

# HOW DIGITAL ASSISTANTS CAN HARM OUR ECONOMY, PRIVACY, AND DEMOCRACY

*Maurice E. Stucke<sup>†</sup> & Ariel Ezrachi<sup>††</sup>*

## ABSTRACT

Digital assistants embody the dream of an effortless future, free from the shackles of yesteryear: a tool which caters to users' needs, excels at anticipating their wants, and delivers a personalized online environment. While digital assistants can certainly offer great value, a closer look reveals how—in an algorithm and data-driven world—a dominant digital assistant may ultimately serve the interests of corporations rather than consumers. Such assistants may be used to establish a controlled and manipulated personalized environment in which competition, welfare, privacy, and democracy give way to corporate interests. The future is not necessarily bleak, but requires our attention if users want the leading assistants to match the effortless dream.

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<sup>†</sup> Professor, University of Tennessee College of Law; Co-founder, The Konkurrenz Group.

<sup>††</sup> Slaughter and May Professor of Competition Law, The University of Oxford. Director, Oxford University Centre for Competition Law and Policy.

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### I. INTRODUCTION

“All you need to do is say,” a 2017 article proclaimed, “‘I want a beer’ and Alexa will oblige. The future is now.”<sup>1</sup> Advances in technology have seemingly increased the choices available to consumers and the convenience of purchasing goods. As sales migrate from brick-and-mortar shops to online sites, consumers appear to be getting more of what they

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1. Matt Tate, *Amazon’s New Alexa Update Means It Can Bring You Beer in Two Hours*, SHORTLIST (Mar. 21, 2017), <http://www.shortlist.com/tech/gadgets/you-can-now-tell-amazons-alexa-to-bring-you-a-beer-amazon-echo>.

desire, including better prices and quality. Such a reality may initially appear welcome and desirable. And yet, looking beyond the ease of online shopping, the super-dominant platforms that have emerged pose several growing threats, including algorithmic collusion, behavioral discrimination, and anticompetitive abuses.<sup>2</sup> Thus, a more complex reality exists.

To see why, this Article examines the developing frontier of personal digital assistants. These helpers are being developed by the leading online platforms: Google Assistant, Apple's Siri, Facebook's M, and Amazon's Alexa-powered Echo.<sup>3</sup> These super-platforms are heavily investing to improve their digital assistant offerings.<sup>4</sup> This Article shows how network effects, big data, and big analytics will likely undermine attempts to curtail the digital assistant's power, and will likely allow it to operate below the regulatory and antitrust radar screens. As a result, rather than advancing overall welfare, a dominant digital assistant—if left to its own devices—can undermine our collective welfare. But the harm is not just economic. The potential anticompetitive consequences from a dominant assistant will likely take a toll on privacy, well-being, and democracy.

For those who grew up watching *The Jetsons*, the prospect of a personal helper might seem marvelous. Many already rely on Google's search engine to find relevant results, Facebook to identify relevant news stories, Amazon for book recommendations, and Siri to place phone calls, send text messages, and find a good restaurant nearby. Many also already benefit from basic digital assistants. Apple iPhones users may instruct Siri to call

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2. See generally ARIEL EZRACHI & MAURICE E. STUCKE, *VIRTUAL COMPETITION: THE PROMISE AND PERILS OF THE ALGORITHM-DRIVEN ECONOMY* (2016).

3. Alphabet Inc., Annual Report (Form 10-K), at 5 (Feb. 03, 2017) (identifying digital assistant providers “such as Apple, Amazon, Facebook, and Microsoft” as competitors) [hereinafter *Annual Report*]. We will refer to the parent holding company Alphabet as Google. Although Microsoft competes in this arena, it announced in 2017 its plans to allow its voice-enabled digital assistant Cortana to work with Amazon's Alexa. Jay Greene & Laura Stevens, *Amazon's Alexa and Microsoft's Cortana Will Soon Be Able to Talk to Each Other*, WALL ST. J. (Aug. 30, 2017, 3:18 p.m.), <https://www.wsj.com/articles/amazons-alexa-and-microsofts-cortana-will-soon-be-able-to-talk-to-each-other-1504120490>. Whether this makes Microsoft a stronger or weaker competitor remains to be seen. Finally, Samsung competes in this space as well. Laura Stevens & Tripp Mickle, *Alexa and Siri Escalate Battle of Virtual Assistants*, WALL ST. J. (Sept. 1, 2017 7:09 PM), [www.wsj.com/articles/alexa-and-siri-escalate-battle-of-virtual-assistants-1504307382](http://www.wsj.com/articles/alexa-and-siri-escalate-battle-of-virtual-assistants-1504307382).

4. Solomon Israel, *Why Apple, Amazon, Google and Microsoft Are All Betting on Smart Speakers*, CBC NEWS (June 12, 2017, 5:00 AM), [www.cbc.ca/news/business/smart-speakers-apple-amazon-google-microsoft-1.4153237](http://www.cbc.ca/news/business/smart-speakers-apple-amazon-google-microsoft-1.4153237).

their family members on speakerphone.<sup>5</sup> Siri can “predict” what app users might want to use, which music they would like to hear. Navigation apps can anticipate where an individual is heading throughout the day and provide traffic updates and time estimates.<sup>6</sup> Even one’s favorite coffee outlet may send a notification and prepare the loyalty card on the device whenever consumers are near an outlet.<sup>7</sup>

Personal digital assistants are also seeking to interact with users in a human-like way. With increasing sophistication, digital assistants promise to transform how individuals access information, communicate, shop, are entertained, control smart household appliances, and raise their children.<sup>8</sup> Digital assistants will also undertake mundane tasks and free up time for users. Amazon’s voice recognition personal assistant Alexa, for example, can already perform many tasks. Alexa can shop (knowing everything one previously bought through Amazon); plan one’s mornings, including accounting for upcoming meetings, traffic, and weather; entertain one with music; suggest movies, shows, or audiobooks; and control one’s smart appliances at home.<sup>9</sup> In 2016, Google showed a video of a suburban family undergoing its morning wakeup routine: “The dad made French press coffee while telling Google to turn on the lights and start playing music in his kids’ rooms. The mom asked if ‘my package’ had shipped. It did, Google said. The daughter asked for help with her Spanish homework.”<sup>10</sup> As a digital assistant—powered by sophisticated algorithms—learns more about its users, their routines, desires, and communications, it can excel in its role.<sup>11</sup>

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5. See, e.g., Paul Horowitz, *Make a Speakerphone Call with Siri from iPhone*, OSXDAILY (Aug. 1, 2015), <http://osxdaily.com/2015/08/01/make-speakerphone-call-siri-iphone/>.

6. See, e.g., Lisa Eadicicco, *Google Maps’ New Hidden Feature Could Be Very Useful*, TIME (Jan. 13, 2016, 3:24 PM), <http://time.com/4178860/google-maps-new-feature/> (describing predictive features of Google Maps application).

7. Sarah Perez, *Starbucks Rolls Out a More Personalized Mobile App Along with a Revamped Rewards Program*, TECHCRUNCH (Apr. 12, 2016), <https://techcrunch.com/2016/04/12/starbucks-rolls-out-a-more-personalized-mobile-app-along-with-a-revamped-rewards-program/>.

8. EZRACHI & STUCKE, *supra* note 2, at 191–202.

9. Greg Miller, *Amazon Echo: The World’s Smartest Assistant*, WALL ST. DAILY (Aug. 4, 2015), <http://www.wallstreetdaily.com/2015/08/04/amazon-echo-assistant/>.

10. Danny Yadron, *Google Assistant Takes on Amazon and Apple to be the Ultimate Digital Butler*, GUARDIAN (May 18, 2016, 2:17 PM), <https://www.theguardian.com/technology/2016/may/18/google-home-assistant-amazon-echo-apple-siri>.

11. Ariel Ezrachi & Maurice Stucke, *How Online Competition Affects Offline Democracy*, OXFORD BUS. LAW BLOG (Feb. 16, 2017), <https://www.law.ox.ac.uk/business-law-blog/blog/2017/02/how-online-competition-affects-offline-democracy>.

In a human-like manner, it can be funny—at just the appropriate level—and trustworthy.<sup>12</sup>

Digital assistants can provide more than information and services; they can anticipate a user's needs and requests.<sup>13</sup> After all, being privy to so many of its users' activities, the assistant will become their digital shadow. As Google's CEO noted, "[y]our phone should proactively bring up the right documents, schedule and map your meetings, let people know if you are late, suggest responses to messages, handle your payments and expenses, etc."<sup>14</sup> The digital assistant, with its users' trust and consent, will likely become the key gateway to the internet.<sup>15</sup> Because of personalization and customization, consumers will likely relinquish other less personal and useful interfaces, and increasingly rely on their digital assistants to anticipate and fulfill their needs.

These technological developments promise to transform and improve the lives of consumers, yet they come at a cost. As they occupy a critical gatekeeper position in a multi-sided market, the assistants may not always operate with consumer interests in mind. This reality raises challenging questions: Despite their apparent promise, can digital assistants actually reduce consumer welfare? Might their rise reduce the number of gateways to the digital world, increase a few firms' market power, and limit competition? And if so, what are the potential social, political, and economic concerns?

Our Article seeks to address these questions. Part II discusses the current race among the super-platforms (Google, Apple, Facebook, and Amazon) to control as many aspects of the online interface as possible and reap the associated benefits. The stakes are high, given several data-driven network effects that will likely lead to market dominance for one or two digital assistants. What are the implications of this winner-take-all contest to be the chief digital assistant? Part III considers the toll a dominant digital assistant can have on competition, democracy, and privacy. Given these risks, one would expect and hope for a "virtuous assistant"—a class of independent assistants, developed by independent firms who treat the users' personal interests as paramount. Part IV identifies several factors that favor

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12. See, e.g., Karen Haslam, *Funny Things to Ask Siri*, MACWORLD (July 24, 2017), <http://www.macworld.co.uk/feature/iphone/funny-things-ask-siri-3656639/>.

13. Ezrachi & Stucke, *supra* note 11.

14. *Google CEO Pichai Sees the End of Computers as Physical Devices*, ECON. TIMES (Apr. 29, 2016, 3:58 PM), <http://economictimes.indiatimes.com/tech/internet/google-ceo-pichai-sees-the-end-of-computers-as-physical-devices/articleshow/52040890.cms>.

15. *Id.*

one of the four super-platforms capturing the digital assistant market and disfavoring the development of an independent virtuous assistant. As market forces will not necessarily prevent and correct the harms we identify, Part V outlines several issues and challenges confronting antitrust enforcers. Part VI concludes.

## II. THE HIGH STAKES RACE AMONG DIGITAL ASSISTANTS

Sales for digital assistants are accelerating, with 35.6 million people in the United States forecasted to use a smart speaker in 2017, up 129% from 2016.<sup>16</sup> Currently Google, Apple, and Amazon are jockeying for their digital assistant to become consumers' chief assistant.<sup>17</sup> Samsung and Microsoft are also in the race, and Facebook is expected to enter with its assistant, "M."<sup>18</sup> With Amazon controlling an estimated 70% of the smart-speaker market as of early 2017—versus 24% for Google Home<sup>19</sup>—the stakes are great and go beyond the mere use of the digital assistant. In this competitive race, each super-platform wants its digital assistant to become the consumers' primary interface—with good reason.

Default options and first-mover advantage matter in the online world.<sup>20</sup> Digital assistants like Alexa, as this Part explores, create a positive feedback

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16. Jack Nicas, *Google Gives Artificial Intelligence More Power in Its Products*, WALL ST. J. (May 17, 2017, 6:59 PM), [https://www.wsj.com/article\\_email/google-gives-artificial-intelligence-more-power-in-its-products-1495050967-IMyQjAxMTE3MjE0ODExNjg1Wj/](https://www.wsj.com/article_email/google-gives-artificial-intelligence-more-power-in-its-products-1495050967-IMyQjAxMTE3MjE0ODExNjg1Wj/). Alexa-enabled devices, Amazon reported in 2017, "were the top-selling products across all categories on Amazon.com this holiday season. Customers purchased and gifted a record-setting number of devices from the Amazon Echo family with sales up over 9x compared to last holiday season." *Alexa Devices Top Amazon Best-Seller List this Holiday – Millions of Alexa Devices Sold Worldwide*, BUS. WIRE (Dec. 27, 2016, 9:00 AM), <http://www.businesswire.com/news/home/20161227005118/en/Alexa-Devices-Top-Amazon-Best-Seller-List-Holiday>.

17. Christopher Mims, *Ask M for Help: Facebook Tests New Digital Assistant*, WALL ST. J. (Nov. 9, 2015, 12:00 AM), <http://www.wsj.com/articles/ask-m-for-help-facebook-tests-new-digital-assistant-1447045202>.

18. Jessi Hempel, *Facebook Launches M, Its Bold Answer to Siri and Cortana*, WIRED (Aug. 26, 2015, 1:00 PM), <https://www.wired.com/2015/08/facebook-launches-m-new-kind-virtual-assistant/>.

19. Jack Nicas, *Google's New Products Reflect Push into Machine Learning*, WALL ST. J. (May 18, 2016, 11:05 PM), <http://www.wsj.com/articles/googles-new-products-reflect-push-into-machine-learning-1463598395>.

20. As noted by European Competition Commissioner Margrethe Vestager, "if Google's apps are already on our phones when we buy them, not many of us will go to the trouble of looking for alternatives. And that makes it hard for Google's competitors to persuade us to try their apps." Margrethe Vestager, *How Competition Supports Innovation*



loop from increasing levels of usage. As more people use a particular digital assistant, the greater the demand for products and services that can connect to that digital platform, the more likely other manufacturers and developers will develop applications for that platform, and the more appealing the platform becomes to consumers, manufacturers, and software developers.<sup>21</sup>

A. NETWORK EFFECTS: WHERE THE BIG CAN GET EVEN BIGGER

“Network effects occur when the value of a product or service for a customer increases when the number of other customers also using it increases.”<sup>22</sup> A telephone is a classic example. As more people have a telephone, the more people one can call, the more use one gets from one’s phone. Facebook’s social network and navigation apps illustrate these network effects. While network effects may be beneficial, they may also tilt the market in favor of a given provider or technology. The stakes are significant with digital assistants because at least four data-driven network effects are at play.

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(May 24, 2016), [https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/how-competition-supports-innovation\\_en](https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/how-competition-supports-innovation_en); see also Kenneth A. Bamberger & Orly Lobel, *Platform Market Power*, 32 BERKELEY TECH. L.J. (forthcoming 2017); J. Jonas Anderson, *Secret Inventions*, 26 BERKELEY TECH. L.J. 917, 956 (2011) (“[F]irst-mover advantage . . . serves as an alternate means of recouping initial investments”); Jane K. Winn, *Are “Better” Security Breach Notification Laws Possible*, 24 BERKELEY TECH. L.J. 1133, 1152 n.85 (2009) (describing related conditions when first-mover advantages are most useful); Stuart J.H. Graham, Robert P. Merges, Pam Samuelson & Ted Sichelman, *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255, 1289 (2009) (explaining that first-mover advantage was “clearly ranked the most important” goal for patent holders in large-scale study of patent holder motivations).

21. See, e.g., Swaroop Poudel, *Internet of Things: Underlying Technologies, Interoperability, and Threats to Privacy and Security*, 31 BERKELEY TECH. L.J. 997, 1010 (2016) (explaining that “[i]ndirect network effects” occur because “the more widely end users adopt a company’s platform, the more vendors and developers are drawn to the platform and vice versa” such that “a company that eventually owns the dominant platform will obtain a tremendous monopoly advantage”); *Rambus v. F.T.C. in the Context of Standard-Setting Organizations, Antitrust, and the Patent Hold-Up Problem*, 24 BERKELEY TECH. L.J. 661, 663, 665 (2009) (describing the analogous problem of technology lock-in as a similar anticompetitive problem).

22. Commission Decision No. M.8124 (Microsoft/LinkedIn), ¶ 341 (Dec. 6, 2016) [hereinafter *Microsoft/LinkedIn Decision*], [http://ec.europa.eu/competition/mergers/cases/decisions/m8124\\_1349\\_5.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m8124_1349_5.pdf); see also *United States v. Microsoft*, 253 F.3d 34, 49 (D.C. Cir. 2001).

### 1. *Attracting Manufacturers and Developers*

One network effect is the positive feedback loop in attracting manufacturers and developers.<sup>23</sup> It will likely be inefficient for developers to create apps, hardware, and software for every digital assistant.<sup>24</sup> Instead they likely will focus on the top-selling digital assistants.<sup>25</sup> So, if more people primarily use Amazon's Alexa, its operating platform's applications and functions will likely attract more developers and smart appliance manufacturers. Consequently, Alexa will learn more skills relative to competitors, making it more attractive than rival digital assistants.

This feedback loop has already begun to manifest in the market. In 2015, to increase sales of Alexa, Amazon opened its Alexa Voice Service to third-party hardware makers, "giving them the tools to integrate Alexa into internet-connected devices."<sup>26</sup> The aim was to connect Alexa to more

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23. Indirect network effects arise when people increasingly use a product or technology (for example, software platforms). See Virginia E. Scholtes, *The Lexmark Test for False Advertising Standing: When Two Prongs Don't Make a Right*, 30 BERKELEY TECH. L.J. 1023, 1025 n.10, 1056 (2015). The more people that use the platform, "the more there will be invested in developing products compatible with that platform, which, in turn reinforces the popularity of that platform with users." Case T-201/04, *Microsoft Corp. v. Comm'n*, 2007 E.C.R. II-3601, ¶1061.

24. *United States v. Microsoft Corp.*, 84 F. Supp. 2d 9, 20 (D.D.C. 1999):

The fixed costs of producing software, including applications, is very high. By contrast, marginal costs are very low. Moreover, the costs of developing software are "sunk"—once expended to develop software, resources so devoted cannot be used for another purpose. The result of economies of scale and sunk costs is that application developers seek to sell as many copies of their applications as possible. An application that is written for one PC operating system will operate on another PC operating system only if it is ported to that system, and porting applications is both time-consuming and expensive. Therefore, application developers tend to write first to the operating system with the most users—Windows. Developers might then port their applications to other operating systems, but only to the extent that the marginal added sales justify the cost of porting. In order to recover that cost, ISVs that do go to the effort of porting frequently set the price of ported applications considerably higher than that of the original versions written for Windows.

25. Marina Lao, *Reclaiming A Role for Intent Evidence in Monopolization Analysis*, 54 AM. U. L. REV. 151, 184 (2004) ("To attract users, any new OS system must support at least all the popular software applications, but few software developers are willing to write applications for a system that does not have a large 'installed base,' i.e., users.").

