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Digitalisation and its impact on innovation



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Digitalisation and its impact on innovation

European Commission

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Digitalisation and its impact on innovation

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Working paper

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EXECUTIVE SUMMARY

Innovation is generally seen as good. Promoting innovation especially in the digital economy is often deemed vital. Increasing the level of innovation, after all, can promote sustainable development, economic growth, prosperity, and citizens' overall welfare. So how can policy makers spur innovation in the digital economy? While there is no simple recipe, this study explores the interplay between innovation and the digital economy from the following seven angles:

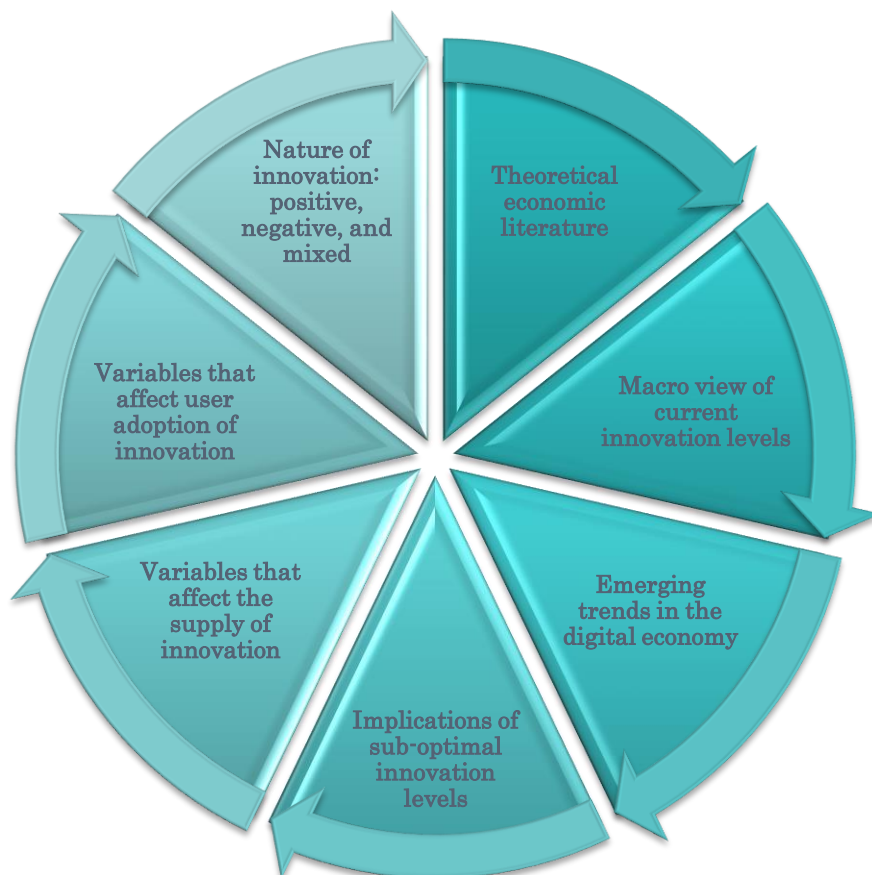


Figure 0. Seven Angles to View the Interplay between Innovation and the Digital Economy

Through the various prisms of economic theory, market data, policy, and law, the study reveals the complex links between innovation and market concentration, the key trends of, and obstacles to, innovation, and ways policy makers can promote innovation in modern digital markets.

Our first angle is a familiar one -- the theoretical economic literature on market characteristics and innovation. The general economic consensus is that by delivering technological improvements, and new products, services, and business

models, innovation forms a central pillar to efficient markets and a key to future prosperity and economic growth. Innovation processes can stimulate dynamic markets, enhance citizens' welfare, and help offset otherwise diminishing marginal returns.

The relationship between innovation and market dynamics, however, has been subjected to a range of theoretical assumptions. Under the Schumpeterian hypothesis, market concentration is understood to allow internalization of the rewards flowing from innovation efforts (increase monopoly rents). Firms innovate to escape competition. Under the Arrowian hypothesis, competitive pressure forms the key to investment in innovation, and that significant market power disincentivizes investment in further innovation. More recent scholarship notes the complex relationship between market concentration and innovation. Notable is the inverted U-shaped relationship between competition and innovation levels. Philippe Aghion and his co-authors suggest that an increase in competition (from an initial low position) increases the rate of innovation, but that high levels of competition decrease the rate of innovation. The reason for the inverted-U shape is that when there is not much competition, firms have little incentive to innovate. Increasing competition, accordingly, will increase the average innovation rate. But once competition is intense, increasing the competitive pressure further may result in a slower average innovation rate. In addition, other variables may impact the investment in innovation, including industry and company characteristics and the political/industrial dimension.

After this familiar angle, we examine how innovative are many markets today. Our second angle offers a macro view of the current level of innovation in the EU and US. It focuses on the supply of innovation – that is the extent to which companies invest in research and development of new products, systems, and processes. While the dynamism of many digital markets may suggest heavy investment in innovation, macro data give rise to concern. From high above, it appears that competition is below optimal levels in many US sectors, and to a lesser extent, in the EU. The data from this angle suggests that many markets are becoming more concentrated and less competitive. Profit margins are widening, with a few firms reaping a significant share. Innovation levels also appear sub-optimal. The reduction in competition in the US, one recent economic paper points out, also coincides with a decrease in labor's share of profits, a slowdown in output and GDP, a decrease in the startup rate of new firms, due to higher barriers erected by incumbents, and an increase in wage inequality.

One noteworthy study is the OECD Digital Economy Outlook 2017. The OECD acknowledges information and communication technologies as enablers of innovation but notes emerging signs that business dynamism and entrepreneurialism are falling short of their potential. The OECD further notes that while small start-ups are better placed to seize new opportunities offered by digital technologies, access to capital and high finance costs may undermine this potential.

Across the Atlantic, innovation also appears to be lagging behind its potential. The head of the Council of Economic Advisers under the Obama administration similarly noted a slowdown in the creation of new businesses, with top firms capturing more market shares. Of concern are signs that higher returns to capital have not been associated with an increase in investment. Businesses in markets with rising concentration and less competition are investing relatively less.

Several 2018 empirical papers also reflect these disturbing trends. There is a significant increase of markups between prices and marginal costs of publicly traded firms in developed economies. The rise in measured markups is associated with increased market power and market concentration. In line with the inverted U-shaped relationship, an IMF study finds that high markups are correlated initially with increasing and then with decreasing investment and innovation rates. This non-monotonicity is more pronounced for firms that are closer to the technological frontier. More concentrated industries also feature a more negative relation among markups, investment, and innovation.

So from our macro view, we see that increased concentration levels and less competition are generally associated with greater profit margins, but not greater investment in innovation. In fact, indicators suggest a decrease in investment, in line with an inverted U-shaped relationship.

Our third angle looks at several emerging trends in the digital economy. Among the key characteristics, noteworthy are the use of data as a key resource for innovation in the digital economy and the ongoing investment in Big Data. Data acts as a significant engine for innovation, but can also act as a barrier in inhibiting entry and growth. We observe a positive feedback loop that may help powerful firms become stronger, as the weak get weaker. Beyond data, the exponential growth of the Internet and mobile communications has seen a proliferation of platforms that often act as intermediaries and as such occupy a central junction for users and service providers. The access to data on users and suppliers places platforms in a favorable position that, at times, act as gate keepers in industries characterized by network effects. Data-driven network effects, may at times, tilt the market in favor of a single winner, which thereby is significantly protected from competitive pressure.

These trends can directly impact citizens' welfare and choices. They may facilitate control over the users' interface. Moreover, they may enable providers to affect the use of, and access to, competing services, increase friction in switching to alternatives, reduce awareness of outside options, and promote the platform's own services. Through the use of personal data and advanced algorithms, platforms and their suppliers may control to a greater extent the digital paths seen and used.

So, what is the price we might pay if a dominant platform suppresses some types of innovation? Our fourth angle examines the implications of sub-optimal

innovation levels. At least two perspectives emerge. The first, being narrow, acknowledges that many markets today may not be as innovative as their current potential, but views this as a transitory state. Policy decisions today can be used to affect future levels of investment in innovation and help optimize markets for innovation. The second, wider perspective, offers an evolutionary view. The level and nature of innovation, being path dependent, may not necessarily return to their natural state. Under this evolutionary perspective, current impediments to innovation can affect not only future levels of innovation but also the types of innovation. Basically, some types of innovation may be lost forever. As a result, today's policy decisions affect not only future levels of investment, but also the paths for innovation and the nature of innovation. This view puts greater responsibility on policy makers to preserve competitive portals, which can have a crucial role to play in the shaping of tomorrow's innovation.

Given these potential stakes, what can policy makers do to promote innovation in the digital economy? We offer policy makers three key perspectives – the supply of innovation, the demand for innovation, and the nature of innovation.

Our fifth angle assesses the variables that affect the supply of innovation. The supply of innovation, as we synthesize from the literature, will likely depend on four key variables: market contestability (markets need to remain contestable for innovation to flourish), appropriability (the extent to which a firm can capture the value created by its innovation and protect the competitive advantage associated with it will increase the incentive to innovate), synergies (for instance, the combination of complementary assets necessary to engage in R&D will enhance the ability to innovate), and the nature of innovation.

From this angle we can see the complex relationship between market structure, and the levels and nature of innovation. No optimal ratio exists among these variables to increase the supply of innovation. Some degree of market power, at times in some industries, serves as an incentive that stimulates innovation (appropriability). But while greater concentration might result from a firm's welfare-enhancing innovation, one cannot say that increasing market concentration, by itself, will necessarily spur welfare-enhancing innovation. As we also see, innovation can continue to occur in heavily concentrated markets, but the nature of innovation might change. For example, open systems, relying on user-driven innovations, might slowly close after a few firms dominate the industry. Users, rather than develop and modify products and services for their own use, rely instead on the dominant firm's innovations. Finally, the primary beneficiaries from the innovation might change. Innovation may simply reinforce the dominant platform's power and user lock-in.

After viewing how these key variables can affect the supply of innovation, we switch perspectives to explore the demand for innovation. Using five stages in the users "innovation-adoption process," we identify how large platforms can influence the demand for, and rate of adoption of, different kinds of innovation.

Adoption of several key technologies in the past took decades. The good news is that with dominant platforms, the adoption rate for some technologies can be shortened to years, if not months. But just as powerful platforms can help users through the five stages in deciding to adopt an innovation, they can increase barriers in one or more of these stages, thereby impeding the technology's adoption. Tactics used to thwart an innovation's adoption may include limiting the potential user's exposure to competing technologies, the use of defaults to take advantage of status quo bias, or the use of data-advantages to reduce users' likelihood of adopting competing products or technologies. Among our examples is how Google and Apple successfully thwarted for years ad blocking technology for smartphones.

The insights from this sixth angle illustrate how a powerful gatekeeper can influence users' adoption of innovations. As a result, one should not solely focus on contestability, appropriability, and synergies that affect the supply of innovation. Policy makers must also consider the pathway of innovation from the angle of user adoption of that technology. Dominant firms can reduce the demand for, and adoption of, technologies, even when markets are contestable, synergies exist with other innovative products, and the dominant platform does not seek to appropriate any gains from that technology.

We often assume increasing innovation levels improves our collective well-being. But does it? Our seventh angle looks beyond the veneer of innovation. From this vantage point, we consider how characteristics of the digital economy may impact the nature of innovation. Because dominant platforms can promote some innovations, while thwarting other innovations that threaten their dominance or business model, one might ask whether innovations are always good? Does increasing the level of innovation necessarily increase overall welfare? Not always.

