on an MIR and the reasons for this; and
- details of our consultation on an MIR.

MIR statutory framework

9.3 Where the CMA considers that there is a case for a more detailed examination of a market (or markets) it may refer the market(s) for an in-depth market investigation.[709] A market investigation seeks to determine whether features of the market(s) have an adverse effect on competition, and if so, decides what remedial action, if any, is appropriate to take using its order making powers,[710] or recommends remedial actions for others to take.[711]

9.4 The CMA may decide to make an MIR when it has reasonable grounds for suspecting[712] that a feature or combination of features of a market (or

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[708] Mobile browsers and cloud gaming MIR case page.
[709] Further guidance on CMA market investigations is set out in CMA3: Market studies and investigations - guidance on the CMA's approach and CC3: Market Investigations Guidelines
[710] If the CMA finds an AEC following any type of market investigation, and decides to take action to remedy, mitigate or prevent an AEC, it has the choice of accepting undertakings (if given and acceptable) and/or making an order. The CMA's order making powers allows it to introduce legally enforceable interventions (ie remedies). Market Studies and Market Investigations: Supplemental guidance on the CMA's approach
[711] Mobile ecosystems: Interim report
[712] The reference test is a 'reasonable grounds to suspect' test and does not require the CMA to have concluded that there are, in fact, features of a market which prevent, restrict or distort competition.

markets) in the UK prevents, restricts or distorts competition, and a market investigation reference appears to be an appropriate and proportionate response.[713] The CMA must consult before making an MIR.

9.5 Where the reference test is met, the CMA can exercise its discretion, to make an MIR. One of the factors taken into account when exercising this discretion is whether it is the most appropriate mechanism for assessing the issues and delivering the required outcomes. The CMA's guidance on making MIRs sets out four criteria which help to guide our exercise of that discretion:

(a) the scale of the suspected problem, in terms of its adverse effect on competition, is such that a reference would be an appropriate response;

(b) there is a reasonable chance that appropriate remedies would be available;

(c) it would not be more appropriate to address the concerns through undertakings in lieu of a reference (UILs); and

(d) it would not be more appropriate to address the competition problems through alternative powers available to the CMA or through the powers of sectoral regulators.

9.6 In considering these factors, we recognise that an MIR leads to significant costs, both to the CMA itself (and the public purse) and to the parties involved. Following a reference, it will be for the market reference group[714] to decide whether competition is indeed prevented, restricted or distorted, and (if so) what, if any, action should be taken to remedy the adverse effect on competition or any detrimental effect on customers resulting from it.[715]

Our decision in our interim report

9.7 In December 2021, we published our interim report which set out our provisional findings on competition in mobile ecosystems. We noted that based on our initial findings, we believed there were reasonable grounds for suspecting that features of the following markets could be restricting or

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[713] Market Studies and Market Investigations: Supplemental guidance on the CMA's approach
[714] If the CMA Board decides that a market investigation reference is to be made, it refers the matter to the CMA Chair, who is responsible under the ERRA13 for constituting the market reference group ('the group') that will undertake the market investigation. The market reference group appointed by the CMA Panel Chair is responsible for the conduct of a market investigation. The group must consist of at least three members selected from the CMA panel. The group is required to decide whether there is an AEC in the market(s) referred and, if so, whether and what remedial action is appropriate. Market Studies and Market Investigations: Supplemental guidance on the CMA's approach
[715] In the form of higher prices, lower quality or less choice of goods or services, or less innovation in relation to goods or services in any market in the UK – see OFT511 - Market investigation references

distorting competition in the UK and therefore that the MIR reference test had been met in relation to:

- mobile operating systems, with a focus on the closed nature of Apple's ecosystem, and on the nature of Google's licensing agreements with device manufacturers;
- app stores and app distribution, with a focus on addressing the sources of Apple's and Google's market power in native app distribution within their respective ecosystems; and
- browsers and browser engines, with a focus on Apple's WebKit restriction and other barriers to competition such as pre-installation, default settings and choice architecture.

9.8 We considered many of the potential interventions discussed in the interim report could be implemented through an MIR, and that given the significance of these markets and the impact of the issues, an MIR appeared to be a proportionate response.