26. Patrick Nixon, *Bezos: Mexico Launch Is Amazon Highlight in Q2*, BUS. NEWS AM. (July 24, 2015), <http://www.bnamericas.com/en/news/ict/fri-bezos-mexico-launch-is-amazon-highlight-in-q2>.



“smart” appliances, like lights, fans, switches, thermostats, garage doors, sprinklers, locks, and other devices. Amazon announced in early 2017 that “[t]ens of thousands of developers” were using the Alexa Voice Service to integrate Alexa into their products, including “Dish DVRs, Ford and Volkswagen vehicles, GE C Lamp, Huawei Mate 9, LG Smart Instaview fridge, and Whirlpool appliances.”<sup>27</sup> Thus, as more people use Alexa, more manufacturers will make smart-products which Alexa can control, and the more appealing Alexa becomes to prospective purchasers and manufacturers.

A second feedback loop occurs as developers teach the digital assistant new skills. Amazon, for example, offers a free Alexa Skills Kit, which “makes it fast and easy for developers to create new voice-driven capabilities for Alexa.”<sup>28</sup> As more people purchase Alexa, more companies will develop new skills for Alexa. In early 2016, for example, Alexa could directly order a pizza from Domino’s or a car from Uber, check credit card balances with Capital One, get fitness information from Fitbit, offer election updates from NBC News, play Jeopardy!, get stock quotes with Fidelity, hear headlines from the Huffington Post, provide a seven-minute workout, and test trivia knowledge with quizzes from Disney.<sup>29</sup> Indeed, Alexa’s skills selection tripled in three months in 2016 alone, with over “3,000 skills available, including Food Network, GE Appliances, Yahoo Sports Fantasy Football, and more.”<sup>30</sup> By mid-2016, Amazon had “tens of thousands of developers building new skills for Alexa.”<sup>31</sup> Also in 2016 Amazon announced “the Alexa Prize, an annual university competition with \$2.5 million dedicated to accelerating the field of conversational artificial intelligence.”<sup>32</sup> The competition’s aim is “to build a ‘socialbot’ on Alexa

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27. *Amazon.com Announces Fourth Quarter Sales up 22% to \$43.7 Billion*, BUS. WIRE (Feb. 02, 2017, 4:01 PM) <http://www.businesswire.com/news/home/20170202006227/en/Amazon.com-Announces-Fourth-Quarter-Sales-22-43.7>.

28. David Isbitski, *Introducing the Alexa Skills Kit, Enabling Developers to Create Entirely New Voice Driven Capabilities*, AMAZON DEVELOPER BLOG (June 25, 2015), <https://developer.amazon.com/blogs/post/Tx205N9U1UD338H/Introducing-the-Alexa-Skills-Kit-Enabling-Developers-to-Create-Entirely-New-Voic>.

29. *Amazon.com Announces First Quarter Sales up 28% to \$29.1 Billion*, BUS. WIRE (Apr. 28, 2016, 4:01 PM), <http://www.businesswire.com/news/home/20160428006852/en/Amazon.com-Announces-Quarter-Sales-28-29.1-Billion>.

30. *Amazon.com Announces Third Quarter Sales up 29% to \$32.7 Billion*, BUS. WIRE (Oct. 27, 2017, 4:01 PM), <http://www.businesswire.com/news/home/20161027006743/en/Amazon.com-Announces-Quarter-Sales-29-32.7-Billion>.

31. *Id.*

32. *Id.*

that will converse with people about popular topics and news events.”<sup>33</sup> Thus, as more people use a particular digital assistant, more companies will develop new skills for that digital assistant (like ordering beer and pizza), which makes the digital assistant more appealing to prospective purchasers and developers.

This type of network effect helped Microsoft maintain its dominance in personal computer operating systems for decades. In *United States v. Microsoft Corp.*, the government argued that network effects acted as structural barriers for those seeking to enter the market for Intel-compatible personal computer operating systems.<sup>34</sup> The U.S. Court of Appeals agreed, and held that an “applications barrier to entry” protected Microsoft’s dominance.<sup>35</sup> That barrier resulted because “(1) most consumers prefer operating systems for which a large number of applications have already been written; and (2) most developers prefer to write for operating systems that already have a substantial consumer base.”<sup>36</sup> This “chicken-and-egg” situation “ensures that applications will continue to be written for the already dominant Windows, which in turn ensures that consumers will continue to prefer it over other operating systems.”<sup>37</sup> The court also noted that this applications barrier to entry led consumers to prefer the dominant operating system, even if they did not need all the available applications:

The consumer wants an operating system that runs not only types of applications that he knows he will want to use, but also those types in which he might develop an interest later. Also, the consumer knows that if he chooses an operating system with enough demand to support multiple applications in each product category, he will be less likely to find himself straitened later by having to use an application whose features disappoint him. Finally, the average user knows that, generally speaking, applications improve through successive versions. He thus wants an operating system for which successive generations of his favorite applications will be released—promptly at that. The fact that a vastly larger number of applications are written for Windows than for other PC operating systems attracts consumers

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33. *Id.*

34. *United States v. Microsoft*, 253 F.3d 34, 49–50, 55 (D.C. Cir. 2001).

35. *Id.* at 55.

36. *Id.*

37. *Id.*

to Windows, because it reassures them that their interests will be met as long as they use Microsoft's product.<sup>38</sup>

This network effect also helped solidify Google's and Apple's dominance over the mobile phone operating system.<sup>39</sup>

## 2. *Learning-by-Doing*

Besides this traditional network effect, an additional network effect involves learning-by-doing. Search engines demonstrate this data-driven network effect clearly.<sup>40</sup> Each person's utility from using the search engine increases when others use it as well.<sup>41</sup> As more people use the search engine, the more likely the search engine can learn consumers' preferences, the more relevant the search results will likely be, which in turn will likely attract others to use the search engine; and the positive feedback continues.<sup>42</sup> Interestingly with this network effect, as more people use the service or product, its quality improves.<sup>43</sup>

This learning-by-doing network effect has multiple applications with digital assistants. One is voice recognition. The more people talk to the assistant, the better able the assistant can learn the different pronunciations, sentence structures, and different ways commands can be made.<sup>44</sup> As the algorithm's skill improves in understanding what people want, developers do not have to code for every variation.<sup>45</sup> As Microsoft states, "[w]hether

38. *Id.*

39. Jonathan Sallet, *The Creation of Value: The Value Circle and Evolving Market Structures*, 11 J. ON TELECOMM. & HIGH TECH. L. 185, 234 (2013).

40. MAURICE E. STUCKE & ALLEN P. GRUNES, *BIG DATA AND COMPETITION POLICY* 172–81 (1st ed. 2016); Press Release, European Comm'n, Antitrust: Commission Fines Google €2.42 Billion for Abusing Dominance as Search Engine by Giving Illegal Advantage to Own Comparison Shopping Service (June 27, 2017), [http://europa.eu/rapid/press-release\\_MEMO-17-1785\\_en.htm](http://europa.eu/rapid/press-release_MEMO-17-1785_en.htm) [hereinafter *EC Fact Sheet*] (discussing high barriers to entry in these markets, in part because of network effects: "the data a search engine gathers about consumers can in turn be used to improve results").

41. STUCKE & GRUNES, *supra* note 40, at 170–81.

42. *Id.*

43. *Id.*

44. Cortana Dev Center, MICROSOFT, <https://developer.microsoft.com/en-us/Cortana> (last visited Oct. 24, 2017).

45. This process is called machine learning. See, e.g., *id.*; Christian Chessman, *A "Source" of Error: Computer Code, Criminal Defendants, and the Constitution*, 105 CALIF. L. REV. 179, 181 n.9 (2017) (explaining that machine learning involves combining "rules of analysis" and "repeated exposure to data patterns" in order to iteratively modify software "output or behaviors" over time); M. I. Jordan & T. M. Mitchell, *Machine Learning: Trends, Perspectives, and Prospects*, 349 SCIENCE 255, 255 (2015) ("Machine

someone says ‘I need a taxi’ or ‘call me a cab,’” its digital assistant Cortana “gets it.”<sup>46</sup>

A second application occurs when the digital assistant learns relevant responses. For example, one 2017 study compared how Google’s and Amazon’s digital assistants understood and responded to 800 queries.<sup>47</sup> Both assistants understood approximately 94% of the queries.<sup>48</sup> What is remarkable is that their ability to answer correctly improved significantly between February and August 2017: from approximately 34% to 54% for Amazon and from 39% to 65% for Google.<sup>49</sup> As one reviewer in early 2016 noted, “[w]ith a rapidly growing slate of features, integrations and use cases, it’s easy to get excited about the Echo’s potential. . . . More than two years after its debut, the smarter-than-ever Amazon remains one of the best connected home products money can currently buy.”<sup>50</sup> Over the next few years, as more skills are developed, more features are added, and more trial-and-error learning occurs,<sup>51</sup> digital assistants will be even smarter and in many more homes.<sup>52</sup>

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learning addresses the question of how to build computers that improve automatically through experience.”).

46. MICROSOFT, *supra* note 44; Harry Shum, *Microsoft AI*, MICROSOFT, <https://wuncontentservice.blob.core.windows.net/berlin-cms/2017/09/Microsoft-AI-Amplifying-human-ingenuity.pdf> (last visited Oct. 24, 2017).

47. Gene Munster, *Faceoff: Amazon Echo Show vs Google Home Part II*, LOUP VENTURES (Aug. 11, 2017), <http://loupventures.com/faceoff-amazon-echo-show-vs-google-home-part-ii/>.

48. *Id.*

49. *Id.*

50. Ry Crist & David Carnoy, *Amazon Echo Review: The Smart Speaker That Can Control Your Whole House*, CNET (July 18, 2017), <https://www.cnet.com/products/amazon-echo-review/>.

51. *See infra* Part IV (describing digital assistant learning process).

52. Jim Marous, *Banking Needs An ‘Amazon Prime’ Marketing Strategy*, FIN. BRAND (July 27, 2017), <https://thefinancialbrand.com/66545/amazon-prime-digital-banking-loyalty-experience-strategy/>; Mary Branscombe, *Making Cortana Smarter: How Machine Learning Is Becoming More Dynamic*, TECHRADAR (Mar. 19, 2015), [www.techradar.com/news/world-of-tech/making-cortana-smarter-how-machine-learning-is-becoming-more-dynamic-1287936](http://www.techradar.com/news/world-of-tech/making-cortana-smarter-how-machine-learning-is-becoming-more-dynamic-1287936); *Google Assistant to Take Over Apple Siri, Amazon Alexa, and Samsung Bixby by 2021: Report*, BGR (Sept. 4, 2017, 2:31 PM), <http://www.bgr.in/news/google-assistant-to-take-over-apple-siri-amazon-alexa-and-samsung-bixby-by-2021-report/>; Stephen Shankland, *How Apple Uses AI To Make Siri Sound More Human*, CNET (Aug. 23, 2017, 3:17 PM), <https://www.cnet.com/news/apple-ai-machine-learning-makes-siri-sound-human-on-ios-11/>.

### 3. *Scope of Data*

A third data-driven network effect involves the scope of personal data collected, which can be used to personalize tasks and predict individualized user needs. The super-platforms already expend significant effort to better track individuals, collect their personal data, and profile them.<sup>53</sup> So the feedback loop adds another dimension: digital assistants no longer merely rely on aggregated insights from the earlier queries of other users, but instead include an additional layer of insight in predicting individual tastes and preferences by using the variety of personal data the super-platform collects about its users.

In other words, the more one uses a digital assistant, and the more personal data it collects, the more opportunities the digital assistant can anticipate one's particular needs. Super-platforms already expressly recognize this fact; as Microsoft noted, "[w]ith a user's permission, Cortana can deliver unique, personal experiences based on her knowledge of user preferences: everything from their favorite food to the location of their next meeting."<sup>54</sup> The scope of the personal data—"what app you are in, previous search history, your current GPS, as well as personal details"—can also provide the needed context for its user's voice inquiry or in anticipating the user's requests.<sup>55</sup>

As the digital assistant seamlessly converses with users, it can also recognize the household's different voices. So if the mother of a large family asks, "Okay Google, what's on my calendar today?" the digital assistant can identify the speaker.

### 4. *Spill-Over Effects*

Because the personal assistant is ostensibly "free" to use, its provider has to monetize its services. One way is through personal data, which it can sell. Or the platform can monetize through advertising and fees from sellers. Here network effects on the "free" (consumer) side can spill over to the "paid" (provider) side, and each side can reinforce the other. As more users with heterogeneous requests are attracted to the digital assistant, a greater variety of advertisers and sellers will migrate to the digital assistant's platform as well.

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53. EZRACHI & STUCKE, *supra* note 2, at chs. 15, 16.

54. MICROSOFT, *supra* note 44.

55. Tich Savanhu, *Leveraging the Rise of Voice Search*, BIZCOMMUNITY (Apr. 4, 2017), <http://www.bizcommunity.com/Article/196/179/160034.html>.

As discussed above, growth in user base for a particular personal assistant will likely drive more companies to develop skills and applications for that assistant.<sup>56</sup> The more consumers rely on a particular digital assistant, the more sellers will be attracted to that platform. The super-platform's power accordingly increases, including the fees it can collect from sellers to transact with its digital assistant's users.<sup>57</sup> (Amazon, for example, earns fees from third-party sellers that sell on its platform.<sup>58</sup>) A dominant platform can also use the inflow of personal data to better target consumers with its own and third-party products and services.

The more personal data the platform collects, the better the platform can target users with personalized sponsored search results and ads.<sup>59</sup> Platforms compete for advertisers based on the return on investment that the platform can deliver.<sup>60</sup> Some of the super-platforms, like Google, earn most of their revenues from advertising.<sup>61</sup> When consumers click on a relevant sponsored ad (which generates revenue on a cost-per-click basis) or see a display ad (which generates revenue on a cost-per-impression basis), Google gets paid.<sup>62</sup> As more users are drawn to the digital assistant and the super-platform's other free services, the super-platform amasses a greater variety of data to effectively target consumers with relevant ads, products, and

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56. See *supra* notes 21–24 and accompanying text.

57. *EC Fact Sheet*, *supra* note 40 (discussing how “the more consumers use a search engine, the more attractive it becomes to advertisers” and the “profits generated can then be used to attract even more consumers”).

58. See Alistair Barr, *Amazon's Sellers Are Furious Over the Website's Fees*, HUFFINGTON POST (May 18, 2013), [http://www.huffingtonpost.com/2013/03/18/amazon-sellers\\_n\\_2899568.html](http://www.huffingtonpost.com/2013/03/18/amazon-sellers_n_2899568.html).

59. Julia Angwin, Surya Mattu & Terry Parris Jr., *Facebook Doesn't Tell Users Everything It Really Knows About Them*, PROPUBLICA (Dec. 27, 2016, 9:00 AM), <https://www.propublica.org/article/facebook-doesnt-tell-users-everything-it-really-knows-about-them>; Julia Angwin, Madeleine Varner & Ariana Tobin, *Facebook Enabled Advertisers to Reach 'Jew Haters'*, PROPUBLICA (Sept. 14, 2017, 4:00 PM), <https://www.propublica.org/article/facebook-enabled-advertisers-to-reach-jew-haters>; Alex Kantrowitz, *Google Allowed Advertisers to Target People Searching Racist Phrases*, BUZZFEED NEWS (Sept. 15, 2017, 11:15 AM), [www.buzzfeed.com/alexkantrowitz/google-allowed-advertisers-to-target-jewish-parasite-black](http://www.buzzfeed.com/alexkantrowitz/google-allowed-advertisers-to-target-jewish-parasite-black).

60. Barr, *supra* note 58; *United States v. Bazaarvoice, Inc.*, No. 13-CV-00133-WHO, 2014 WL 203966, at \*21 (N.D. Cal. Jan. 8, 2014) (“A critical asset in building a successful social commerce network is to have the largest audience possible because that is how advertisers and marketers and brands think about the value they get.”) (internal quotations omitted).

61. STUCKE & GRUNES, *supra* note 40, at 196–97.

62. *Id.*



services.<sup>63</sup> The more time users spend on the platform's services (such as search engines, email, maps, videos, etc.), the more opportunities the platform can target users in the moments that matter for a purchasing decision, and the more ad revenues it attracts relative to other online sites. This network effect is already at play in online markets; in the first quarter of 2016, for example, it was estimated that "85 cents of every new dollar spent in online advertising" went to Google or Facebook.<sup>64</sup>

Digital assistants are already deploying ads and are likely to continue doing so in the future. In 2017, users of Google's digital assistant received an ad for the movie "Beauty and the Beast" even when they simply asked, "OK Google, what's my day like?"<sup>65</sup> (Google denied calling it a commercial; instead it wanted to "call out timely content."<sup>66</sup>) Amazon is currently testing ads with its digital assistant, and ads are expected to increase.<sup>67</sup> But the ad may not always appear through the digital assistant. A user might ask Google Home about good hotels in Palm Beach, and an advertisement for the Ritz Carlton might appear across its expanding platform of "free" services (such as sponsored search results, ads in emails, and display ads in videos). The ad might also appear across media (such as personal computers, smartphones, tablets, and soon, "smart" household appliances and driverless cars).<sup>68</sup>

Ultimately, as more people use a particular digital assistant, the more skills the assistant acquires, the better the assistant becomes in recognizing commands and faces, the better the assistant becomes in anticipating users' needs and responding to their requests. The platform, in turn, becomes more attractive to sellers and advertisers who want to target these users, which

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63. *Id.*

64. John Herrman, *Media Websites Battle Faltering Ad Revenue and Traffic*, N.Y. TIMES (Apr. 17, 2016), <https://www.nytimes.com/2016/04/18/business/media-websites-battle-falteringad-revenue-and-traffic.html>.

65. Ben Fox Rubin, *Ads for Voice Assistants Are Here and They're Already Terrible*, CNET (Apr. 21, 2017, 5:00 AM), <https://www.cnet.com/news/ads-voice-assistants-amazon-alexa-google-home-burger-king/>.

66. *Id.*

67. Nicholas Shields, *Get Ready for Ads on Alexa*, BUS. INSIDER (May 15, 2017, 9:33 AM), <http://www.businessinsider.com/amazon-trials-voice-assistant-ads-2017-5>.

68. Victor Luckerson, *Google Wants to Put Ads in Your Refrigerator*, TIME (May 21, 2014, 12:53 PM), <http://time.com/107593/google-ads-nest-refrigerator-internet-of-things/> (noting Google's expectation "that users will be using [its] services and viewing [its] ads on an increasingly wide diversity of devices in the future, and thus [its] advertising systems are becoming increasingly device-agnostic"); see also Lothar Determann & Bruce Perens, *Open Cars*, 32 BERKELEY TECH. L.J. 913, 918–19 (2017) (describing "behavioral data" that smart car developers "can monetize for advertising and other purposes").

generates more revenue for the platform to connect its assistant with other technologies and ostensibly “free” services.