In examining the nature of innovation, we describe three categories of innovation: positive, negative, and mixed. We explore several examples of this negative innovation. Firms employ these innovations to maintain or obtain monopoly power without benefitting consumers. At times, they use this negative innovation to transfer wealth from consumers to themselves, or to exclude competitors. From this angle, we consider how changes in market characteristics may impact the nature of innovation and the possibility of it being exploitative, exclusionary, or cannibalistic.

Several key takeaways emerge from this perspective. First, the nature of innovation may take a path that runs against societal goals and benefits a few at the expense of many. Second, increasing the overall level of innovation will not necessarily increase overall welfare. Third, while policy makers generally do not want to chill the incentives to innovate, some types of innovation should be chilled. Fourth, policy makers cannot assume that market forces or regulators will generally deter negative innovation. Some types of negative innovation may be

beyond the scope of antitrust, privacy, or consumer protection law. Even when they aren't, enforcers may be overly deferential to the claimed innovation. Finally, developing the tools to determine when innovation is positive, negative, or mixed, what conditions foster the myriad forms of negative innovation, and implementing policies to deter negative innovation will be critical.

Thus, the goal for policy makers is to not simply increase the overall level of innovation, as that will not necessarily increase overall welfare. Ideally, the regulatory framework would reduce firms' incentive/payoffs to engage in negative innovation, while promoting (or at least not chilling) their incentive to invest in innovations that generally promote overall welfare. So what is the recipe to achieve this balance?

We would caution policy makers about anyone peddling a simple recipe. In our final part, we review several of the available policy instruments used to facilitate innovation. Inevitably, the level, nature, and direction of innovation may be influenced by a variety of regulatory policies, including in the digital economy, privacy, consumer protection, competition and state aid, education, taxation, intellectual property, access to capital, and property law. Thus, boosting positive innovation requires a comprehensive policy approach.

With these challenges in mind, we explore the benefits and limitations of several available policy and enforcement measures. We consider it preferable to focus future intervention on ex-ante measures – aimed at creating a regulatory and economic landscape, which helps open the competitive portals for positive and welfare-enhancing mixed innovation. Even then, one should be aware that any form of intervention might influence the identity of the winners and losers of tomorrow. Ex-post, case-by-case intervention should be limited primarily to instances when actions by companies are clearly in breach of existing legal regimes such as competition, privacy, consumer protection, or intellectual property laws.

Whenever reaching into the tool box, policy makers should assess the challenges and risks associated with intervention or the lack of it. It therefore underscores the need for a measured and careful approach. On one hand, excessive intervention comes at a cost and could chill innovation, hinder disruptive positive innovation, undermine investment, increase the burden on smaller operators, and determine the likely winners and losers. On the other hand, non-intervention should not be seen as benign, as it too reflects a policy decision on the likely winners and losers under the status quo, and may be detrimental to welfare-enhancing innovation. The goal is to optimize the preconditions for welfare-enhancing innovation, while accounting for the legal, business, technological, and market environments.

Ultimately, there is no easily available recipe for policy makers on how to promote the good forms of innovation, while deterring the bad. Indeed, one key

takeaway from this paper is that such a recipe is illusive, and would likely need to be continuously updated. In a rapidly evolving environment, the task is far from simple. Nonetheless, the seven angles outlined herein can help policy makers refine their tools to promote welfare-enhancing innovations. But in this pursuit, it is worth reminding ourselves that innovation, like competition, is not an end to itself. It is simply one of many means to promote overall well-being. Citizens may sacrifice innovation, at times, to further other, more important, values, including privacy and autonomy, necessary for our well-being.

1 Introduction

This study sets to explore the interplay between innovation and the digital economy. The study examines the way in which digitalisation processes in communication and IT infrastructure (hardware and software), platforms, e-commerce, digital content, and digital solutions may affect the scope and nature of innovation, including research and development. Taking note of the complex links between innovation and market concentration, the study seeks to evaluate key trends of, and obstacles to, welfare-enhancing innovation and reflect on possible means to enhance and incentivize it in data-driven markets.

Innovation in the digital economy can support inclusive growth and development in Europe, and in doing so support the overarching goals of the Union, which include the promotion of “the well-being of its peoples,”¹ and “the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress.”² Safeguarding and promoting welfare-enhancing innovation are therefore key to the Union’s prosperity and its citizens’ welfare. In a similar vein, so is the creation of an environment hospitable to entrepreneurial activity, investment, and innovation.

While there is general consensus that dynamic efficiencies are important in promoting economic growth, there has been significant divergence on how to spur innovation. Limited rivalry in increasingly concentrated markets was one concern. But admittedly the data on innovation levels, and the link between concentration and innovation, were inconclusive. With respect to the level of innovation, the link between market structure and innovation has been subjected to inconsistent approaches.

There have also been blind spots in the literature. As for the nature of innovation, the assumption is that increasing the level of innovation will promote an inclusive economy and overall wellbeing. The social costs of externalities, which have drawn far less attention, call for greater refinement in our design of the innovation landscape.

¹ Art 3(1) Consolidated Version of the Treaty on European Union [2012] OJ C 326/13 [hereinafter “the TEU”].

² Ibid.

This Paper's contribution to the literature and policy makers is its providing seven angles to assess pathways to innovation in the digital economy.

Our first angle in **Part 2** is the theoretical economic literature on market characteristics and innovation. After examining the theoretical literature, we inquire *just how innovative are many markets today?* **Part 3** provides a macro view of the current level of innovation in many markets. Having outlined the theory and considered the current level of innovation, **Part 4** identifies several key characteristics in the digital sector, to provide a more granular reflection of the drivers and obstacles to innovation. With the picture that emerges in mind, **Part 5** then considers two potential policy implications: first, a narrow implication, which acknowledges that many markets today may not be as innovative as their current potential, but views this as a transitory state. The second, wider perspective, offers an evolutionary reading, according to which the level and nature of innovation, being path dependent, would not return to their original state. Under this perspective, policy makers should have even greater concern. Today's abuses by dominant firms, under this perspective, can deprive future generations of innovations.

So how do we get innovators to innovate? **Part 6** assesses the variables that affect the *supply of innovation*. **Part 7** provides another dimension with an analytical framework that explores the *demand for innovation*. **Part 8** offers the final angle, which supplements the discussion of supply and demand for innovation, in considering how characteristics of the digital economy may impact the *nature of innovation*. **Part 9** highlights some of the challenges in developing policies that promote positive innovation, while deterring negative innovation. We conclude with reflections for policy makers on the possible trade-offs among innovation, digitalisation, and our welfare.

2 Theoretical Framework – Schumpeterian and Arrowian Views

The relationship between innovation and market dynamics has been subjected to a range of theoretical assumptions.

Notable is the *Schumpeterian hypothesis*, according to which market concentration is understood to allow internalization of the rewards flowing from innovation efforts (increase monopoly rents).³ It therefore supports “creative destruction” – that is, the dynamic process in which new technologies replace the old. This hypothesis has been often viewed as establishing a negative correlation between competition and innovation. Others read into the hypothesis a more restrictive assumption that “a degree of market power is the necessary reward for innovation, rather than its cause.”⁴ In line with this hypothesis, it has been argued, that market power in digital

³ JOSEPH SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY* (Harper & Brothers 1942). Accordingly, market concentration, economies of scale in research and development, and superior risk-management facilitate innovation.

⁴ Giulo Federico, *Horizontal Mergers, Innovation and the Competitive Process*, 8 *JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE* 668–677 (2017), <https://doi.org/10.1093/jeclap/lpx071>. The US Supreme

environment may be transitory in nature and therefore does not affect the incentives to innovate. According to this view, disruptive innovation, reversible network effects, new technologies, and the threat of displacement create constant pressure on leading platforms and providers, and thus ensure continued investment in innovation.⁵ Furthermore, across industries, competition and conglomerate expansion maintain an ongoing competitive pressure and investment in innovation.⁶

Also notable is the *Arrowian hypothesis*, which suggests that competitive pressure forms the key to investment in innovation, and that significant market power disincentivizes investment in further innovation.⁷ Accordingly, competition is viewed as a necessary pressure since a monopoly would likely under-invest in new technologies (or only invest when it generates additional profits).

The empirical economic literature reveals a complex reality with varying results.⁸ Of particular significance is the *inverted U-shaped relationship*, which suggests that an increase in competition (from an initial low position) increases the rate of innovation, but high levels of competition decrease the rate of innovation. As suggested by Aghion et al., competition may increase the incremental profit from innovating (the “escape-competition effect”) but may also reduce innovation incentives for laggards (the “Schumpeterian effect”):⁹

Court, for example, surmised that monopoly prices “is an important element of the free-market system. The opportunity to charge monopoly prices—at least for a short period—is what attracts ‘business acumen’ in the first place; it induces risk taking that produces innovation and economic growth.” *Verizon Commc'ns Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407, 124 S. Ct. 872, 879, 157 L. Ed. 2d 823 (2004).

⁵ David S. Evans, *Why the Dynamics of Competition for Online Platforms Leads to Sleepless Nights But Not Sleepy Monopolies* (25 July 2017), <https://ssrn.com/abstract=3009438> or <http://dx.doi.org/10.2139/ssrn.3009438>.

⁶ Nicolas Petit, *Technology Giants, the Mologopoly Hypothesis [sic] and Holistic Competition: A Primer* (20 October 2016), <https://ssrn.com/abstract=2856502> or <http://dx.doi.org/10.2139/ssrn.2856502>.

⁷ Kenneth. J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in R. Nelson, *THE RATE AND DIRECTION OF INVENTIVE ACTIVITIES: ECONOMIC AND SOCIAL FACTORS* (Princeton University Press 1982).

⁸ See, for example, Anna A. Bykova, *The Impact of Industry's Concentration on Innovation: Evidence from Russia*, 11 *JOURNAL OF CORPORATE FINANCE RESEARCH* 37 (2017); Frank Crowley & Declan Jordan, *Does More Competition Increase Business-Level Innovation? Evidence from Domestically Focused Firms in Emerging Economies*, 26 *ECONOMICS OF INNOVATION AND NEW TECHNOLOGY* 477-488 (2017); George R.G. Clarke, *Competition Policy and Innovation in Developing Countries: Empirical Evidence*, 3 *INTERNATIONAL JOURNAL OF ECONOMICS AND FINANCE* 38-49 (2011); Richard Blundell, Rachel Griffith, & John Van Reenen, *Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms*, 66 *REVIEW OF ECONOMIC STUDIES* 529-54 (1999).

⁹ Philippe Aghion, Nick Bloom, Richard Blundell, Rachel Griffith & Peter Howitt, *Competition and Innovation: an Inverted-U Relationship*, 120 *QUARTERLY JOURNAL OF ECONOMICS* 720, 701-28 (2005); see also Philippe Aghion, Ufuk Akcigit & Peter Howitt, *The Schumpeterian Growth Paradigm*, 7 *ANNUAL REVIEW OF ECONOMICS* 557-75 (2015); Philippe Aghion, Matias Braun & Johannes Fedderke, *Competition and Productivity Growth in South Africa*, 16 *ECONOMICS OF TRANSITION* 741-68 (2008); and more generally, see Morton I. Kamien & Nancy L. Schwartz, *On the Degree of Rivalry for Maximum Innovative Activity*, 90 *Q. J. ECON.* 245-60 (1976).

