European Competition Journal

ISSN: 1744-1056 (Print) 1757-8396 (Online) Journal homepage: https://www.tandfonline.com/loi/recj20

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To cite this article: Benjamin Edelman & Damien Geradin (2016) Android and competition law: exploring and assessing Google's practices in mobile, European Competition Journal, 12:2-3, 159-194, DOI: 10.1080/17441056.2016.1254483

To link to this article: https://doi.org/10.1080/17441056.2016.1254483

Published online: 24 Nov 2016.

European Competition Journal, 2016
Vol. 12, Nos. 2–3, 159–194, http://dx.doi.org/10.1080/17441056.2016.1254483

Android and competition law: exploring and assessing Google's practices in mobile

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(*Received 2 October 2016; accepted 26 October 2016*)

Since its launch in 2007, Android has become the dominant mobile device operating system worldwide. In light of this commercial success and certain disputed business practices, Android has come under substantial attention from competition authorities. We present key aspects of Google's strategy in mobile, focusing on Android-related practices that may have exclusionary effects. We then assess Google's practices under competition law and, where appropriate, suggest remedies to right the violations we uncover.

Keywords: Android; antitrust; competition policy; exclusion; mobile communication devices; remedies; tying
JEL Classification: K21; L42; L41; L40; L99

Since its launch in 2007, Android has become the dominant mobile device operating system ("OS") worldwide. In 2015, there were more than 4.4 billion mobile phone users and 1 billion tablet users in the world,[1] over 80% of which run Google Android.[2] In light of this commercial success and certain disputed business practices, Android has come under substantial attention from competition authorities. For instance, in September 2015, Russia's Federal Antimonopoly Service completed an investigation finding that Google broke Russia's competition rules by

*Corresponding author. Email: dgeradin@edgelegal.eu
†The authors have no current clients adverse to Google with respect to the practices discussed herein. No client of either author requested or suggested this article or had a right to review it prior to publication.
[1]'Number of mobile phone users worldwide from 2013 to 2019,' *Statista*, 2016; "Number of tablet users worldwide from 2013 to 2019," *Statista*, 2016.
[2]'Global mobile OS market share in sales to end users from 1st quarter 2009 to 1st quarter 2016,' *Statista*, 2016.

unfairly bundling its own services and preventing rival products from being installed on Android software.[3] Then, in April 2016, the European Commission sent a statement of objections to Google indicating its preliminary view that Google had committed an abuse of a dominant position by imposing certain restrictions on Android device manufacturers and mobile network operators.[4] The Korean Fair Trade Commission announced a similar investigation in August 2016,[5] and the US Federal Trade Commission was reported in September 2015 to have begun investigating Google's tactics in mobile[6] despite the Commission's prior decision not to pursue Google's disputed tactics in search and search preferencing.[7]

A recurring theme in these investigations is the concern that Google's Android-related practices protect or enhance its position of strength in some key applications or services, Google Search among others, to the detriment of competing app makers and service providers. We share this concern. As we show in this paper, Google's practices can produce exclusionary effects on competing app makers and service providers. Of course, Google's practices are unlikely to harm the thousands of firms or individuals developing apps that do not compete with Google's. But these practices harm makers of apps that directly compete with Google's key apps, including in the sectors most important to advertisers and most frequented by users. In particular, we show that Google's restrictions imposed on manufacturers of commercially viable Android users would increase the difficulty of a new, innovative mobile search engine challenging Google Search and competing on the merits.

Antitrust investigations are complex and fact-intensive, and thus the goal of this paper is not to offer a full antitrust analysis of Google's Android-related practices. Even if this were our aim, it would not be possible because most of the licences and other documents implementing the restrictions at issue are not

[3]Federal Antimonopoly Service of the Russian Federation, 'FAS Russia Decision and Determination of 18 September 2015', No 1-14-21/00-11-15. The Russian authorities also fined Google for its practices in mobile. See 'Russian Antimonopoly Service Fines Google $6.7 Mln' *Russian Legal Information Agency* (11 August 2016) <http://www.rapsinews.com/news/20160811/276651091.html>.

[4]European Commission, 'Antitrust: Commission Sends Statement of Objections to Google on Android Operating System and Applications' (20 April 2016, IP/16/1492) <http://www.ipeuropa.eu/rapid/press-release_IP-16-1492_en.htm>.

[5]Song Jung-a, 'South Korea Confirms Google Antitrust Probe' *The Financial Times* (12 August 2016) <http://www.ft.com/cms/s/0/59bd6b78-6044-11e6-b38c-7b39cbb1138a.html#axzz4Hn7Tu74P>.

[6]Brent Kendall and Alistair Barr, 'FTC Looking at Complaints over Google's Android Control' *The Wall Street Journal* (25 September 2015) <http://www.wsj.com/articles/ftc-looking-at-complaints-over-googles-android-control-1443201867>.

[7]'Statement of the Federal Trade Commission Regarding Google's Search Practices' *The Federal Trade Commission* (3 January 2013) <https://www.ftc.gov/system/files/documents/public_statements/295971/130103googlesearchstmtofcomm.pdf>.

public (although there are some notable exceptions which we examine in subsequent sections). This difficulty is compounded by the fact that there is to date only a single antitrust authority decision or court judgment assessing Google's restrictions under antitrust rules. (Indeed, even that decision, by Russia's Federal Antimonopoly Service, was until recently available only in Russian. Only in the course of this article did we obtain, and post to the web, an English translation.[8]) In light of these limitations, we use the available information to provide a critical analysis of some of the restrictions that apply to device manufacturers that wish to develop commercially viable Android devices, and to assess the arguments offered by Google (including some of the papers Google has commissioned) to justify these restrictions.[9]

Undistorted competition in mobile environments carries special importance given the growing reliance of individuals on mobile communications devices, such as smartphones or tablets, as their primary means of access to the Internet. The Microsoft antitrust investigations were set against a PC-centric era in which most users relied on desktops and laptops,[10] but today Android plays a correspondingly central role for the majority of users.[11] Without denying Android's merits, this paper concludes that Google's Android-related contract provisions harm competition to the detriment of developers of competing apps and services, as well as to the detriment of consumers. The restrictions also hurt Android device manufacturers by constraining their options, reducing their secondary revenue sources and limiting their ability to distinguish themselves from competitors. To protect competition on the merits and assure that consumers have access to the best devices and services, we suggest that these practices should be eliminated and their historic harm undone.

Against that background, this paper is divided into five sections. In Section I, we present the relevant aspects of Google's Android business and the key contract provisions in dispute. In Section II, we explore the harms resulting from these provisions. In Section III, we apply relevant legal principles, and in Section IV we propose remedies responsive to the apparent violations and harms. Section V offers a brief conclusion.

[8]Benjamin Edelman, 'English Translation of FAS Russia Decision in Yandex v. Google' <http://www.benedelman.org/news/092816-1.html>.

[9]Kent Walker, 'Android's Model of Open Innovation' *Google Europe Blog* (20 April 2016) <http://googlepolicyeurope.blogspot.com/2016/04/androids-model-of-open-innovation.html>.

[10]'Computer Ownership Up Sharply in the 1990s', U.S. Department of Labor, Bureau of Labor Statistics (March 1999) <http://www.bls.gov/opub/btn/archive/computer-ownership-up-sharply-in-the-1990s.pdf>.

[11]See Preston Gralla, 'The Era of the PC Is over – IDC' *Computerworld* (2 December 2010) <http://www.computerworld.com/article/2469794/mobile-apps/the-era-of-the-pc-is-over——idc.html>.

I. Google's Android business model and licensing requirements

A. *Android's business model, market positioning and apps*

Google's Android business is grounded in the company's August 2005 acquisition of Android, Inc., a small firm founded in 2003 to develop a mobile operating system.[12] In November 2007, approximately 10 months after the public launch of Apple's iPhone,[13] Google unveiled what it called the Open Handset Alliance, an "alliance of leading technology and wireless companies" collaborating to develop "the first truly open and comprehensive platform for mobile devices."[14]

As an operating system, Android necessarily sits between hardware, applications and users. It provides application developers with standard interfaces to send and receive data as well as to present and receive information from users. It also provides hardware manufacturers with an ecosystem of software applications, as well as user demand and marketing support.

Apple iOS, available on iPhones and iPad tablets, is Android's main rival.[15] However, Apple iOS is not a realistic alternative to Android for mobile device manufacturers because iOS is not available to install on third-party hardware such as the devices offered by HTC, Lenovo, LG, Samsung and others. Historically, hardware makers could choose from among several other mobile operating systems, including Windows Phone and Symbian. But as of 2016, neither option is commercially viable. No Symbian handsets have shipped since 2013.[16] Windows Phone is officially still available, but has found a harsh reception in the market, selling a total of 101 million devices from 2011 through 2015 – compared to 4.5 billion iOS and Android phones in the same period – leading Microsoft and Nokia to drop Windows Phone offerings and reviewers to declare "Windows Phone is dead."[17] As a result, hardware manufacturers see little alternative to Android.

A portion of Android's commercial success results from its price. From the outset, Google offered Android to hardware manufacturers at no charge.[18] In

[12]Lisa Eadicicco, 'The Rise of Android: How a Flailing Startup Became the World's Biggest Computing Platform' *Business Insider* (27 March 2015) <http://www.businessinsider.com/how-android-was-created-2015-3>.

[13]Charles Arthur, 'The History of Smartphones: Timeline' *The Guardian* (24 January 2012) <https://www.theguardian.com/technology/2012/jan/24/smartphones-timeline>.

[14]'Industry Leaders Announce Open Platform for Mobile Devices' *Open Handset Alliance* (5 November 2007) <http://www.openhandsetalliance.com/press_110507.html>.

[15]Kate Bevan, 'Android Wars Are Raging as Rivals Challenge Google's Dominance' *The Financial Times* (19 October 2014) <http://www.ft.com/cms/s/2/3ed11e7e-4d6b-11e4-bf60-00144feab7de.html>.

[16]Christopher Null, 'The End of Symbian: Nokia Ships Last Handset with the Mobile OS' *PC World* (14 June 2013) <http://www.pcworld.com/article/2042071/the-end-of-symbian-nokia-ships-last-handset-with-the-mobile-os.html>.

[17]Tom Warren, 'Windows Phone Is Dead' *The Verge* (28 January 2016) <http://www.theverge.com/2016/1/28/10864034/windows-phone-is-dead>.