B. HOW THE NETWORK EFFECTS INCREASE THE COMPETITIVE STAKES

Firms compete to dominate markets characterized by network effects.<sup>69</sup> As one product or standard increases in popularity, it trends toward dominance. The big get bigger, until they dominate the industry.<sup>70</sup> As one U.S. court observed, “once dominance is achieved, threats come largely from outside the dominated market, because the degree of dominance of such a market tends to become so extreme.”<sup>71</sup> At that stage, the benefits from network effects may be dwarfed by the impact on competition and innovation.

Digital assistants are starting to exhibit these network effects. By July 2017, for example, Amazon’s Alexa acquired over 15,000 skills—up from its 10,000 skills in February 2017, which was triple what it had in September 2016.<sup>72</sup> By mid-2017, Google in contrast had 378 skills, while Microsoft had only 65 skills.<sup>73</sup> To avoid falling behind, Google is partnering with Walmart Stores Inc. whereby users of Google Express shopping service can easily order from the retail giant using Google’s virtual assistant.<sup>74</sup>

As the digital economy shifts from a mobile-dominated world to an AI-dominated platform, the leading platforms’ plans are clear: they “envision a future where humans do less thinking when it comes to the small decisions that make up daily life.”<sup>75</sup> That increased reliance on the digital assistant is the Holy Grail for the super-platforms. Their aim is to increase the time users spend on their platform—on the gate which they control—which in turn delivers income from advertisements, referrals, and purchasing activities.

The key is to control as many aspects of the online interface and reap the associated benefits. As Google CEO Sundar Pichai wrote shareholders in 2016, “[t]he next big step will be for the very concept of the ‘device’ to fade away. Over time, the computer itself—whatever its form factor—will

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69. Poudel, *supra* note 21, at 1010.

70. *Id.*

71. Novell, Inc. v. Microsoft Corp., 505 F.3d 302, 308 (4th Cir. 2007).

72. Sarah Perez, *Amazon’s Alexa Passes 15,000 Skills, Up From 10,000 in February*, TECHCRUNCH (July 3, 2017), <https://techcrunch.com/2017/07/03/amazons-alexa-passes-15000-skills-up-from-10000-in-february/>.

73. *Id.*

74. Stevens & Mickle, *supra* note 3.

75. Yadron, *supra* note 10.

be an intelligent assistant helping you through your day.”<sup>76</sup> Google, for example, announced in 2017 that its Assistant “will soon be available via an app on iPhones . . . as well as a variety of other devices, including refrigerators, washing machines and toys,” following a similar move by Amazon.<sup>77</sup> In discussing its digital assistant, Google’s CEO said, “We want users to have an ongoing two-way dialogue with Google.”<sup>78</sup> Google is not alone in that sentiment; “Alexa may be Amazon’s most loved invention yet — literally — with over 250,000 marriage proposals from customers and counting,” said Jeff Bezos, Amazon’s founder and CEO. “And she’s just getting better. Because Alexa’s brain is in the cloud, we can easily and continuously add to her capabilities and make her more useful — wait until you see some of the surprises the team is working on now.”<sup>79</sup>

As consumers spend more time conversing primarily with their digital assistant, who will increasingly predict and fulfill their needs, they will less frequently search the web, look at price-comparison websites, or download apps. Google’s search engine used “to show just ten blue links in [its] results, which you had to click through to find your answers.”<sup>80</sup> Now Google is “increasingly able to provide direct answers—even if you’re speaking your question using Voice Search—which makes it quicker, easier and more natural to find what you’re looking for.”<sup>81</sup> Rather than searching online for information, you can now talk with Google Assistant “in a natural conversational way to help you get things done.”<sup>82</sup> Thus, Google Assistant forms part of the company’s “effort to further entrench itself in users’ daily lives by answering users’ queries directly rather than pointing them to other sources.”<sup>83</sup>

The more a user converses with and delegates to the digital assistant, the better it can predict the user’s tastes, and the more likely consumers generally will rely on it for daily activities. As the digital assistant accumulates information over time, the switching costs (and quality gap)

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76. Jay Greene, *Microsoft, Other Tech Giants Race to Develop Machine Intelligence*, WALL ST. J. (June 14, 2016, 6:58 PM), <http://www.wsj.com/articles/tech-giants-race-to-develop-machine-intelligence-1465941959>.

77. Nicas, *supra* note 16.

78. Jack Nicas, *Google Makes Push into Artificial Intelligence with New Offerings*, WALL ST. J. (May 18, 2016, 3:58 PM), <https://www.wsj.com/articles/google-makes-push-into-artificial-intelligence-with-new-offerings-1463595169>.

79. *Id.*

80. *Annual Report*, *supra* note 3.

81. *Id.*

82. *Id.*

83. Nicas, *supra* note 19.

between digital assistants will become higher.<sup>84</sup> One could therefore be willingly locked into one's comfort zone. Illustrative are efforts by Facebook, which in 2015 announced a beta version of its digital assistant: M.<sup>85</sup> M can replace most web searches and apps with a function within Facebook Messenger.<sup>86</sup> As the next Part discusses, the removal of the human element from the search activity, and partly from the decision-making, transfers more power to the platform. The digital assistant will use its own tools and may exercise its own judgment (or the judgment of the super-platform) as to prioritizing and communicating the results. When it does so, it will not likely have its users' interests in mind.

### III. IMPLICATIONS OF THIS WINNER-TAKE-ALL CONTEST TO BE THE CHIEF DIGITAL ASSISTANT

If firms compete to dominate markets characterized by network effects, what are the implications if one or two digital assistants control the market? As this Part explores, a dominant digital assistant may abuse its gatekeeper position in three ways. First, such a digital assistant can lessen competition, to the detriment of sellers upstream and consumers downstream. Second, it poses significant risks to democracy and the marketplace of ideas. Third, it may take a significant toll on privacy and personal peace of mind.

#### A. ECONOMIC CONCERNS

A dominant digital assistant raises several economic concerns. As illustrated earlier, Google and other super-platforms have the goal of increasingly providing direct answers—through voice queries—which makes it quicker, easier, and more natural to find results. Rather than searching online for information, users will talk with Google Assistant, Alexa, or another digital assistant in a natural and conversational way. By controlling the interface between the user and sellers or advertisers, the companies controlling the dominant digital assistants can abuse their significant market power, adversely affecting both sellers upstream and users downstream.

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84. See, e.g., Sharon D. Nelson & John W. Simek, *Are Alexa and Her Friends Safe for Office Use?*, LAW PRAC., September/October 2017, at 27 (“Unfortunately, Amazon uses all of the history to make Alexa ‘smarter’ by learning what you ask for and how you ask it. If you delete all the voice history, Alexa will effectively revert back to a new factory setting. That’s the tradeoff between privacy and usability. Maintaining your privacy means less usability.”).

85. Mims, *supra* note 17.

86. *Id.*

### 1. *Upstream Anticompetitive Effects*

Consider the following question: who pays the digital assistant? Consumers pay for the hardware, such as for the iPhone to access Siri. But none of the super-platforms charge a monthly fee for using their digital assistants. Once a consumer buys Amazon's Echo, she can access Alexa without additional charges. This initially appears to be extraordinary: each super-platform encourages users to heap as many tasks as possible on its free digital assistant. To contextualize both the invasiveness and magnitude of these digital assistants, consider their analogue: if a company offered you a *human* assistant, upon whom you could heap as many tasks as possible, without incurring any charge, would you accept the offer? Would you trust them with your intimate information, or to observe you in your home? Would you be confident in that assistant to ultimately promote your interests or the company's?

The issue concerns the true employers/principals of these digital assistants. On a superficial level, the digital assistants directly serve users. The digital assistant will dim the lights upon command and change the temperature as needed. But this new trusted alter ego, to whom individuals outsource their decision-making is also partial. After all, being the ostensibly "free" part of a multi-sided market, users do not directly pay for the digital assistant's services. The digital assistant ultimately must cater to the needs of its real employer—the platform. Of course, consumers can still benefit when the platform's interests are aligned with the interests of its users. But individuals may often be unaware of when such alignment is absent.

As more customers rely on the digital assistant for purchases, entertainment, news, services, and information, the more attractive the platform becomes to sellers. Sellers know that the inclusion of their products and services on a platform's search results may be crucial for commercial visibility. As these "information and referral junctions" become a crucial gatekeeper between suppliers and consumers, the platform's bargaining power and ability to distort competition upstream increase.<sup>87</sup>

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87. See, e.g., Ioannis Lianos & Evgenia Motchenkova, *Market Dominance and Search Quality in the Search Engine Market*, 9 J. COMPETITION L. & ECON. 419, 422 (2013) ("Search engines act as 'information gatekeepers': they not only provide information on what can be found on the web (equivalent to yellow pages), but they also are 'an essential first-point-of-call for anyone venturing onto the Internet'" and how search engines differ from other two-sided platforms, as they "detain an important amount of information about their customers and advertisers (the 'map of commerce').").

The gatekeeper may charge, like powerful price comparison websites, an entrance fee (commission) from sellers for the right to be featured in the digital assistant's options. Some platforms, for instance, allow for preferential placement based on the level of payment or commission they receive from sellers. For instance, pay-for-placement fees allow a platform to charge higher rates to sellers for the right to be positioned at the top of the list on the default page result. Such positioning may distort competition when the user is unaware of the preferential positioning and assumes that the top results are the best (or most relevant) ones objectively picked by the website's algorithms. One example of such manipulation of results is in online air and hotel bookings.<sup>88</sup> Following Expedia's 2015 acquisition of Orbitz, for example, "the online travel agency implemented a new program that enables hotel properties to move to the first page of Expedia's listings for an additional 10 percent commission."<sup>89</sup> Another example is gas and electricity aggregators.<sup>90</sup> Such aggregators may also delist sellers which are

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88. See, e.g., *US Airways, Inc. v. Sabre Holdings Corp.*, No. 11 CIV. 2725 (LGS), 2017 WL 1064709, at \*5 (S.D.N.Y. Mar. 21, 2017) ("Ultimately, US Airways had no choice but to accept them in the US Airways-Sabre 2006 contract for fear of being removed from the Sabre GDS or being retaliated against, for example, through 'display biasing,' which means reordering search results as they appear in the system to disadvantage a particular airline."). Several factors can influence how hotel booking intermediaries order hotels, including "customer ratings and complaints"; "if hotels are willing to pay larger commissions"; "photo quality"; and "if a hotel is quicker to turn shoppers into buyers." Scott McCartney, *How Booking Sites Influence Which Hotels You Pick*, WALL ST. J. (Jan. 27, 2016), <http://www.wsj.com/articles/how-booking-sites-influence-which-hotels-you-pick-1453921300>. Some hotels have criticized how these intermediaries tailor their search results. The American Hotel & Lodging Association told the *Wall Street Journal*, "[b]iased or misleading search results from these sites or via web searches can be highly problematic, particularly on those booking websites that purport to be helping consumers comparison shop based off of less than objective information." *Id.* (internal quotation marks omitted).

89. *Vista/Cvent: High Combined Market Share and Entry Barriers in Strategic Meeting Management Could Create Hurdle to Clearance; Increased DOJ Interest in Data Privacy May Drive Additional Scrutiny*, CAPITOL FORUM (July 20, 2016), <http://createsend.com/t/j-2C8274378D0F467C>.

90. Rachel Rickard Straus, *Price Comparison Website Bosses Under Attack From MPs for Not Showing Customers the Best Deals*, THIS IS MONEY (Feb. 4, 2014, 6:44 AM), <http://www.thisismoney.co.uk/money/bills/article-2939364/Price-comparison-website-bosses-attack-MPs.html> ("The executives at uSwitch, MoneySupermarket, Compare the Market, Confused.com and Go Compare were hauled in front of the MPs after it was claimed . . . that some were 'hiding' the best gas and electricity deals from their customers."). Among other things, platforms were accused of "not showing the cheapest tariffs by default if it meant they wouldn't earn a commission." *Id.*



disruptive to the platform's operation (or advertising-driven business model).<sup>91</sup>

Such strategy may further intensify in markets in which the gatekeeper is vertically integrated. For instance, the platform could insist that sellers and buyers use its payment system or other related products.<sup>92</sup> Such integration might enable the gatekeeper to leverage its power to related markets, pushing out independent operators.

Google showed how a powerful intermediary could abuse its market power upstream. Google's search engine is dominant.<sup>93</sup> In 2017, the European Commission fined Google a record amount (€2.42 billion) for abusing its dominant position in searches.<sup>94</sup> As the Commission noted, Google's search engine "provides search results to consumers, who pay for the service with their data."<sup>95</sup> In 2004 Google entered a separate market, namely comparison shopping. One problem for Google was that the comparison shopping market already had several established players; another problem was that Google's product (Froogle) was subpar.<sup>96</sup> But comparison shopping services relied to a large extent on traffic to be competitive.<sup>97</sup> Moreover, the comparison shopping service market has its own network effects: as more customers use that comparison shopping site, the more likely retailers will want to list their products with that comparison shopping service. To improve its position on the market for comparison shopping, Google used its dominant search engine to redirect traffic. From 2008, Google began pushing its own comparison shopping service, while

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91. EZRACHI & STUCKE, *supra* note 2, at 179–86.

92. See, e.g., Kathleen De Vere, *Google Tweaks Policy, All Google Play Apps Must Use Google's Payment System*, ADWEEK (July 31, 2012), <http://www.adweek.com/digital/google-drops-the-hammer-on-third-party-android-billing-services-apps-must-use-googles-billing-system/>.

93. *Search Engine Market Share Worldwide*, STATCOUNTER, <http://gs.statcounter.com/search-engine-market-share/all/worldwide/2016> (last visited Oct. 24, 2017) (noting that Google possessed 91.84% search engine market share worldwide in 2016); Press Release, European Comm'n, Antitrust: Commission Fines Google €2.42 Billion for Abusing Dominance as Search Engine by Giving Illegal Advantage to Own Comparison Shopping Service (June 27, 2017), [http://europa.eu/rapid/press-release\\_IP-17-1784\\_en.htm](http://europa.eu/rapid/press-release_IP-17-1784_en.htm).

94. Press Release, *supra* note 93.

95. *Id.*

96. *Id.* ("Contemporary evidence from Google shows that the company was aware that Froogle's market performance was relatively poor (one internal document from 2006 stated 'Froogle simply doesn't work').").

97. *Id.* ("More traffic leads to more clicks and generates revenue.").

relegating the rival (and superior) comparison shopping services.<sup>98</sup> Most people click on the first few results provided by Google's search engine.<sup>99</sup> Few people go to the second page, and even fewer go to the third page of results.<sup>100</sup> Google systematically placed its own comparison shopping service on the first page at or near the top of the search results.<sup>101</sup> Google relegated the rival shopping services to later pages—the better ones only appeared on page four of Google's search results, and others appeared even further down the list.<sup>102</sup>

As a result of its illegal practices, Google effectively increased the traffic to its own comparison shopping service, while drying up the traffic to its rivals' services.<sup>103</sup> As the Commission noted:

Since the beginning of each abuse, Google's comparison shopping service has increased its traffic 45-fold in the United Kingdom, 35-fold in Germany, 19-fold in France, 29-fold in the Netherlands, 17-fold in Spain and 14-fold in Italy. Following the demotions applied by Google, traffic to rival comparison shopping services on the other hand dropped significantly. For example, the Commission found specific evidence of sudden drops of traffic to certain rival websites of 85% in the United Kingdom, up to 92% in Germany and 80% in France. These sudden drops could also not be explained by other factors. Some competitors have adapted and managed to recover some traffic but never in full.<sup>104</sup>

It is remarkable how effectively Google stifled competition in the comparison shopping market. Even though Google was intentionally degrading the quality of its search results, few consumers, if any, switched to other search engines, such as Yahoo! or Bing.<sup>105</sup> Even though competitors were a click away, competition was not. Moreover, users could have scrolled to the fourth page of Google's search results, but few did. For search results on personal computers:

[T]he ten highest-ranking generic search results on page 1 together generally receive approximately 95% of all clicks on generic search results (with the top search result receiving about 35% of

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98. *Id.*

99. *Id.*

100. *Id.*

101. *Id.*

102. *Id.*

103. *Id.*

104. *Id.*

105. *Id.* (noting Google's consistently high market share for search in the EU).

all the clicks). The first result on page 2 of Google's search results receives only about 1% of all clicks. The effects on mobile devices are even more pronounced given the much smaller screen size.<sup>106</sup>

In what consumers often view as a neutral environment, the ability to switch did not match the incentive to do so. Google effectively increased the friction for consumers to use rival shopping services, while reducing the friction for its own (subpar) product.<sup>107</sup>

The anticompetitive effects of search degradation will be likelier and more severe with a dominant digital assistant. For one thing, with the Google Shopping case the issue was whether the rivals' services were on the first, fourth, or subsequent pages of Google's results.<sup>108</sup> In contrast, digital assistants will not provide several pages of results. As they promise to become "more conversational,"<sup>109</sup> digital assistants will likely offer one or two suggestions. If many consumers—whether on their PCs or mobile phones—did not look at the second or third page of the search engine's results, users will likely hear even fewer suggestions from their digital assistant. Moreover, if many users did not "multi-home" by running the same search query on multiple search engines, they are less likely to multi-home by searching independently online. Instead, they will likely rely on their assistant's one or two suggestions.

For example, one 2017 study sought to better understand how Amazon's digital assistant recommends items. Over 450 products—in health care, beauty, household cleaning, electronics, and grocery categories—were ordered, and "an overwhelming number of products Alexa suggested tended

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106. *EC Fact Sheet*, *supra* note 40; *see also* ORG. FOR ECON. COOPERATION & DEV., ALGORITHMS AND COLLUSION - NOTE FROM THE UNITED KINGDOM 5 (2017), [https://one.oecd.org/document/DAF/COMP/WD\(2017\)19/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2017)19/en/pdf) [hereinafter UK SUBMISSION] ("[H]igh ranking and prominent visibility in search results (whether organic or non-organic) may be important to a business' ability to compete effectively; and this is partly due to consumers' online search behaviours, in particular their propensity to focus their attention, clicks and purchases on links at the top of returned search results and rarely venture beyond the first results page.").

107. Press Release, *supra* note 93.

108. *EC Fact Sheet*, *supra* note 40 ("Real-world consumer behaviour, surveys and eye-tracking studies demonstrate that consumers generally click far more on search results at or near the top of the first search results page than on results lower down the first page, or on subsequent pages, where rival comparison shopping services were most often found after demotion.").