9.9 However, we did not consider that making an MIR was the most appropriate mechanism for assessing the issues and delivering the required outcomes at that point in time. Our assessment was that the new pro-competition regime, once legislated for, would in principle be best placed to tackle the competition concerns we had identified in this market study to date. We provided the following reasons:

(a) the need, in most cases, for ongoing monitoring and updating of measures which would require continuous oversight;

(b) the interconnected nature of the different activities; and

(c) the risk that a market investigation could cut across the work to establish a new regime.[716]

9.10 Nor, at that time, had we received any stakeholder representations for us to carry out a market investigation into mobile ecosystems.

9.11 We therefore decided not to make an MIR and published our Notice of that decision alongside the interim report.[717] However, we committed to keeping this decision under review during the second half of the study, taking into account any relevant market or legislative developments that may arise. We

[716] Mobile ecosystems: Interim report.
[717] Decision not to make a market investigation reference.

noted that we would continue to review the possible use of all of the CMA's available powers in relation to the issues we identified, including the possibility of an MIR at a later point in time or taking further enforcement action under our competition or consumer powers.

9.12 In particular, we highlighted that we might revisit that decision not to make a reference if the legislation required to bring the proposed new regime into force was not laid before Parliament for some time.

Our updated decision to consult on a reference

9.13 In the context of this ongoing assessment of how best to use our existing tools to address the concerns we have identified in the study, we have now decided to consult on making an MIR in relation to mobile browsers and cloud gaming.

9.14 In forming this decision, there have been several important developments since we published our interim report:

- We received several submissions from parties with a broad range of interests, including from browser vendors, urging us to take action now. This includes several responses to our interim report,[718] as well as more recent submissions and requests to make an MIR following the government's response to its consultation on the proposed new pro-competition regime for digital markets.[719]

- We received a large volume of responses to our interim report from individual web developers and small businesses, detailing their concerns regarding mobile browsers and browser engines, and further specific examples of how they are facing additional burdens and restrictions and how this might affect the quality of current and future goods and services for mobile users.[720]

- We also heard further concerns from several cloud gaming providers about Apple's restrictions and the impact on their business, and harm to consumers prevented from accessing these innovative new services.

- Through the second half of our study, we have undertaken substantial additional analysis regarding our competition concerns and the benefits

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[718] Including the following responses to our interim report and decision not to consult on an MIR: Response: Basecamp ; Response: Coalition for App Fairness; Response: DMG Media; Response: European Publishers Council ; Response: Guardian Media Group; Response: Movement for an Open Web ; Response: Professional Publishers Association; Response: DuckDuckGo; Response: Mozilla.
[719] A new pro-competition regime for digital markets - government response to consultation - GOV.UK.
720 See 'Responses to the Interim Report' on the Mobile Ecosystems case page here: Mobile ecosystems market study - GOV.UK. Around 40 of 70 responses were from web developers.

and risks associated with potential interventions. In that regard, the evidence and expert advice we have gathered with respect to mobile security has given us increased confidence that interventions to remove certain restrictions – in particular those relating to mobile browsers and cloud gaming services – could be implemented without compromising users' privacy, security, or safety online.

- The government has now published its response to the consultation on the new regime which confirmed that it intends to bring in legislation for the DMU, though we now understand this will not be in the current parliamentary session (ie within the next year).

9.15 Based on these developments, we now consider it to be the right time to consult on making a market investigation reference into mobile browsers and cloud gaming. The proposed MIR will allow us to focus on specific and discrete issues and, if necessary, introduce relatively self-contained remedies that should not need as much ongoing oversight or iteration (making them well suited to our market investigation powers). We have received strong representations and evidence that suggest the interventions we have considered as part of this market study could be implemented effectively through a market investigation, and without the need for a wider package of complementary interventions in connected markets. We believe interventions in these related areas could deliver substantial benefits to UK consumers and businesses that operate online, with the potential to unlock new ways of accessing and experiencing online content.