[18]Juan Carlos Perez, 'Google Offers Up 'Android' As Its New Open Mobile Platform' *Macworld* (5 November 2007), http://www.macworld.com/article/1060897/android.html.

contrast, Symbian and Windows Phone both initially charged licence fees, albeit subsequently dropping those fees to zero in response to competition from Android.[19] In a paper commissioned by Google, Prof. Körber points out:

> Google operates on two-sided markets on which the consumers decide about the success of a service, but the remuneration comes from advertising clients. The distribution of Android (and of most apps and mobile services) for a zero price is an indirect tool to attract as much attention as possible by the consumers, increase mobile usage, and ultimately monetise this usage, through advertising or otherwise.[20]

Application availability is a second reason for Android's popularity. Mobile devices can view web pages, but many services are better accessed through apps which include executable code that runs on the local device – providing functionality even when a device is unable to connect to a data network, and allowing direct access to device hardware such as location sensors, accelerometer, camera and microphone. These apps are written for specific platforms, and app makers naturally focus on the most popular mobile platforms in order to reach as many users as possible.

Google and others now offer a wide range of apps for a variety of purposes. For example, for sending and receiving email, there is Google's Gmail app, but also all manner of others including from widely known firms (such as Microsoft Outlook for Android and Yahoo Mail) as well as boutique specialists (Kale Interactive WeMail, Boxer and TypeApp's TypeMail). For mapping and navigation, Google Maps and Google Waze are widely used, but consumers can also choose among MapQuest, Nokia HERE, Sygic, BackCountry Navigator and dozens more. In many sectors, particularly those that are novel or small, consumers choose only among independent apps, without any offerings from Google.

As we discuss below, most Android devices come bundled with an additional software package known as Google Mobile Services (GMS). GMS includes widely used Google apps including Google Maps, Gmail and YouTube, each of which is available only through GMS and not for separate download by device manufacturers, carriers or end users. GMS also includes Google Play, the app store where users can download other apps from Google and third parties.

Some apps carry disproportionate importance to users, not just for their frequency of use or value when used, but especially for the lack of substitutes.

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[19] Andreas Constantinou, 'Nokia and Symbian to Become One; Royalty-Free, Open Source Roadmap', *Vision Mobile* (24 June 2008) <http://www.visionmobile.com/blog/2008/06/nokia-and-symbian-to-become-one-royalty-free-open-source-roadmap/>; Brad Chacos, 'Microsoft Makes Windows Free on Phones, Small Tablets, and Gizmos – but Not PCs', *PC World* (2 April 2014) <http://www.pcworld.com/article/2139080/microsoft-makes-windows-free-on-iot-and-small-mobile-devices-but-not-pcs.html>.

[20] Torsten Körber, *Let's Talk about Android – Observations on Competition in the Field of Mobile Operating Systems* (German Version: NZKart 4 July 2014), 378–6, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2462393>.

Google apps enjoy special power in this regard. Consider Google's YouTube, which is extremely popular and has no close competitors. For one, no other content library offers YouTube's distinctive format. With over 400 hours of video uploaded to YouTube every minute, no other content library can match the breadth of content available at YouTube.[21] In principle, other apps can present content hosted by YouTube, but Google retains preferred search, channel subscription, personalized recommendations and easy sharing capabilities for its own app.[22] In addition, a native app provides integrated messaging,[23] faster frame rates with higher image quality,[24] and, in a June 2016 addition, live video streaming.[25]

Users typically obtain apps from app "marketplaces" which organize available software, track developer identity and reputation, and collate other users' reviews and assessments. While Android apps are available from a variety of marketplaces, Google makes its apps available only from the company's own marketplace, Google Play. Furthermore, with 2.2 million apps, Google Play has several times more apps than any competing Android app store.[26] These advantages give Google Play outsourced importance to users. As discussed below, Google imposes certain contractual restrictions on device manufacturers wishing to preinstall Google Play and other Google apps.

B. *Licensing and other contractual obligations for Android device manufacturers*

Depending on which type of "Android" devices they want to offer, device manufacturers have to sign one or several agreements.

1. *Building a "bare" Android device*

If a device manufacturer is prepared to offer a "bare" Android device, it need only pass technical tests[27] and accept the Android License Agreement. This approach

[21] 'Hours of Video Uploaded to YouTube Every Minute as of July 2015', *Statista*, 2016.
[22] YouTube App, *Google Play* <https://play.google.com/store/apps/details?id=com.google.android.youtube&hl=en>.
[23] Davey Alba, 'YouTube's New Messenger Means You'll Never Have to Leave YouTube' *Wired* (11 May 2016) <http://www.wired.com/2016/05/youtubes-new-messenger-means-youll-never-leave-youtube/>.
[24] Jim Lynch, 'YouTube for Android Now Supports 60 FPS Video' *InfoWorld* (1 July 2015) <http://www.infoworld.com/article/2942751/android/youtube-for-android-now-supports-60-fps-video.html>.
[25] Davey Alba, 'Youtube's New Messenger Means You'll Never Have to Leave Youtube' *Wired* (11 May 2016) <http://www.wired.com/2016/05/youtubes-new-messenger-means-youll-never-leave-youtube/>.
[26] 'Number of Apps Available in Leading App Stores as of June 2016' *Statista*, 2016.
[27] 'Compatibility Test Suite', *Android* (2016) <http://source.android.com/compatibility/cts/index.html>.

reduces the contractual restrictions the manufacturer must accept, potentially increasing flexibility to configure a device as the manufacturer sees fit. However, this approach foregoes several key benefits that most device manufacturers seek.

Notably, bare Android devices are not permitted to include *any* Google apps (the distribution of which is conditioned on other contracts discussed below). For some Google apps, the device manufacturer may substitute an alternative – perhaps Yahoo Maps instead of Google Maps. But for other Google apps, the alternative is less clear. Notably, as discussed above, there is no apparent substitute for YouTube. Most troublesome is the prohibition that bare Android devices include Google Play, the app store whereby users obtain other apps, both from Google and from independent app developers. Without Google Play, users cannot easily obtain the Google apps they typically expect.

As a result, bare Android is not what consumers expect when they purchase modern mobile devices.

2. *Building a "normal" Android device*

To obtain GMS and distribute an Android device that consumers view as "normal," a manufacturer must sign two additional agreements.

First, the device manufacturer must sign a Mobile Application Distribution Agreement (MADA). It seems the MADA is customized for each manufacturer, and by all indications Google intended MADAs to be confidential. Nonetheless, the main MADA requirements can be found in the two MADAs which became publicly available during the course of copyright litigation between Google and Oracle.[28] First, manufacturers must "preinstall" "all Google applications" that Google specifies.[29] Second, Google requires that these preinstalled apps be prominent, with certain apps presented "at least on the panel immediately adjacent to the Default Home Screen" and others "no more than one level below the Phone Top."[30] Newer MADAs even specify the sequence, from left to right and top to bottom, in which the Google apps must be presented.[31] Third, Google requires that Google Search "must be set as the default search provider for all Web

[28]Mobile Application Distribution Agreement (Android) Between Google Inc. and HTC Corporation. § 2.1. (1 January 2011) [hereinafter Google-HTC MADA]; exhibit 286 in *Oracle America Inc. v. Google*, 872 F.Supp.2d 974 (N.D. Cal., 2012). Mobile Application Distribution Agreement (Android) Between Google Inc. and Samsung Electronics Co., Ltd (1 January 2011) [hereinafter Google-Samsung MADA], exhibit 2775 in *Oracle v. Google*.
[29]MADA section 2.1.
[30]MADA section 3.4.(2)–(3).
[31]Amir Efrati, 'Google's Confidential Android Contracts Show Rising Requirements' *The Information* (26 September 2014) <https://www.theinformation.com/Google-s-Confidential-Android-Contracts-Show-Rising-Requirements>.

search access points," ruling out the possibility of any other search provider being the default.[32] Subsequent revisions require that Google Search be the default for "assist" and "voice search" functions, and in addition require that Google Search be activated when a user presses and holds a device's physical "Home" button or "swipes up" from a digital home button.[33] Fourth, Google requires that Google's Network Location Provider service be preloaded and the default, tracking users' geographic location at all times and sending that location information to Google.[34] Finally, Google requires that any time a mobile app presents a web page, the web page must be rendered by a "Google WebView Component" (the core of a web browser).[35]

To make a "normal" Android device, a device manufacturer also needs to sign the Anti-Fragmentation Agreement ("AFA"). The provisions of the AFA are confidential, and as far as we know, no copy has ever been released to the public – not from Google, through litigation, by accident or in any other way. Nonetheless, Google confirms the existence of the AFA, explaining that "we ask manufacturers who are preloading our apps to put their device through a compatibility test and sign our Anti-Fragmentation Agreement."[36] By all indications, Google's stated concern is modified Android code, a so-called fork, which could cause some devices to be unable to run apps that work on other devices, or otherwise to be incompatible. Notably, it seems that the AFA is a company-wide document, binding a manufacturer for all of its present and even future devices.[37] Thus, AFA obligations apply to the entire operations of the companies that sign.

3. *Learnings from device manufacturers' experience marketing bare Android*

When challenged about MADA and AFA restrictions, Google typically points out that device manufacturers are not required to accept these agreements to manufacture Android devices. For example, Google's General Counsel in April 2016 argued that Google's "partner agreements are entirely voluntary – anyone can use Android without Google."[38] Indeed, Google made such claims as early as the 2007 announcement of Android when Google's Andy Rubin stated that

[32]MADA section 3.4(4).
[33]Efrati (n 31).
[34]MADA section 3.8(c).
[35]Efrati (n 31).
[36]'Frequently Asked Questions', *Google* (2016) <https://landing.google.com/intl/en/androidisforusers/faq.html>.
[37]See Commission press release (n 4) ("However, if a manufacturer wishes to pre-install Google proprietary apps, including Google Play Store and Google Search, on any of its devices, Google requires it to enter into an 'Anti-Fragmentation Agreement' that commits it not to sell devices running on Android forks" (emphasis added)).
[38]Walker (n 9).

"Google will include its apps suite with the platform, but since the platform is open, a manufacturer or operator can remove some or all the applications."[39]

While these claims are strictly true, they do not capture the commercial reality of customer requirements or the reality of the choice available to a device manufacturer. If a manufacturer offers bare Android, it need not preload any specific Google app, but in that case the device cannot include *any* Google app including those that are expected by the vast majority of users and are necessary for commercial success. To get even a single Google app, including the Play Store that provides access to others' apps, the device manufacturer must sign the MADA and the AFA, committing to preload a full suite of Google apps, accepting Google's other requirements and promising not to use modified versions of Android on any devices they sell. This is far from the flexibility Google suggests.