109. Frederic Lardinois, *The Google Assistant Is Getting More Conversational*, TECHCRUNCH (May 17, 2017), <https://techcrunch.com/2017/05/17/the-google-assistant-is-getting-more-conversational/>.

to be those available to Prime members” and “products with Amazon Choice designation, which is given to the top brand in each product group, were far more likely to be recommended for first-time orders.”<sup>110</sup> Thus Alexa did not provide a panoply of products, but recommended ones Amazon specifically designated. And Amazon will not necessarily offer the cheapest or best value product. ProPublica, for example:

looked at 250 frequently purchased products over several weeks to see which ones were selected for the most prominent placement on Amazon’s virtual shelves — the so-called ‘buy box’ that pops up first as a suggested purchase. About three-quarters of the time, Amazon placed its own products and those of companies that pay for its services in that position even when there were substantially cheaper offers available from others. That turns out to be an important edge. Most Amazon shoppers end up clicking “add to cart” for the offer highlighted in the buy box.<sup>111</sup>

Thus, companies may pay Amazon for this “Choice designation.”<sup>112</sup> Or Amazon may simply have its assistant promote its own products.<sup>113</sup>

Another reason why search bias will be likelier and more effective with digital assistants is that it will be harder to detect. In the Google Shopping case, the Commission had a ready counterfactual: namely how the results would have looked if Google’s own comparison shopping service were subject to Google’s own generic search algorithm.<sup>114</sup> Absent Google’s manipulation of the search results, its generic algorithm presumably would have given greater prominence to other shopping services. For example, a rival service might have been on the first page, while Google’s shopping service appeared on the fourth page. Thus, the Commission ordered equal treatment, namely that “Google has to apply the same processes and methods to position and display rival comparison shopping services in

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110. Marty Swant, *Alexa Is More Likely to Recommend Amazon Prime Products, According to New Research*, ADWEEK (July 7, 2017), <http://www.adweek.com/digital/alexa-is-more-likely-to-recommend-amazon-prime-products-according-to-new-research/>.

111. Julia Angwin & Surya Mattu, *Amazon Says It Puts Customers First. But Its Pricing Algorithm Doesn’t*, PROPUBLICA (Sept. 20, 2016, 8:00 AM), [www.propublica.org/article/amazon-says-it-puts-customers-first-but-its-pricing-algorithm-doesnt](http://www.propublica.org/article/amazon-says-it-puts-customers-first-but-its-pricing-algorithm-doesnt).

112. OLIVIA LAVECCHIA & STACY MITCHELL, AMAZON’S STRANGLEHOLD: HOW THE COMPANY’S TIGHTENING GRIP IS STIFLING COMPETITION, ERODING JOBS, AND THREATENING COMMUNITIES 20–21 (2016), [https://ilsr.org/wp-content/uploads/2016/11/ILSR\\_AmazonReport\\_final.pdf](https://ilsr.org/wp-content/uploads/2016/11/ILSR_AmazonReport_final.pdf).

113. *Id.* at 24–25.

114. Press Release, *supra* note 93.

Google's search results pages as it gives to its own comparison shopping service.”<sup>115</sup>

With digital assistants, the antitrust agency may lack a ready counterfactual, as there might not be a generic search algorithm. Instead, the digital assistant, using the consumer's personal data, personalizes results for that person's tastes. Google Assistant, for example, can utilize users' search history and customize its responses based on what it knows about the users' queries.<sup>116</sup> So when you ask your Assistant, “What movie do you recommend?,” your results will likely differ from your neighbor's. Thus, it will be harder for the competition authority to reconstruct what the digital assistant would have recommended, but for the search degradation.<sup>117</sup>

A third reason why search bias will be likelier and more effective with dominant digital assistants is their omnipresence. In the Shopping case, Google could lessen competition even though users could download apps of competing services (or change their default search engine). When many users rely on a dominant digital assistant, it will be harder for the disfavored seller to reach the user. Even when a disfavored seller can gain a user's attention, the digital assistant may interject with its own recommendation, suggesting a special deal by a member of its platform's ecosystem. In this multi-sided market, the digital assistant may subtly push certain products and services and degrade or conceal others, all in the name of personalization. Rather than deter such abuses, market forces, given the data-driven network effects, can actually increase entry barriers.<sup>118</sup>

## 2. *Downstream Anticompetitive Effects*

Competition officials are familiar with price discrimination, where different consumers are charged different prices, depending on their willingness and ability to pay. Digital assistants can help facilitate

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115. *EC Fact Sheet*, *supra* note 40.

116. *Virtual Assistant Comparison: Cortana, Google Assistant, Siri, Alexa, Bixby*, DIG. TRENDS (Aug. 29, 2017, 8:44 AM), <https://www.digitaltrends.com/computing/cortana-vs-siri-vs-google-now/>.

117. *Not So Froogle: The European Commission Levies a Huge Fine on Google*, ECONOMIST (July 1, 2017), <https://www.economist.com/news/business/21724436-its-case-not-perfect-it-asks-right-questions-european-commission-levies-huge> (“If search algorithms become more personalised, as is expected to be the case with digital assistants such as Amazon's Alexa, it will be even more difficult to detect bias.”).

118. *EC Fact Sheet*, *supra* note 40 (discussing how network effects increase entry barriers).

*behavioral discrimination*, a durable, more pernicious form of price discrimination.

Online behavioral discrimination, as we explore in *Virtual Competition*,<sup>119</sup> will likely differ from the price discrimination in the brick-and-mortar world in several important respects. First is the shift from imperfect price discrimination to near perfect, or first-degree, price discrimination. Second, sellers can use the personal data to target consumers with the right emotional pitch to increase overall consumption.<sup>120</sup> A third way behavioral discrimination differs from price discrimination is its durability.

The U.K. competition authority already found price discrimination to be more prevalent online.<sup>121</sup> With a powerful digital assistant, behavioral discrimination becomes likelier. The digital assistant can help the super-platform refine its profile of users, including their likely reservation price (defined as the upper threshold of willingness to pay), use of outside options, shopping habits, general interests, and weaknesses (including moments when their willpower is fatigued).

First, with more personal data about its users' preferences, habits, weaknesses, and other traits, the digital assistant can segment users into even smaller groups to better identify their likely reservation price.<sup>122</sup> The

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119. See generally EZRACHI & STUCKE, *supra* note 2.

120. Basically, this process involves manipulating personal data in order to get users to purchase items they otherwise did not want, at the highest price they are willing to pay. See Ariel Ezrachi & Maurice E. Stucke, *The Rise of Behavioural Discrimination*, 37 EUR. COMPETITION L. REV. 485, 486 (2016).

121. UK SUBMISSION, *supra* note 106, at 7.

122. *Id.* at 2. The United Kingdom noted that:

Algorithms can be used to set different prices for different customers, including through online tracking and profiling of consumers. The combination of: a) the greater and greater volume of data available to firms about customers, and b) the increasingly sophisticated means of using algorithms to swiftly analyse this data and gather very granular intelligence about customers' preferences, purchases or price sensitivity, is likely to increase further the opportunities for firms to engage in detailed segmentation and price discrimination.

*Id.* Similarly, Commissioner Terrell McSweeney of the Federal Trade Commission explained:

Big data and algorithms enable sellers to more effectively target and price discriminate against specific customers. Thus, even though a



ride-sharing app, Uber, for example, confirmed in 2017 that it uses customer data to better price discriminate. As *Bloomberg* reported:

The new fare system is called “route-based pricing,” and it charges customers based on what it predicts they’re willing to pay. It’s a break from the past, when Uber calculated fares using a combination of mileage, time and multipliers based on geographic demand. Daniel Graf, Uber’s head of product, said the company applies machine-learning techniques to estimate how much groups of customers are willing to shell out for a ride. Uber calculates riders’ propensity for paying a higher price for a particular route at a certain time of day. For instance, someone traveling from a wealthy neighborhood to another tony spot might be asked to pay more than another person heading to a poorer part of town, even if demand, traffic and distance are the same.<sup>123</sup>

Given its ubiquity in the home, a digital assistant will have even more personal data, more opportunities to observe how users respond to different advertisements, pricing, and products, and more opportunities to learn the right price point for that user. VIZIO, as Section III.C discusses, collected TV data to help third parties analyze a household’s behavior across devices. Likewise, a digital assistant, connected to the user’s smart television and search engine, can also monitor whether the user visited a particular website following a television advertisement related to that website, or whether the user viewed a particular television program following exposure to an online advertisement for that program.

But the digital assistant could also be proactive. It can recommend the entertainment (such as Alexa suggesting a movie produced or distributed by Amazon), choose the advertisements before the movie, suggest an easy, frictionless way to buy the advertised product (“Alexa, order me this

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company may not have been able to effectively target certain consumers for higher prices in the past, that in itself is no guarantee that it might not be able to do so in the future. Data is becoming more robust and algorithms are becoming more powerful. The Commission defined markets on the basis of price discrimination in its successful challenge to the Sysco/U.S. Foods merger — and I would not be surprised to see the concept of price discrimination markets take on increasing importance in U.S. antitrust agency challenges going forward.

Terrell McSweeney, Commissioner, Fed. Trade Comm’n, Competition Law: Keeping Pace in a Digital Age \*8 (Apr. 15, 2016), 2016 WL 1613290.

123. Eric Newcomer, *Uber Starts Charging What It Thinks You’re Willing to Pay*, BLOOMBERG (May 19, 2017, 12:19 PM), <https://www.bloomberg.com/news/articles/2017-05-19/uber-s-future-may-rely-on-predicting-how-much-you-re-willing-to-pay>.

product”), deliver quickly that product (through Amazon Prime), and if perishable, remind the user to replenish that product.

Second, as users increasingly converse with and trust it, the digital assistant can learn what emotional pitch will likely induce the user to buy products or services that they might not otherwise have wanted.<sup>124</sup> Facebook, according to an internal document, promoted advertising campaigns that exploited its users’ emotional states, including users as young as fourteen years old:

[T]he selling point of this 2017 document is that Facebook’s algorithms can determine, and allow advertisers to pinpoint, “moments when young people need a confidence boost.” If that phrase isn’t clear enough, Facebook’s document offers a litany of teen emotional states that the company claims it can estimate based on how teens use the service, including “worthless,” “insecure,” “defeated,” “anxious,” “silly,” “useless,” “stupid,” “overwhelmed,” “stressed,” and “a failure.” . . . [T]he documents also reveal a particular interest in helping advertisers target moments in which young users are interested in “looking good and body confidence” or “working out and losing weight.”<sup>125</sup>

Facebook denied offering tools to target people based on their emotional state.<sup>126</sup> Nonetheless, the dark side of behavioral economics emerges. The dominant digital assistant can use the findings from behavioral economics to advance the platform’s own interest. As observed in 2011 by an executive of DraftFCB, one of the leaders in thinking about how to incorporate the discipline of behavioral economics with the practice and business of modern advertising and marketing:

If anything, behavioral economics impact will only grow in the future, because it works hand in glove with the growing centrality of digital solutions in marketing. You can’t understand the success of digital platforms like Amazon, Facebook, Farmville, Nike Plus,

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124. Ezrachi & Stucke, *supra* note 120.

125. Sam Machkovech, *Report: Facebook Helped Advertisers Target Teens Who Feel “Worthless”*, ARS TECHNICA (May 1, 2017, 12:00 AM), <https://arstechnica.com/information-technology/2017/05/facebook-helped-advertisers-target-teens-who-feel-worthless/>; Nick Whigham, *Leaked Document Reveals Facebook Conducted Research to Target Emotionally Vulnerable and Insecure Youth*, NEWS.COM.AU (May 1, 2017, 2:16 PM), [www.news.com.au/technology/online/social/leaked-document-reveals-facebook-conducted-research-to-target-emotionally-vulnerable-and-insecure-youth/news-story/d256f850be6b1c8a21aec6e32dae16fd](http://www.news.com.au/technology/online/social/leaked-document-reveals-facebook-conducted-research-to-target-emotionally-vulnerable-and-insecure-youth/news-story/d256f850be6b1c8a21aec6e32dae16fd).

126. *Comments on Research and Ad Targeting*, FACEBOOK (Apr. 30, 2017), <https://newsroom.fb.com/news/h/comments-on-research-and-ad-targeting/>.

and Groupon if you don't understand behavioral economic principles like social proof, the impact of variable intermittent social rewards, feedback loops, and scarcity. Behavioral economics will increasingly be providing the behavioral insight that drives digital strategy.<sup>127</sup>

Just as Uber uses the findings from behavioral economics to nudge its drivers,<sup>128</sup> so too the digital assistant can reward users for expanding its role in their daily lives. The digital assistant—in taking on additional tasks—can nudge users along the path of least resistance, offering an array of new rewards for their efforts. Companies are already training algorithms to help them identify human emotions.<sup>129</sup> Affectiva, for example, collected over one billion video frames of facial expressions.<sup>130</sup> Its algorithms, according to its promotional video, can help develop ads that “optimize” a target audience’s moment-by-moment engagement and predict likely sales and “virality.”<sup>131</sup> Thus, a digital assistant could use “emotion data” to help create content and advertisements to spur consumption.<sup>132</sup>

A third way a dominant digital assistant can facilitate behavioral discrimination is by reducing user exposure to—and incentive to seek—outside options. Friction is the buzzword for online sellers.<sup>133</sup> Amazon is designing its digital assistant to reduce friction—whether in renting a movie

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127. John Kenny et al., *Where is Behavioral Economics Headed in the World of Marketing?*, NUDGE BLOG (Oct. 9, 2011), <http://nudges.org/2011/10/09/where-is-behavioral-economics-headed-in-the-marketing-worlding/>.

128. Noam Scheiber, *How Uber Uses Psychological Tricks to Push Its Drivers' Buttons*, N.Y. TIMES (Apr. 2, 2017), <https://www.nytimes.com/interactive/2017/04/02/technology/uber-drivers-psychological-tricks.html>.

129. Luke Dormehl, *AI Assistants Will Soon Recognize and Respond to the Emotion in Your Voice*, DIG. TRENDS (Sept. 14, 2017, 11:41 AM), <https://www.digitaltrends.com/cool-tech/affectiva-emotion-in-voice/>; Hope Reese, *The Machine Knows How You Feel: How AI Can Detect Emotion*, TECHREPUBLIC (Jan. 4, 2016, 7:44 AM), [www.techrepublic.com/article/the-machine-knows-how-you-feel-how-ai-can-detect-emotion/](http://www.techrepublic.com/article/the-machine-knows-how-you-feel-how-ai-can-detect-emotion/).

130. Dormehl, *supra* note 129; Affectiva, *Affectiva Overview*, YOUTUBE (Nov. 6, 2014), [https://www.youtube.com/watch?time\\_continue=162&v=mFrSFMnskI4](https://www.youtube.com/watch?time_continue=162&v=mFrSFMnskI4).

131. Affectiva, *supra* note 130.

132. Scholars have already begun to consider the practical implications of collecting and monetizing “emotion data” in the analogous context of autonomous cars, which will likely be among the technologies to integrate digital assistants. See Determann & Perenz, *supra* note 68, at 920 (“Chemical sensors can detect alcohol and perhaps other chemicals on the breath. If a[n autonomous] vehicle carries such medical sensors, the vehicle-connected computer might also use the data from them to assess whether the driver and passengers are hungry and monetize that as an advertising opportunity.”).

133. Marous, *supra* note 52.

or buying more batteries.<sup>134</sup> For example, users of Amazon's digital assistant can sign up for Amazon Prime simply by saying, "Alexa, sign me up for Prime."<sup>135</sup> Once users are signed up, friction is further reduced for verbally ordering items or streaming music. An Amazon executive identified the following questions developers should ask:

- How many decisions are between a customer and completing a task?
- Are each of these decisions absolutely necessary?
- If so, can you make the decision for the customer by pre-selecting an option?
- If not, and the customer absolutely needs to make that decision, how can you simplify the decision process?
- If there are multiple decisions, could you combine them into one decision?
- Can you present the most important decision first to the customer?
- How can you preserve the decision once it's been made so that you don't have to ask the customer again in the future?<sup>136</sup>

A digital assistant's voice activation will reduce friction further. Amazon's digital assistant added in 2017 Alexa Show, where users can easily request, see, and order items from Amazon.<sup>137</sup> Indeed, while Alexa Show looks like a tablet, users primarily converse with it. The greater the ease in conversing with the digital assistant, the less friction in ordering products and services, the more likely users will rely on the digital assistant's recommendations (rather than turning to their PC or phone to search for, and order, products). The company comScore predicts that voice searches will make up fifty percent of all searches by 2020.<sup>138</sup>

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134. *Id.*

135. *Alexa, What Are Your Prime Day Deals?*, BUS. WIRE (July 5, 2017, 3:42 AM), <http://www.businesswire.com/news/home/20170705005339/en/>.

136. *Amazon's Friction-Killing Tactics to Make Products More Seamless*, FIRST ROUND REVIEW, <http://firstround.com/review/amazons-friction-killing-tactics-to-make-products-more-seamless/> (last visited Oct. 24, 2017).

137. WIRED, *Amazon's Alexa Can Now Show You Things* | WIRED, YOUTUBE (June 26, 2017), <https://www.youtube.com/watch?v=4TvL8gY-TLQ>.

138. Eric Enge, *The Rise of Personal Assistants*, SEARCH ENGINE LAND (Sept. 12, 2017, 9:49 AM), <http://searchengineland.com/rise-personal-assistants-280658>.

This reduction in friction has already increased sales. Amazon Echo owners in 2016, for example, spent about ten percent more on Amazon than they did before owning the digital assistant.<sup>139</sup> They also purchased from Amazon six percent more often than they did before the digital assistant.<sup>140</sup> According to one press report, “Echo owners may become some of the most valuable customers to Amazon by repeatedly returning to the marketplace and making higher average order values, driving up incremental sales gains for the company.”<sup>141</sup> (Likewise, as noted above, Google is coordinating with Walmart so that users can receive personalized shopping results based on their online and in-store Walmart purchases.<sup>142</sup>)

As with search degradation, personalization will make behavioral discrimination harder to detect. As a digital assistant learns to accommodate a particular user’s particular tastes, it will be harder to identify when the digital assistant degrades quality. “As companies collect more user data and algorithms have more opportunities to experiment (such as presenting items and suggesting other purchases),” the OECD noted, “pricing becomes more dynamic, differentiated and personalised.”<sup>143</sup> As more online retailers switch to dynamic (and personalized) pricing and product offerings, it will be harder for consumers to discover a general market price and to assess their outside options.<sup>144</sup> It may be easier to assess quality degradation for objective queries (such as the distance between two cities or the current temperature). But for these objective queries, the digital assistant typically lacks the incentive to intentionally distort quality. After all, its platform will

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139. *Amazon Echo Owners Are Spending More Money on Amazon*, BUS. INSIDER (Sept. 19, 2016, 11:30 PM), <http://www.businessinsider.com/amazon-echo-owners-are-spending-more-money-on-amazon-2016-9>; Darrell Etherington, *Amazon Echo Owners Spend More on Amazon, Says NPD*, TECHCRUNCH (Sept. 15, 2016), <https://techcrunch.com/2016/09/15/amazon-echo-owners-spend-more-on-amazon-says-npd/>.