Our concerns

9.16 Through our market study into mobile ecosystems, we identified a number of competition concerns in relation to the supply of mobile browsers and the distribution of cloud gaming services that result in harms to consumers. These concerns are set out in detail in Chapters 5 and 6 respectively, and include the following:

- Apple's restrictions mean that users of Apple devices face inferior experiences than those of Android devices when browsing the web or using cloud gaming services. All browsers on Apple devices have a reduced set of features compared to browsers on Android devices (primarily as a result of Apple's restriction on alternative browser engines[721]). In relation to cloud gaming, Apple has effectively blocked

[721] These restrictions include, in particular, Apple's ban on alternative browser engines, together with limits to Apple's support for web apps in its WebKit browser engine.

these from iOS devices as a native app on the App Store, thus preventing Apple users from discovering and accessing innovative and advanced gaming experiences.

- These restrictions also mean that Apple faces a reduced incentive for investment and innovation. Its browser (and browser engine) does not face a credible threat of losing users on quality grounds, while its app store is protected from the potential competition from cloud gaming services.

- Web apps (applications which run in browsers) have the potential to disrupt or challenge the status quo for native app distribution, in which we also found that both Apple and Google have market power in their respective ecosystems. Web apps could also lead to potential cost savings for developers (costs which are ultimately borne by consumers). The evidence we have gathered also suggests that Apple's restrictions are currently holding back the viability of web apps across both ecosystems. This is also relevant to cloud gaming, given that at present web apps are the only way of distributing cloud gaming services on iOS devices.

- Website developers are negatively affected by Apple's restrictions and lower level of investment in its browser engine. They face additional burdens from bugs, glitches, and missing features that are likely to be passed through to consumers to some degree through increased prices or lower quality services.

- Apple's and Google's browsers face limited effective competition within their respective ecosystems, in part, due to the powerful effects of pre-installation and default settings on user behaviour. In many cases, these arrangements are linked to contractual agreements and financial incentives that Google has in place with other device manufacturers (including Apple). As highlighted in Chapter 5 and Appendix E, Google has agreements in place that weaken competition between browsers in both Apple's and Google's ecosystems.

9.17 In relation to both mobile browsers and cloud gaming, we found restrictions on competition are likely to be acting as a brake on innovation in the sector. These are key examples where potentially disruptive innovation is being held back by the restrictions imposed by Apple.

9.18 Both are valued services with greater untapped potential. Mobile web browsers are a key gateway for people to access the web from mobile devices and as a result, are important to many UK businesses seeking to reach users. Mobile browsers are one of the most used apps on people's phones. Apple and Google both have strong positions in mobile web browsing

– with a combined share of supply of around 90% for their browsers and 97% of all mobile web browsing in the UK in 2021 using either Apple's or Google's browser engine. Cloud gaming services are a developing innovation which give users instant access to high-quality games on their mobile devices through streaming from the cloud. Cloud gaming services have potential to play an important role in how consumers access and play games on mobile devices and present many benefits to consumers over hardware-based gaming.

9.19 As we set out in Chapter 7 of this final report, we consider that weak competition within and between mobile ecosystems harms consumers and businesses in the UK, as well as potentially the economy and society more broadly.

9.20 We have also identified a number of potential interventions which could address these concerns, explored in Chapter 8. We have received strong representations and evidence which suggest the interventions we have considered as part of this market study could be implemented effectively through a market investigation, and without the need for a package of complementary interventions in connected markets. We believe interventions in these related areas would be complementary and could deliver substantial benefits to UK consumers and businesses that operate online, with the potential to unlock new ways of accessing and experiencing online content such as games. We believe these potential benefits of undertaking the proposed MIR therefore outweigh the cost of undertaking an MIR.

9.21 Given these findings and the above-mentioned developments, we now consider an MIR on mobile browsers and cloud gaming will allow us to further explore our concerns and if appropriate take targeted action to address them.

9.22 We recognise there are substantive concerns and calls for further action across a number of other areas, in particular relating to app distribution and the relationship with app developers, as well as wider calls for revisiting our previous study on digital advertising. However, the CMA must balance the ability to use its current powers in areas where these are better suited, alongside the case for further action, as well as ensuring the scope of any MIR is manageable and targeted. In particular, it is important for us to ensure that potential interventions are capable of being implemented effectively through a market investigation, without the need for a package of complementary interventions, or continuous monitoring across connected markets.