[P]roduct market competition should foster innovation in neck-and-neck sectors where firms operate at the same technological level: in such sectors, increased product market competition reduces pre-innovation rents, thereby increasing the incremental profits from innovating and becoming a leader. This is known as the ‘escape-competition effect’. On the other hand, these models predict a negative ‘Schumpeterian effect’ on laggard firms in unleveled sectors: increased competition reduces the post-innovation rents of laggard firms and thus their incentive to catch up with the leader. However, this effect is (partly) counteracted by an ‘anticipated escape-competition effect’ once the laggard has caught up with the current leader in the sector. The escape-competition and Schumpeterian effects, together with the fact that the equilibrium fraction of neck-and-neck sectors depends positively on the laggards’ innovation incentives in unleveled sectors and negatively on neck-and-neck firms’ innovation incentives in leveled sectors, imply that the equilibrium fraction of sectors where firms are neck and neck should decrease with competition: this is the ‘composition effect’ of competition.¹⁰

Further complicating the relationship between innovation and market structure are contextual characteristics unique to different industries.¹¹ Naturally, different sectors may exhibit varying levels and intensities of investment in research and development, and different levels of protection to innovation and the degree of reward sharing.¹² Further, within sectors, one may observe asymmetries between firms in their scope of activity (national or international), cost levels, and commitment to innovation.¹³ Uncertainty as to the outcome of innovation also plays a central role in affecting the zeal with which companies approach the strategic decision to invest in new technology. Lastly, a political/industrial dimension should be acknowledged, as heterogeneous economic developments, regulatory frameworks, and availability of capital markets affect investment in innovation.

3 Current Levels of Competition and Innovation

So just how innovative are digital markets today? Innovation today can appear, at least initially, robust. The digital landscape is characterized by an on-going flurry of start-ups, adoption of new technologies, and the rise and fall of market players. Search engines, social networking, and communications and shopping platforms are some visible examples. These processes in some markets have helped increase

¹⁰ Philippe Aghion, Stefan Bechtold, Lea Cassar, & Holger Herz, *The Causal Effects of Competition on Innovation: Experimental Evidence*, Working Paper 19987 (2014), <http://www.nber.org/papers/w19987>.

¹¹ Spencer Weber Waller & Matthew Sag, *Promoting Innovation*, 100 IOWA L. REV. 2223, 2226 (2015).

¹² Raymond De Bondt & Jan Vandekerckhove, *Reflections on the Relation Between Competition and Innovation*, 12 JOURNAL OF INDUSTRY COMPETITION AND TRADE 7-19 (2010), <https://doi.org/10.1007/s10842-010-0084-z>.

¹³ See, for example, Jan Boone, *Intensity of Competition and the Incentive to Innovate*, 19 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION 705-726 (2001), [https://doi.org/10.1016/S0167-7187\(00\)00090-4](https://doi.org/10.1016/S0167-7187(00)00090-4).

choice and market transparency, improve access to markets, reduce search costs, and lower prices. Digital innovation in some markets has had a positive transformative effect, providing new channels for expansion and entry, and stimulated competition, economic growth, and employment.¹⁴ Some areas of the digital economy display dynamic tendencies with rapid growth that cannot easily be matched in the brick-and-mortar world. The online infrastructure and its scalability help remove some of the more traditional constraints and market barriers and resulted in notable dynamism.¹⁵

Studies and reports on the supply of innovation review the level of market competition, dynamism, and investment in research and development. Illustrative is a 2017 Report by the UK Department for Business, Innovation and Skills on “Dynamic Competition in Online Platforms.”¹⁶ The Report finds that “network effects which might otherwise act as a barrier to entry, encourage dynamic competition.” It notes the “frequent entry with new platforms which materially affect the market share of incumbent platforms, e.g. Spotify and other streaming services in the music sector, TripAdvisor and Airbnb and other Sharing Economy services in the accommodation sector; comparethemarket.com and GoCompare in the car insurance price comparison sector; and first Facebook, then Twitter, Instagram and Pinterest, among others, in the social network sector.” While concentration may increase over time in each sector, cross-industry competition from other sectors often intensifies. For instance, the market for search engines may be heavily concentrated, yet subjected to competitive pressures from other platforms such as social networks.

While anecdotal in nature, these signs would be encouraging. Importantly, however, three caveats should be noted when considering anecdotal reviews of market dynamics. *First*, one must distinguish between entrants and successful entrants, which can grow post-entry. *Second*, one should be mindful of consolidation post-entry. That is, the fate of those successful entrants and their ability to operate independently in the market. Note, for example, the landscape for instant messaging following Facebook’s acquisition of WhatsApp and Instagram, and the way such consolidation has affected data aggregation and entry barriers. *Third*, one should be mindful of brand proliferation by a single holding group. For example, the online travel industry seemingly displays many companies offering many services. Yet, the industry is dominated by two leading groups: [1] Booking Holdings, which as the world’s leading provider of online travel and related services, controls six brands:

¹⁴ Leonid Kogan, Dimitris Papanikolaou, Amit Seru, & Noah Stoffman, *Technological Innovation, Resource Allocation, and Growth*, 132 QUARTERLY JOURNAL OF ECONOMICS 665–712 (2017), <https://doi.org/10.1093/qje/qjw040>; Bronwyn H. Hall, *Innovation and Productivity*, NBER WPR 17178 (2011).

¹⁵ U.K. House of Lords, Paper 129, 10th Report of Session 2015–16, *Online Platforms and the Digital Single Market at 25* (April 20, 2016), <https://publications.parliament.uk/pa/ld201516/ldselect/ldcom/129/12902.htm>.

¹⁶ Andrew Lilico & Matthew Sinclair, *Dynamic Competition in Online Platforms - Evidence from Five Case Study Markets* (March 2017), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/602816/Digital_Platforms_report_new_BEIS.pdf.

Booking.com, Priceline, Agoda, KAYAK, Rentalcars.com, and OpenTable¹⁷; and [2] the Expedia group, which includes, Expedia.com, Hotels.com, Hotwire.com, CarRentals.com, Trivago, Venere.com, Travelocity, Orbitz, CheapTickets, and HomeAway.¹⁸ Expedia is under common control with IAC, which controls other widely known online brands, such as Match, Tinder, PlentyOfFish, OkCupid, HomeAdvisor, Angie’s List, Vimeo, Dotdash, Dictionary.com, The Daily Beast, and Investopedia.¹⁹

Moving from anecdotal review of market dynamics to wider market trends and innovation, one may use several data points to estimate investment in innovation.

The OECD Digital Economy Outlook 2017²⁰ acknowledges information and communication technologies (ICTs) and investment in cloud services as enablers of innovation.²¹ The OECD emphasizes, however, that despite digital opportunities, there are emerging signs that business dynamism and entrepreneurship are falling short of their potential:

...entry rates appear to have steadily declined over the period, while churning rates and growth dispersion – more stable before the crisis – have dropped considerably since 2009, especially in non-financial business services...This decline in dynamism across countries is particularly marked in [Information and Communication Technology] -producing and [Information and Communication Technology]-using sectors. Figure 5.3 illustrates a strong decline in entry rates (number of entering units over number of entering and incumbent units) for [Information and Communication Technology]-producing manufacturing and service sectors between 2001 and 2015, with some recovery immediately before the crisis. This is

¹⁷ Booking Holdings, Fact Sheet (last visited June 27, 2018), <https://www.bookingholdings.com/about/factsheet/>.

¹⁸ Expedia, Inc. Annual Report (Form 10-K) (8 February 2018), <http://ir.expediagroup.com/static-files/efeebda9-9df8-4535-a7c9-6542d37ccb65>.

¹⁹ IAC/InterActiveCorp Annual Report (Form 10-K) (1 March 2018), <http://ir.iac.com/static-files/66a65771-ec1c-480d-8e89-64d2d312d44c>. Expedia and IAC/InterActiveCorp. are related parties since they are under common control, given that Barry Diller serves as Chairman and Senior Executive of both Expedia and IAC.

²⁰ OECD, OECD DIGITAL ECONOMY OUTLOOK 2017 (OECD Publishing Paris 2017), <http://dx.doi.org/10.1787/9789264276284-en>.

²¹ Vincenzo Spiezia, *Are ICT Users More Innovative?: An Analysis of ICT-Enabled Innovation in OECD Firms*, OECD Journal: Economic Studies, vol. 2011/1 (2011), https://doi.org/10.1787/eco_studies-2011-5kg2d2hkn6vg. The effectiveness of such investments would typically depend on complementary investments in knowledge-based capital (KBC). See OECD Digital Economy Outlook 2017, *supra* note 20. The 2017 outlook measures changes in ICT and KBC investment, in an attempt to identify innovation trends. It reports that “in 2015, ICT investment in the OECD area represented 11% of total fixed investment and 2.3% of gross domestic product (GDP). Almost 60% of ICT investment was devoted to computer software and databases.” And that “[i]n most OECD countries, investments in ICTs in the aftermath of the 2007 crisis have been more resilient than total investments. As a result, the share of ICT investment in total investment was higher in 2015 than in 2007.” (ibid at page 197). An increased investment in KBC is also noted and highlighted as an important factor which can spur growth and yield knowledge that can spill over to other parts of the economy (ibid).

mirrored in the [Information and Communication Technology]-using sectors, which also exhibit a pronounced decline in dynamism over the same period, especially when looking at manufacturing. However, the remaining sectors of the economy are characterised by a more modest decrease in entry rates, occurring mostly after the crisis.²²

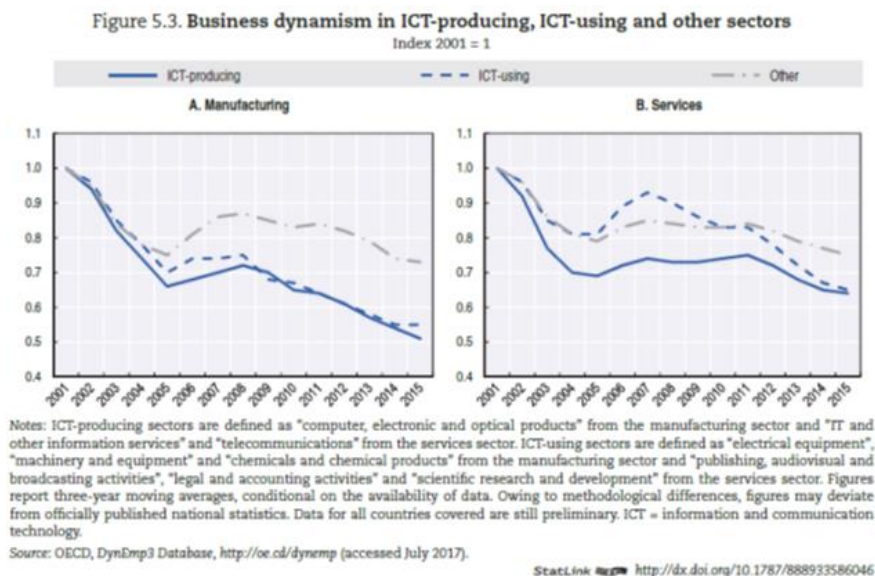


Figure 1. Source: OECD, 2017

The OECD further notes that while small start-ups are better placed to seize new opportunities offered by digital technologies, access to capital and high finance costs may undermine this potential. Innovative crowd funding and peer-to-peer loans do not provide an effective alternative. Limited capital may further undermine an entrant's ability to introduce new products, technologies, and networks. On the other hand, access to capital may allow newcomers to subsidize the switching costs and prevent inefficient lock-in.²³

Likewise, across the Atlantic, innovation appears to be lagging its potential. A US report from the head of the Council of Economic Advisers under the Obama administration noted, in 2016, a slowdown in the creation of new businesses, with top firms capturing more market share.²⁴

²² Ibid at page 199.