140. BUS. INSIDER, *supra* note 139; Etherington, *supra* note 139.

141. BUS. INSIDER, *supra* note 139.

142. Sridhar Ramaswamy, *Shop Walmart and More of Your Favorite Stores, Faster*, GOOGLE (Aug. 23, 2017), <https://www.blog.google/products/assistant/shop-walmart-and-more-your-favorite-stores-faster/> (“For example, if you order Tide PODS or Gatorade, your Google Assistant will let you know which size and type you previously ordered from Walmart, making it easy for you to buy the right product again.”).

143. ORG. FOR ECON. COOPERATION & DEV., ALGORITHMS AND COLLUSION - BACKGROUND NOTE BY THE SECRETARIAT (2017), [https://one.oecd.org/document/DAF/COMP\(2017\)4/en/pdf](https://one.oecd.org/document/DAF/COMP(2017)4/en/pdf) [hereinafter OECD BACKGROUND NOTE].

144. Kathy Kristof, *How Amazon Uses “Surge Pricing,” Just Like Uber*, CBS NEWS: MONEYWATCH (July 24, 2017, 10:08 AM), <https://www.cbsnews.com/news/amazon-surge-pricing-are-you-getting-ripped-off-small-business/>.

not profit by telling users it is twenty-eight degrees Celsius, when it is actually twenty-six degrees outside. The danger lies in more subjective queries (or tasks that the digital assistant undertakes automatically).

As a result, digital assistants will blur the line between personalization and behavioral discrimination. Even when users swim upstream by searching the web, the ads, products, or search results they see may be orchestrated by the dominant digital assistant. Consequently, as the assistant accumulates more information, it will be aware of the extent to which users venture out and seek other options. Its aim is to deliver the right product or service at a price that the user is willing to pay. As users increasingly rely on their popular digital assistant for suggestions, it can increasingly suggest personalized things (such as on-demand customized clothing<sup>145</sup>) or services to buy, and the price it has successfully negotiated. As Google noted in 2017, “[s]ometimes your Assistant should be the one to start [the conversation]—so over the next few months, we’re bringing proactive notifications to Google Home.”<sup>146</sup> While helping one’s son with his Spanish, the digital assistant might suggest a particular app or private tutor that tremendously helped other students struggling with the same issue. Because the tutoring is customized, it will be harder to assess whether the price the tutor charges is the fair market price or simply a price its parents would tolerate. Moreover, if the tutoring service is helping other children improve their grades, the parents would not want their child to be at a competitive disadvantage—especially if they eye the same highly selective universities. Thus, the dominant digital assistant can prompt purchases that its users otherwise would not consider, at higher prices, even when competition is a click away.

#### B. CONCERNS OVER HOW ECONOMIC POWER CAN TRANSLATE INTO POLITICAL POWER

The previous Section illustrated how a dominant digital assistant can confer its provider with market power—namely the ability to command supra-competitive profits through behavioral discrimination, fees on sellers seeking to access users, or search degradation. Importantly, the power does not stop there. As users increasingly rely on the digital assistant, the super-

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145. Andrew Tarantola, *Adidas Will Knit You a \$200 Sweater While You Wait*, ENGADGET (Mar. 21, 2017), <https://www.engadget.com/2017/03/21/adidas-will-knit-you-a-200-sweater-while-you-wait/>.

146. Scott Huffman, *Your Google Assistant is Getting Better Across Devices, from Google Home to Your Phone*, GOOGLE (May 17, 2017), <https://www.blog.google/products/assistant/your-assistant-getting-better-on-google-home-and-your-phone/>.



platform can affect not only what users buy, but also their views and the public debate. The reliance on a powerful gatekeeper could enable its operator to intellectually capture users, and subsequently decision makers, in an attempt to ultimately ensure that public opinion and government policies align with the corporate agenda. While such propositions may sound apocalyptic, they should not be brushed aside.<sup>147</sup> Here we briefly illustrate several risks that a dominant digital assistant could pose to the marketplace of ideas.

One risk is bias. Currently, the super-platforms do not report the news. But many people rely on the super-platforms' algorithms to find news of interest.<sup>148</sup> One concern is that users will prefer news that supports their preexisting beliefs. One 2015 study of over ten million Facebook users "observed substantial polarization among hard [news] content shared by users, with the most frequently shared links clearly aligned with largely liberal or conservative populations."<sup>149</sup> After the algorithm ranked the stories,<sup>150</sup> Facebook users were slightly less likely to see politically different viewpoints.<sup>151</sup> Individual choice, however, further substantially limited

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147. We have discussed the fascinating link between market power and intellectual and regulatory capture at length in *Virtual Competition*. See EZRACHI & STUCKE, *supra* note 2, at 244–47.

148. One 2015 study found that sixty-one percent of Millennials (those born between 1981 and 1996) in the United States were "getting political news on Facebook in a given week." Amy Mitchell, Jeffrey Gottfried & Katerina Eva Matsa, *Millennials and Political News: Social Media—The Local TV for the Next Generation?*, PEW RES. CTR. (June 1, 2015), <http://www.journalism.org/2015/06/01/millennials-political-news/>. This was a much larger percentage than any other news source. *Id.* A 2016 study found that Facebook "sends by far the most mobile readers to news sites of any social media sites"—82 percent of the social traffic to longer news stories and 84 percent of the social traffic to shorter news articles. Katerina Eva Matsa, *Facebook, Twitter Play Different Roles in Connecting Mobile Readers to News*, PEW RES. CTR. (May 9, 2016), <http://www.pewresearch.org/fact-tank/2016/05/09/facebook-twitter-mobile-news/>. Overall "8% of voters named Facebook as their main source for [2016] election news, outpaced only by Fox News (19% of voters) and CNN (13%)." Jeffrey Gottfried, Michael Barthel & Amy Mitchell, *Trump, Clinton Voters Divided in Their Main Source for Election News*, PEW RES. CTR. (Jan. 18, 2017), <http://www.journalism.org/2017/01/18/trump-clinton-voters-divided-in-their-main-source-for-election-news/>.

149. Eytan Bakshy et al., *Exposure to Ideologically Diverse News and Opinion on Facebook*, 348 SCIENCE 1130, 1130 (2015).

150. The order in "which users see stories in the News Feed depends on many factors, including how often the viewer visits Facebook, how much they interact with certain friends, and how often users have clicked on links to certain websites in News Feed in the past." *Id.* at 1131.

151. *Id.*

users' exposure to ideologically cross-cutting content.<sup>152</sup> One article asked whether the propagation of fake news before the 2016 U.S. election was an antitrust problem.<sup>153</sup> The fake news problem arose after Facebook implemented product changes that deterred its users from clicking on external news links, and to rely instead on its Instant Articles.<sup>154</sup> Granted, Facebook did not author the fake news stories; but it can manipulate what its two billion users can easily see (and not see). One concern with a dominant digital assistant is that it will not provide an ideologically diverse news stream.<sup>155</sup> Instead a dominant digital assistant will filter the information users receive based on their preexisting preferences, thereby further reducing the viewpoints its users receive and leading to "echo chambers" and "filter bubbles."<sup>156</sup>

Moreover, select groups can manipulate the dominant digital assistant's algorithm to amplify their message. As *The Guardian* reported, Google's autosuggest may be used to propagate biased views against minorities.<sup>157</sup> Partisan groups may also use a more traditional avenue by simply paying the digital assistant for preferential listing.<sup>158</sup> In a world where many users view their search results as unbiased, camouflaged manipulation, as the

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152. *Id.*

153. Sally Hubbard, *Why Fake News is an Antitrust Problem*, FORBES (Jan. 10, 2017, 12:00 AM), <https://www.forbes.com/sites/washingtonbytes/2017/01/10/why-fake-news-is-an-antitrust-problem/>.

154. *Id.*

155. Due to pervasive psychological confirmation biases, users are unlikely to want to hear both the conservative and liberal slant for every news story. See Andrea M. Matwyshyn, *The Law of the Zebra*, 28 BERKELEY TECH. L.J. 155, 210 (2013) ("Particularly when the topic is an emotionally-charged or threatening issue, confirmation bias is a common occurrence.").

156. OECD BACKGROUND NOTE, *supra* note 143, at 43; see also ORG. FOR ECON. COOPERATION & DEV., ALGORITHMS AND COLLUSION - NOTE FROM THE EUROPEAN COMMISSION 2 (2017) (noting that when it comes to recommending newspaper articles, personalization can limit the range of views that consumers are exposed to, which is the so-called "filter bubble" or "echo chamber" phenomenon).

157. Carole Cadwalladr, *Google, Democracy and the Truth About Internet Search*, GUARDIAN (Dec. 4, 2016, 5:00 AM), <https://www.theguardian.com/technology/2016/dec/04/google-democracy-truth-internet-search-facebook>; see also Stephanie Bornstein, *Reckless Discrimination*, 105 CALIF. L. REV. 1055, 1102 (2017) ("There is also a serious risk that biasing features could be programmed inadvertently into an algorithm . . ."); Solon Barocas & Andrew D. Selbst, *Big Data's Disparate Impact*, 104 CALIF. L. REV. 671, 671 (2016) (describing discrimination as "unintentional emergent property" from various algorithms).

158. Carole Cadwalladr, *How to Bump Holocaust Deniers Off Google's Top Spot? Pay Google*, GUARDIAN (Dec. 17, 2016, 5:32 PM), <https://www.theguardian.com/technology/2016/dec/17/holocaust-deniers-google-search-top-spot>.

Russia's influence on the 2016 U.S. presidential elections reflects, becomes a powerful and dangerous tool.<sup>159</sup>

A second risk is censorship, whereby the dominant digital assistant is “programmed to control or block the content that certain users are able to access.”<sup>160</sup> The digital assistant can enforce governmental censorship of information with particular religious, political, and social views. For example, in 2017 Apple removed several popular apps that enabled users to evade government censorship from the Chinese version of its app store.<sup>161</sup> Or the super-platform can self-censor as to what is appropriate content. Facebook is grappling with this issue. In 2017, it asked users for input on several questions, including:

- How aggressively should social media companies monitor and remove controversial posts and images from their platforms?
- Who gets to decide what's controversial, especially in a global community with a multitude of cultural norms?
- Who gets to define what's false news — and what's simply controversial political speech?<sup>162</sup>

Ultimately the answers to these questions will come not from users, but the powerful super-platform. It will ultimately decide what news its digital assistant will provide and to whom. One early example occurred when Google's digital assistant censored a Burger King video. According to the *New York Times*, the video stated:

“You're watching a 15-second Burger King ad, which is unfortunately not enough time to explain all the fresh ingredients in the Whopper sandwich,” the actor in the commercial said. “But I got an idea. O.K. Google, what is the Whopper burger?” Prompted by the phrase “O.K. Google,” the Google Home device

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159. Mike Isaac & Daisuke Wakabayashi, *Russian Influence Reached 126 Million Through Facebook Alone*, N.Y. TIMES (Oct. 30, 2017), <https://www.nytimes.com/2017/10/30/technology/facebook-google-russia.html>; Marguerite Reardon et al., *Congress Grills Facebook, Twitter, Google Over Russian Influence*, CNET (Nov. 1, 2017, 1:56 PM), [www.cnet.com/news/congress-grills-facebook-twitter-google-over-russian-influence/](http://www.cnet.com/news/congress-grills-facebook-twitter-google-over-russian-influence/).

160. OECD BACKGROUND NOTE, *supra* note 143, at 43.

161. Paul Mozur, *Apple Removes Apps from China Store That Help Internet Users Evade Censorship*, N.Y. TIMES (July 30, 2017), <https://www.nytimes.com/2017/07/30/technology/china-apple-censorship.html>.

162. Elliot Schrage, *Introducing Hard Questions*, FACEBOOK (June 15, 2017), <https://newsroom.fb.com/news/2017/06/hard-questions/>.

beside the TV in the video lit up, searched the phrase on Wikipedia and stated the ingredients. But within hours of the ad's release — and humorous edits to the Whopper Wikipedia page by mischievous users — tests from The Verge and BuzzFeed showed that the commercial had stopped activating the device. Burger King, which did not work with Google on the ad, said Google appeared to make changes by Wednesday afternoon that stopped the commercial from waking the devices, in what amounted to an unusual form of corporate warfare in the living room. Google, which previously said it had not been consulted on the campaign, did not respond to requests for comment.<sup>163</sup>

Censoring a fast-food restaurant's annoying advertisement may not cause much alarm. In fact, many may welcome it. But Google can also censor its maps, YouTube videos, Google News, AdWords, and search engine results.<sup>164</sup> Thus we can see why conservatives and socialists are raising concerns about Google censoring their viewpoints.<sup>165</sup> Conservatives were also concerned over allegations in 2016 that the social network Facebook manipulated for political purposes the rankings of news stories for its users, suppressing conservative viewpoints.<sup>166</sup> (Facebook denied doing this.)<sup>167</sup>

A third risk is manipulation, whereby the dominant digital assistant's algorithms select information according to particular business or political interests (of the super-platform), instead of its relevance or quality.<sup>168</sup> The

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163. Sapna Maheshwari, *Burger King 'O.K. Google' Ad Doesn't Seem O.K. With Google*, N.Y. TIMES (Apr. 12, 2017), <https://www.nytimes.com/2017/04/12/business/burger-king-tv-ad-google-home.html>.

164. Robert Epstein, *The New Censorship*, U.S. NEWS & WORLD REPORT (June 22, 2016, 9:00 AM), <https://www.usnews.com/opinion/articles/2016-06-22/google-is-the-worlds-biggest-censor-and-its-power-must-be-regulated>.

165. Leo Goldstein, *Google's Search Bias Against Conservative News Sites Has Been Quantified*, WUWT (Sept. 8, 2017), <https://wattsupwiththat.com/2017/09/08/a-method-of-google-search-bias-quantification-and-its-application-in-climate-debate-and-general-political-discourse/> ("Google Search is biased in favor of left/liberal websites against conservative websites, and is extremely biased in favor of climate alarmism against climate realism."); Tucker Warns About 'Ominous' Google Censorship of Political Content, FOX NEWS INSIDER (Sept. 7, 2017, 9:31 PM), <http://insider.foxnews.com/2017/09/07/tucker-ominous-google-censorship-certain-political-content>; Peter Hasson, *Anti-Corporate Voices on Both Right and Left Claim Google Censorship*, DAILY CALLER (Aug. 31, 2017, 7:53 PM), <http://dailycaller.com/2017/08/31/anti-corporate-voices-on-both-right-and-left-claim-google-censorship/>.

166. Deepa Seetharaman, *Facebook Rebuts Criticisms About a Bias Against Conservatives*, WALL ST. J. (May 10, 2016, 8:41 AM), [www.wsj.com/articles/facebook-refutes-criticisms-about-a-bias-against-conservatives-1462890206](http://www.wsj.com/articles/facebook-refutes-criticisms-about-a-bias-against-conservatives-1462890206).

167. *Id.*

168. OECD BACKGROUND NOTE, *supra* note 143, at 43.

composition and order of the news feed can affect users' inclinations. With sixty-one percent of Millennials relying on the social network to receive their news, the power of the network becomes clear. Users rely on the super-platforms, in part, because they believe the algorithms objectively identify the most relevant results.<sup>169</sup> But Google's conduct with Froogle demonstrates, a powerful platform can intentionally degrade the quality of its search results to promote its own corporate interests. Robert Epstein illustrated how Google, in manipulating the rankings of its search results, could shift the voting preferences of undecided voters by "20 percent or more—up to 80 percent in some demographic groups—with virtually no one knowing they are being manipulated."<sup>170</sup> Other dominant super-platforms like Facebook can also manipulate elections.<sup>171</sup> Jonathan Zittrain has warned of the super-platform's potential ability to predict political views, identify party affiliation, and engage in targeted campaigning to mobilize distinct groups of voters to take action.<sup>172</sup> Indeed, Russian operatives established competing Facebook groups, the chair of the Senate Intelligence Committee noted, to "fuel divisions among Americans."<sup>173</sup>

Super-platforms have already used their market dominance to promote certain corporate agendas. Google, for example, used its homepage to protest against the Stop Online Piracy Act, asking users to petition Congress.<sup>174</sup> Consumer Watchdog, in comparing the search results of Bing, DuckDuckGo, and Google, accused Google of "manipulating its search engine results to favor opposition" to Section 230 of the Communications Decency Act.<sup>175</sup> Google was leading the "[t]ech industry efforts to block

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169. Claire Cain Miller, *When Algorithms Discriminate*, N.Y. TIMES (July 9, 2015), <https://www.nytimes.com/2015/07/10/upshot/when-algorithms-discriminate.html>.

170. Robert Epstein, *How Google Could Rig The 2016 Election*, POLITICO (Aug. 19, 2015), <http://www.politico.com/magazine/story/2015/08/how-google-could-rig-the-2016-election-121548>.

171. Jonathan Zittrain, *Facebook Could Decide an Election Without Anyone Ever Finding Out*, NEW REPUBLIC (June 1, 2014), <https://newrepublic.com/article/117878/information-fiduciary-solution-facebook-digital-gerrymandering>.

172. *Id.*

173. Mary Louise Kelley, Ryan Lucas & Richard Burr, *How Russia Used Facebook to Organize 2 Sets of Protesters*, NPR (Nov. 1, 2017, 4:53 PM), <https://www.npr.org/2017/11/01/561427876/how-russia-used-facebook-to-organize-two-sets-of-protesters>.

174. Jared Newman, *SOPA and PIPA: Just the Facts*, PCWORLD (Jan. 17, 2012, 6:00 PM), [https://www.pcworld.com/article/248298/sopa\\_and\\_pipa\\_just\\_the\\_facts.html](https://www.pcworld.com/article/248298/sopa_and_pipa_just_the_facts.html).