Nonetheless, some device manufacturers have pursued this approach. Their experiences illustrate the challenges of offering bare Android to mainstream consumers in western markets. A notable example is Amazon, which in July 2014, began to distribute Fire Phones which did not preload any Google apps and indeed were not marketed with the Android name or logo. Reviews prominently complained about the lack of Google apps. The Wall Street Journal's review flagged the problem: "Don't expect to get all the apps you love: Though it runs on a version of Google's Android operating system, Google apps like Maps, Drive and YouTube are locked out."[40] Furthermore, if a consumer had already purchased a paid app via Google Play for a prior Android device, a non-Google Play device would be unable to recognize the prior purchase or install the app – requiring the customer to repurchase every such app.[41] With these limitations, the Fire Phone was not commercially viable, and Amazon discontinued it just one year after launch, taking a $170 million write-down on the project.[42]

Similarly, beginning in February 2014, Nokia offered the Nokia X, running bare Android customized with Nokia's services, notably without Google apps.[43] This approach also attracted little consumer excitement. A mobile device

[39]Greg Sterling, 'Google's Android Arrives: Not Gphone but an Open Source Mobile Phone Platform' *Search Engine Land* (5 November 2007) <http://searchengineland.com/googles-android-arrives-not-gphone-but-an-open-source-mobile-phone-platform-12611>.
[40]Geoffrey A Fowler, 'Amazon Fire Phone Review: Full of Gimmicks, Lacking Basics' *The Wall Street Journal* (23 July 2014) <http://www.wsj.com/articles/amazon-fire-phone-review-full-of-gimmicks-lacking-basics-1406077565>.
[41]ibid.
[42]Kia Kokalitcheva, 'Amazon Is Killing Off the Fire Phone' *Fortune* (9 September 2015) <http://fortune.com/2015/09/09/amazon-killing-fire-phone/>.
[43]Tom Warren, 'This Is Nokia X: Android and Windows Phone Collide' *The Verge* (24 February 2014) <http://www.theverge.com/2014/2/24/5440498/nokia-x-android-phone-hands-on>.

analyst remarked that the phone "falls short" of consumers' expectations.[44] Bloggers noted specific problems including lacking Google apps, lacking Google Play access to obtain other apps, and specific apps (WhatsApp among others) unavailable even through Nokia's app store.[45] Meanwhile, in April 2014, Microsoft announced its purchase of Nokia, creating a strategic conflict since the primary rationale for the transaction was to advance Microsoft's Windows Phone operating system. Facing a poor market reception as well as internal conflict, Nokia X was discontinued in July 2014.[46]

Much of the weakness of non-GMS devices comes from the lack of Google Play and resulting unavailability of Google apps and difficulty obtaining third-party apps. In principle, end users can "sideload" desired apps directly onto an Amazon Fire Phone or other non-GMS phone. Indeed, the web site sideloadfirephone.com is devoted entirely to this possibility. But enabling sideloading requires first reducing phone security settings, which users will rightly hesitate to do. Moreover, rather than accessing a convenient app store via an app preinstalled on the phone, users must navigate sites like sideloadfirephone.com and rawapk.com, which are notably less intuitive. Sideloading users also forego other app store features such as reviews, one-tap app activation, uninstall and more. A user might sideload the Google Play app store onto an Amazon Fire Phone. But the process of sideloading Google Play is particularly convoluted, requiring 11 separate steps including four downloads from a file-hosting site with no obvious indicia of trustworthiness.[47] Users have every reason to distrust this process and refuse to attempt it.

Relatedly, even if a user manages to sideload a competing app store, that app store would remain unsatisfactory to most users. Google withholds its own apps from competing app stores, immediately putting competing app stores at a major disadvantage.[48] Furthermore, Google Play has several times more apps than any other Android app store,[49] and popular independent apps are systematically missing from third-party app stores.[50]

One might draw a somewhat more favourable view of the marketability of bare Android devices based on, at the least, the survival of Amazon's Kindle Fire tablet.

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[44]'Discontinued Nokia X Phones Suffered from a Lack of Identity' *Gadgets 360* (18 July 2014) <http://gadgets.ndtv.com/mobiles/features/discontinued-nokia-x-phones-suffered-from-a-lack-of-identity-561119>.

[45]Narender Singh, 'Do Not Buy Nokia X Devices (Including X2) – My Reasons' *TechMesto* (17 July 2014) <https://www.techmesto.com/avoid-nokia-x-xl/>.

[46]*Gadgets 360* (n 44).

[47]'Google Play for the Amazon Fire Phone' *Sideload Fire Phone* (2016) <http://sideloadfirephone.com/google-play-for-the-amazon-fire-phone/>.

[48]'Why Android Users Should Have Google Play Store App on Their Device' *Neurogadget* (17 May 2016) <http://neurogadget.net/2016/05/17/android-users-google-play-store-app-device/30446>.

[49]*Statista* (n 21).

[50]See eg *Gadgets 360* (n 44), as to WhatsApp missing from the Nokia X app store.

First released in November 2011, the Kindle Fire tablet has been repeatedly updated and seems to have found a pool of satisfied customers, focusing on media content that Amazon licences and distributes. Yet as a non-MADA-compliant device, a Kindle Fire tablet also lacks GMS and thus cannot preinstall any Google apps – an omission that users widely complain about.[51] Here too, third-party web sites provide sideloading instructions, but the process is unattractive in the many steps required, not to mention deceptive advertising which diverts users to unrelated apps.[52] Sideloading Google Play remains the most difficult, requiring a USB connection to a Windows computer, adjusting Kindle Fire security settings, ignoring Windows security warnings, installing special drivers on the computer and running a script on the computer to modify the Fire tablet to run Google Play – a process that one web site explains in four sections with 23 paragraphs of instructions (plus eight bulleted substeps) and 12 screenshots.[53] Even if technical experts find the process workable, it is far from accessible to ordinary users.

Experience in certain developing countries offers a somewhat different sense of the importance of GMS and hence the need for device manufacturers to accept Google's MADA and AFA restrictions. Most notable is China, where Android enjoys nearly 74% market share,[54] yet GMS-equipped phones are virtually absent.[55] The absence of GMS is explained in part by a full ecosystem of competing apps (including competing app stores from well-established Chinese firms[56]) which make it feasible for manufacturers to forego GMS. Furthermore, at various points the Chinese government has blocked most Google servers from sending data in an out of China,[57] making it particularly easy for competitors to develop apps and services that consumers find more reliable and ultimately more attractive than Google's offerings. That said, these factors are unlikely to recur elsewhere.

[51]'Can't Use Voice Search on Kindle Fire' *Amazon Developer Forums* (21 September 2014) <https://forums.developer.amazon.com/questions/14243/cant-use-voice-search-on-kindle-fire.html>.

[52]Locust, 'How to Install Google Play Store App on Kindle Fire Without Rooting' *thefiretablet.com* <http://thefiretablet.com/posts/install-free-google-play-store-app-on-kindle-fire-without-rooting/>.

[53]Chris Hoffman, 'How to Install the Google Play Store on Your Amazon Fire Tablet' *How-To Geek* (6 November 2015) <http://www.howtogeek.com/232726/how-to-install-the-google-play-store-on-your-amazon-fire-tablet/>.

[54]'Market Share Held by Smartphone Operating Systems in China from 2013 to 2016, by Month' *Statista*, 2016.

[55]Meg Butler, 'Why No One in China Has an Android Phone' *GSM Nation* (23 November 2012) <http://www.gsmnation.com/blog/2012/11/23/why-no-one-in-china-has-an-android-phone/>.

[56]Viranch, 'Google and China: 5 Reasons Why It's Tough to Bring Back the Play Store' *TechPP* (28 November 2015) <http://techpp.com/2015/11/28/google-china-play-store/>.

[57]Keith Bradsher and Paul Mozur, 'China Clamps Down on Web, Pinching Companies Like Google' *The New York Times* (21 September 2014).

For example, most countries are unlikely to block Google services, and most companies lack strong local incumbents to provide key services.

Beginning in 2014, mobile software firm Cyanogen touted its "Google-free" version of Android, substituting third-party services for each component of GMS.[58] But Cyanogen's approach was, by all accounts, slow to catch on – leading to 2016 layoffs and widespread discussion of shifts in the company's strategy.[59] On the whole, Cyanogen's suite of competing apps could not match Google's functionality. Moreover, Cyanogen's strategy remained importantly limited by Google's various restrictions, including preventing Cyanogen and manufacturers from selecting desired Google apps (due to MADA restrictions) and preventing manufacturers from shipping some Cyanogen devices and some GMS devices (per the AFA discussed below).

In his Google-commissioned article, Prof. Körber suggests that bare Android is a viable option for device manufacturers, arguing that "some OEMs and MNOs actually exclude GMS and Google services from their Android devices, and nevertheless are successfully [*sic*] on the markets."[60] But in fact the few manufacturers that tried to avoid MADA requirements are notable primarily for their failures, as discussed above. Körber cites Amazon Fire, Nokia X and CyanogenMod as examples of non-GMS devices. But to the extent that he presents these as successful or commercially viable, time has proven his claims mistaken; his article was published in July 2014, on the eve of discontinuation of Nokia X and just before withdrawal of the Fire Phone. Nor do Cyanogen's struggles and sluggish market acceptance advance Körber's argument.

As a result, device manufacturers seeking to offer commercially viable Android devices have no choice but to sign the MADA and AFA contracts and accept the significant restrictions they contain.

II. Harmful effects of the requirements imposed on Android manufacturers

We now turn to the effects of Google's restrictions on Android, including the MADA and AFA contracts. While the specific effects vary, the restrictions all contribute to protecting Google's dominance in search, as well as in other key apps and services for which alternatives are available.

[58]R Maxwell, 'Cyanogen Wants to Take the 'Google' out of Android' *Phone Arena* (25 January 2016) <http://www.phonearena.com/news/Cyanogen-wants-to-take-the-Google-out-of-Android_id65194>.

[59]Leo Sun, 'Wannabe Google Assassin Cyanogen Runs Out of Bullets' *The Motley Fool* (28 July 2016) <http://www.fool.com/investing/2016/07/28/googles-wannabe-assassin-cyanogen-runs-out-of-bull.aspx>.

[60]Körber (n 20).

A. *Requiring mobile device manufacturers to include certain Google apps and defaults in order to get any part of Google mobile services*

The MADA contracts implement Google's strategy of making GMS an all-or-nothing choice for device manufacturers, increasing the likelihood of manufacturers choosing Google's app suite and correspondingly increasing the barriers against competition from makers of rival apps.

1. *Foreclosing entry by competing apps and services*

Google's MADA strategy is grounded in Google's market power in areas without close substitutes (including Google Play and YouTube). With that power, Google compels distribution of its other apps and services (such as Google Search and Maps), even if competitors have viable offerings. In particular, Google uses its market power in the first group to protect and expand in the second – enlarging its dominance and deterring entry.