²³ See, for example, strategies by Uber, Alibaba and Amazon, as discussed in E. Glen Weyl & Alexander White, *Let the Best 'One' Win: Policy Lessons from the New Economics of Platforms*, University of Chicago, Institute for Law and Economics Working Paper Series Index (December 2014), https://chicagounbound.uchicago.edu/law_and_economics/719/.

²⁴ "In 1982, young firms [those five-years old or younger] accounted for about half of all firms, and one-fifth of total employment," observed Jason Furman, Chairman of the Council of Economic

A partial explanation for the decline in firm entry rates may be found in increased barriers to entry. These barriers to entry can come in the form of advantages that have accrued to incumbents over time. For example, increased economies of scale may mean that incumbents experience lower costs than new firms, making it harder for entrants to compete. Or demand-side network effects—when a product or service increases in quality the more people use it—may tip the scale in favor of a single provider. Incumbent advantages may also come in the form of successful political lobbying, in which incumbent firms have the resources to lobby for rules that protect them from new entrants.²⁵

With fewer start-ups that actually survive, one important source of innovation can diminish. Further, the report notes that US labor markets have become less fluid, with workers less likely to move between jobs, industries, occupations, and locations.²⁶ More recent enforcement activity in the US identified a number of no-poaching agreements which raise antitrust concerns and undermined employment markets.²⁷ These no-poaching agreements in hindering worker mobility can hinder *process* and *incremental* innovation, particular where competitors are clustered geographically.²⁸

Advisers. But by 2013, these figures fell “to about one-third of firms and one-tenth of total employment.” Jason Furman, Chairman, Council of Economic Advisers, *Beyond Antitrust: The Role of Competition Policy in Promoting Inclusive Growth* (September 16, 2016),

https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160916_searle_conference_competition_furman_cea.pdf; see also Jonathan B. Baker, *Market Power in the U.S.*

Economy Today (March 2017), <http://equitablegrowth.org/research-analysis/market-power-in-the-u-s-economy-today/>.

²⁵ Furman, *supra* note 24.

²⁶ *Ibid.*

²⁷ For example, the US Department of Justice in 2018 found that Knorr-Bremse AG and Westinghouse Air Brake Technologies Corporation (Wabtec), two of the world’s largest rail equipment suppliers, had for years maintained unlawful agreements not to compete for each other’s employees. US Dep’t of Justice, *Press Release: Justice Department Requires Knorr and Wabtec to Terminate Unlawful Agreements Not to Compete for Employees* (April 3, 2018), <https://www.justice.gov/opa/pr/justice-department-requires-knorr-and-wabtec-terminate-unlawful-agreements-not-compete>.

²⁸ Tracy R. Lewis & Dennis A. Yao, *Innovation, Knowledge Flow and Worker Mobility* (May 2006), <http://www.people.hbs.edu/dyao/LewisYaoMobility.pdf>:

Facilitation of employee mobility increases dissemination of knowledge which feeds innovation and economic growth. Many of the factors that increase mobility such as efficient placement markets and better matching are the felicitous results of geographic concentration of firms. Other factors such as a relative worker shortage and a shorter product life cycle are characteristics of rapidly growing industries.” The authors’ analysis suggests an explanation for why particular industrial structures and geographic clusters are self-reinforcing and it provides a general lens through which to see how labor markets, innovation, and industrial clusters interact.

Another disturbing sign in the US is how the share of income going to capital has risen, and the share of income going to labor has fallen.²⁹ Also relevant to the innovation debate is the rise in the rate of return on capital relative to the safe rate of return and possible reduction in business investment. The Chairman of the Council of Economic Advisers observed:³⁰

Since the 1980s, the safe rate of return, as measured by real interest rates on government bonds, has fallen steadily. However, the rate of return on capital—both all private capital and nonfinancial corporate capital—has held steady or even increased over the same period, mirroring, at least in the last decade and a half, the share of income going to capital instead of to labor.³¹

Contrary to what economic theory would predict, the higher returns to capital have not been associated with an increase in business investment. In fact, business investment has been particularly weak in recent years. Some of most recent weakness likely represents temporary adjustments to

²⁹ Furman, *supra* note 24. One study presented a “superstar firm” model for the labor share change. David Autor, David Dorn, Lawrence F. Katz, Christina Patterson, John Van Reenen, *The Fall of the Labor Share and the Rise of Superstar Firms*, NBER Working Paper (May 1, 2017), <http://www.nber.org/papers/w23396>. Their model is “based on the idea that industries are increasingly characterized by a ‘winner take most’ feature where a small number of firms gain a very large share of the market.” The study hypothesizes that:

markets have changed such that firms with superior quality, lower costs, or greater innovation reap disproportionate rewards relative to prior eras. Since these superstar firms have higher profit levels, they also tend to have a lower share of labor in sales and value-added. As superstar firms gain market share across a wide range of sectors, the aggregate share of labor falls. Our model, combined with technological or institutional changes advantaging the most productive firms in many industries, yields predictions that are supported by Census micro-data across the bulk of the U.S. private sector. First, sales concentration levels rise across large swathes of industries. Second, those industries where concentration rises the most have the sharpest falls in the labor share. Third, the fall in the labor share has an important reallocation component between firms—the unweighted mean of labor share has not fallen much. Fourth, this between-firm reallocation of the labor share is greatest in the sectors that are concentrating the most. Fifth, these broad patterns are observed not only in U.S. data, but also internationally in European OECD countries. Notably, the growth of concentration is disproportionately apparent in industries experiencing faster technical change as measured by the growth of patent-intensity or total factor productivity, suggesting that technological dynamism, rather than simply anti-competitive forces, is an important driver of this trend.

But the study’s authors acknowledge that their findings could be consistent with another story, namely “firms initially gain high market shares by legitimately competing on the merits of their innovations or superior efficiency. Once they have gained a commanding position, however, they use their market power to erect various barriers to entry to protect their position.”

³⁰ Furman, *supra* note 24.

³¹ *Ibid.*

transitory factors, like low oil prices, but nonresidential fixed investment as a share of overall GDP has shown a downward trend since the 1980s.³²

According to the report, despite the higher returns to capital, businesses in markets with rising concentration and less competition are investing relatively less. Several economic studies have identified the correlation among increased dominance, increased profits, and decreased competition,³³ and the hypothesis that large corporations invest less in research and development has been shared by others.³⁴ The wide margins, and the absence of innovative challenges by new entrants that would cause those margins to erode, are another worrying sign.³⁵ It may suggest relative erosion in investment in future innovation and prosperity.

This investment gap, another recent economic study found, is driven by industry leaders who have higher profit margins, but lower investment and lower capital.³⁶

³² Ibid.

³³ One study, for example, showed that the increase in concentration levels has implications for firm performance, as concentration levels affect profitability, innovation, and returns to investors:

First, the increase in industry concentration levels is associated with remaining firms generating higher profits through higher profit margins. The results indicate that the increase in profit margin is due to increased market power, rather than simply an increased efficiency because of changes in economies of scale. Second, mergers in industries that become more concentrated enjoy more positive market reactions, consistent with the idea that market power considerations are becoming a key source of value during these corporate events. Finally, firms in industries that become more concentrated experience significant abnormal stock returns, suggesting that considerable portion of the gains accrues to shareholders. In general, our findings suggest that despite popular beliefs, competition may be weakening over time.

Gustavo Grullon, Yelena Larkin & Roni Michaely, *Are US Industries Becoming More Concentrated?* (October 2016), https://finance.eller.arizona.edu/sites/finance/files/grullon_11.4.16.pdf.

³⁴ William Lazonick, *Profits Without Prosperity*, HARVARD BUSINESS REVIEW (September 2014), <https://hbr.org/2014/09/profits-without-prosperity>; Alexandra Scaggs, *On Juggernaut Companies and Profit Margins*, FINANCIAL TIMES (July 25, 2017), <https://ftalphaville.ft.com/2017/07/25/2191784/on-juggernaut-companies-and-profit-margins/>.

Note the reference in that article to the Goldman Sachs Global Investment research report which establishes that correlation.

³⁵ Nancy LeTourneau, *Goldman Sachs CEO Questions Sanders While His Analysts are Prepared to Question Capitalism*, WASHINGTON MONTHLY (February 4, 2016), <https://washingtonmonthly.com/2016/02/04/goldman-sachs-ceo-questions-sanders-while-his-analysts-are-prepared-to-question-capitalism/>; Nicole Dieker, *Goldman Sachs Wonders if It's Time to Question "The Efficacy of Capitalism"*, THE BILLFOLD (February 5, 2016), <https://www.thebillfold.com/2016/02/goldman-sachs-wonders-if-its-time-to-question-the-efficacy-of-capitalism/>.

³⁶ Germán Gutiérrez & Thomas Philippon, *Declining Competition and Investment in the U.S.*, NBER Working Paper No. 23583 (July 2017), <https://www.nber.org/papers/w23583>. The paper used a mixture of firm- and industry-level data to test the implications of higher US and foreign competition on both leader and industry investment. To test the idea that firms that do not face the threat of entry have less incentive to invest and innovate, the study used Chinese import exposure. Industries "most affected by Chinese competition saw a decline in the number of domestic firms, but at the same time, leaders in these industries increased investment the most."

The study noted several facts. One was the broad increase in concentration across most US industries. Second was how corporate investment was unexpectedly weak in recent years across advanced economies, including the US and Europe. The study found that “declining competition is (partly) responsible for the low rate of investment in the U.S.”

A 2018 working paper published by the National Bureau of Economic Research provides support to the observation of increases in overall market power.³⁷ The study, which examines the financial statements of over 70,000 firms in 134 countries, identifies a steady rise in markups (i.e., the ratio of the price to the marginal cost of production): “Globally, since 1980 there has been a steady rise from a markup of around 1.1 to a markup of 1.6 in 2016... steady rise in the first two decades (1980s and 1990s), and the virtually flat evolution in 2000s. In the last few years, there has again been a sharp increase.”³⁸ The study, in using a cost-based method, rather than a demand driven approach, avoids controversial assumptions as to market definition or competitive behavior. Figure 2, illustrates the global rise in markups, and the rise in Europe and the United States, over the period 1980-2016. It generally reflects a steady rise in the 1980s and 1990s, limited evolution in the beginning of the century and a sharp increase in recent years.

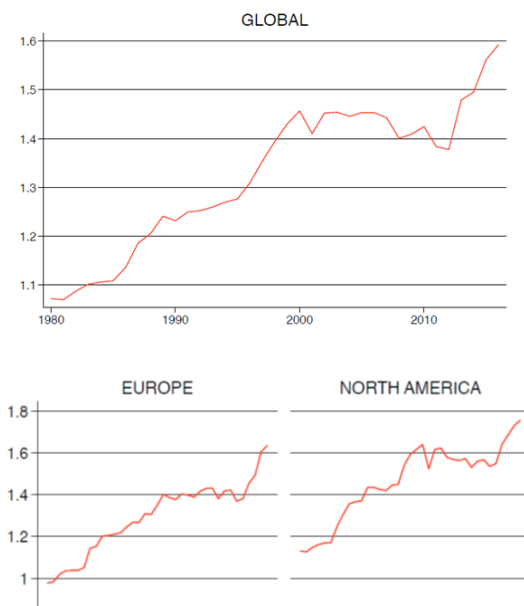


Figure 2. Rise in markups, 1980-2016. Source: NBER Study³⁹

Firms “in industries with higher excess entry in the 1990’s invested more in the 2000’s, after controlling for firm fundamentals.”