175. John M. Simpson, *Google Appears to Be Manipulating Its Search Engine Results to Defend Internet Law that Enables Sex Trafficking, Consumer Watchdog Finds*, CONSUMER WATCHDOG (Sept. 11, 2017), <http://www.consumerwatchdog.org/newsrelease>

any amendment to Section 230, which protects websites from liability for material posted by third parties on their sites.”<sup>176</sup> As Consumer Watchdog found, “[t]hree of the top four links returned under the news tab for the search term ‘Section 230’ were to articles from the Electronic Frontier Foundation, a staunch opponent of amending the Internet law.”<sup>177</sup> In contrast, Bing and DuckDuckGo “gave links to articles presenting all sides of the issue.”<sup>178</sup>

As the European Commissioner concluded:

The way that algorithms are used to make decisions automatically could even undermine our democracy. These days, social media is a vital source of news. One recent study found that nearly two thirds of US adults get their news this way. So the scope for social media algorithms to create an alternative reality, by showing people one story after another that just isn't true, is a concern for us all.”<sup>179</sup>

If users increasingly rely on one digital assistant, it will increasingly learn about many citizens’ social and political views, behavior, and susceptibility to biases. Facebook, for example, “collects data on roughly 1.6 billion people, including ‘likes’ and social connections, which it uses to look for behavioral patterns such as voting habits, relationship status and how interactions with certain types of content might make people feel.”<sup>180</sup> But Facebook does not simply passively collect data about its users; it also has the power to affect behavior. One study, which later proved quite controversial, sought to examine “emotional contagion,” whereby people transfer positive and negative moods and emotions to others.<sup>181</sup> This was the “first experimental evidence for massive-scale emotional contagion via

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/google-appears-be-manipulating-its-search-engine-results-defend-internet-law-enables-s-0.

176. *Id.*

177. *Id.*

178. *Id.*

179. Margrethe Vestager, Comm’r, European Comm’n for Competition, Algorithms and Competition, Address at Bundeskartellamt 18th Conference on Competition (Mar. 16, 2017), [https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/bundeskartellamt-18th-conference-competition-berlin-16-march-2017\\_en](https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/bundeskartellamt-18th-conference-competition-berlin-16-march-2017_en).

180. Daniela Hernandez & Deepa Seetharaman, *Facebook Offers Details on How It Handles Research*, WALL ST. J. (June 14, 2016), <http://www.wsj.com/articles/facebook-offers-details-how-it-handles-research-1465930152>.

181. Adam D. I. Kramer, Jamie E. Guillory & Jeffrey T. Hancock, *Experimental Evidence of Massive-Scale Emotional Contagion Through Social Networks*, 111 PROC. NAT’L ACAD. SCI. 8788 (2014).



social networks.”<sup>182</sup> People, when posting on Facebook, frequently express positive or negative emotions.<sup>183</sup> Their friends later see these posts via Facebook’s “News Feed” product. Facebook uses a ranking algorithm that continually tests which content is shown or omitted in the News Feed.<sup>184</sup> The aim is to show particular Facebook users “the content they will find most relevant and engaging.”<sup>185</sup> Facebook, as part of the study, intentionally manipulated its News Feed algorithm.<sup>186</sup> Some users received less positive content.<sup>187</sup> Other received less negative emotional content.<sup>188</sup>

Did that manipulation impact what the 689,003 test subjects posted?<sup>189</sup> It did. When Facebook surreptitiously reduced friends’ positive content in the News Feed for one week, the users were less positive: “a larger percentage of words in the users’ status updates were negative and a smaller percentage were positive.”<sup>190</sup> When Facebook surreptitiously reduced their friends’ negative content in the News Feed, the Facebook users were less negative themselves. People who were exposed to fewer emotional posts (either positive or negative) in their News Feed “were less expressive overall on the following days.”<sup>191</sup> Thus by manipulating the News Feed, Facebook could influence users’ moods.

Interestingly, Facebook could manipulate users’ emotions without prohibiting users from accessing content. The users’ search costs were low, because their friends’ content:

was always available by viewing a friend’s content directly by going to that friend’s wall” or “timeline,” rather than via the News Feed. Further, the omitted content may have appeared on prior or subsequent views of the News Feed. Finally, the experiment did not affect any direct messages sent from one user to another.<sup>192</sup>

If Facebook can affect a user’s mood and engagement by simply promoting some content over another in the user’s News Feed, just imagine the power

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182. *Id.* at 8789.

183. *Id.* at 8788.

184. *Id.*

185. *Id.*

186. *Id.*

187. *Id.* at 8788–89.

188. *Id.*

189. *Id.*

190. *Id.* at 8789.

191. *Id.* at 8790.

192. *Id.* at 8789.

of a dominant digital assistant to affect citizens' moods, behavior, and views.

Ultimately, in a world where digital assistants play a key role as a gateway to news, they will have the power to affect its composition. Without noticing, citizens could outsource the task of shaping their world view to a dominant corporation. Normally, with power comes great responsibility.<sup>193</sup> That is indeed the case in EU competition law when a firm dominates markets for goods and services.<sup>194</sup> This concern of the super-platform's shirking of this responsibility arose with fake news. As worldwide web inventor Tim Berners-Lee noted:

Today, most people find news and information on the web through just a handful of social media sites and search engines. These sites make more money when we click on the links they show us. And, they choose what to show us based on algorithms which learn from our personal data that they are constantly harvesting. The net result is that these sites show us content they think we'll click on – meaning that misinformation, or 'fake news', which is surprising, shocking, or designed to appeal to our biases can spread like wildfire. And through the use of data science and armies of bots, those with bad intentions can game the system to spread misinformation for financial or political gain.<sup>195</sup>

Thus, when a few gatekeepers dominate the digital assistant market, economic power can translate into political power—be it through payment by third parties or as a result of the platform itself opting to advance one agenda over another. The marketplace of ideas, just like online markets for goods and services, may be manipulated.

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193. Meng Ding, *Perfect 10 v. Amazon.com: A Step Toward Copyright's Tort Law Roots*, 23 BERKELEY TECH. L.J. 373, 373 (2008) (quoting SPIDER-MAN (Columbia Pictures 2002)).

194. Case C-413/14 P, *Intel Corp. v. Commission*, ¶ 135 (Sept. 6, 2017), <http://curia.europa.eu/juris/document/document.jsf?jsessionid=9ea7d0f130d5d76741cb58524179974ae33bfb72e370.e34KaxiLc3eQc40LaxqMbN4PaN8Oe0?text=&docid=194082&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=195067> (“[A] dominant undertaking has a special responsibility not to allow its behaviour to impair genuine, undistorted competition on the internal market”).

195. Tim Berners-Lee, *Three Challenges for the Web, According to Its Inventor*, WORLD WIDE WEB FOUND. (Mar. 12, 2017), <http://webfoundation.org/2017/03/web-turns-28-letter/>.

### C. PRIVACY CONCERNS

Smartphones currently collect and store an immense amount of data (including information that users may not ever use, such as their movements or search history).<sup>196</sup> As Google, Apple, Facebook and other leading tech firms told the Supreme Court in 2017:

People search online for all manner of information, including medical advice, and rely on the Internet for their jobs, schooling, and interpersonal communications. They reveal their habits, views, and preferences by interacting with apps used to navigate almost every facet of their lives. They store photos and emails in the cloud, rely on data-collecting devices such as fitness trackers to manage their health, and use smart appliances to provide home security and efficiency. For many of these activities, there is no analog-era analogy; in the past, for instance, a user did not have to tell a company when and how he wanted to adjust his thermostat, thereby risking losing all privacy protection in that information.<sup>197</sup>

Digital assistants (and the smart technologies connected with them) aim to collect even more personal data. A 2017 criminal case offers a glimpse at the potential privacy implications created by digital assistants. The Bentonville Police Department in Arkansas was investigating a death at the defendant's residence.<sup>198</sup> The defendant was charged with first-degree murder.<sup>199</sup> While searching the defendant's residence, the police seized an Echo device.<sup>200</sup> The police next served Amazon with a warrant seeking any audio recordings and transcripts that were created as a result of interactions with defendant's Amazon Echo.<sup>201</sup> Citing "important First Amendment and privacy implications at stake," Amazon sought to quash the search warrant

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196. Brief for Technology Companies as Amici Curiae in Support of Neither Party at 18, *Carpenter v. United States*, No. 16-402, 2017 WL 3530959 (U.S. Aug. 14, 2017) ([hereinafter *Carpenter Amicus Brief*]). Nest Labs, which manufactures smart thermostats, and its parent Google were among the amici. *Id.*

197. *Id.* at 27.

198. Memorandum of Law in Support of Amazon's Motion to Quash Search Warrant at 6, *State v. Bates*, No. CR-2016-370-2 (Cir. Ct. Ark., Feb. 17, 2017) [hereinafter *Amazon Memorandum*].

199. *Id.*

200. *Id.*

201. *Id.*

“unless the Court finds that the State has met its heightened burden for compelled production of such materials.”<sup>202</sup>

As Amazon told the court, the privacy concerns were significant. Its digital assistant “can be commanded to, among other things, play music, stream podcasts, play audio books, request information about various subjects, or request ‘real-time information,’ including news, weather, and traffic conditions related to the user’s or any other location.”<sup>203</sup> As one example, “users may ask for information about a sensitive health condition or a controversial political figure.”<sup>204</sup> Users can also use their digital assistant to order products from Amazon, including books and other expressive materials. Thus, the digital assistant sweeps in significant amounts of data that can “reveal much more in combination than any isolated record.”<sup>205</sup> Those with access to the data can reconstruct “[t]he sum of an individual’s private life.”<sup>206</sup>

Amazon was concerned with governmental invasions of its users’ privacy and First Amendment interests. As Amazon cautioned, “the knowledge that government agents are seeking records concerning customer purchases of expressive material from Amazon ‘would frost keyboards across America.’”<sup>207</sup> Indeed, “‘rumors of an Orwellian federal criminal investigation into the reading habits of Amazon’s customers could frighten countless potential customers’ into cancelling their online purchases through Amazon, ‘now and perhaps forever,’ resulting in a chilling effect on the public’s willingness to purchase expressive materials.”<sup>208</sup>

Eventually, after the defendant consented, Amazon disclosed the information to the State.<sup>209</sup> But government surveillance remains a concern. Facebook, Apple, and Google, among others, recently impressed this point

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202. *Id.* at 1. Amazon argued that the State must demonstrate: (1) a compelling need for the information sought, including that it is not available from other sources; and (2) a sufficient nexus between the information and the subject of the criminal investigation. *Id.* at 2.

203. *Id.* at 5.

204. *Id.*

205. *Id.* at 9 (quoting *Riley v. California*, 134 S. Ct. 2473, 2489 (2014)).

206. *Id.* (quoting *Riley*, 134 S. Ct. at 2489).

207. *Id.* at 14 (quoting *In re Grand Jury Subpoena to Amazon.com Dated August 7, 2006*, 246 F.R.D. 570, 573 (W.D. Wis. 2007) [hereinafter *Grand Jury Subpoena*]).

208. *Id.* (quoting *Grand Jury Subpoena*, 246 F.R.D. at 573).

209. Andrew Blake, *Amazon Gives Up Alexa Data Sought in Murder Probe*, WASH. TIMES (Mar. 8, 2017), <http://www.washingtontimes.com/news/2017/mar/8/amazon-gives-alexa-data-sought-murder-probe/>.

to the Supreme Court: “While amici’s customers understand that data is collected by service providers as part of providing digital technologies, customers still expect privacy with respect to other parties, including the government.”<sup>210</sup> As the amici argued, “[d]igital technologies have become a necessary aspect of life today.”<sup>211</sup> Individuals cannot realistically forgo these technologies; nor can users of these digital technologies avoid transmitting sensitive data to the technologies’ service providers. Nonetheless, users expect that data to remain private.<sup>212</sup>

But it is questionable whether the accused can challenge under the Fourth Amendment any warrantless search or seizure of data Amazon’s digital assistant collects from individuals. This is because the accused—under a line of Supreme Court cases—would have no reasonable expectation of privacy in the data they share with third parties, like Amazon.<sup>213</sup>

Another concern is covert government surveillance. One example, according to WikiLeaks documents disclosed on the subject, is the Central Intelligence Agency’s “Weeping Angel” program. The CIA basically

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210. *Carpenter Amicus Brief*, *supra* note 196.

211. *Id.* at 13.

212. *Id.* at 17. The amici rely in part on a poll by the Pew Research Center, where “93% of adults say that being in control of who can get information about them is important: 74% feel this is ‘very important’; 19% say it is ‘somewhat important.’ 90% say that controlling what information is collected about them is important—65% think it is ‘very important’ and 25% say it is ‘somewhat important.’” *Id.* at 19 n.3 (quoting Mary Madden & Lee Rainie, *Americans’ Attitudes About Privacy, Security and Surveillance*, PEW RES. CTR. (May 20, 2015), [www.pewinternet.org/2015/05/20/americans-attitudes-about-privacy-security-and-surveillance/](http://www.pewinternet.org/2015/05/20/americans-attitudes-about-privacy-security-and-surveillance/)). Additionally, “Americans say they do not wish to be observed without their approval; 88% say it is important that they not have someone watch or listen to them without their permission (67% feel this is ‘very important’ and 20% say it is ‘somewhat important’).” *Id.*

213. *United States v. Miller*, 425 U.S. 435, 443 (1976) (holding that the government, consistent with the Fourth Amendment, can obtain “information revealed to a third-party and conveyed by him to government authorities, even if the information is revealed on the assumption that it will be used only for a limited purpose and the confidence placed in the third-party will not be betrayed”); Sarah Wilson, *Compelling Passwords from Third Parties: Why the Fourth and Fifth Amendments Do Not Adequately Protect Individuals when Third Parties Are Forced to Hand Over Passwords*, 30 BERKELEY TECH. L.J. 1, 14 (2015) (explaining that the third-party doctrine strips users of privacy rights in stored passwords); Mark Daniel Langer, *Rebuilding Bridges: Addressing the Problems of Historic Cell Site Location Information*, 29 BERKELEY TECH. L.J. 955, 965 (2014) (criticizing application of the third-party doctrine to location information gathered from smartphones); Erin Murphy, *The Case Against the Case for Third-Party Doctrine: A Response to Epstein and Kerr*, 24 BERKELEY TECH. L.J. 1239, 1250 (2009) (criticizing the third-party doctrine generally).

hacked smart televisions, transforming them into covert microphones.<sup>214</sup> “After infestation, Weeping Angel places the target TV in a ‘Fake-Off’ mode, so that the owner falsely believes the TV is off when it is on. In ‘Fake-Off’ mode the TV operates as a bug, recording conversations in the room and sending them over the Internet to a covert CIA server.”<sup>215</sup> The CIA could also remotely hack and control popular smartphones, which could be instructed to send the CIA “the user’s geolocation, audio and text communications as well as covertly activate the phone’s camera and microphone.”<sup>216</sup> Presumably, other governments would have similar incentives and ability to hack digital assistants to monitor and gather evidence. In an unconcentrated digital assistant market, personal data is dispersed across many firms. In contrast, in a monopolized market, personal data is concentrated in one or few firms. This increases the government’s incentive to circumvent the firm’s privacy protections and tap into the digital assistant’s capabilities.<sup>217</sup> Also, the fewer the number of firms controlling the personal data, the risk increases that the government will “capture” the firms, using its many levers.<sup>218</sup>

But another privacy concern, which Amazon did not address in its court filing, is the private collection and use of this data. A 2017 FTC case against the television manufacturer VIZIO suggests the extent to which private

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214. Press Release, Wikileaks, Vault 7: CIA Hacking Tools Revealed (Mar. 7, 2017), <https://wikileaks.org/ciav7p1/>.

215. *Id.*

216. *Id.*

217. See, e.g., Barton Gellman & Ashkan Soltani, *NSA Infiltrates Links To Yahoo, Google Data Centers Worldwide, Snowden Documents Say*, WASH. POST (Oct. 30, 2013), [https://www.washingtonpost.com/world/national-security/nsa-infiltrates-links-to-yahoo-google-data-centers-worldwide-snowden-documents-say/2013/10/30/e51d661e-4166-11e3-8b74-d89d714ca4dd\\_story.html](https://www.washingtonpost.com/world/national-security/nsa-infiltrates-links-to-yahoo-google-data-centers-worldwide-snowden-documents-say/2013/10/30/e51d661e-4166-11e3-8b74-d89d714ca4dd_story.html).

218. Kelton Sears, *Alexa and the Dawn of So-What Surveillance*, SEATTLE WEEKLY (Mar. 29, 2017, 1:30 AM), <http://www.seattleweekly.com/news/alexa-and-the-dawn-of-so-what-surveillance/>. On the one hand, a dominant firm might have the resources to fight off the government. On the other hand, as personal data is spread out across many firms, there are more firms that the government would have to bribe (or coerce) to access the data. As the number of bribes increase, the lower the likely value of each bribe to each firm possessing the personal data, and the greater the likelihood that the bribe will be less than the value to the digital assistant producer for securing the data. Moreover, a dominant firm is likely to lobby the government on many more fronts. Brian Fung & Hamza Shaban, *To Understand How Dominant Tech Companies Are, See What They Lobby For*, L.A. TIMES (Sept. 1, 2017, 12:55 PM), <http://www.latimes.com/business/technology/la-fi-tn-silicon-valley-lobbying-20170901-story.html>. This can increase the likelihood of secretly cooperating with the government in accessing the data if doing so yields greater benefits on the other fronts.



collection might have dangerous implications for consumer rights.<sup>219</sup> The FTC alleged that since February 2014, VIZIO televisions continuously tracked what consumers were watching.<sup>220</sup> Over ten million VIZIO televisions transmitted information about what the viewer was watching “on a second-by-second basis.”<sup>221</sup> Why the intrusive tracking? VIZIO profited from selling the consumers’ television viewing history to third parties.<sup>222</sup> One purpose for the viewing data was to analyze advertising effectiveness. With the VIZIO TV data, third parties could analyze a household’s behavior across devices, for example, “(a) whether a consumer has visited a particular website following a television advertisement related to that website, or (b) whether a consumer has viewed a particular television program following exposure to an online advertisement for that program.”<sup>223</sup> Another purpose for the viewing data was to better target the household members on their other digital devices.<sup>224</sup>

VIZIO eventually settled.<sup>225</sup> An outstanding legal issue was whether VIZIO’s disclosure was “unfair” or “deceptive” under section 5 of the FTC Act. As the FTC alleged, consumers were never directly informed that their new VIZIO televisions were tracking their viewing habits or selling this data to better target them with personal ads.<sup>226</sup> The acting FTC Chair concurred in the enforcement action only because VIZIO deceptively omitted information about its data collection and sharing program.<sup>227</sup> But she did not support the count in the complaint alleging that VIZIO’s collection and sharing of the data without consumers’ consent was inherently “unfair.”<sup>228</sup>

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219. Complaint for Permanent Injunction and Other Equitable and Monetary Relief, FTC v. VIZIO, Inc., No. 2:17-cv-00758 (D.N.J. Feb. 6, 2017) [hereinafter *FTC Complaint*], [https://www.ftc.gov/system/files/documents/cases/170206\\_vizio\\_2017.02.06\\_complaint.pdf](https://www.ftc.gov/system/files/documents/cases/170206_vizio_2017.02.06_complaint.pdf).