Tying apps together helps Google whenever a device manufacturer sees no substitute to even one of Google's apps. Some manufacturers may be willing to offer devices that default to Bing Search, DuckDuckGo, MapQuest or Yahoo Maps, particularly if paid a fee to do so. The manufacturer could retain the payment as profit, or pass the savings to consumers via a lower retail price. But only Play lets a manufacturer offer comprehensive access to substantially all apps. Furthermore, a manufacturer would struggle without YouTube preinstalled; such a device would be unattractive to many consumers, and in many markets, mobile carriers would struggle to sell costly data plans for devices without YouTube access. Needing Google Play and YouTube, a manufacturer must then accept Google Search, Maps, Network Location Provider and more – even if the manufacturer prefers a competitor's offering or would prefer payment for installing some alternative.

Google's ties thus harm competition. For one, the restrictions prohibit alternative vendors from outcompeting Google's apps on the merits. No matter their advantages, device manufacturers must install Google's full suite as instructed by the MADA. Furthermore, Google can amend its rules to make its new apps the default in the corresponding categories, and updated MADAs reveal that Google has indeed made such revisions.[61]

Moreover, Google's ties impede competitors' efforts to pay device manufacturers for distribution. Where Google permits installation of additional apps, a manufacturer cannot provide a competing app maker with default or exclusive placement (precisely the options ruled out by Google's requirement of preinstalling its app). Rather, the manufacturer can offer only inferior duplicative placement. Consider, say, Yahoo Maps – a competitor to Google Maps. Yahoo Maps

[61] Efrati (n 31).

managers likely seek increased usage of their service, and if the Yahoo Maps app were the only mapping app preinstalled on a new smartphone, Yahoo's projections would probably indicate substantial usage – enough to justify a large up-front payment to the phone manufacturer. But with Google Maps guaranteed to remain installed and prominent, because the MADA so requires, Yahoo's projections will anticipate much lower usage, hence less worth paying for. At best, Yahoo will be willing to make some reduced payment to a device manufacturer. Equally likely is that the reduction in value may make the deal pointless, too small to be worth pursuing, as competing app makers are forced to resort to other promotional methods or, for some apps, accept the reality that there is no cost-effective way to reach the required users.

2. *Additional harms when Google requires default settings*

Many of Google's MADA requirements insist not just that mobile device manufacturers preinstall Google apps, but that they preset Google apps and services as the default from each search access point. These defaults entail an important element of exclusivity. Each search access point can only have one default search provider. Furthermore, each device can have only one default assist for voice search; a device can trigger only one function based on a prolonged button push; a device can have only one default Network Location Provider and only one component that renders web pages inside of apps. Google's MADA provisions insist that Google receives each of these benefits.

In principle, Google's compulsory defaults leave manufacturers free to install other apps and services as non-defaults. But experience shows that few users change their defaults or otherwise stray from the default system settings.[62] Deference to the default is particularly likely for services with no user-facing user interface (such as location tracking) or with no visible user interface (such as voice search). If competing app and service makers perceive low usage response to non-default placement, they will be correspondingly unwilling to pay for such placement, as detailed in the prior section. In any event, such placement will be correspondingly limited in its ability to advance competition.

Körber's Google-commissioned paper also argues that the MADA requirement that Google Search be the default "is of a very limited practical relevance" because, he says, the requirement only applies to a "specific intent" by which one Android app can invoke another.[63] But the plain language of the MADA imposes a notably broader requirement, insisting that device manufacturers

[62]See eg Jared Spool, 'Do Users Change Their Settings?' *User Interface Engineering* (14 September 2011) <https://www.uie.com/brainsparks/2011/09/14/do-users-change-their-settings/>. See also Jakob Nielsen, 'The Power of Defaults' *Nielsen Norman Group* (26 September 2005) <https://www.nngroup.com/articles/the-power-of-defaults/>.
[63]Körber (n 20), at 9.

must set "Google Search … as the default search provider for all Web search access points."[64] The plain language of the MADA thus encompasses default search from the text entry box on an Android device's home screen – a valuable and prominent search interface of great importance in directing users' searches. Moreover, more recent MADAs include a specific requirement that Google Search be a user's default voice search[65] – here too, widely and frequently used.

3. *Assessing Google's justifications*

In response to the European Commission's announcement that it had adopted a statement of objections against Google's contractual restrictions in mobile software licensing, Google's General Counsel[66] offered several arguments to justify the company's approach.

First, Google noted that Android is "open source" and that device manufacturers "can download the entire operating system for free, modify it how [they] want, and build a phone."[67] Indeed, as Google points out, device manufacturers need not sign the MADA if they do not want to be bound by the restrictions it contains. Nonetheless, this carries a high price to manufacturers, as their devices would then be deprived of Google Play, YouTube and other Google apps that the majority of users expect to have preloaded on their devices. Without these apps and features, most consumers will find a device unattractive, as Nokia, Amazon and others have learned, as discussed in Section I.B.3. Google offers manufacturers no real option when asking them to choose between Google's restrictions versus commercial irrelevance.

Second, Google observes that manufacturers can "choose to load the suite of Google apps to their device and freely add other apps as well."[68] But this is little solace to manufacturers who, having promised to preinstall Google apps, cannot offer a competitor exclusivity or the most prominent placement, as discussed in Section II.A.1. Furthermore, certain Google requirements demand exclusivity, either explicitly or through technical architecture, including for default search provider, location provider and voice search provider, as discussed in Section II.A.2. For these services and functions, Google errs in claiming manufacturers can install other options in parallel.

Third, Google denies that consumers are harmed because they can "personalize their devices and download apps on their own – including apps that directly compete with [Google's]."[69] But user customizations only partially discipline

[64]MADA Section 3.4(4).
[65]Efrati (n 31).
[66]Walker (n 9).
[67]ibid.
[68]ibid.
[69]ibid.

Google. For one, only savvy users make major customizations.[70] Furthermore, user customizations give competing app developers no way to pay to attract users *en masse*, as they could by, for example, contracting with device manufacturers or carriers. Nor do user customizations let app developers partially subsidize devices.

Fourth, Google notes that "while Android is free for manufacturers to use, it's costly to develop, improve, keep secure, and defend against patent suits."[71] Google says the company had therefore to offset those costs via "revenue [from] Google apps and services [it] distribute[s] via Android."[72] Surely Google should be allowed to operate a two-sided business model, including using revenue from one portion of the business to cover costs elsewhere. But Google's choice of a two-sided business model cannot be *carte blanche* to eliminate competition. Following Google's logic, every two-sided business would be free to restrict competition on the free side of its business on the basis of the unsubstantiated claim that such restrictions stimulate demand for its fee-paying activities. Moreover, following Google's logic, competition authorities would be prohibited from limiting or disallowing such restrictions. This mischaracterizes the state of competition law. While there is nothing inherently wrong in distributing Android for free, Google's choice to do so cannot legitimize the company's exclusionary tactics.

In addition, authors of papers commissioned by Google developed additional arguments to justify the MADA restrictions. First, Körber argues that

> the MADA must be seen in the context of competition among "mobile device ecosystems" (Android, iOS, Windows Phone, Blackberry and others). Most OEMs install the suite of apps on their devices as consumers expect smartphones to come with functionalities and apps "out of the box". … The MADA ensures that users – who choose to buy a device with GMS – get a device with a full set of apps that offer a "Google experience" similar to the "Apple experience" offered by iOS devices or the "Microsoft experience" offered by Windows Phone devices.[73]

Whatever the benefits of the "experience" Körber emphasizes, we question whether that benefit outweighs the effects on competition. Notably, Körber's

[70] See eg Derek Walter, 'How to Change the Default Search Engine in Android' *Green Bot* (5 February 2015) <http://www.greenbot.com/article/2879150/how-to-change-the-default-search-engine-in-android.html>, noting, among other complications, that the procedure varies across devices.

[71] Walker (n 9).

[72] ibid.

[73] Körber (n 20). See also J Gregory Sidak, *Do Free Mobile Apps Harm Consumers?* 52 San Diego Law Review 619, 674 (2015). ("The MADA's conditions on distribution of GMS enable android-operated devices to meet consumer expectations. The vast majority of mobile devices reached the end user with a set of pre-installed apps that offer consistent out-of-the-box experience that consumers demand.")

reasoning ignores the foreclosure of competing best-of-breed apps that cannot gain traction in a world of "experience" ecosystems. Nor is it realistic to ask an upstart app maker to make a full "experience" of its own, as a full ecosystem is of course much more burdensome than a single great app. That Apple provides such an "experience" is beside the point from a competition perspective; as the dominant platform, Android is rightly subject to greater restrictions.

Second, Sidak argues that the MADA "enables Google to prevent free riding by its competitors."[74] In support of this argument, Sidak presents the case of Google Play. But manufacturers' distribution of Google Play, onto additional devices even without other Google apps and services, would be the very opposite of the "free-riding" Sidak claims. When a user buys an app through Google Play, Google retains a commission of 30%, passing the remaining 70% through to the app maker.[75] If Google deems this 30% fee insufficient in light of the costs of making and operating Google Play, Google could raise the fee as it sees fit. Nor would other Google apps support Sidak's argument. For example, the YouTube app shows commercials, and industry analysts estimate that YouTube now at least covers its costs based on this ad revenue.[76] Far from "free-riding" on Google investments, manufacturers who distribute the YouTube app would be giving Google no-charge additional distribution of a revenue-generating service.

B. *Preventing manufacturers from selling devices running on competing operating systems based on Android*

To distribute GMS and the must-have Google apps, Google also requires device manufacturers to accept the AFA. As discussed in Section I.B.2, the effects of this requirement are particularly difficult to assess because, to our knowledge, the AFA has never been released to the public.

Papers commissioned by Google style the AFA as a benefit to consumers, reducing the problem of modified OS code yielding incompatibilities. For example, Sidak argues that "[f]ragmentation might cause the malfunctioning of mobile apps and thus degrade the quality of the consumer experience." He notes corresponding problems for app developers: "Fragmentation would also harm the development of apps for Android-operated devices. As fragmentation worsens, the cost of developing and maintaining apps for divergent versions of Android rises."[77]

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[74] Sidak (n 73), at 675.

[75] 'Transaction Fees', *Google Developer Console Help* <https://support.google.com/googleplay/android-developer/answer/112622?hl=en>.

[76] Rolfe Winkler, 'YouTube: 1 Billion Viewers, No Profit' *Wall Street Journal* (25 February 2015) <http://www.wsj.com/articles/viewers-dont-add-up-to-profit-for-youtube-1424897967>.

[77] Sidak (n 73), at 671.