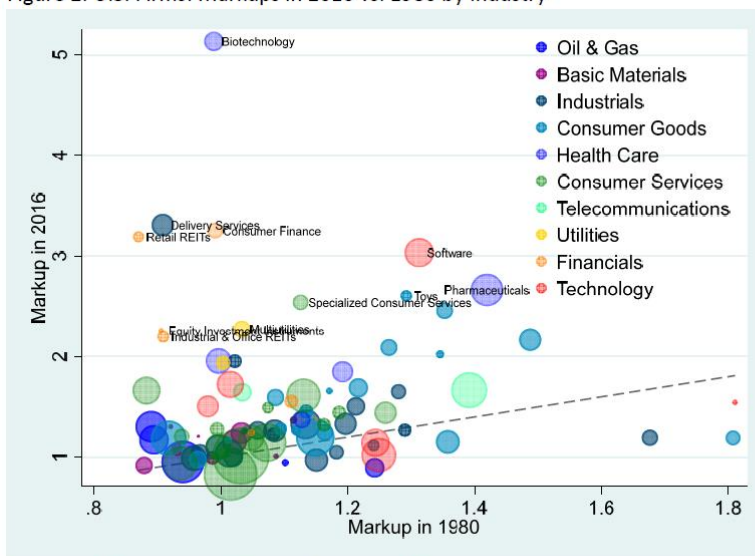
³⁷ Jan De Loecker & Jan Eeckhout, *Global Market Power*, NBER Working Paper 24768 (June 2018), <http://www.nber.org/papers/w24768>.

³⁸ Ibid, page 5.

³⁹ Ibid, pages 4, 6.

A 2018 IMF working paper, *Global Market Power and its Macroeconomic Implications*, provides further context and considers the effects on innovation.⁴⁰ The study analyses data of companies from various sectors in 74 countries, and considers the link among market concentration, corporate profits, and investment in innovation. Similarly to De Loecker & Eeckhout’s 2018 study, the IMF working paper unveils a significant increase of markups between prices and marginal costs of publicly traded firms in developed economies.

Figure 2. U.S. Firms: Markups in 2016 vs. 1980 by Industry



Note: Dashed line indicates 45-degree line along which markups are equal over time. Size of markers based on sales in 2016. Color of marker indicates ICB industry to which sub-sector belongs.

Figure 3. Source: IMF Study

According to the study, the rise in measured markups is associated with increased market power and market concentration. Furthermore, using capital expenditure and R&D spending data of US firms, the study found high markups are

correlated initially with increasing and then with decreasing investment and innovation rates. This non-monotonicity is more pronounced for firms that are closer to the technological frontier. More concentrated industries also feature a more negative relation between markups and investment and innovation.⁴¹

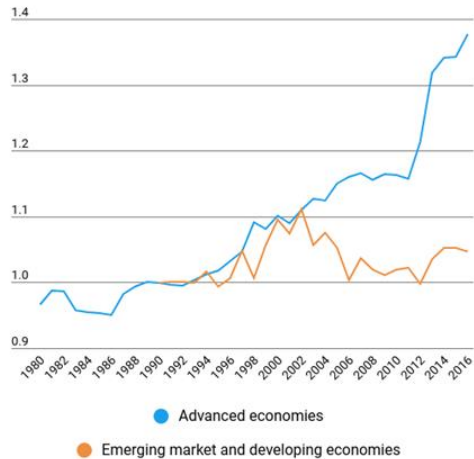
⁴⁰ Federico J. Díez, Daniel Leigh & Suchanan Tambunlertchai, *Global Market Power and its Macroeconomic Implications*, IMF Working Paper WP/18/137 (June 2018), <https://www.imf.org/en/Publications/WP/Issues/2018/06/15/Global-Market-Power-and-its-Macroeconomic-Implications-45975> [hereinafter IMF Study].

⁴¹ Ibid.

Market power

Markups in advanced economies have been rising since the 1980s.

(average markups of listed firms in each country income group, index 1990 = 1)



Source: Díez, Leigh, and Tambunlertchai, forthcoming, "Global Market Power and its Macroeconomic Implications," IMF Working Paper.
Note: Figure based on data for 33 advanced economies and 41 emerging market and developing economies.



Figure 4. Source: IMF Study

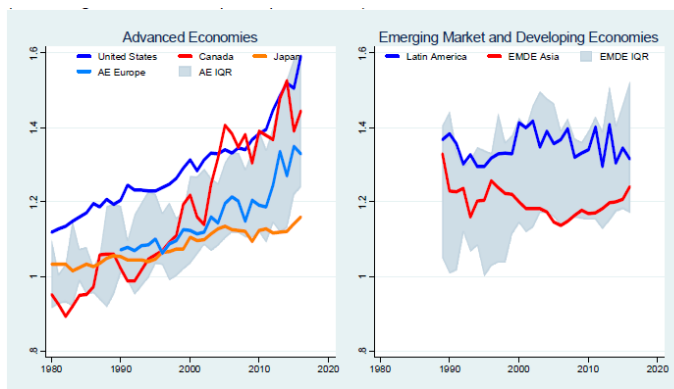
The data supports the inverted U-shaped relationship, discussed in Part 2. Namely, “firms have lower incentives to invest in innovation as their market position strengthens” and “as markets become more concentrated, higher markups are associated with lower investment.”⁴²

The study notes markups of firms in advanced economies increased by an average of 35 percent during 1980–2016.⁴³ The US leads the group with a 42 percent increase in markups, with markups increasing across all major industries, during this period.⁴⁴ The increase has been driven by a small number of leading firms that extract especially high markups. Markups in Europe mainly increased since 2000.

⁴² Ibid at page 13.

⁴³ A 2017 study also found using firm-level data on the accounts of publicly traded firms in the US starting in 1950, “that markups have been relatively constant between 1950 and 1980 at around 20% above marginal cost,” but from 1980 onwards, there has been marked change in this pattern with markups steadily rising from 18% to nearly 67% in 2014, a three and a half fold increase.” Jan De Loecker & Jan Eeckhout, *The Rise of Market Power and the Macroeconomic Implications*, NBER Working Paper No. 23687 (2017), <http://www.nber.org/papers/w23687>. Over a thirty-five year period, “that is an increase in the price level relative to cost of 1% per year.” Ibid.

⁴⁴ The sales of the US firms in the sample were equivalent, in 2016, to 79 percent of US Gross Domestic Product. IMF Study, *supra* note 40, at 4.



Note: Figure reports markup estimates for 33 advanced economies (AEs) and 41 emerging market and developing economies (EMDEs). For country groups (AE Europe, Latin America, and EMDE Asia) figure reports median of included countries. IQR denotes inter-quartile range.

Figure 5. Evolution of estimated markups across economies. Source: IMF Study⁴⁵

To position the data about Europe, in comparison to other advanced economies, we note another 2018 working paper.⁴⁶ The study notes how US markets experienced a continuous rise in concentration and profit margins, while EU markets did not. As an illustrative example the working paper notes telecom markets. In the US, the level of concentration of these markets has steadily increased, while investment decreased. By contrast, the EU did not experience similar trend. As a result, they note how broadband prices in the US are significantly higher than in Europe, where pro-competitive regulation has been implemented.

* * *

In sum, competition appears to be below optimal levels in the US, and to a lesser extent, in the EU. Data, although of a general nature, supports the view that many markets are becoming more concentrated and display less competition.⁴⁷ Profit margins are widening, with a few firms reaping a significant share. Innovation levels are also sub-optimal. The reduction in competition in the US, as De Loecker and Eeckhout among others point out, also coincides with a decrease in labor's share of profits; decrease in low skill wages; decrease in labor force participation; decrease in labor flows; decrease in migration rates; slowdown in output and GDP; decrease in

⁴⁵ Ibid at page 13.

⁴⁶ Germán Gutiérrez & Thomas Philippon, *How EU Markets Became More Competitive than US Markets: a Study of Institutional Drift*, NBER Working Paper No. 24700 (June 2018), <http://www.nber.org/papers/w24700>.

⁴⁷ But note the opposite view which questions the magnitude of overall increased concentration levels in well-defined markets and the impact on competition. Carl Shapiro, *Antitrust in a Time of Populism* (24 October 2017), <http://faculty.haas.berkeley.edu/shapiro/antitrustpopulism.pdf>.

startup rate of new firms, due to higher barriers erected by incumbents; and an increase in wage inequality.⁴⁸

4 Key Trends in the Digital Sector

Having outlined the theoretical framework on innovation and market features and recent empirical data on the current levels of innovation and state of competition, we now consider key characteristics in the digital sector, to provide a more granular reflection of the drivers and obstacles to innovation.

The digital transformation can stimulate dynamic efficiencies and support both incremental and radical breakthrough innovation in goods, services, processes, strategies, and organization. It has had notable implications on businesses, scientific research, health services, agriculture, and all aspects of our lives.

Digitalization fosters new interconnection, new and evolving ecosystems, and a host of technologies and applications.⁴⁹ These processes are often complex and vary between industries.

Still, several general themes, as reflected in Figure 6, characterize the digital landscape, and can affect present and future innovation.

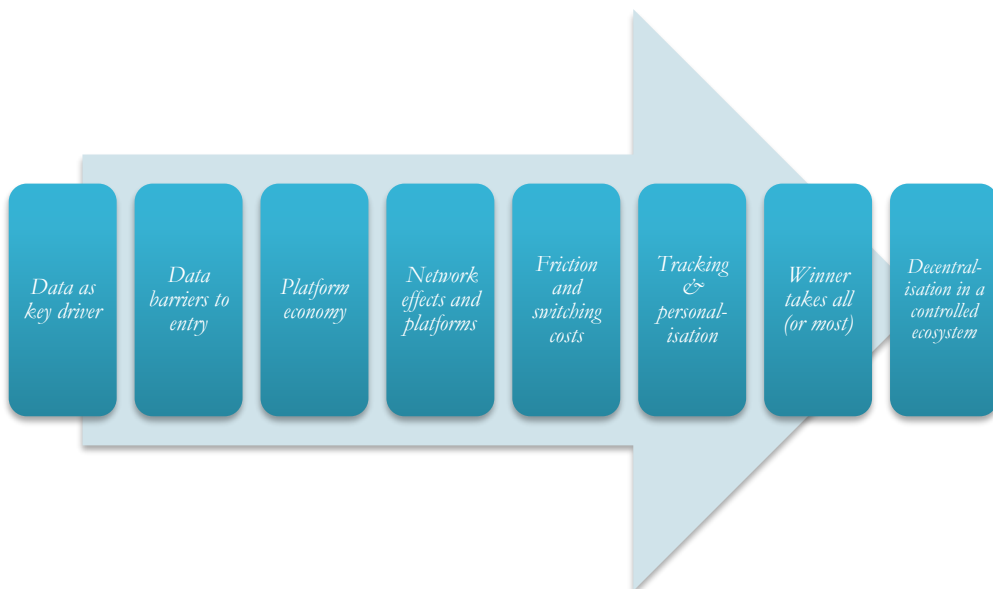


Figure 6

⁴⁸ De Loecker & Eeckhout, *supra* note 43, at 31.

⁴⁹ OECD Digital Economy Outlook 2017, *supra* note 20.