220. *Id.* at 4.

221. *Id.*

222. *Id.* at 5.

223. *Id.*

224. *Id.*

225. Press Release, Fed. Trade Comm’n, VIZIO to Pay \$2.2 Million to FTC, State of New Jersey to Settle Charges It Collected Viewing Histories on 11 Million Smart Televisions without Users’ Consent (Feb. 6, 2017), <https://www.ftc.gov/news-events/press-releases/2017/02/vizio-pay-22-million-ftc-state-new-jersey-settle-charges-it>.

226. See *FTC Complaint*, *supra* note 219, at 9.

227. *In re Vizio, Inc.*, FTC File No. 1623024 (Feb. 6, 2017) (concurring statement of Acting Chair Maureen K. Ohlhausen), <https://www.ftc.gov/public-statements/2017/02/concurring-statement-acting-chairman-maureen-k-ohlhausen-matter-vizio-inc>.

228. *Id.*

The VIZIO enforcement action illustrates the privacy implications of a dominant digital assistant. First, it appears that a dominant digital assistant can collect this personal information. Based on the Acting Chair's construction of the FTC Act, a super-platform can use its digital assistant to track consumers, collect their data, develop personal profiles, and target them with behavioral ads. It can even sell that data to third parties. All that seems to be required is that it discloses the collection and use of data to consumers. But suppose Amazon or Google state broadly in its privacy statement that the data it collects across its products and services is used for advertising purposes. Whether or not this disclosure is sufficient to infer consent remains unclear.<sup>229</sup>

A second issue is what constitutes consent and who must consent. The FTC complaint focused on consumers that purchased VIZIO televisions. But a dominant digital assistant will sweep in data from children, other household members, relatives, friends, and others in the house. With facial recognition technology, a dominant digital assistant can track individuals across neighborhoods and cities.<sup>230</sup> It is unclear whether the super-platform has to inform (or obtain consent from) anyone besides the purchaser of the tracking.

A third issue is control over the data. Nothing under the current U.S. law provides adults (or teenagers) with a way to review the personal information that the dominant digital assistant collected about them, nor does current law give them a way to revoke their consent and refuse the further use or collection of personal information, or to delete already-retained personal information.<sup>231</sup>

Ultimately consent has less significance when dealing with a monopoly.<sup>232</sup> Firms can exercise market power multiple ways, such as

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229. *Amazon Privacy Notice*, AMAZON (Aug. 29, 2017), <https://www.amazon.com/gp/help/customer/display.html?nodeId=468496>.

230. *Nowhere to Hide: What Machines Can Tell from Your Face*, ECONOMIST (Sept. 9, 2017), <https://www.economist.com/news/leaders/21728617-life-age-facial-recognition-what-machines-can-tell-your-face>.

231. The Children's Online Privacy Protection Act of 1998, which affords these protections, applies to data collected on children under thirteen years old. Children's Online Privacy Protection Rule, 16 C.F.R. § 312.2 (2017).

232. *US Airways, Inc. v. Sabre Holdings Corp.*, No. 11 CIV. 2725 (LGS), 2017 WL 1064709, at \*13 (S.D.N.Y. Mar. 21, 2017) (evidence of market power includes forcing customers "to do things they would not do in a competitive market, such as signing contracts with terms they would not otherwise accept").

raising price or reducing quality.<sup>233</sup> One facet of competition for “free” goods is privacy protection.<sup>234</sup> Just as a monopoly retailer can increase price above competitive levels, so too a dominant digital assistant can depress privacy protections below competition levels.<sup>235</sup> As the European Commission found when reviewing the Microsoft/LinkedIn merger, consumer choice and privacy protection would be substantially reduced.<sup>236</sup> A dominant digital assistant could collect more personal data and provide less privacy protection than it otherwise could in a competitive market.<sup>237</sup> Users would have no real choice.<sup>238</sup> Instead, they would have to rely on the monopolist’s beneficence for any privacy protections. This is especially troubling when the digital assistant is connected not only to a user’s TV set, but to computers, smart appliances, security cameras, smartphones, and smart cars, as well as the super-platform’s other services (such as search engines, email, maps, and the like).

Thus, unlike monopolies of the past, a dominant digital assistant will know far more intimate details about consumers.<sup>239</sup> Even something as innocuous as a smart thermometer can detect and transmit “not just a

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233. U.S. DEP’T OF JUSTICE & FED. TRADE COMM’N, HORIZONTAL MERGER GUIDELINES 2 (2010), [www.justice.gov/atr/horizontal-merger-guidelines-08192010](http://www.justice.gov/atr/horizontal-merger-guidelines-08192010) (“A merger enhances market power if it is likely to encourage one or more firms to raise price, reduce output, diminish innovation, or otherwise harm customers as a result of diminished competitive constraints or incentives.”).

234. STUCKE & GRUNES, *supra* note 40, at ch. 17.

235. *Id.*; Press Release, European Comm’n, Mergers: Commission Approves Acquisition of LinkedIn by Microsoft, Subject to Conditions (Dec. 6, 2016), [http://europa.eu/rapid/press-release\\_IP-16-4284\\_en.htm](http://europa.eu/rapid/press-release_IP-16-4284_en.htm) (“[T]he Commission concluded that data privacy was an important parameter of competition between professional social networks on the market, which could have been negatively affected by the transaction.”).

236. *See, e.g., Microsoft/LinkedIn Decision*, *supra* note 22, ¶ 350 (“[T]o the extent that these foreclosure effects would lead to the marginalisation of an existing competitor which offers a greater degree of privacy protection to users than LinkedIn (or make the entry of any such competitor more difficult), the Transaction would also restrict consumer choice in relation to this important parameter of competition when choosing” a professional social network).

237. Eleonora Ocello & Cristina Sjödin, *Microsoft/LinkedIn: Big Data and Conglomerate Effects in Tech Markets*, EUR. COMMISSION: COMPETITION MERGER BRIEF 5 (May 2017), <http://ec.europa.eu/competition/publications/cmb/2017/kdal17001enn.pdf> (discussing how the foreclosure of competing networks post-merger could adversely impact the choice of consumers as to the level of data protection offered, as some competitors offered a greater degree of privacy protection to users than LinkedIn).

238. *Id.*

239. *Carpenter Amicus Brief*, *supra* note 196, at 25 (noting how “digital devices and services produce and record data that, alone or in the aggregate, has the potential to reveal highly sensitive information about all aspects of our private lives”).

home's temperature, but information about the homeowner's habits—whether and when the occupants are home, and where they are in the home.”<sup>240</sup>

Nor does simply shutting off the digital assistant offer a viable alternative in a modern world that is so heavily dependent on integrated technology. A total ban on internet use, the Seventh Circuit found back in 2003, would sweep more broadly and impose a greater deprivation on defendant's liberty than was necessary: “such a ban renders modern life—in which, for example, the government strongly encourages taxpayers to file their returns electronically, where more and more commerce is conducted on-line, and where vast amounts of government information are communicated via website—exceptionally difficult.”<sup>241</sup> Smartphones, as the Supreme Court recognized, “are now such a pervasive and insistent part of daily life.”<sup>242</sup> The Court cited one 2013 poll where “nearly three-quarters of smartphone users report being within five feet of their phones most of the time, with 12 percent admitting that they even use their phones in the shower.”<sup>243</sup> More than twice as many respondents in another poll “were willing to give up sex instead of their smart phone or caffeine.”<sup>244</sup> With the rise of smart appliances, it will be even harder to turn off a digital assistant and smartphone.<sup>245</sup>

But if any super-platform abused its position of trust, some might respond, one can turn to more privacy-focused alternatives. Yes Google, Apple, Facebook, and Amazon may strive to be the dominant digital assistant. But other companies may launch competing assistants. Thus, if a super-platform failed to respect users' privacy, one issue is whether users would opt for another digital assistant. As this Part explored, however, market competition may not effectively cure these privacy concerns because users may be unaware of some of the tactics the super-platform deploys to increase its profitability while undermining its users' welfare. Another problem, as the next Part explores, is that the ability to switch digital assistants may be more limited than one might anticipate.

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240. *Id.*

241. *United States v. Holm*, 326 F.3d 872, 877 (7th Cir. 2003).

242. *Riley v. California*, 134 S. Ct. 2473, 2484 (2014).

243. *Id.* at 2490.

244. *Poll: Americans Choose Smartphones Over Sex*, SACHS MEDIA GRP. (Apr. 12, 2017), <https://sachsmedia.com/news/poll-americans-choose-smartphones-over-sex/>.

245. *Carpenter Amicus Brief*, *supra* note 196, at 16 (noting how forgoing the use of networked devices would render modern life exceptionally difficult).

#### IV. WHY THE LEADING DIGITAL ASSISTANT WILL LIKELY BE FROM GOOGLE, APPLE, FACEBOOK, OR AMAZON

With the possibility that a digital assistant can act against its users' interest, one would expect and hope for a "virtuous assistant"—a class of independent assistants, developed by independent firms that prioritized consumer interests. These virtuous assistants could warn users when behavioral discrimination is at play, when outside options are ignored, when price alignment seems out of order, or when personal data is collected. They may even deploy countermeasures to maximize user welfare in the face of such strategies. They could monitor news feed and alert users if they are targeted with particular stories (or missing stories from traditional journalism outlets). They can promote users' interest—aware of their preferences and safeguarding their autonomy.

Predicting the leading technology five years from now is tricky. But several factors favor one of the four super-platforms (Google, Apple, Amazon, and Facebook) capturing the digital assistant market, and disfavoring an independent virtuous assistant. To work well (and gain popularity), the digital assistant will likely have to operate from an existing platform—such as a mobile platform—and in order to tap into the vast wealth of preexisting data offered by such platforms. This is true for several reasons: first, the scale and scope of data needed favor emergence from a platform; second, the data-driven network effects are best effectuated by a platform, and third, platforms can facilitate the integration of the digital assistant with other apps and services, such as texts, mapping, photographs, and more.

Personal data is the first key element. To provide relevant services and recommendations, the digital assistant must first learn the user's habits and preferences. To learn their preferences and predict the users' desires, digital assistants will require a significant volume and variety of personal data. Absent these features, an "isolated" helper would be of little use and value—indeed, it would not be a *personal* digital assistant. Based on the user's personal data—including chat history, geolocation, previous purchasers, and browsing habits—the digital assistant can provide and anticipate personalized recommendations.

Some argue that the value is not from the data or the data-driven network effects, but the algorithms that process the data. But if this were true, noted Lukas Biewald, co-founder and CEO of CrowdFlower, the big tech players IBM, Facebook, Google, and Microsoft would not open source some of their algorithms "without worrying too much about giving away

any secrets.”<sup>246</sup> As Biewald noted, “it’s because the actual secret sauce isn’t the algorithm, it’s the data. Just think about Google. They can release TensorFlow without a worry that someone else will come along and create a better search engine because there are over a trillion searches on Google each year.”<sup>247</sup> Another example is Facebook’s M, where the underlying code and algorithms are largely open source.<sup>248</sup> The key assets are not the algorithms—otherwise, why would Facebook share them? Instead, the key is the combination of the scale and scope of data, and the algorithm’s ability to learn by trial-and-error. As the *Wall Street Journal* reported, “Facebook Messenger already has more than 700 million users,” which yields it the following advantage: “with access to so many users, Facebook has a plausible way to get the gigantic quantity of conversational data required to make a chat-based assistant sufficiently automated.”<sup>249</sup> With more users making more requests, M can quickly process more tasks easily.<sup>250</sup> By learning through servicing users, digital assistants can take a proactive role—anticipating the user’s needs and wants—rather than merely following instructions. This requires the platform to have enough users, data, and opportunities to experiment to train the algorithms.<sup>251</sup> The super-platforms already possess far more personal data than any startup could readily and affordably obtain.<sup>252</sup> New entrants will be at a significant disadvantage. Any independent virtuous assistant will likely lack the scale

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246. Daniel Gutierrez, *Human-in-the-Loop is the Future of Machine Learning*, INSIDEBIGDATA (Jan. 11, 2016), <http://insidebigdata.com/2016/01/11/human-in-the-loop-is-the-future-of-machine-learning/>.

247. *Id.*

248. Mims, *supra* note 17.

249. *Id.*

250. *Id.*

251. STUCKE & GRUNES, *supra* note 40, at 181–82.

252. *Japan's Antimonopoly Law At Turning Point*, STANDARD EXAM’R (Sept. 18, 2017, 9:56 AM), <http://www.standard.net/Business/2017/09/18/Japan-s-antimonopoly-law-at-turning-point>; *Fuel of the Future: Data Is Giving Rise to a New Economy*, ECONOMIST (May 6, 2017), <https://www.economist.com/news/briefing/21721634-how-it-shaping-up-data-giving-rise-new-economy>; Franklin Foer, *How Silicon Valley Is Erasing Your Individuality*, WASH. POST (Sept. 8, 2017), [https://www.washingtonpost.com/outlook/how-silicon-valley-is-erasing-your-individuality/2017/09/08/a100010a-937c-11e7-aace-04b862b2b3f3\\_story.html](https://www.washingtonpost.com/outlook/how-silicon-valley-is-erasing-your-individuality/2017/09/08/a100010a-937c-11e7-aace-04b862b2b3f3_story.html); Rana Foroohar, *Big Tech’s Power Remains Unchallenged*, FIN. TIMES (Sept. 19, 2017), <https://www.ft.com/video/19982ee4-0468-4efe-8e06-86057bb728e7>.



and scope of data (to train their digital assistant), as well as the products necessary to attract new users and convince existing users to switch.<sup>253</sup>

Network effects are the second key element. As we saw, traditional network effects help the leading platform attract more developers and smart-technology manufacturers. Plus, the “learning-by-doing” and “scope” network effects improve the quality of super-platform’s algorithm in predicting users’ needs and tastes. Only a few companies in mid-2017 have the requisite volume and variety of personal data and opportunities to experiment for their digital assistants to be competitive: Amazon, Facebook, Google, and Apple.

The third key element is the scope of services the personal assistant can offer, and the extent to which the digital assistant is integrated in these other services. The European Commission’s recent decision in the *Microsoft/LinkedIn* merger is instructive on how integration, at times, can foreclose competition.<sup>254</sup> Before the Commission approved the transaction, it noted the possible adverse effects which could result from the integration of LinkedIn’s features into the existing Microsoft platform.<sup>255</sup> Such integration would make the LinkedIn features “particularly prominent” to Microsoft Outlook users and “likely enhance LinkedIn’s visibility to a very large number of users” more so than when LinkedIn was a stand-alone professional social network.<sup>256</sup> This would increase the size of the professional social network (and use of the network effects to Microsoft’s advantage).<sup>257</sup> Second, Microsoft could leverage its platform (such as Outlook users’ address books) to suggest new LinkedIn connections and thereby further significantly expand the size of its professional social network.<sup>258</sup> While LinkedIn would increase in size (and power), Microsoft could hinder competing professional social networks by denying access to

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253. Sofia Grafanaki, *Autonomy Challenges in the Age of Big Data*, 27 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 803, 841 (2017) (noting how the winner in the race among digital assistants “will most likely depend on which company can create the most seamless experience across devices and platforms. In other words, the key is the aggregation of personal information.”).

254. See, e.g., *Microsoft/LinkedIn Decision*, *supra* note 22, ¶ 330 (noting how integrating LinkedIn features into Microsoft Office, while denying competing professional social network service providers access to Microsoft APIs may foreclose competing providers).

255. Press Release, *supra* note 235.

256. See, e.g., *Microsoft/LinkedIn Decision*, *supra* note 22, ¶ 328.

257. *Id.* ¶ 324.

258. *Id.* ¶ 328.

its Outlook API (and potentially other Microsoft APIs).<sup>259</sup> If Microsoft did so, “such providers would likely have no counterstrategy at their disposal to sufficiently counter the merged entity's actions.”<sup>260</sup> As a result, such integration would likely increase the LinkedIn platform's size and usage in a way that rivals could not match.<sup>261</sup> Due to the network effects, LinkedIn would continue growing toward dominance, and competing professional social network providers would be unable to compete effectively.<sup>262</sup>

The Commission's concern in *Microsoft/LinkedIn* was the emergence of a durable monopoly and its concomitant effects.<sup>263</sup> Likewise, the super-platform can nudge users to its digital assistant by seamlessly integrating its digital assistant with its wide offering. Google, for example, announced in 2017 that it was incorporating artificial intelligence into its Gmail service—which is used by over a billion people—“for features such as suggesting responses to messages.”<sup>264</sup> Google, as the chief digital assistant, can analyze our emails, texts, or photos, and suggest replies.<sup>265</sup> Google argues that given:

its 17 years of work cataloguing the internet and physical world, its assistant is smarter and better able to work with its email, messaging, mapping and photo apps. And since Google makes software for smartphones, smartwatches and old-fashioned computers, Google says people will be able to have one conversation with multiple machines.<sup>266</sup>

A standalone virtuous assistant would be at a disadvantage. As Google told developers in 2017, its Android mobile operating system is used on over two billion active devices worldwide; its Google Play online store, Google Maps, Gmail, Chrome operating system and search app all have over one billion monthly users.<sup>267</sup> Developing a platform of similar scale

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259. *Id.* ¶ 329.

260. *See, e.g., id.*

261. *Id.* ¶ 330.

262. *Id.* ¶ 343.

263. *Id.* ¶ 348.

264. *Google Assistant Coming to iPhones; Will Take on Siri*, WION (May 18, 2017, 1:11 PM), <https://www.wionews.com/science-tech/google-assistant-coming-to-iphones-will-take-on-siri-15719>.

265. Yadron, *supra* note 10.

266. *Id.*

267. Reinhardt Krause, *Google Trumpets Platform User Base vs. Apple, Facebook, Amazon*, INV. BUS. DAILY (May 18, 2017), <http://www.investors.com/news/technology/google-trumpets-platform-user-base-vs-apple-facebook-amazon/>.

and scope from scratch would likely be too costly and time consuming for a competitor. For example, Microsoft spent over “\$4.5 billion into developing its algorithms and building the physical capacity necessary to operate” its search engine Bing.<sup>268</sup> Thus, a standalone virtuous assistant would likely need to access and function well with the super-platform’s services.

Super-platforms have already taken steps in order to consolidate market power. Amazon in 2017, for example, partnered with Microsoft so that its digital assistant will get better functionality via Cortana by accessing Microsoft users’ work calendars and emails.<sup>269</sup> Before then “Amazon, Microsoft, Apple, and Google ha[d] all built rival digital assistants that have been seen as walled gardens blocked off from each other, and this partnership signals a move to make them work better together.”<sup>270</sup>

While Amazon and Microsoft might agree to partner with each other, and while Apple might be willing to have Google’s digital assistant operate on its iPhone,<sup>271</sup> a dominant super-platform may not allow a nascent virtuous assistant to access its platform and users.<sup>272</sup> It could deny access to the Google Play online store and Apple’s App Store.<sup>273</sup> It could restrict access to its user’s calendar, email, or texting app. It could give preferential

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268. FED. TRADE COMM’N, MEMORANDUM RE: GOOGLE INC FILE NO. 111-0163 at 76 (2012), <http://graphics.wsj.com/google-ftc-report> (hosting the inadvertently-leaked report).