We acknowledge the problem of fragmentation and the potential benefit of policies that reduce fragmentation. But the Commission's Statement of Objections and other publicly available information indicate that Google's AFA restrictions go considerably further. In particular, the AFA commits a device manufacturer to not distribute a modified version of Android on *any* of its devices.[78] Notably, the AFA appears to apply to *all* of a manufacturer's devices, not just a single device for which the manufacturer seeks benefits that Google conditions on the AFA. In particular, a carrier cannot accept the AFA as to some of its devices, but retain the right to distribute other devices that violate AFA.

Amazon's experience is illustrative. Amazon's Fire Phone and Fire Tablet both use alternative versions of Android, modified from Google's standard version. It seems Amazon was permitted to design and sell devices with this modified code precisely because Amazon is not a manufacturer of GMS-equipped phones that bind all of Amazon to the AFA. In contrast, if competing phone manufacturer Samsung were to attempt to sell the Fire (or any other device that, like Fire, was grounded in a modification of Android), that would breach the AFA and expose Samsung to cancellation of its licence to distribute GMS, which Samsung of course relies on for its scores of other devices. The experience of phone manufacturer Acer offers a useful example. When Acer in 2012 planned to sell phones running a modified version of Android, the company reported that Google required it not to do so and threatened to withhold access to other Google software.[79] The AFA thus makes it commercially infeasible for established device manufacturers, including Samsung and others, from attempting the architectural innovation Amazon explored in Fire. It is little stretch to think such innovation would be more successful by Samsung than by Amazon – Samsung's experience as the largest manufacturer of phones would likely help.[80] But the AFA denies Samsung this strategy and denies consumers the benefit of devices that combine Amazon's creative approach with Samsung's experience.

On this understanding, the AFA substantially raises the stakes for any company considering distributing a modified version of Android. By requiring that a manufacturer give up all licences to GMS when it distributes a customized version of Android contrary to the AFA, Google requires any manufacturer to "bet the company" on its

[78]'Statement by Commissioner Vestager on Sending a Statement of Objections to Google on Android Operating System and Applications' *European Commission Press Release Database* (20 April 2016) <http://europa.eu/rapid/press-release_STATEMENT-16-1506_en.htm>, "Google prevents manufacturers who wish to pre-install Google apps on *even one* of their devices from using modified, competing versions of Android on *any* of their other devices" (emphasis added).

[79]Michael Kan, 'Google Threat Blamed as Acer Cancels China Smartphone Launch' *Computerworld* (13 September 2012) <http://www.computerworld.com/article/2492455/data-center/google-threat-blamed-as-acer-cancels-china-smartphone-launch.html>.

[80]'Smartphone Vendor Market Share, 2015, Q2' *IDC* <http://www.idc.com/prodserv/smartphone-market-share.jsp>.

experiment with a non-GMS version of Android. Established device manufacturers – those best positioned to offer high-quality devices that consumers want – cannot justify foregoing their existing business for the small chance at something new.

C. *Exclusionary payments to device makers*

In a press release on 20 April 2016, the European Commission noted that in addition to the above restrictions, Google may have breached EU competition law by "giving financial incentives to manufacturers and mobile network operators on condition that they exclusively preinstall Google Search on their devices."[81] According to Commissioner Vestager, the Commission found evidence that as a result of such payments, "device manufacturers and mobile network operators have refrained from preinstalling alternative search services."[82] Industry sources confirm these allegations, describing Revenue Sharing Agreements (RSAs) that provide a device manufacturer with a share of Google's advertising revenue from searches on that device only if the device manufacturer commits not to install competing search services. We are informed that some RSAs disallow any competing search services, while others name specific competitors whose apps and search providers must not be installed.[83]

Google has neither acknowledged such payments nor tried to justify them. In our view, Google's rationale for such payments is probably that while the MADA requires that Google be the "default" search provider, it leaves open the possibility of a manufacturer preinstalling other search apps – perhaps a Bing or Yahoo icon leading to a search box. We question how many users would use such an app if it were installed in this way, both because it would not be the default and because it seems that most users broadly tend to favour Google search. Nonetheless, Google's payments to manufacturers rule out this possibility – thereby excluding the opportunity for rival search engines to get even the benefit of parallel, limited access to users.

Google's payments also risk creating an all-or-nothing decision for countries or regions where a device is to be offered, further impeding entry by prospective competitors. In many sectors, an entrant would most readily offer a new service only in a particular national or regional market – for example, a search engine that searches only pages in a given language, or a service that reviews local businesses only in a given geographic scope. Such an entrant would naturally seek distribution only within the corresponding region, and could offer viable payments for distribution only within that area. Consider the interaction of this strategy with Google's payments for search defaults. If Google's payments are

[81] 'Antitrust: Commission Sends Statement of Objections to Google on Android Operating System and Applications' *European Commission Press Release Database* (20 April 2016) <http://europa.eu/rapid/press-release_IP-16-1492_en.htm>.
[82] Vestager (n 78).
[83] Our industry source prefers not to be listed by name or affiliation due to the sensitivity of these allegations.

contingent on *worldwide* exclusive preinstallation of Google Search, consistent with the worldwide scope of the MADA and AFA, an entrant could not offer a payment only for distribution in the specific country or region where it focuses operation; the entrant would have to bid against Google on a worldwide basis where Google predictably wins.

D. *Dispute resolution and penalties further compel device manufacturer compliance*

After carefully reviewing all applicable contracts, some device manufacturers might look for opportunities to install third-party apps or otherwise customize devices, both to provide distinctive devices and to obtain additional revenue. But Google's contractual framework and approach to dispute resolution might cause device manufacturers to fear taking actions that Google views unfavourably. For one, Google's MADA specifically requires that a device manufacturer obtain Google's approval for each new device.[84] Nothing in the MADA compels Google to provide its approval in any particular circumstances or with any particular speed, and indeed the MADA leaves open the possibility that Google might withhold approval for unrelated matters. While the relevant portions of other contracts are not publicly available, by all indications Google similarly retains significant discretion in each. Device manufacturers thus anticipate that if they implement strategies that Google dislikes, they may face retaliation up to and including prohibitions that they distribute Google apps. Indeed, when Google sought to block distribution of certain software from competing geolocation service Skyhook, Google told Samsung that its devices "cannot be shipped" with the disfavoured Skyhook code.[85] Anticipating similar threats from Google, other device manufacturers correctly perceive that they must not take actions adverse to Google.

Notably, Google's agreements with device manufacturers allow Google to impose penalties, including stop-ship orders, on a unilateral basis. In the Samsung incident described, Google did not need to seek ratification from a court or even an arbitrator or other independent authority. Rather, Google imposed the stop-ship order on its own and with immediate effect.

E. *Preventing entry by a more efficient competitor*

Taken together, Google's contractual restrictions could impede entry even by a competitor that is better than Google and, in the relevant sense, more efficient

[84]MADA section 4.3.

[85]Email from Andy Rubin to WP Hong, 22 June 2010, 'RE: [Urgent] GPS-Related Issue on Galaxy S'. Affidavit of Douglas R Tillberg for Plaintiff's Opposition to Defendant's Motion to Dismiss or for Summary Judgment (Exhibit 16), Skyhook Wireless, Inc. v. Google Inc., 86 Mass. App. Ct. 611 (2014).

than Google. Consider some company NewCo that produces a mobile search engine of notably high quality, such that once users try NewCo's service, they prefer it to Google Search. How would NewCo make its offering known to consumers?

NewCo could pay device manufacturers to preinstall its search engine on their devices. But that technique would be ineffective because Google's MADA requirements would assure both that Google would remain preinstalled and indeed also the default. NewCo's payments would yield only parallel, additional placement of much-reduced value. Furthermore, even if NewCo were willing to pay device manufacturers to preinstall its offering, its efforts could be thwarted by Google's incentive payments to device manufacturers for exclusive preloading of Google Search. While NewCo could attempt to outbid Google, that would be an expensive effort for the modest benefit of a parallel and additional placement.

If NewCo found it intractable to gain access to consumers on mainstream Android devices, the company could instead try to reach users via an alternative Android platform to be developed by an interested manufacturer. But here too, Google restrictions stand in the way. Any established manufacturer would be unable to take such a risk on NewCo, as it would be commercial suicide to breach the AFA and lose the ability to preload GMS on any of its devices.

Nor is it any serious answer to suggest that NewCo do business with Apple. Google reportedly pays Apple more than $1 billion to be the default search provider on iPhone.[86] A new entrant would be unable to make an up-front payment even a fraction of that size, plus Google's contract with Apple has an extended duration, preventing competitors from counterbidding to contest the market.

It is equally unrealistic to suggest that NewCo might build its own mobile ecosystem to avoid the restrictions Google imposes. If NewCo encouraged mobile device manufacturers to preinstall its search engine on "bare" Android devices, the resulting devices would forego the benefits contingent on a MADA. Such devices would thus forego all Google apps – effectively requiring that NewCo offer not just a better search engine but a full suite of apps including maps, mail, photos, a video library and more. Such devices would also forego Google Play delivery of apps from third parties – thus requiring that NewCo somehow devises a method of providing third-party apps, either via a new app store or via sideloading as described in Section I.B.3. Google's restrictions thus raise the bar required for a more efficient competitor. With these restrictions in place, it is not enough for NewCo to be better at search, as NewCo must also build or replace the entire set of services Google offers.

The above hypothetical example illustrates how Google's contract provisions interlock to impede entry even by competitors with high-quality offerings. An

[86]Joel Rosenblatt and Adam Satariano, 'Google Paid Apple $1 Billion to Keep Search Bar on iPhone' *Bloomberg* (21 January 2016) <http://www.bloomberg.com/news/articles/2016-01-22/google-paid-apple-1-billion-to-keep-search-bar-on-iphone>.

occasional competitor might somehow find a way through, but Google's restrictions block the most natural approaches and raise the entrant's costs and challenges.

III. Legal assessment

We begin with two important observations. First, as noted above, our legal assessment of Google's Android-related practices is constrained by the lack of publicly available information on some of the contractual requirements Google imposes on device manufacturers that want to manufacture commercially viable devices. The AFA is one notable example of a contract that to this day is unavailable to the public. In addition, we have only limited information about the financial incentives that Google allegedly pays to device manufacturers and mobile network operators on the condition that Google Search is preloaded as the exclusive search provider on their devices. As a result, our antitrust assessment of Google's practices will largely focus on the MADA-related restrictions, for which contracts became available to the public as discussed in footnote 28. We also provide a brief, albeit necessarily incomplete, assessment of the AFA and the financial incentives.