9.23 As evidenced by our decision to consult on this MIR now, the CMA remains committed to the continued review and ongoing use of its toolkit where we

believe we can make significant, targeted, and effective impact to address the concerns identified through this study, as well as our previous and future digital work. As part of this we will continue to take into account of any further relevant market or legislative developments that may arise. This includes the possibility of making an MIR or taking further enforcement action under our competition or consumer powers, on other issues arising from this study or other CMA work, at a later point in time.

9.24 We also note that there are a number of international developments which could address similar concerns as those raised in our market study, in particular through the Digital Markets Act.[722] These are also an important factor for us to take into account during any MIR and more widely when considering the further use of our tools as discussed above. We will therefore continue to engage with the European Commission and our counterparts in other countries, as discussed further in the next chapter which sets out our proposed next steps.

Our consultation

9.25 Given our view that the reference test has been met and our provisional view that it would be appropriate for us to make a reference in relation to mobile browsers and cloud gaming in the UK, we are now commencing a period of consultation.

9.26 Further details on the relevant legal framework, the case for an MIR, the proposed scope and our assessment of the factors relevant to the exercise of the CMA's discretion to make an MIR, is set out in our consultation document and the draft Terms of Reference. These have been published separately from this final report.[723]

9.27 We are proposing the scope of the MIR to cover: the supply of mobile browsers and mobile browser engines, and the distribution of cloud gaming services through app stores on mobile devices (and the supply of related ancillary goods and services) in the United Kingdom.

9.28 For the purposes of this reference:

- 'mobile browsers' means applications which enable users of mobile devices to access the world wide web;

[722] We discussed how the European Commission's Digital Markets Act relates to the interventions we have considered in Chapter 8.
[723] Mobile browsers and cloud gaming MIR case page.

- ‘mobile browser engines’ means the underlying technology which applications on mobile devices use to transform web page source code into content with which users can engage;
- ‘cloud gaming services’ means services which allow for the streaming of games from remote servers to users’ devices;
- ‘distribution through app stores on mobile devices’ means the availability of native applications for download through an app store; and
- ‘mobile devices’ means smartphones and tablets.

9.29 We welcome representations from interested parties on the proposed reference set out in the consultation, which includes a number of questions where we would welcome views from respondents.

9.30 We invite responses to our consultation by 22 July 2022, including the proposed scope and appropriateness of an MIR to address the issues we have identified. Responses can be sent by email to: browsersandcloud@cma.gov.uk

10. Next steps

Introduction

10.1 When we launched this market study in June 2021, we stated that our overarching objective was to assess whether mobile ecosystems are working well and in the interests of consumers and, where problems exist, consider potential interventions to address them.

10.2 We also explained how the market study would support and inform the CMA's ongoing programme of work in digital markets, which includes:

- establishing the new pro-competition regulatory regime for digital markets in the UK;
- supporting current and further direct action by the CMA; and
- promoting regulatory alignment.

10.3 The publication of this final report is an important milestone in the achievement of these aims, but further work remains to be done. This chapter sets out the key next steps the CMA will be taking towards these goals beyond this study, which include:

- taking direct action using our markets, competition and consumer powers;
- continuing to support the government in establishing the new regime; and
- working with others at home and abroad.

10.4 We reflect on progress and key next steps for each of these areas in turn below.

Direct action by the CMA

10.5 Our overall strategy in digital markets involves two elements. The first is preparing to put the government's proposed new digital markets regime into action through the DMU as soon as legislation is passed. The second is using the CMA's current powers in the meantime to take targeted action in order to tackle problems more immediately wherever possible.

10.6 **Alongside this report, we are consulting on our proposal to make a market investigation reference into mobile browsers and cloud gaming.** As set out in Chapter 9, we have reasonable grounds to suspect that one or more features (alone or in combination) in relation to mobile browsers and

cloud gaming prevent, restrict or distort competition in the UK, and that this may be leading to significant consumer harm. **We are also announcing the launch of a CA98 investigation into Google's Play Store rules for in-app payments,** in light of the recent tightening of Google's rules which means that they are more closely aligned with Apple's rules on this issue. We will continue to keep our portfolio of both digital markets work and enforcement action under review.