269. Tom Warren, *Microsoft and Amazon Partner to Integrate Alexa and Cortana Digital Assistants*, VERGE (Aug. 30, 2017, 4:11 AM), <https://www.theverge.com/2017/8/30/16224876/microsoft-amazon-cortana-alexa-partnership>.

270. *Id.*

271. Reinhardt Krause, *Siri, What’s Coming to Apple iPhones? Google’s Digital Assistant*, INV. BUS. DAILY (May 16, 2017), <http://www.investors.com/news/technology/siri-whats-coming-to-apple-iphones-googles-ai-digital-assistant/>.

272. *See, e.g.*, Grafanaki, *supra* note 253, at 841:

Because users pay companies like Google with their attention and their data, which the companies then convert to advertising revenue, Google’s incentive is to keep users “locked-in” to its services in order to keep collecting information, even if competitors may offer better products. Such efforts are also present in Google’s new product development in an attempt to harness the momentum that is moving away from desktop search and direct it to other products that the company can use as platforms for its advertising business. This would seem like a simple rule of business, but for the fact that Google is also the way that users find potentially competing products, raising concerns about some of its practices.

273. *See* EZRACHI & STUCKE, *supra* note 2, at 184–86 (discussing Disconnect being kick out of Google Play Store).

treatment to its own digital assistant, by pre-loading it on its smartphone, having it on the smartphone's opening screen, or integrating it into its other popular products, including its search engine and the operating system.<sup>274</sup> It may exclude the virtuous assistant from its online wallet, such as Apple Pay or Google Wallet.<sup>275</sup> It could degrade the virtuous assistant's functionality by having it run slower than the operating system's digital assistant.<sup>276</sup> Users would likely blame the virtuous assistant for its tardiness. Or the super-platforms may simply block the virtuous assistant by arguing that doing so protects its users. For example, the super-platform may argue that privacy considerations restrict interoperability with the virtuous assistant.<sup>277</sup>

Consequently, at least three key elements—data, network effects, and scope of platform's services—increase the likely switching costs and undermine a potential virtuous assistant's success. Although these elements favor the super-platform, a popular virtuous assistant remains possible. Despite the possibility for such a virtuous assistant, we are rather pessimistic. Perhaps the easiest way to explain our pessimism is to ask the following: Which search engine did you use today (or this past week)? Did you opt for one which does not harvest information and retains your anonymity (such as DuckDuckGo) or for one which tracks your behavior to better target you with personalized ads? Did you limit the ability of your phone apps to access personal and geolocation information? Do you often change the default option? When downloading an app or update, do you read the terms and conditions? Even if you did, did you still accept the terms—despite not certainly knowing who will access your data and what they will do with it?

In sum, a virtuous assistant is possible. Its presence might possibly limit the ability of the dominant digital assistant to abuse its power. But in reality, the majority of users may lack the incentive to switch. They may find it difficult to quantify cost and harm, and when faced with complex decision making, they may opt for the default. To illustrate—despite the European Commission's record fine against Google and Google's repeated privacy

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274. See STUCKE & GRUNES, *supra* note 40, at 164–65, 295; Mark Gurman, *7 Ways Google's Digital Assistant is Hobbled on Apple's iPhone*, AUSTRALIAN FIN. REV. (May 19, 2017, 10:18 AM), <http://www.afr.com/technology/mobiles-and-tablets/apple/7-ways-google-digital-assistant-is-hobbled-on-apples-iphone-20170518-gw8cef>.

275. See STUCKE & GRUNES, *supra* note 40, at 295–96.

276. See *id.* at 295.

277. See Janice M. Mueller, *Patent Misuse Through the Capture of Industry Standards*, 17 BERKELEY TECH. L.J. 623, 633 (2002) (describing the anticompetitive effects of restricting digital assistant interoperability).

violations,<sup>278</sup> there has not been a mass exodus to rival search engines. Few people use multiple search engines (even though it very easy to multi-home).<sup>279</sup> When the search engine yields results that are not directly responsive to their query, most people attempt a different search query, rather than a different search engine.<sup>280</sup> If virtuous search engines, such as DuckDuckGo, have not prevented the abuses of the dominant search engine, we remain doubtful that a virtuous digital assistant (by DuckDuckGo or others) will fare any better.<sup>281</sup> If most users do not multi-home search engines, it is less likely they will train new digital assistants. Consequently, the combination of network effects, data, and the scope of the super-platform's services will likely lead one or two dominant digital assistants—either belonging to Google, Apple, Facebook, or Amazon.

## V. POSSIBLE INTERVENTION

Though this Article focuses heavily on competition, the problems we identify reach beyond antitrust and so do the possible solutions. As any solution will depend on which digital assistants become dominant, their abuses, and the state of antitrust and privacy law and enforcement. When considering possible solutions, however, one can divide the solutions into two groups: First, a case-specific ex-post approach, which is reactive by nature. Second, an ex-ante approach, which focuses on changes to the regulatory or market framework. This Part briefly explore these two approaches.

To begin, an ex-post approach may lead to intervention when the platform operating the digital assistant holds a dominant position and abuses it. To establish dominance, market power must be sustained over time. It is important to stress that any form of ex-post intervention will have to be carefully measured to avoid chilling innovation and investment. Interventions will have to balance the benefits which flow from advanced technology and artificial intelligence against the welfare risks identified above.

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278. See STUCKE & GRUNES, *supra* note 40, at 61–65.

279. Ezrachi & Stucke, *supra* note 120, at 490 n.37.

280. Amy Gesenhues, *Study: Top Reason a User Would Block a Site from a Search? Too Many Ads*, SEARCH ENGINE LAND (Apr. 15, 2013, 1:42 PM), <http://searchengineland.com/?p=155708>.

281. For a review of the possible ways in which algorithms could promote customer welfare, see Michal S. Gal & Niva Elkin-Koren, *Algorithmic Consumers*, 30 HARV. J.L. & TECH. 309 (2017).

There are several difficulties with applying an ex-post approach to evaluate abuses by digital assistants. Regulators will have to evaluate whether the incumbent can operate independent of competitors and consumers; whether network effects and switching costs shield it from competitive pressure and establish dominance; and if dominance has been established, whether that position of dominance has been abused.

One noteworthy challenge concerns the dynamic of competition in markets in which services are offered for “free.” Competition officials often adopt a price-centric approach to assess market power, namely whether the firm can charge supracompetitive prices. Rarely do they assess market power primarily in the form of non-price effects such as quality.<sup>282</sup> Another challenge concerns the weight regulators should attribute to disruptive innovation, which may suffice to ensure that the incumbents refrain from abusing their gatekeeper position.

Abuse may be established when the dominant undertaking engages in exclusionary, predatory or, in the EU, exploitative conduct.<sup>283</sup> Such strategies have attracted the European Commission’s scrutiny in the past in the area of operating systems and search engines. In *Microsoft*,<sup>284</sup> the Commission was concerned with the leveraging of market power from the operating systems when Microsoft bundled Windows Media Player<sup>285</sup> and restricted interoperability with a view towards encouraging use of only Windows PCs with Microsoft group servers, thus discouraging investment

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282. See generally STUCKE & GRUNES, *supra* note 40, at 107–26 (exploring non-price forms of market power in greater detail); Ariel Ezrachi & Maurice E. Stucke, *The Curious Case of Competition and Quality*, 3 J. ANTITRUST ENFORCEMENT 227 (2015).

283. See, e.g., *United States v. Grinnell Corp.*, 384 U.S. 563, 570–71 (1966) (holding that the offense of monopolization under Section 2 of the Sherman Act requires proof of “(1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident”); J. Thomas Rosch, Comm’r, Fed. Trade Comm’n, *Wading Into Pandora’s Box: Thoughts On Unanswered Questions Concerning The Scope And Application Of Section 2 & Some Further Observations On Section 5*, Remarks at the LECG Newport Summit on Antitrust Law & Economics 1 (Oct. 3, 2009), [https://www.ftc.gov/sites/default/files/documents/public\\_statements/wading-pandoras-box-thoughts-unanswered-questions-concerning-scope-and-application-section-2-some/091003roschlecgspeech.pdf](https://www.ftc.gov/sites/default/files/documents/public_statements/wading-pandoras-box-thoughts-unanswered-questions-concerning-scope-and-application-section-2-some/091003roschlecgspeech.pdf).

284. Commission Decision, Case 37.792—Microsoft, C(2004) 900; Case T-201/04, *Microsoft Corp. v. Comm’n*, 2007 E.C.R. II-3601 (rejecting Microsoft’s appeal of the commission’s decision).

285. Commission Decision, Case 37.792—Microsoft, C(2004) 900, ¶ 826–34; *Microsoft*, 2007 E.C.R. II-3601 ¶ 856.



in non-Microsoft group servers.<sup>286</sup> Relatedly, in its Google investigation, the Commission raised concerns as to search degradation by Google and possible leveraging of market power.<sup>287</sup> In the case of digital helpers, of concern may be the super-platform's ability to favor its own services downstream and push out "as efficient" service providers (exclusionary abuse), or the ability to engage in price discrimination and extracting welfare from users (exploitative abuse). Intervention in such cases will bring the abuse to an end, and may include measure aimed at insuring access to the interface and better interoperability of platforms. At the extreme, when faced with a dominant platform which downgrades interoperability of others, one could consider forced access to the dominant firm's APIs.<sup>288</sup>

But the *ex post* approach has its shortcomings. First the agencies and courts may question the market power of digital assistants and their ability to behave independently of others.

Even if customers are locked in, one may have difficulties establishing some forms of abuse. The personalization of the service may make it difficult to ascertain an objective benchmark for comparison. For example, the European Commission alleged that Google favored its own comparison shopping service over those of competitors; users—to their detriment—did "not necessarily see the most relevant results in response to queries."<sup>289</sup> Inherent in this observation are several assumptions: (i) Google's organic or natural algorithm ordinarily provides objective results that most people would find relevant, (ii) Google manipulated the rankings of its organic search engine to systematically position and prominently display its comparison shopping service in its general search results pages, irrespective of its merits, and (iii) a remedy exists, namely enabling the organic algorithm—without interference—to treat Google's own comparison

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286. Commission Decision, Case 37.792—Microsoft, C(2004) 900, ¶ 642–46; *Microsoft*, 2007 E.C.R. II-3601 ¶ 651.

287. Press Release, *supra* note 40.

288. For illustration, consider the theory of harm and remedy in Case T-201/04, *Microsoft Corp. v. Comm'n*, 2007 E.C.R. II-3601, where Microsoft was found to infringe Article 102 of the Treaty on the Functioning of the European Union because it refused to supply interoperability information to its competitors. *See also* Case C-418/01, *IMS Health GmbH & Co. OHG v. NDC Health GmbH & Co. KG*, 2004 E.C.R. I-5039; EUROPEAN COMM'N STRATEGY CENT., ENTER THE DATA ECONOMY (2017), [https://ec.europa.eu/epsc/sites/epsc/files/strategic\\_note\\_issue\\_21.pdf](https://ec.europa.eu/epsc/sites/epsc/files/strategic_note_issue_21.pdf).

289. Press Release, European Comm'n, Antitrust: Commission Takes Further Steps in Investigations Alleging Google's Comparison Shopping and Advertising-Related Practices Breach EU Rules (July 14, 2016), [http://europa.eu/rapid/press-release\\_IP-16-2532\\_en.htm](http://europa.eu/rapid/press-release_IP-16-2532_en.htm).

shopping service and those of rivals in the same way (namely no bias in favor of Google). Thus, the Commission could prove Google's intentional degradation with a ready counterfactual, namely what Google's own "organic" algorithm would have ranked as relevant, absent the manipulation.

But for a personalized search engine, tailored to each individual's particular tastes, credible counterfactuals to quality degradation may be difficult to establish. There may not be an organic algorithm. Nor is there an objective baseline for "Alexa, what's the latest on Donald Trump?" If Alexa provides a *Washington Post* story (which Amazon's CEO owns), it may be difficult to assess whether this is evidence of quality degradation. What interests conservatives may not interest liberals.<sup>290</sup> Even if the topic is of interest, the user might desire a particular viewpoint.<sup>291</sup> Thus, it will likely be harder to prove search degradation for a *personalized* digital assistant than for a *general* search engine.<sup>292</sup> As the primary interaction takes place at the personal-assistant level, the effects may be seen more as personalization (and thus a legitimate part of technological progress) than exclusionary.

Third is the political will to challenge monopolization cases. In contrast to the European Commission, the U.S. Department of Justice and Federal Trade Commission have not meaningfully prosecuted monopolistic abuses over the past few decades. The DOJ criminally prosecuted more persons in one year under the Migratory Bird Treaty Act (227 in 2012) than it has civilly and criminally prosecuted monopolies over the past 35 years (13 since 1980).<sup>293</sup> Between 2007 and 2016, the DOJ opened seventeen monopolization investigations, and brought only one case (in 2011).<sup>294</sup>

Beyond the traditional ex-post application of antitrust law, one may identify a range of instruments which could be used, ex ante, to support consumer welfare. Ex ante measures—implemented through sector investigations, agreed commitments, regulatory instruments, or consumer protection laws—may be used to require compliance with preconditions to promote privacy competition, ensure that the platform's incentives are aligned with users' interests, and prevent some of the market dynamics which could give rise to exclusionary or exploitative effects.

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290. See Bakshy et al., *supra* note 149, at 1130–31.

291. See *id.*

292. ECONOMIST, *supra* note 117.

293. STUCKE & GRUNES, *supra* note 40, at 300.

294. *Id.*; DEPT. OF JUSTICE, ANTITRUST DIVISION WORKLOAD STATISTICS FY 2007–2016 at 1, 5 (2017), <https://www.justice.gov/atr/division-operations>.

For instance, basic measures would ensure that users retain autonomy, are made aware of outside options and can switch with limited or no costs. One could require digital assistants to indicate clearly, either in a pop-up window or voice warning when their suggestions are “sponsored” or when they offer service through their own platform network while excluding others. Users may be able to opt out of personalized ads or sponsored products.<sup>295</sup> All these measures, to be effective, require short and clear communications. Often the consent in today’s click-wrap is little more than a façade.<sup>296</sup> Knowing and voluntary consent is key. When users have few, if any, viable options, consent is not real but forced.<sup>297</sup> In addition, “consent fatigue” or digital helpers managing consent forms on their users’ behalf, could lead to meaningless agreement and undermine customer empowerment.<sup>298</sup>

To allow switching between digital assistants, regulators and policymakers should encourage data mobility. One proposal in Europe is a “Personal Information Management System,” which collects and stores the user’s data:

With PIMS, users would have a personal digital deck where all their information is stored. Services (such as Facebook) would then run on this deck, giving users the ability to keep track and control the information they share and, above all, easily use that information for multiple platforms. Hence, PIMS have the potential to significantly increase transparency and portability of data and, therefore stimulate data service competition.<sup>299</sup>

With adequate safeguards one should be able to transfer the core parameters, which will enable a new digital assistant to start from a position of personalization. At the providers’ side, mobility would require access to platforms and the provision of interoperability information. Mobility may require the development of basic industry standards for key data points and will need to take into account issues of licensing and IP rights. Their development should nonetheless allow sufficient freedom for developers, to enable disruptive innovation.

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295. Transparency is key—for example, in a 2017 update, Google allowed users to opt out of personalized ads. Ryan Whitwam, *How to Disable Personalized Ads on Android*, FORBES (Mar. 31, 2017, 11:56 AM) <https://www.forbes.com/sites/ryanwhitwam/2017/03/31/how-to-disable-personalized-ads-on-android/>. This is a positive move, which ensures user control over his or her data and search environment.

296. STUCKE & GRUNES, *supra* note 40, at ch. 21.

297. *Id.* at 58–66.

298. EZRACHI & STUCKE, *supra* note 2, at 226.

299. *Id.* at 12.

## VI. CONCLUSION

In industries dominated with data-driven network effects, consumers will likely receive free digital assistants. These assistants will excel at mundane tasks—and as AI develops—they will increasingly assist users with their daily tasks. Seeing the salient, day-to-day benefits, users may trust and rely on their digital assistant. The assistant will no longer be simply making French press coffee and turning on the lights in the kids' rooms. It will be tutoring children, entertaining families, telling happy or sad stories from around the world, ordering food (and the books that it recommends), and summoning the driverless car to whisk people to work.

As consumers welcome digital assistants into their homes, they may not recognize their toll on our well-being. It is often hard to quantify long-term costs and balance these against short-term gains. Digital assistants may be helpful, no doubt. As the digital assistant increasingly controls mundane household tasks, like regulating room temperature and playing music, it will be harder to turn off. It will also be tempting to increasingly rely on the digital assistant for other activities, such as receiving news, selecting shows to watch, and identifying goods to buy. But consumers should be mindful about the power they may have on data gathering and distribution and the subsequent implications for privacy and our welfare.

Policymakers cannot assume that market forces will deliver the virtuous assistant or curb the abuses described in this Article. Market forces, given data-driven network effects, have the potential to increase entry barriers, make the strong platforms (and their digital assistants) even stronger, and weaken many independent digital assistants. These assistants would assist in consolidating economic and political power into fewer hands. Market forces, left unchecked, may yield a dominant and devious digital assistant even though the technology exists for an independent virtuous assistant. The large platform could extract even more personal data and command even higher rents to allow other corporations to reach consumers. Not only will consumer wallets be affected, but super-platforms could also manipulate political and social discourse. These privacy, economic, and political concerns will increase when the digital assistant is connected not only to television sets, but computers, smart appliances, security cameras, smartphones, and smart cars.

In sum, while it is easier to see the immediate benefits from these digital assistants, understanding the long-term risks—while harder to see—is key. No one likes a snooping digital assistant, especially one that profits at the expense of innocent consumers. As this Article has described, super-platforms and their digital assistants present unique challenges. Regulators

and legislators must take steps to minimize the risks and protect consumers interests and freedom. This is not a campaign against innovation, nor is it a call for unconstrained state intervention. Rather, we should ask for a balanced policy—one which promotes competition and innovation and most importantly, social welfare. In a nutshell, the goals for a data-driven economy should be an economy that's inclusive, protects the privacy interests of its citizens, promotes the citizenry's overall wellbeing, and also promotes a healthy democracy.