Data as key driver - Data serves as a key resource for innovation in the digital economy. With sufficient data, companies can improve their algorithms, production, services, business organization, and strategies. Accessing, collecting, organizing, and analyzing data can provide companies and governments with insights on the efficient use of resources, market conditions, demand characteristics, research paths, and opportunities for growth.⁵⁰

Notable is the data revolution in business strategies. One survey of two marketers from B2B and B2C organizations in the UK and Europe found that 83 percent of marketers have decided already to invest in Big Data, “because of the granular and detailed understanding it gives them about their consumers.”⁵¹ Big Data and artificial intelligence (AI) are playing a pivotal role in the strategic decision-making of organizations, with the aim of reaching a “Big Data advantage” over rivals.⁵² Further, Big Data represents a “core economic asset that can create significant competitive advantage for firms and drive innovation and growth.”⁵³

One characteristic of the digital environment concerns the variety (scope) of personal data. The more data points one can obtain, the more valuable the data can be for

⁵⁰ The European Commission noted in 2015 that the “use of big data by the top 100 EU manufacturers could lead to savings worth €425 billion” and that studies estimate that “by 2020, big data analytics could boost EU economic growth by an additional 1.9%, equalling a GDP increase of €206 billion.” European Commission, Digital Single Market: Why we need a Digital Single Market (2015),

http://europa.eu/rapid/attachment/IP-15-4653/en/Digital_Single_Market_Factsheet_20150325.pdf; see also *In algorithms we trust: How AI is spreading throughout the supply chain*, THE ECONOMIST (March 31, 2018), <https://www.economist.com/news/special-report/21739428-ai-making-companies-swifter-cleverer-and-leaner-how-ai-spreading-throughout>.

⁵¹ Amy Gravelle, *Can Big Data Turn Today's Marketers Into Tomorrow's Data-Empowered CEOs?*, MARKETING MAGAZINE (February 24, 2014), <http://www.marketingmagazine.co.uk/article/1282025/big-data-turn-todays-marketers-tomorrows-data-empowered-ceos>; dnx, *When will marketing be promoted to the boardroom? The reality of big data's promise* conducted by Circle Research, March 21, 2014, reprinted in eMarketer (April 2014), http://www.quantita.pe/documentos/eMarketer_Roundup_Using_Big_Data_to_Power_Marketing_Performance.pdf (survey of marketing professionals in Europe in January 2014 about the ways marketing departments use big data: 30 percent identified said to store multichannel information (e.g., sales, website, mobile, social media data, etc.); 29 percent said to segment customers (discover new micromarkets); 29 percent said to determine marketing strategy; 23 percent said to analyze buying behavior patterns; 23 percent said to justify marketing strategy; 21 percent said to develop personalized communications for individual customers; 15 percent said to predict future trends; 13 percent said to develop personalized offers for individual customers; 12 percent said to respond to customer requests and/or complaints in real time (e.g., on social media); 8 percent said to collaborate with other organizations (e.g., share data); 4 percent said to set price points; 2 percent said to sell lists of data to generate revenue; 4 percent said “Other” ; and, 2 percent said “None of these”).

⁵² *Two-faced: The sunny and the dark side of AI, AI will mainly be good for business, but mind the pitfalls*, THE ECONOMIST (March 31, 2018), <https://www.economist.com/news/special-report/21739430-ai-will-mainly-be-good-business-mind-pitfalls-sunny-and-dark-side>.

⁵³ OECD, *Exploring data-driven innovation as a new source of growth: Mapping the policy issues raised by “big data” in SUPPORTING INVESTMENT IN KNOWLEDGE CAPITAL, GROWTH AND INNOVATION* (OECD Publishing 2013), at 319.

future planning. To illustrate, consider digital personal assistants and online search results which can improve from the variety of personal data on users. If people use, besides the search engine, other services offered by the company (such as e-mail, web-browser, texting, mapping, purchasing, etc.), the company, in collecting the variety of personal data, can develop user profiles to better predict users' tastes and interests, and better target users with more relevant organic and sponsored results.

Data barriers to entry – Big Data can be key in promoting demand for innovation. At the same time, barriers to data could inhibit these processes. The OECD noted that alongside the significant improvement offered by data-driven services, a positive feedback loop helps the strong become stronger, as the weak get weaker.⁵⁴

The more personal data a company collects, the greater the variety of the data, and the faster the company can collect and process the data, the greater the data's potential value. To maintain or improve their competitive advantage, incumbents may have strong incentives to limit their competitors' access to datasets and be averse to data-portability policies.

The significance of data as valuable input, and the benefits from its scope, support widening of a firm's operation and integration. Given that data's value depends on its volume, variety, and how quickly the data is collected and analyzed, companies will increasingly focus on opportunities to acquire a data-advantage through mergers.⁵⁵ The consolidation can enable valuable efficiencies, while, at the same time, can impact the availability of data, as a resource, for other market participants.

Platform economy – Beyond data, the exponential growth of the Internet and mobile communications has seen a proliferation of platforms – ranging from online social networks, video sharing, communications, search engines, shopping sites, to mobile and computer operating systems. Platforms often act as intermediaries and as such occupy a central junction for users and service providers. The ecosystem they foster enables communication, access, and scale and as such has the potential to increase transparency, competition, and innovation.

“Generally, where there is a two-sided platform,” the UK competition authority observed, “there is more value to both sides of having more users.”⁵⁶ A traditional

⁵⁴ OECD, *Data-Driven Innovation for Growth and Well-Being: Interim Synthesis Report 29* (October 2014), <http://www.oecd.org/sti/inno/data-driven-innovation-interim-synthesis.pdf>; reference within quotation is to Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network ECONOMY* (Harvard Business Press, 1999).

⁵⁵ According to one estimate, the number of Big-Data-related mergers doubled between 2008 and 2013 - from 55 to 134. European Data Protection Supervisor, *Report of Workshop on Privacy, Consumers, Competition and Big Data 2 June* (July 11, 2014), at 1, https://secure.edps.europa.eu/EDPSWEB/webdav/site/mySite/shared/Documents/Consultation/Big%20Data/14-07-11_EDPS_Report_Workshop_Big_data_EN.pdf.

⁵⁶ Office of Fair Trading (OFT), ME/6167/13: Completed Acquisition by Motorola Mobility Holding (Google, Inc.) of Waze Mobile Limited, 11 November 2013, para 19 (OFT, Google/Waze), http://webarchive.nationalarchives.gov.uk/20140402142426/http://www.oft.gov.uk/shared_of/mergers_ea02/2013/motorola.pdf.

spill-over network effects emerges, where more users attract more sellers, advertisers, or suppliers on the other side, which, in turn, can attract more users. The network effect can be limited to local markets (such as Uber where more passengers in a particular town attract more drivers) or span geographic markets (where, for example, as more travelers turn to Airbnb for housing in a particular city, more accommodation owners will list on the site, which can increase each guest's utility, with greater variety of accommodations and prices; as the online platform attracts more guests, the utility of accommodation owners also can increase: they have a better sense of the market price for their accommodation and a greater variety of guests to choose from for a greater range of dates).

Unlike traditional multi-sided markets (e.g., television, radio, and newspapers), online platforms can collect personal data, create user profiles, target users with specific ads, and even enlist users to endorse products. As a result, the data-driven network effects can be more dynamic. Personal data can accelerate the spill-over effects on both sides of the online platform.⁵⁷

As Facebook told investors, “We have over 184 million people using Facebook every day in the U.S., which is considerably more than Super Bowl every day on mobile alone.”⁵⁸ Facebook also attracts 6 million advertisers.⁵⁹ The more data Facebook collects on users, the better it can target them with relevant ads, and the more likely users will respond to the ads. In leveraging the scope and scale of personal data to predict what ads would interest its users, the platform can target users with ads that generate demand, “and use the repeat opportunity to show people ads, moving [them] down the funnel to demand fulfilment.”⁶⁰ As a result, the platform attracts more advertisers. With more advertisers, the online platform has a greater variety of ads from which to target users. Using the advertising profits, the platform can expand its network geographically and across products (such as acquiring popular apps, like Instagram and WhatsApp). In attracting more users, the online platform can harvest even more personal data to identify relevant ads and target users across the web, mobile, and social channels. As its platform, advertising network, and audience grow, the value of its data and analytics can increase.

Network effects and platforms – The digital economy is characterized by network effects that offer distinct efficiencies and economies of scale. At the same time, network effects can form barriers to entry, and risk limiting the competitive pressure

57 For elaboration see Maurice E. Stucke & Allen P. Grunes, *Big Data and Competition Policy* 285-87 (Oxford University Press 2016).

58 Facebook, Inc. (FB) Fourth Quarter and Full Year 2017 Results Conference Call, January 31, 2018, at 12, https://s21.q4cdn.com/399680738/files/doc_financials/2017/Q4/Q4-17-Earnings-call-transcript.pdf. The trends in the number of users affect Facebook's “revenue and financial results” by influencing the number of ads it can show, and the value of its ads to marketers. Facebook 2017 Annual Report (10-K), at 35 (February 1, 2018), <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001326801/c826def3-c1dc-47b9-99d9-76c89d6f8e6d.pdf>.

59 Facebook Fourth Quarter and Full Year 2017 Results Conference Call, *supra* note 58, at 18.

60 *Ibid* at page 17.

on the incumbent.⁶¹ At times, entrants can use pricing strategies to defy some network effects – for instance, by subsidizing users’ switching costs.⁶² At other times, network effects may tip the market in favor of a leading provider, which may become inefficiently entrenched.

Friction and switching costs – The ongoing digital transformation changes the way people interact and businesses operate. Interconnectivity takes place through digital paths and subsequently is controlled, to some extent, by those providing the path or operating on it. Part of the attempt to control the user interface, in order to increase opportunities for data harvesting and profit, concerns prolonging the users stay on a given platform and maximizing income from advertising or services. Platforms thus may seek to reduce interoperability and awareness of outside options. For example, they may exclude certain services or increase friction in accessing third parties’ services. High search and switching costs are used to “lock in” users and reduce the ability of competitors to access them.

Tracking and personalization – The common business model in many multi-sided markets is based on the potential income firms may generate from utilizing their customer base. In particular, in a data-driven economy, personal data on user behavior, preferences, weaknesses, and habits is the new currency for the advertising- and marketing-dependent business models.⁶³ There is a “growing potential for big data analytics to have an immediate effect on a person’s surrounding environment or decisions being made about his or her life.”⁶⁴ As the European Data Protection Supervisor observed, “Governments and companies are able to move beyond ‘data mining’ to ‘reality mining,’ which penetrates everyday experience, communication and even thought.”⁶⁵ Using sophisticated algorithms, companies engage in data mining, data trade, online marketing, pattern recognition,⁶⁶ demand estimation, and price optimization.⁶⁷ This information is the fuel that drives

⁶¹ Germany, in 2017, for example, amended its competition law to specify that direct and indirect network effects be taken into account in assessing a firm’s market position. § 18 (3(a)) of the Act against Restraints of Competition (Competition Act – GWB) - Last amended by Article 10(9) of the Act of 30 October 2017, https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Others/GWB.pdf?__blob=publicationFile&v=6.

⁶² Weyl & White, *Let the Best 'One' Win*, *supra* note 23.

⁶³ For elaboration see ARIEL EZRACHI & MAURICE E. STUCKE, *VIRTUAL COMPETITION: THE PROMISE AND PERILS OF THE ALGORITHM-DRIVEN ECONOMY* (Harvard University Press 2016).

⁶⁴ Executive Office of the President, *President’s Council of Advisors on Science and Technology*, REPORT TO THE PRESIDENT, *BIG DATA AND PRIVACY: A TECHNOLOGICAL PERSPECTIVE* 5 (May 2014), https://www.whitehouse.gov/sites/default/files/docs/big_data_privacy_report_may_1_2014.pdf (giving as examples of high-velocity data “click-stream data that records users’ online activities as they interact with web pages, GPS data from mobile devices that tracks location in real time, and social media that is shared broadly”).