Second, we have also seen that Google's Android-related practices are investigated in various jurisdictions whose antitrust laws vary to some extent. We primarily assess these practices under EU competition law because European authorities seem to be taking the closest look at Google's practices in this area. However, we take a conservative approach by, for instance, applying a more demanding test to Google's tying conduct than the one required by the EU case-law. In this section, we identify three exclusionary practices: (i) Google's MADA requirements that device manufacturers include certain Google apps and defaults in order to get any part of GMS; (ii) Google's AFA prohibition that device manufacturers sell devices running on competing operating systems based on Android and (iii) Google's financial incentives to device manufacturers and carriers for exclusive preinstallation of Google Search. The first and third directly protect Google's dominance Search, while the first also benefits other Google's position in the market for certain other apps and services. The second raises the stakes for device manufacturers and increases the effectiveness of the other methods. We review these practices in turn.

A. *MADA requirements that device manufacturers include certain Google apps and defaults in order to get any part of Google mobile services*

As discussed in Section II.A, Google's MADA strategy leverages the company's market power in certain services and apps for which there is no clear substitute (most notably Google Play and YouTube) in order to compel device manufacturers wishing to manufacture commercially viable devices to install other services and apps (including Google Search and Google Maps) for which there are substitutes. This is a clear case of tying.

In this section, we describe the notion of tying, as well as its possible pro- and anti-competitive effects. We then review the legal test applied to tying under EU competition law, and we apply that test to Google's tying practices.

1. *Tying and its effects*[87]

Tying generally refers to a situation where a seller refuses to sell one product (the "tying" product) unless the buyer also takes another product (the "tied" product).[88] Sellers can implement tying on a contractual basis, with a tie enforced through contractual provisions to that effect. Sellers can also use a technical or technological tie where, for instance, the tying and the tied product are physically integrated or designed in such a way that they can only work together.

Tying is commonly used by firms with or without market power to offer better, cheaper and more convenient products and services. Shoes have always been sold with laces and cars with tyres. But product integration extends beyond these simple products and has become a key business strategy in many industries. For instance, manufacturers of consumer electronics combine many components into a single product that works better or is more cost effective, smaller or energy-efficient. Smartphones comprise elements that used to be provided separately (phone, camera and more), and the smartphone's screen and software provide a flexible platform that allows integration of ever more functions.

While tying is usually pro-competitive, it may also be used as an exclusionary strategy. First, a firm that is dominant in the market for the tying product may seek to extend its market power into the market for the tied product. Since consumers must obtain the tying product from the dominant firm, the firm can expand its dominance by tying the purchase of the two goods together.[89] If the firm ties a complementary product to its monopoly product, customers can only buy the monopoly product if they also purchase the tied product. Second, there may be circumstances where tying protects dominance in the tying product market.[90] Consider a

[87]Our articulation of the relevant legal standard and proposed text is based in part on a working paper draft ultimately published, in part, as Benjamin Edelman, *Does Google Leverage Market Power Through Tying and Bundling?* 11 Journal of Competition Law & Economics 365 (2015). The relevant sections were largely removed from the published text due to space constraints.

[88]In *Eastman Kodak*, the Court defined tying as "an agreement by a party to sell one product but only on the condition that the buyer also purchase a different (or tied) product, or at least agrees that he will not purchase that product from any other supplier." Eastman Kodak v. Image Technical Servs, 504 U.S. 451, 461 (1992). See also Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings issued in December 2008, OJ 2009, C45/7, at § 48.

[89]See Einer Elhauge and Damien Geradin, *Global Antitrust Law and Economics* (2nd edn 2011), at p. 562 et seq.

[90]See eg R Cooper Feldman, Defensive Leveraging Strategy in Antitrust, 87 Georgetown Law Journal 2079 (1999).

tying monopolist that expects successful tied product-makers to evolve into tying product-makers. Such a monopolist has an incentive to foreclose rivals in the tied product markets to prevent or reduce competition in its tying market.

We offer several additional observations as to the effects of tying in online markets. First, anti-competitive harm may occur even if users are not asked to pay directly for the tying product or the tied product. A provider of free online services may have an incentive to extend its dominance in the provision of some services (the tying services) to other services (the tied services) in order to improve its capacity to monetize the services it provides on the paying side of the platform (e.g., advertising).[91] This strategy is particularly prominent among multi-sided platforms: A platform operator may provide service to one set of users without a direct charge, choosing instead to profit from fees charged to others. For example, in the context we consider, Google may find that it can increase its advertising revenue by controlling a greater share of online services (search, maps, travel services, etc.).

Second, while competition law does not require a showing of dominance in the tied product market, it makes no difference if the firm engaged in the tie is also dominant in that market. For instance, if Firm A manufactures dominant product X (for which there is no substitute) and Y (which is highly successful, but for which there are substitutes), A might protect Y by tying it to X. Thus, a firm's dominance in the tied product market does not mean that it cannot benefit from a tie, as the tie may be used to protect it from challenges from competing products. That is the case here, since Google can use the apps and services for which there are no substitutes to protect and increase its dominant position in search and other key apps to which there are substitutes.

Third, additional measures may magnify the effects of tying. One might not ordinarily think of favoured formatting, preferred placement or default settings as "products" that could be tied. But a dominant firm that controls an enabling infrastructure (such as a search engine result page or an operating system) is well positioned to grant preferential access to these benefits, specifically reserving special benefits only for its own services. Given the known importance of formatting and placement in shaping users' actions and the known importance of defaults in influencing users' choices,[92] these benefits are likely to significantly sway market outcomes.

2. *The EU case-law on tying*

The European Commission has issued a number of decisions concerning tying, most famously its 2004 finding that Microsoft abused its dominant position on

[91]Jean-Charles Rochet and Jean Tirole, *Platform Competition in Two-Sided Markets*, 1 Journal of the European Economic Association 990 (2003).
[92]n 62.

the PC operating system market. In *Microsoft*, the Commission decided that Microsoft infringed Article 102 of the Treaty on the Functioning of the European Union (TFEU) by tying Windows with Windows Media Player (WMP).[93] The Commission found that anti-competitive tying requires the presence of the following elements: (i) The tying and the tied goods are two separate products; (ii) The undertaking concerned is dominant in the tying product market; (iii) The undertaking concerned does not give customers a choice to obtain the tying product without the tied product and (iv) The tying in question forecloses competition.[94]

The Commission found that WMP and Windows were two separate products.[95] The distinctness of products had to be assessed with an eye towards consumer demand. The Commission noted that the market provided media players separately, which the Commission considered evidence of separate consumer demand for media players versus client PC operating systems. It also found that Microsoft was dominant in the market for PC operating systems and established that customers were not given the choice of acquiring the tying product without the tied product. As to the element of foreclosure, the Commission first stated that tying has a harmful effect on competition,[96] but also acknowledged that there were circumstances "which warrant a closer examination of the effects that tying has on competition in this case."[97] The Commission thus decided to use an effects-based approach and found that Microsoft's conduct created anti-competitive effects, hence condemning Microsoft's tie of WMP.

Microsoft subsequently appealed the decision of the Commission to the General Court of the EU (GC).[98] In its judgment, the GC supported the position of the Commission that (i) operating systems for PCs and media players are distinct products; (ii) Microsoft is dominant on the market for operating systems and (iii) the condition of coercion is met in that Microsoft did not give consumers the option of obtaining Windows without WMP. However, the GC departed from the Commission's effects-based approach to evaluating foreclosure. It noted the Commission's finding that the ubiquitous presence of WMP on PCs provided a significant "competitive advantage" to Microsoft, and the GC said that this finding was "sufficient to establish that the fourth constituent element of abusive bundling is present in this case."[99] For the GC to demonstrate that the

[93]Commission Decision, 24 March 2004, Case *COMP/C-3/37.792 Microsoft*. See Damien Geradin, Limiting the Scope of Article 82 of the EC Treaty: What Can the EU Learn from the US Supreme Court's Judgment in Trinko in the Wake of Microsoft, IMS, and Deutsche Telekom, 41 Common Market Law Review 1519 (2004).
[94]ibid at § 794.
[95]ibid, section 5.3.2.1.2.
[96]ibid at § 835.
[97]ibid at § 841.
[98]*Microsoft v. Commission*, T-201/04, [2007] ECR 2007 II-3601. See generally, Christian Ahlborn and David S Evans, 'The Microsoft Judgement and Its Implications for Competition Policy Towards Dominant Firms in Europe', 75 Antitrust Law Journal 887 (2009).
[99]ibid at § 1058.

tying in question creates a competitive advantage that rivals are unable to replicate, it was thus sufficient to show that WMP was ubiquitous. After demonstrating such a competitive advantage, it is no longer necessary to show that the tying produces foreclosure effects in the market in question.

Although the European Commission can probably satisfy itself in applying the test developed by the GC in *Microsoft* to establish a breach of Article 102 TFEU, we think that it is generally desirable that antitrust authorities apply a stricter test requiring them to establish that the tying practice under investigation produces foreclosure effects and consumer harm. Furthermore, we suggest that the assessment should consider any efficiencies that may be generated by the challenged practice. With these extensions, in the next section we develop a six-step test, which we subsequently apply to Google's tying.

3. *Proposed modified test*

Because tying can be a source of efficiencies, we believe that such practices should be analysed with consideration of the following six questions: (i) Does the defendant have market power in the tying product; (ii) Are the tying and the tied product different?; (iii) Are the tying product and the tied product tied together?; (iv) Does the tie foreclose competitors?; (v) Does the tie create consumer harm? and (vi) Are there countervailing efficiencies?

To establish the presence of illegal tying, we suggest that foreclosure effects and consumer harm must be demonstrated, not merely presumed. We then balance such harms against any efficiencies generated by the tie in order to determine the net effect of the tie.

4. *Application of the test to Google's MADA restrictions*

We now apply our six-part test to Google's MADA restrictions.

a. *Market power in the tying product*. Google uses as tying products certain services and apps for which there are no clear substitutes, such as Google Play and YouTube. The Commission has not yet defined a market for "app stores," but such a market can be defined based on requirements and functionality. Notably, Google is dominant in this market not only because it has several times more apps than any competing Android app stores,[100] but more fundamentally because Google makes its popular apps available only through Google Play. Thus, for mainstream Android users, there is no real alternative to Google Play.

It is also impossible for device manufacturers to preload a must-have Google app without also taking the other apps specified by Google in the MADA. Any such must-have app also serves as a tying product. This is the case for

[100] *Statista* (n 26).

YouTube, for which there is no real alternative because YouTube hosts a distinctive quantity and selection of video content. Indeed, ComScore reports that YouTube is the only video app among the top 15 apps.[101] YouTube would be found dominant on any reasonable definition of the mobile video service market.