10.7 These announcements join our growing portfolio of digital work, which already included:

- competition law investigations into:
  - Apple's App Store rules for in-app payments;[724]
  - Meta's use of data to compete with others' services;[725]
  - Meta and Google's agreement in advertising markets;[726]
  - Suspected anti-competitive conduct by Google in ad tech;[727]
  - Amazon and Google on fake reviews;[728]
- our work on Google's Privacy Sandbox, where along with the ICO we are overseeing Google's removal of third-party cookies from Chrome following Google's commitments;[729]
- consideration of Meta's acquisition of Giphy (which is under appeal);[730] and
- our market study into music and streaming markets.[731]

10.8 This portfolio will continue to grow as we do more to tackle problems in digital markets using our current powers. As explained in Chapters 8 and 9, there are some issues which the DMU powers will be better placed to address, but, where we can use our existing tools, we will do so.

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[724] Investigation into Apple AppStore - GOV.UK.
[725] CMA investigates Facebook's use of ad data - GOV.UK.
[726] Investigation into suspected anti-competitive agreement between Google and Meta and behaviour by Google in relation to header bidding - GOV.UK.
[727] Investigation into suspected anti-competitive conduct by Google in ad tech - GOV.UK.
[728] Online reviews - GOV.UK.
[729] Investigation into Google's 'Privacy Sandbox' browser changes - GOV.UK.
[730] Facebook, Inc (now Meta Platforms, Inc) / Giphy, Inc merger inquiry - GOV.UK.
[731] Music and streaming market study - GOV.UK.

Supporting the establishment of the new regime for digital markets

10.9 Experts around the world, including those involved in the UK's Furman Review in March 2019, have concluded that existing competition laws are not always well suited to solving the problems in fast-moving digital markets. A new pro-competition approach is needed to oversee the most powerful digital firms – and this study has provided further evidence for this.

10.10 Our current powers are important, but they can be too slow for fast-moving digital markets, and are focused on fixing problems after the fact, rather than preventing them before they arise. While they work well across the economy, they are less well suited to some of the specific challenges we see in digital markets today and are much less well suited to tackling ongoing and evolving concerns in markets.

10.11 In May 2022 the government confirmed its intention to bring forward legislation to establish a new, pro-competition regulatory regime to address concerns relating to digital platforms with 'strategic market status' as soon as parliamentary time allows.[732] The Queen's Speech on 10 May 2022 further announced the government's plan to publish a draft Bill including measures on competition in digital markets.[733]

10.12 The CMA supports the government's final proposals. This legislation will provide us with the tools we need to fully and swiftly address the competition problems in digital markets, as well as those that are likely to develop in future. More specifically, as set out in Chapter 8, for many of the issues identified in this market study, the most effective means to tackle these is through the Digital Markets Unit and its new tailored powers.

10.13 We will continue to work with the government on the draft Bill and with Parliament and stakeholders to ensure it is given the scrutiny and debate it deserves. We will do this by:

- continuing our work to assess competition in digital markets in the UK, and explaining our findings to government officials, parliamentarians, and others;
- considering how our findings and assessment of potential interventions inform the design of the new regime; and

[732] Government response to the consultation on a new pro-competition regime for digital markets.
[733] Queen's Speech 2022 - GOV.UK.

- supporting the government by ensuring ministers and officials have the necessary information and evidence to inform the design of necessary legislation.

10.14 In the meantime, the DMU has been established on a non-statutory basis within the CMA since April 2021, and we will continue its work to prepare for the new regime. We have made significant progress in building the knowledge, capability, and skills we will need to oversee the new regime. This includes developing our horizon-scanning capability, working closely with the technical experts in our Data, Technology and Analytics (DaTA) unit, forming relationships with a wide range of key stakeholders, and leading or contributing to the range of CMA work already underway. The DMU will continue to grow as the legislation progresses, and as it moves to becoming fully operational.

10.15 We will continue to prepare for the full DMU role and take action using the CMA's existing powers to explore and identify concerns within digital markets using our markets, enforcement and consumer powers.

Working with others at home and abroad

Working with other UK regulators

10.16 Due to the increasing overlap between competition in digital markets and wider public policy objectives such as privacy, security, and online safety, there is an increasing need for regulators and policy makers to work together and overcome any perceived tensions between their respective remits.