⁶⁵ EDPS, *Towards a new digital ethics: Data, dignity and technology*, OPINION 4/2015, September 11, 2015, at 6.

⁶⁶ CHRISTOPHER M. BISHOP, *PATTERN RECOGNITION AND MACHINE LEARNING* (Springer Science & Media 2006).

⁶⁷ *Pricing Algorithms: Is the Price You Pay Right?*, BLOOMBERG (May 12, 2015), <https://www.bloomberg.com/news/videos/b/02d3f0f0-e653-4ca1-8bdd-0f95a5a81212>; Ariel

the companies' advertising-dependent business model. A data advantage over rivals can enable the company to achieve critical economies of scale, which could tilt the data—and competitive balance—in its favor. Indeed, leading companies do not limit themselves to mere improvements in harvesting and analyzing data, but also compete on infrastructure and emerging markets. As Evgeny Morozov noted, “Google and Facebook have figured out that they cannot be in the business of organizing the world’s knowledge if they do not also control the sensors that generate that knowledge and the gateways through which it passes.”⁶⁸

Winner takes all (or most) - Network effects and barriers to expansion and entry can help insulate some operators from the competitive pressure. They may tip the market and entrench a provider’s market position.

The winners in the network and data-collection arms race benefit several ways:

- first, in improving their self-learning algorithms;
- second, in capturing greater value from the data (either directly or indirectly through advertising-related services or behavioral discrimination);
- third, in using the profits to expand their platform, thereby attracting more users, advertisers, and personal data; and
- finally, as their platforms evolve into super-platforms increasing the dependency of other apps on their platform – and capturing the personal data and attention of users.

While many argue these trends may lead to distinct market power,⁶⁹ some suggest that “monopoly platform ownership is socially preferable to fragmented ownership if platform effects are strong and possibly even if they are weak.”⁷⁰

Decentralization in a controlled ecosystem – It was once assumed that the Internet and technology would de-centralize power and foster an inclusive framework. End-to-end use of technology could enable users to directly communicate and control many characteristics of the interface. This decentralizing vector, in eroding the

Ezrachi & Maurice E. Stucke, *The Rise of Behavioural Discrimination*, 37 EUROPEAN COMPETITION LAW REVIEW 484 (2016).

⁶⁸ Evgeny Morozov, *Socialize the Data Centres!*, NEW LEFT REVIEW (January–February 2015), <http://newleftreview.org/11/91/evgeny-morozov-socialize-the-data-centres>.

⁶⁹ *The Economist* reported “Alphabet [Google], Facebook and Amazon are not being valued by investors as if they are high risk, but as if their market shares are sustainable and their network effects and accumulation of data will eventually allow them to reap monopoly-style profits.” *Business in America: Too much of a good thing; Profits are too high. America needs a giant dose of competition*, THE ECONOMIST (March 26, 2016), <http://www.economist.com/node/21695385/print>; see also *The Data Economy*, THE ECONOMIST (May 6-12, 2017).

⁷⁰ Volker Nocke, Martin Peitz, & Konrad Stahl, *Platform Ownership*, 5 J. EUR. ECON. ASSN. 1130-1160 (2007), cited in Weyl & White, *Let the Best 'One' Win*, *supra* note 23.

traditional gatekeepers' power, could foster access by alternative news and entertainment sources. Importantly, however, these platforms may operate on an opposite vector – namely the control over the platform or interface – which is often centralized and can influence and impact user behavior.

5 Policy Implications of Key Trends in the Digital Sector

What are the policy implications of the key trends in the digital sector, when considered alongside the theories of market structure and innovation explored in Part 2 and empirical findings of the level of innovation and competition discussed in Part 3?

While the digital landscape may appear dynamic, the macro picture that emerges is at best mixed. Undoubtedly, any macro picture is likely to be incomplete. While in some areas of the digital economy, increased concentration and less investment in innovation have been noticeable, dynamic competition may characterize other sectors. Further, high concentration levels in some industries may reflect valuable efficiencies and economies of scale, which favor large firms at the expense of dynamism.

But the market indicators largely support the view that high concentration levels and high markups are likely to undermine investment in innovation. The digital trends will not necessarily disturb this view.

Instead, the anecdotal evidence suggests the contrary. Google, Apple, Facebook, Amazon, and Microsoft had the largest absolute increase in market capitalization between 2009 and 2017.⁷¹ As of June 2018, they were the largest US public companies by market capitalization.⁷² Venture capitalists now talk of “kill-zones” around the dominant online platforms.⁷³ Google’s, Facebook’s and Amazon’s annual conferences “held to announce new tools, features, and acquisitions, always ‘send shock waves of fear through entrepreneurs,’” according to one investment firm, and “[v]enture capitalists attend to see which of their companies are going to get killed next.”⁷⁴ One cannot assume that the digital economy will reverse the current trends, and promote a more inclusive economy. Instead, the data-driven network effects and entry barriers, discussed in Part 4, can further reduce competition in many sectors,

⁷¹ PwC, *Global Top 100 Companies by market capitalization 31 March 2017 update*, <https://www.pwc.com/gx/en/audit-services/assets/pdf/global-top-100-companies-2017-final.pdf> [slide 32].

⁷² The Largest Companies By Market Capitalization Today, <http://www.symbolsurfing.com/largest-companies-by-market-capitalization>; see also Jeff Desjardins, *Chart: The Largest Companies by Market Cap over 15 Years*, VISUAL CAPITALIST (Aug. 12, 2016), <https://www.visualcapitalist.com/chart-largest-companies-market-cap-15-years/>.

⁷³ *The Future of Tech Startups: Into the Danger Zone*, THE ECONOMIST (U.K. edition) (June 2, 2018), at 61, http://weblogibc-co.com/wp-content/uploads/2018/06/The_Economist_UK_Edition_-_June_02_2018.pdf.

⁷⁴ *Ibid.*

chill innovation and entry of new firms, and widen the wealth and income inequality gap.

So what are the implications if innovation levels remain suboptimal? What is the price we pay? The picture is complex and does not necessarily lead to a single clear conclusion. To see why, we'll consider the debate in Tom Stoppard's play, *Arcadia*, over the destruction of the ancient Library of Alexandria. Thomasina and her tutor Septimus debated over whether we have recreated all the cultural knowledge that was lost after that great fire:

THOMASINA: . . . the enemy who burned the great library of Alexandria without so much as a fine for all that is overdue. Oh, Septimus!—can you bear it? All the lost plays of the Athenians! Two hundred at least by Aeschylus, Sophocles, Euripides—thousands of poems—Aristotle's own library! . . . How can we sleep for grief?

SEPTIMUS: By counting our stock. Seven plays from Aeschylus, seven from Sophocles, nineteen from Euripides, my lady! You should no more grieve for the rest than for a buckle lost from your first shoe, or for your lesson book which will be lost when you are old. We shed as we pick up, like travellers who must carry everything in their arms, and what we let fall will be picked up by those behind. The procession is very long and life is very short. We die on the march. But there is nothing outside the march so nothing can be lost to it. The missing plays of Sophocles will turn up piece by piece, or be written again in another language. Ancient cures for diseases will reveal themselves once more. Mathematical discoveries glimpsed and lost to view will have their time again. You do not suppose, my lady, that if all of Archimedes had been hiding in the great library of Alexandria, we would be at a loss for a corkscrew?

The exchange raises the macro issue of levels of innovation, and the role of *path dependence* and *competitive portals*, namely critical inflection points when antitrust enforcement can make a difference.

Under *Septimus's perspective*, innovation is like bolts. Path dependencies play a minor role; we eventually arrive at the same competitive equilibrium and enjoy the same innovations (with or without the restraints of earlier monopoly). So, monopolies, like the destruction of the Library of Alexandria, do not impose any long-term harm. The level of innovation today does not significantly affect future levels of innovation. Potential competitors will materialize and veer the market towards its natural competitive equilibrium (and what the market would have looked like absent the monopolistic restraints). So, while a monopoly may temporarily cause harm, dynamic disruption will shepherd the market to the new competitive equilibrium where we would have been (but for the monopoly).

Septimus's perspective may be true for homogeneous goods, where price is the key parameter of competition. The monopoly elevates the price of bolts, entrants lower the price. The bolts remain the same, but their price differs. In the digital economy,

the assumption goes further: innovators will materialize whatever competition officials and monopolists do, or do not do, and bring society the innovations that would have occurred but for the monopoly. Indeed, the race may be for the entire market, not just a piece of it, so the incentives to derail a monopoly are said to be even greater. With or without Archimedes, someone would have developed a corkscrew.

Under *Thomasina's perspective*, we can be far less confident that tomorrow's level of innovation is relatively unaffected by today's market behavior and characteristics. Under her perspective, innovation undertakes an evolutionary economic process, where "chance plays a significant role", and "small, random (and therefore unpredictable) events may have severe long-run consequences."⁷⁵ We may not necessarily recover what was lost (by the fire or abuses of a dominant firm).

Thomasina's perspective may be especially relevant in complex adaptive ecosystems, such as many technology industries. When the competitive portals are open, entry, expansion, or random events during these periods of competitive opportunity can foster experimentation and significant innovation. On the other hand, a dominant firm may use its market power to close the competitive portals. Thus, abuse of dominance, if unchecked, may have greater negative implications beyond that immediate industry and time-frame. The long-run consequences of monopolistic practices may not simply be higher prices, but foregone innovations. So, contrary to Septimus's belief, some great works lost in the Library of Alexandria were never recreated, and innovations derivative of those great works were never developed. Thus, one price we may pay—when monopolies are unchecked in these industries—are innovations foregone.

Under Septimus's perspective, many markets today may not be as competitive and innovative as their potential. Turning to Thomasina's perspective, what are the implications of highly concentrated markets, weak corporate investment, and declining competition on future levels of innovation?

A key takeaway is that innovation and dynamic forces may need competitive portals, i.e., windows of opportunity. To illustrate competitive portals, let us consider whether the former AT&T and IBM monopolies still affect us today. Would our current technological developments exist if AT&T's and IBM's monopolies went unchallenged during the 1970s? Can we assume that the level of innovation would be the same today if the US Department of Justice never prosecuted these monopolies?

The DOJ's break-up of AT&T is considered one of antitrust's success stories in unleashing innovation. Less clear is IBM. The Reagan administration famously sacked the DOJ's 13-year-old investigation into the computer monopoly. One scholar called the government's case "the greatest waste of resources in the history of antitrust

⁷⁵ Bart Verspagen, *The Use of Modeling Tools for Policy in Evolutionary Environments*, 76 TECHNOLOGICAL FORECASTING & SOCIAL CHANGE 453-461 (May 2009), <http://www.sciencedirect.com/science/article/pii/S0040162508001121>.

enforcement.”⁷⁶ Some might say that IBM’s computer dominance (outside of mainframes), with or without any antitrust investigation, was destined to be eclipsed—and cite the Wintel combination of Microsoft’s Windows operating system and Intel microprocessors.