Of course tying products can change over time. For example, if competition effectively disappears in a given area (perhaps due to Google's tie or other market forces), Google's offering in that sector may come to lack any competitor, and Google can then use that offering as a tying product. Perhaps Google's maps offerings, Google Maps and Waze, are or might soon be must-have apps that similarly lack competition and thus can serve as tying products. Indeed, within Google Play's Navigation section, those two apps each have more than five times as many reviews as the nearest competitor. (Mapquest, once a household name, has less than 1% as many Google Play reviews as Google Maps, by all indications indicating correspondingly light usage of its Android app.[102]) While some US users turn to Bing or Yahoo, South Koreans to Naver and Russians to Yandex, there is no clearly viable general-purpose search engine in most other countries, creating the possibility that even search could become a tying product.

b. *A tie*. The MADA contracts specifically prohibits device manufacturers from preloading Google Play, YouTube or any other must-have apps without also preloading Google Search, Google Chrome and the other apps Google specified in the MADA. The essence of Google's tying strategy is that as long as a device manufacturer finds even a single Google app essential to the commercial success of its devices, it must preload all other Google apps.

c. *The tying and the tied product(s) are separate*. It is hard to deny that Google Play and apps such as Google Search or Chrome are distinct products. The apps offer distinct functionalities accessed via distinct on-screen icons. The apps are embodied in software code distributed in distinct "APK" (Android Package Kit) file bundles, and each app uses a different APK which can be and is updated separately from the others. Furthermore, users can manually deactivate some Google apps and the others will continue to function. The apps are separately tracked by the Android operating system for purposes of memory consumption, network transmissions, battery usage and more. Even Google's contract-writers recognize the separation between the apps, periodically revising the MADA to adjust which apps must be included.[103]

[101]'Top 15 Smartphone Apps – Total U.S. Smartphone Mobile Media Users, Age 18 + (iOS and Android Platforms) – July 2016' *Comscore*, <http://www.comscore.com/Insights/Market-Rankings>, data as of 25 August 2016.
[102]Authors' calculations from Google Play, 28 September 2016.
[103]Efrati (n 31).

Moreover, using the test contained in the EU tying case-law, there is clearly separate demand for Google Play versus, say, Google Search. A user of an Android phone may, for instance, be interested in using Google Play to download a broad selection of third-party apps, but prefer to use another company's search service, perhaps to obtain greater privacy protections than Google Search offers.

d. *Foreclosing competition*. Google's tie produces exclusionary effects by hindering rival app makers' efforts to compete with Google Search and other key apps, which device manufacturers are bound to preload on their devices in order to provide Google Play and other Google must-have apps. As a result of the tie, additional apps such as Google Search, Chrome and Maps are ubiquitous on Android devices from leading manufacturers despite the availability of potential competitors. Moreover, the tie makes it impossible for rival app makers to pay device manufacturer to exclusively install their apps on Android devices in order to reach users *en masse*. Whatever amount a rival app maker might be willing to pay for exclusive placement, such as a placement simply is not available.

Moreover, the foreclosure effects of the tie are magnified by Google's additional requirements. Google requires that its preinstalled apps be prominent, with some "at least on the panel immediately adjacent to the Default Home Screen" and others "no more than one level below the Phone Top."[104] These requirements reduce a device manufacturer's ability to feature competitors by relegating Google apps to inferior placement. New contracts also specify the sequence in which Google apps must be presented,[105] further limiting a device manufacturer's flexibility to promote competitors.

Google's tactics also foreclose competition for components outside the confines of apps. Google requires that devices use its Network Location Provider service,[106] its WebView Component (the core of a web browser),[107] and its voice search and hardware-button-activated search.[108] By requiring that all these settings feature Google, in each instance exclusively because the specified setting can accommodate only one option at a time, Google prevents competitors from gaining market position via these settings and the corresponding availability to users.

An additional foreclosure mechanism arises from the leverage theory offered in a recent paper by Choi and Jeon.[109] They consider a firm in a competitive market A with a two-sided structure in which the firm would ordinarily find it

[104]MADA section 3.4.(2)–(3).
[105]Efrati (n 31).
[106]MADA section 3.8(c).
[107]Efrati (n 31).
[108]ibid.
[109]Jay Pil Choi and Doh-Shin Jeon, 'A Leverage Theory of Tying in Two-Sided Markets', CEPR Discussion Paper No. DP11484 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2834821>.

optimal to set a negative price to one side in order to attract more users on the other side. For example, a search engine operator might pay consumers in order to attract more advertisers, yielding additional advertising fees more than sufficient to cover the payments to users. While such payments are attractive in principle, they suffer numerous practical problems such as fraud, and thus we often instead observe a zero payment to users in such circumstances. A competitor seeking to enter market A is thus unable to set a lower price to consumers, and as a result all firms in this market earn excess profits that are not competed away through payments to consumers. Against that backdrop, the authors point out the possibility of the firm tying its offering in market A to its monopolistic offering in some other market B. A user who wants the firm's B product is then required to accept the A product. If the monopolist's offering in B is sufficiently compelling, many users may choose it, thereby accepting the monopolist's offering in A and increasing the monopolist's market share in A – letting the monopolist expand while satisfying the non-negativity constraint on payments to consumers. Notably, the monopolist's effort in no way requires that its offering in market A be preferable to competitors' offerings. Taking A to be the market for mobile apps and mobile search, and B to be the market for app stores and mobile operating systems, this theory arguably applies to Google's conduct in mobile. Choi and Jeon thus offer a robust theoretical understanding of Google's conduct and the resulting harm to consumers.

e. *Consumer harm*. By foreclosing rival app makers, Google harms consumers. First, mobile device users would benefit from greater competition between Google's tied apps (Search, Chrome, etc.) and other apps. As explored in Section II.D, a new mobile search engine would struggle to attract users on Android devices in light of the preload and prominence required for Google Search. The same is true for every app competing with a Google offering that has guaranteed distribution and prominence per the MADA. Moreover, the list of apps benefiting from the MADA changes from time to time, as Google sees fit.[110] As a result, even if Google lacks an offering in a new category or has not historically favoured its app via a MADA provision, Google can easily do so in the future. Although many of the apps at issue are free, in up-front purchase price, they nonetheless impose costs on users including in advertising as well as collection and processing of private information. In all these regards, Android device users would benefit from competition to increase product diversity and innovation.

The benefits of competition would be particularly pronounced for the types of users that pay for Google's services, most notably advertisers. When Google knows that it controls most of the advertising venues for reaching users on a mobile device, it can raise prices with relative confidence – ultimately raising

[110]Efrati (n 31).

prices in light of advertisers' willingness to pay. In contrast, if other vendors also reached users on mobile devices, prices would fall correspondingly – potentially to prices closer to services' marginal cost, which would probably be quite low. Witness the intense competition among the many online publishers that sell banner advertising, for which prices have dropped sharply,[111] versus high prices for search ads,[112] where Google is the only commercially significant seller in most markets. Competition in mobile apps portends a world of low advertising prices, benefiting the advertisers whose payments put the system in motion; whereas lack of competition will bring needlessly high prices that deny advertisers a significant share of the efficiencies of electronic marketing. When Google drives up the price of advertising, advertisers pass a portion of that cost on to consumers (according to the relative elasticity of supply and demand.[113]

Additional harm results from Google's efforts to block or sharply limit app makers from paying for distribution by device manufacturers and network operators. With such payments, device manufacturers and network operators would receive a secondary revenue stream to complement consumers' cash payments. In competitive markets, device manufacturers and network operators would compete away these additional revenues by lowering the device purchase prices they charge to consumers. But when Google prevents device manufacturers and network operators from offering certain valuable placements (e.g. exclusive preinstallation) and limits other placements, Google prevents such payments, leaving consumers with higher device purchase prices.

f. *Efficiencies*. In its Guidance Paper on Article 102 TFEU,[114] the Commission observes that in

> the enforcement of Article [102], the Commission will also examine claims put forward by a dominant undertaking that its conduct is justified. A dominant undertaking may do so either by demonstrating that its conduct is objectively necessary or by demonstrating that its conduct produces substantial efficiencies which outweigh any anti-competitive effects on consumers. In this context, the Commission will assess whether the conduct in question is indispensable and proportionate to the goal allegedly pursued by the dominant undertaking.[115]

[111]Farhad Manjoo, 'Fall of the Banner Ad: The Monster That Swallowed the Web' *The New York Times* (5 November 2014) <http://www.nytimes.com/2014/11/06/technology/personaltech/banner-ads-the-monsters-that-swallowed-the-web.html>.
[112]Mark Ballard, 'AdWords Brand CPCs Rising? Here's Why and What You Can Do about It' *Search Engine Land* (23 July 2015) <http://searchengineland.com/adwords-brand-cpcs-rising-heres-can-225648>.
[113]Michal Fabinger and Glen Weyl, 'Pass-Through as an Economic Tool: Principle of Incidence under Imperfect Competition' 121(3) Journal of Political Economy 528 (2013).
[114]Communication from the Commission – Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, O.J. 2009, C 45/7.
[115]ibid at § 28.

Both directly and via various commissioned articles, Google has offered explanations and justifications for its MADA restrictions. In our view, these arguments are unpersuasive (see Section II.A.3) and do not meet the test set by the Commission. In fact, Google does not so much seek to justify its practices on the grounds that they are a source of efficiencies, but rather by denying their restrictive effects, emphasizing the great degree of "freedom" that Google's Android policy gives to device manufacturers. While it is strictly true that a manufacturer does not have to sign the MADA to develop a bare Android device, they have no choice but to sign this agreement – and thus accept its restrictions – if they wish to manufacture a commercially viable device. Moreover, Section II.D explains how these restrictions – combined with the restrictions contained in the AFA and the financial incentives granted to some manufacturers and MNOs – would make it quite difficult, if not impossible, for an equally or more efficient new search engine to compete with Google Search. Even if these restrictions were a source of efficiencies, they would not justify complete rival foreclosure.

We are therefore sceptical about Google's claim that its "partner agreements have helped foster a remarkable – and, importantly, sustainable – ecosystem, based on open-source software and open innovation."[116] While Android is a successful ecosystem, at least in terms of market penetration, the restrictions Google imposes on device manufacturers make Android much less opened than claimed. Whatever the goal the restrictions seek to achieve, they create disproportionate harm competition and innovation.

B. *AFA prohibition that device manufacturers sell devices running on competing operating systems based on Android*

Device manufacturers hoping to manufacture commercially viable Android devices must not only sign the MADA, which guarantees ubiquitous distribution to Google apps, but also the AFA, which prevents them from making or distributing modified versions of Android. While our assessment is necessarily limited without access to the exact contractual provisions, the AFA appears to be another effort by Google to leverage its market power in certain services to prevent the creation of alternative platforms that would weaken its control.

Based on what is publicly known about the AFA, it seems to create two forms of exclusionary effects. First, the AFA prevents leading device manufacturers from developing an alternative Android-based platform. The development of a *single* device using such a platform, perhaps as an experiment to assess market reaction, would deprive a manufacturer of access to Google Play and must-have Google apps for *all* its devices. This form of defensive leveraging reduces platform diversity and is particularly harmful in light of the paucity of competing mobile OS platforms.