10.17 In the UK, the Digital Regulation Cooperation Forum (DRCF) was formed in 2020 to address this challenge. The DRCF – which includes the CMA, the Information Commission's Office (ICO), the Office of Communications (Ofcom), and the Financial Conduct Authority (FCA), has the following goals:

- to promote greater coherence, so that where regulatory regimes intersect the DRCF helps to resolve potential tensions, offering clarity for people and industry;

- to work collaboratively on areas of common interest and jointly address complex problems; and

- to work together to build the necessary capabilities, learning from what each regulator is doing and striving to be best in class, both now and in the future.

10.18 The CMA will continue to work with other DRCF members to tackle the challenges posed by regulation of online platforms, and realise the opportunities of joint working to ensure regulatory coherence.[734] Furthermore, where there are specific areas of overlap between our respective regulatory remits, we actively engage either bilaterally or multilaterally with relevant regulators.

10.19 For instance, in May 2021 we issued a joint statement with the ICO on the relationship between competition and data protection law in digital markets.[735] Since then, in February 2022, the CMA secured commitments from Google relating to its Privacy Sandbox investigation. Working closely with the ICO, the CMA now has a role in overseeing the development of Google's proposals for replacements to third-party cookies, so that they protect privacy without unduly restricting competition and harming consumers.[736]

10.20 We have continued this joined up approach in the context of mobile ecosystems, where data protection and privacy concerns have been raised as justifications for practices that impact competition. In this report, we have set out the substantial progress we have made through this engagement, highlighting several points of principle on which the CMA and ICO are aligned. We have applied these principles when assessing Apple's ATT framework, where we found that there is scope to address many of our competition concerns while protecting or enhancing the benefits for consumers. In partnership with the ICO, we hope to continue the constructive dialogue we have had with Apple on its ATT framework now that our market study has concluded.

10.21 We have also engaged closely with Ofcom in context of mobile ecosystems and the potential impact Apple and Google have on traditional communications services. This engagement has covered issues including eSIMs and Apple's iCloud Private Relay,[737] both of which have been raised by telecommunications firms in response to our interim report. We will continue to engage with Ofcom on these issues, as well as others which impact communications infrastructure and services.

10.22 We will continue to work with our DRCF partners, including Ofcom and the ICO, on addressing areas of interaction between online safety, privacy regimes and competition. As set out in the DRCF's recently published plan of

734 For instance, in April 2022 the DRCF published two papers relating to: the benefits and harms of algorithms; and on the landscape of algorithmic auditing and the role of regulators. See Findings from the DRCF Algorithmic Processing workstream - Spring 2022 - GOV.UK.
735 CMA-ICO joint statement on competition and data protection law - GOV.UK.
736 Decision to accept commitments (publishing.service.gov.uk)
737 See section on Apple iCloud Private Relay in Appendix J and section on eSIMs in Appendix M.

work for 2022 to 2023, this is a critical point for the UK's approach to regulating digital technologies and services, and it will be increasingly important for regulators to work closely together in tackling these challenges.[738]

10.23 Finally, it will be important for us to work closely with the FCA and PSR where our work on mobile ecosystems relates to payments or other financial transactions, such as in-app payments and contactless payments. We will continue this engagement now that our market study has concluded.

Engagement with international counterparts

10.24 International collaboration between competition authorities is now more important than ever, as many of the competition challenges posed by the largest digital firms are truly global in nature. Proactive and cooperative international engagement is vital in seeking to understand and develop a broad consensus on the nature of the underlying issues and different forms of intervention.

10.25 The UK is not alone in bringing forward proposals for interventions to tackle these issues – as highlighted in Chapter 8. While there are differences in approach between each jurisdiction, there is increasing international alignment on the diagnosis of issues and the proposed way forward. There is clearly a growing consensus that changes are needed to introduce greater competition into digital markets and oversee these large tech firms.

10.26 Alongside the UK government's proposals for a pro-competition regime for digital markets, there is comparable digital markets legislation in other jurisdictions either under development, in particular the proposed Digital Markets Act in the EU and the Open App Markets Act bill in the US; or already enacted, such as the recent amendment to the South Korean Telecommunications Business Act in 2021.

10.27 In addition to legislation, there have been other market studies into mobile ecosystems, for instance those carried out by authorities in Australia, Japan, and the US:

- In April 2021 the ACCC published a report which found that Apple's App Store and Google's Play Store have significant market power in the distribution of mobile apps in Australia, and measures are needed to address this.[739] The ACCC put forward a series of potential measures,

[738] Digital Regulation Cooperation Forum: Plan of work for 2022 to 2023 - GOV.UK.
[739] Dominance of Apple and Google's app stores impacting competition and consumers | ACCC.

including allowing consumers to rate and review all apps, giving consumers the ability to change pre-installed defaults, providing users with alternative payment options and ring fencing information collected by Apple and Google from the app stores from their other operations.

- A specialist digital markets unit within the Japanese government launched a consultation in April 2022 on the competitive landscape of mobile ecosystems, raising concerns about the conduct of Apple and Google and suggesting establishing rules to open up iOS and Android devices to greater competition.

- The National Telecommunications and Information Administration (NTIA) in the US is developing a report to the White House on ways to improve competition in the mobile app ecosystem. The NTIA recently undertook a 'request for comment', which concluded in May 2022.[740]

10.28 As set out in Chapter 8 and Appendix A, there are also a number of competition investigations and litigation (brought both by governments and private parties) ongoing which target some of the markets within this study.

10.29 These activities, and indeed any further statements by other authorities, could potentially result in changes that would affect market conditions in the UK. It is also clear from these cases that lessons can be learned about how changes are introduced, designed, monitored and enforced. We are closely monitoring the work carried out in other jurisdictions and are contributing to the global debate on how to tackle the problems associated with digital platforms with substantial market power. This reflects our belief that the most effective way to promote competition in these markets will be through action that is internationally coherent, by achieving a common understanding of the problems and broad agreement over the way to tackle them.

10.30 Furthermore, where appropriate, we will work with other authorities on areas of significant overlap. For instance, our two recently announced investigations into Google's and Meta's conduct in relation to header bidding[741] and Google's other practices in ad tech[742] will run in parallel with European Commission investigations on the same subject and an ongoing lawsuit by the

[740] Request for Comments on Competition in the Mobile App Ecosystem | National Telecommunications and Information Administration (ntia.gov).
[741] Investigation into suspected anti-competitive agreement between Google and Meta and behaviour by Google in relation to header bidding - GOV.UK.
[742] Investigation into suspected anti-competitive conduct by Google in ad tech - GOV.UK.

Attorneys General of many US States.[743] We will seek to work closely with the Commission and the US agencies as these investigations move forward.

10.31 Throughout this market study, we have sought to engage with international counterparts looking at these issues, including the competition authorities in Europe, the United States, Australia and Japan, to draw on their findings and previous experience of investigating these matters. We have also sought to share our own findings and experiences with others commencing work on similar topics.

10.32 More widely, the CMA will continue to engage with international counterparts through sharing information, case theories, and best practice. This includes through continued participation of existing competition and consumer networks such as the Organisation for Economic Cooperation and Development (OECD), the International Competition Network (ICN), the International Consumer Protection Enforcement Network (ICPEN) and the G7 group.

Concluding the market study

10.33 Through the work of this market study, we have built up a comprehensive understanding of mobile ecosystems, while supporting the diagnosis of our competition concerns with extensive detail and evidence on the functioning of the markets incorporated within them.

10.34 The content of this final report and supporting appendices (which contain significant further detail) are another important contribution to regulator's and policy makers' understanding of mobile ecosystems. The information contained in this report will be useful additions to the wider global debate about these markets.

10.35 We would like to thank the numerous stakeholders that have cooperated constructively with the market study. The insight and evidence they have provided has been invaluable in producing this report.

10.36 The CMA looks forward to continuing our work in this area and other digital markets, and in particular continuing to support the establishment of the new pro-competition regime here in the UK, while making active and effective use of our existing toolkit where appropriate.

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[743] AG Paxton Applauds European Investigation into Big Tech as Texas Leads the Way | Office of the Attorney General.

10.37 If you would like to discuss the findings of this market study with us, you can contact us by email at: mobileecosystems@cma.gov.uk.

10.38 If you would like to contact the non-statutory DMU team established within the CMA to discuss our digital work and preparations for the new regime more generally, you can contact us by email at: dmu@cma.gov.uk.