[116]See Walker (n 9).

Second, the AFA deprives rival app makers of access to alternative Android platforms to commercialize their apps. If large device manufacturers could offer devices based on a modified Android platform that did not include GMS, while maintaining access to GMS for their other devices, then rival app makers could seek preferred distribution on the modified devices. By assuring that such devices do not come to market, from the large manufacturers best positioned to provide low-cost high-quality devices, Google rules out that strategy and further reduces opportunities for rival app makers.

The AFA's harm to consumers thus flows not only from foreclosed competition in apps, but also from the reduced opportunity for device manufacturers to develop or distribute an alternative Android-based platform.[117] While any device manufacturer could in theory develop such platforms, the reality is that only companies with no prior history in developing mobile devices (e.g., Amazon) or Android devices (e.g., Nokia) are willing to accept the trade-offs Google imposes when a manufacturer modifies Android. Large manufacturers of Android devices are better positioned to develop and commercialize alternative Android platforms based on the skills and capabilities they have developed with Google's version of Android, but they cannot accept the penalties Google imposes for experimentation. As a result, end users are left with a choice between Google's version of Android on mainstream devices, modified Android on a few unusual devices from inexperienced manufacturers and the iOS platforms. With iOS too costly for many users, and devices from lesser-known manufacturers predictably unattractive, many end users are left with no practical choice except Google's Android.

Whatever the efficiencies resulting from the AFA, we doubt that the need to protect Android from fragmentation justifies the all-or-nothing bet-the-company choice Google imposes on device manufacturers. Moreover, experience from Amazon, Nokia and lesser-known manufacturers suggests that most modifications of Android are at the level of the user interface, leaving the operating system's core intact and making it likely that apps will continue to work as expected. In this context, the risk of fragmentation could be addressed by strict compatibility requirements and testing rather than by a quasi-prohibition against modifications.

C. *Financial incentives to device manufacturers and carriers for exclusive preinstallation of Google search*

As discussed in Section II.C, Google has neither admitted nor attempted to justify its apparent practice of paying financial incentives to device manufacturers and mobile network operators for the exclusive preloading of Google Search on

[117] In this respect, you could argue that there is an element of "exploitation" in Google's approach in that it forces device manufacturers that want to develop commercially viable Android devices to "unfair trading conditions." Case C-333/94, *Tetra Pak International SA v. Commission*, [1996] E.C.R. I-5951.

their devices. Assuming that the European Commission is correct in claiming that Google pays incentives for exclusive preloading, this contradicts Google's claim that device manufacturers may "choose to load the suite of Google apps to their device and *freely add other apps* as well" (emphasis added).[118] The reality is manufacturers subject to these incentives would not be "free" to load mobile search competing with Google Search; such additions would require forfeiting the incentive, a monetary penalty that is the opposite of "free."

As discussed in Section II.C, we are puzzled by Google offering incentives for exclusive preloading because the MADA already ensures that Google search will be preloaded and default. The clearest direct benefit to Google, above and beyond what the MADA already assures, is the elimination of *non-default* installation of competitors, e.g. a Bing or Yahoo app leading to those vendors' search tools, in parallel to a default and more prominent Google offering. At the same time, exclusivity payments also offer benefit to Google by hindering growth of prospective entrants. For example, exclusivity to Google prevents device manufacturers from learning about consumer response to alternative search engines. When device manufacturers are committed to Google exclusively, Google hinders alternative search engines in their efforts to gain traction, ruling out the possibility of an alternative search engine paying to preinstall its service on thousands of new phones and thereby gaining the market position and scale necessary to attract advertisers and build a reputation with consumers.

It is difficult to analyse conduct about which so little known, but payments for exclusive preloading of Google Search appear to be similar to practices previously condemned under European competition law. Consider the payments that Intel allegedly awarded PC manufacturers on the condition that they postpone, cancel or otherwise restrict the launch of specific AMD-based products – a practice condemned under Article 102 TFEU.[119] Google might argue that interested Android end users retain the ability to acquire a competitor's offering by installing an alternative search app on their devices. But users seem to do so infrequently. Nor would the potential user response, offsetting a portion of the harmful effect, justify payments whose purpose appears calculated to stop rivals. In our view, there is little doubt that such exclusionary payments would infringe Article 102 TFEU.

IV. Remedies

If Google's practices are found impermissible under competition law, a crucial further question will be what changes must be made in response.

A natural starting point is to end Google's contractual ties, allowing device manufacturers to install Google apps in whatever configurations they find

[118] Walker (n 9).
[119] Commission Decision, 13 May 2009, COMP/C-3 /37.990 – *Intel.*

convenient and in whatever way they believe the market will value. One might expect to see low-cost devices that feature Yahoo Search, MapQuest maps and other apps that vendors are willing to pay to distribute. Other developers will retain a "pure Google" experience, foregoing such payments from competing app makers but offering apps from a single vendor, which some users may prefer.

To assure that contractual ties are truly unlocked, Google would need to be barred from implementing pretextual restrictions or other practices that have the same effect as the contractual ties. For example, Google ought not limit the functionality of Google Play when accessed from devices with competing apps, nor should Google withhold the latest versions of the operating system or apps from device manufacturers who begin to distribute competitors' apps.

Google might counter that with no compulsion to use Google apps, the OS will not be profitable.[120] But this reasoning is in tension with Google's prior proclamations that the company will make more money when users increase their online activity.[121] In any event, if Google wants to charge a fee for Android, or for some of its apps, it would be free to do so. Of course such a fee could not itself be anti-competitive. For example, it would surely be anti-competitive for Google to offer Google Play alone for $50 per device, but the full GMS suite (per the MADA) for free – a hollow choice designed to make only the latter viable.

Remedies should also seek to affirmatively restore competition.[122] We see several possibilities. For one, we note the importance of app stores in distributing apps and the crucial role Google Play has taken as the sole app store that offers Google apps. Were Google apps available in other app stores, either because Google was required to distribute them there or because other app stores were permitted to copy them there, this would help competing app stores gain traction and demonstrate value to users. For example, if Amazon were permitted to copy Google apps into its app store, Amazon Fire devices would instantly become significantly more attractive to many users, ending a key weakness criticized in many reviews. Google might object to this remedy as intrusive, but it would require nothing more than copying small APK files or authorizing app stores to make such copies themselves. Moreover, this remedy is directly linked to Google's

[120] See Walker (n 9).

[121] Erick Schoenfeld, 'Breaking: Google Announces Android and Open Handset Alliance' *TechCrunch* (5 November 2007) <https://techcrunch.com/2007/11/05/breaking-google-announces-android-and-open-handset-alliance/>.

[122] We do not discuss here the possibility of financial penalties on Google, but they could come in two fashions. First, competition authorities can impose fines, and it is likely that if the European Commission were to adopt an infringement decision against Google's Android-related practices, this decision would be combined with a fine, potentially a large one. Moreover, decisions of competition authorities would likely be followed by damages actions, and some plaintiff law firms are already getting ready to pursue such actions. See Gaspard Sebag, 'Google Faces New Menace in EU as Hausfeld Eyes Damages Lawsuits' *Bloomberg* (1 September 2015) <http://www.bloomberg.com/news/articles/2015-09-01/google-faces-new-menace-in-eu-as-hausfeld-eyes-damages-lawsuits>.

practice of using Google Play and Google apps in a tying scheme that foreclosed the development of other app stores.

In light of the impediments Google put in the way of competing app developers, a full remedy would also attempt to restore competition for key apps. Here, the European experience with Windows is squarely on point. From 2010 to 2014, a new Windows computer in Europe was required to show a screen offering a choice of five web browsers, in random order, with no default such that each user made an affirmative choice.[123] The same approach could be used for Android. "Ballot box" decisions would most naturally be requested for all the categories of apps that benefited from tying under Google's MADA. Alternatively, the ballot box could be restricted to the categories that are most commercially significant, i.e. those with frequent usage and those that show advertising. A ballot box could also be presented when a user first activates a given category of app, i.e. when a user first requests a map or first requests a local review, in order to get "just-in-time" contextualized decisions and reduce the up-front decisions requested of users.

V. Looking ahead

Competition lawyers and scholars often claim that regulatory interventions in high-tech markets create more harm than good. Rather, they suggest, what matters most is Schumpeterian competition in which new firms displace old ones.[124] Whether or not one shares these views as a general matter, Google's practices have the striking effect of impeding entrants. The incumbent phone makers best-positioned to create innovative devices – efficient at hardware manufacturing, competing vigorously with each other for device market share – cannot stray from Google's requirements lest they lose the right to distribute GMS on their existing devices. New firms, like Amazon, bring important new resources yet are doubly hamstrung both by inexperience in the device market and by the incompatibilities and limitations Google intentionally imposes. The best-funded entrants, such as Microsoft with Windows Mobile, similarly struggle without access to any portion of Google's ecosystem and the apps and services that consumers expect. Nor is it reasonable to expect a successful challenge to Google's behemoth from a niche player (like Cyanogen) or a declining firm (such as Nokia). For those who favour Schumpeterian competition, in this instance it is not at all clear where the entrant might come from.

[123]Dave Heiner, 'The Browser Choice Screen for Europe: What to Expect, When to Expect It' *Microsoft TechNet* (19 February 2010) <https://blogs.technet.microsoft.com/microsoft_on_the_issues/2010/02/19/the-browser-choice-screen-for-europe-what-to-expect-when-to-expect-it/>.

[124]See eg Geoffrey A Manne and Joshua D Wright, 'Google and the Limits of Antitrust: The Case Against the Antitrust Case Against Google', 34 Harvard Journal of Law and Public Policy 171 (2011); J Gregory Sidak and David J Teece, 'Dynamic Competition in Antitrust Law', 5 Journal of Competition Law & Economics 581 (2009).

In the realm of search, Google has been widely alleged to favour its own services – a strategy which struck some as improper[125] but seemed to others the natural privilege of dominance in search.[126] In mobile operating systems, Google's contractual approach arguably reduces the disagreement somewhat. Whereas Google's tactics in search use elements of technological tying, with the key practices embodied within Google code, Google's tactics in mobile draw more heavily on contracts whose black-letter provisions seem particularly out of line when subjected to scrutiny. It is in part for this reason that we think competition authorities are particularly likely to question Google's contractual restrictions.

Disclosure statement

No potential conflict of interest was reported by the authors.

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[125]See eg Edelman (n 87).
[126]Robert H Bork and Gregory Sidak, *What Does the Chicago School Teach about Internet Search and the Antitrust Treatment of Google?*, 8 Journal of the Competition Law and Economics 663 (2012).