But one issue is whether the DOJ’s antitrust investigation opened the competitive portal that facilitated Microsoft’s growth. In the late 1960s, IBM controlled about 70 percent of the computer market. After the DOJ challenged IBM’s practices, particularly its “bundling” hardware and software, IBM changed course. This led to the development of the computer software industry. As IBM’s second president Thomas J Watson, Jr wrote, “[p]recipitated by a massive antitrust complaint filed against IBM by the Justice Department in January 1969, the company reexamined its practices and decided to stop requiring customers to buy software, services, and hardware as one bundle in June of the same year. This pricing change opened up software markets to independent companies.”⁷⁷

A decade later, when preparing to launch its personal computers, the still dominant IBM approached the start-up Microsoft about creating a version of a BASIC computer program. Microsoft suggested that IBM talk to Digital Research, whose CP/M operating system had become the standard for computer hobbyists. One account is that Digital Research’s president apparently disliked the arrogant IBM from his university days and was late in meeting the IBM executives. After the negotiations stalled, IBM returned to Microsoft to create an operating system for its personal computer. When introducing its personal computer, IBM sold the Microsoft operating system for a much lower price than the CP/M-86 system.⁷⁸

So one cannot assume that with or without antitrust enforcement, Microsoft (or some other operating system) would have become dominant by the 1990s. If anything, the DOJ’s investigation of IBM, it appears, opened a competitive portal, namely IBM’s decision to unbundle software from its computers, which enabled software development to flourish.

Likewise, the US and EU prosecutions of Microsoft in the 1990s-2000s provided a competitive portal for Google’s browser and search engine, and Facebook’s social network.

Thus, under Thomasina’s perspective, policy makers should be particular concerned about the closing of today’s competitive portals on future innovation. *First*, the big platforms are likely to get bigger. In its 2017 World Investment Report on the digital

⁷⁶ John E. Lopatka, *United States v IBM: A Monument to Arrogance*, 68 ANTITRUST L.J. 145, 146 (2000).

⁷⁷ Robin Lougee-Heimer, *The Common Optimization INterface for Operations Research: Promoting Open-Source Software in the Operations Research Community*, 47 *IBM J Research and Development* 59 (2003), citing Thomas J Watson, Jr, *Father, Son, and Co: My Life at IBM and Beyond* (Bantam 1990).

⁷⁸ See Eric Beinhocker, *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics* (Harvard Business Review Press 2006) 326–7; Gary Kildall Special, <https://archive.org/details/GaryKildall>.

economy, the UNCTAD noted how “tech mega-corporations are enjoying exceptional growth momentum.”⁷⁹

Figure IV.2. Trends in assets, operating revenues and employees of the 2015 top 100 MNEs
(indexed, 2010 = 100)



Source: ©UNCTAD, based on UNCTAD’s FDI/MNE database, company reports and data from Orbis BvD and Thomson ONE.
Note: The analysis includes the subset of UNCTAD’s 2015 ranking of the top 100 MNEs that had reported information consistently for the relevant years (97 MNEs for assets and operating revenues, of which 9 tech, 8 telecom and 80 other MNEs; 81 MNEs for employees, of which 6 tech, 8 telecom and 67 other MNEs).

Figure 7. Source: UNCTAD 2017 World Investment Report

⁷⁹ UNCTAD, 2017 World Investment Report 161 (United Nations Publication 2017). “Some of these companies, such as Alphabet (Google) and Microsoft, are leading the digital revolution; others, such as Oracle, heavily rely on and benefit from the acceleration of the internet to deliver their value proposition. When including telecom [multinational enterprises], other important enablers of the digital economy, 19 [multinational enterprises] in the top 100 are [information and communication technologies] companies – a sizeable portion of megacorporations.” (ibid). As UNCTAD’s report further noted:

In the last five years, the largest tech [multinational enterprises] have outpaced traditional [multinational enterprises] and telecom companies, with assets growing by more than 10 per cent annually, compared with an essentially flat trend for the other two groups. Growth in operating revenues and employees is more moderate, but still higher than in other members of the top 100 [multinational enterprises]. These figures confirm that tech [multinational enterprises] represent by far the most dynamic players among the largest global multinationals. The fast growth of tech [multinational enterprises] is a result of multiple and interrelated factors, including strong technological and market momentum prompted by the digital revolution, financial solidity and spending capacity due to very high margins and liquidity, as well as a managerial culture oriented towards investment and innovation. As a result, not only have tech mega-corporations gained market dominance in their core segments, but they have also successfully expanded in neighbouring digital areas. In just a few years, some have become digital hubs operating across the full spectrum of the digital economy.

ibid.

Second, as Part 4 addresses, the competitive portals can close even further with data-driven network effects and customer lock-in.

Third, critics argue how antitrust enforcers in the US have not been vigilant in keeping the competitive portals open. The decline in competition and increase in markups in the US, reflected in Part 3, began in the 1980s. This coincided with the adoption by some US antitrust enforcers and courts of more laissez faire theories and presumptions that disfavored intervention in markets.⁸⁰ A search of the DOJ database in mid-2018 reveals the decline in enforcement. The DOJ, for example, since 1999 brought only one monopolization case under Section 2 of the Sherman Act.⁸¹ (In contrast, the DOJ, between 1970 and 1972, brought 39 civil and 3 criminal cases against monopolies and oligopolies.⁸²) The DOJ, for example, brought its last predation case in 1999.⁸³ US merger enforcement, which is supposed to prevent competitive harms in their incipiency, now focuses on mergers in only highly concentrated industries.⁸⁴ The US agencies rarely challenge vertical restraints (such as resale price maintenance).⁸⁵ The agencies do not challenge many exclusionary practices either.⁸⁶ The one province is cartel enforcement, which there is no shortage in supply.

* * *

⁸⁰ See, for example, William E. Kovacic, *The Intellectual DNA of Modern U.S. Competition Law for Dominant Firm Conduct: The Chicago/Harvard Double Helix*, 2007 COLUMBIA BUSINESS LAW REVIEW 1 (2007).

⁸¹ US Department of Justice, Antitrust Division Workload Statistics, FY 2007 – 2016, <https://www.justice.gov/atr/file/788426/download>; US Department of Justice, Antitrust Division Workload Statistics, FY 2000-2009, <https://www.justice.gov/sites/default/files/atr/legacy/2012/04/04/281484.pdf>.

⁸² US Department of Justice, Antitrust Division Workload Statistics, FY 1970 – 1979, <https://www.justice.gov/atr/antitrust-division-workload-statistics-fy-1970-1979>.

⁸³ The government ultimately lost that case. The court held that tests proffered by government to measure incremental costs of airline's capacity additions were invalid, so that government failed to establish pricing below appropriate measure of cost. *United States v. AMR Corp.*, 335 F.3d 1109 (10th Cir. 2003).

⁸⁴ See, e.g., John Kwoka, *The Structural Presumption and the Safe Harbor in Merger Review: False Positives or Unwarranted Concerns?*, 81 ANTITRUST L.J. 837 (2017) (examining FTC merger data between 1996 and 2011, finding significant decline in enforcement of mergers in industries with a HHI below 3000, and finding that reliance on a lower bound of concentration below which mergers should be approved may be misplaced, since there are numerous mergers below that bound that are anticompetitive).

⁸⁵ The last vertical price fixing case, according to the DOJ's data base, was brought over twenty years ago, and was part of a price-fixing cartel. *United States v. Ixtlera de Santa Catarina, S.A. de C.V.*, Civil Action No. 96CV96-6515 (E.D. Pa. filed September 26, 1996), <https://www.justice.gov/atr/case-document/complaint-136>. One can search for horizontal, but not vertical, restraints in the FTC data base. Federal Trade Commission, Cases and Proceedings: Advanced Search <https://www.ftc.gov/enforcement/cases-proceedings/advanced-search>.

⁸⁶ The DOJ, according to its data base, brought its last exclusive dealing case in 2010, and before that in 2002. See *United States v. Blue Cross Blue Shield of Michigan*, Case 2:10-cv-14155-DPH-MKM (E.D. Mich. filed October 18, 2010), <https://www.justice.gov/atr/case-document/file/489536/download> and *United States v. Mathworks*, Civil Action No. 02-888-A (E.D. Va. filed June 21, 2002), <https://www.justice.gov/atr/case-document/file/502536/download>.

Whether policy makers take Septimus’s or Thomasina’s perspective, they should not be sanguine about the current levels of innovation. The evidence suggests that many markets today may not be as innovative as their current potential. And to the extent Thomasina’s perspective is correct, policy makers should have greater concern as competitive portals close, chilling innovations that may never be recaptured.

6 Analytical Framework – The Supply for Innovation

If markets today may not be as innovative as their current potential, what then are the optimal market conditions for innovators to innovate? The empirical economic literature in Part 3 reveals a complex reality with varying results. The multitude of influencing variables are significant as they directly affect the ability of policy makers to identify a simple “linear” approach to the subject.⁸⁷ The following four key variables, as this Part synthesizes, can impact the supply of innovation: *market contestability*, *appropriability*, *synergies*, and the *nature of innovation*.

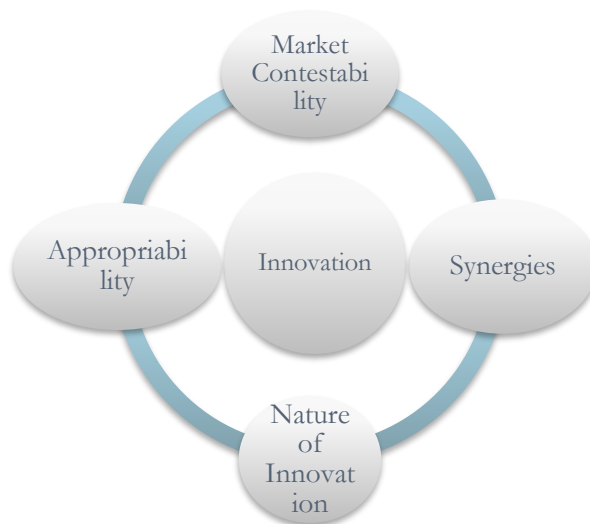


Figure 8.

The Competition Directorate of the European Commission harmonized the Schumpeterian and Arrowian schools of thought along three principles:

- *Contestability* - markets need to remain contestable for innovation to flourish;
- *Appropriability* - the extent to which a firm can capture the value created by its innovation and protect the competitive advantage associated with it will increase the incentive to innovate; and

⁸⁷ Tony Curzon Price & Mike Walker, *Incentives to Innovate v Short-term Price Effects in Antitrust Analysis*, 7 JOURNAL OF EUROPEAN COMPETITION LAW & PRACTICE 475–482 (2016), <https://doi.org/10.1093/jeclap/lpw024>.

- *Synergies* arising for instance from the combination of complementary assets necessary to engage in R&D, will enhance the ability to innovate.⁸⁸

When competition policy promotes *contestability* (i.e., by keeping markets competitive) while not unduly hindering *appropriability*, “it will be compatible with both Arrow and Schumpeter and therefore will encourage innovation.”⁸⁹

With respect to the first variable, *contestability*, the European Commission, in its publications, has taken the view that rivalry between innovators will likely promote their respective incentives to invest in research and development.⁹⁰ In its Horizontal Merger Guidelines, the Commission states that “[e]ffective competition brings benefits to consumers, such as low prices, high quality products, a wide selection of goods and services, and innovation.”⁹¹ The Commission further states:

In markets where innovation is an important competitive force, a merger may increase the firms’ ability and incentive to bring new innovations to the market and, thereby, the competitive pressure on rivals to innovate in that market. Alternatively, effective competition may be significantly impeded by a merger between two important innovators, for instance between two companies with “pipeline” products related to a specific product market. Similarly, a firm with a relatively small market share may nevertheless be an important competitive force if it has promising pipeline products.⁹²

With respect to the second variable, *appropriability*, the Commission tries to strike the right balance of when a dominant firm must deal with a rival or customer: “particular attention must be paid to the impact which such an interference might have on the incentives for investment and innovation in the markets concerned.”⁹³ Imposing on dominant firms a general duty to deal with rivals or customers can weaken their incentives to innovate. After all, why innovate when a rival can simply free ride on one’s investment?⁹⁴

On the other hand, if a dominant firm can freely refuse to deal with anyone for any reason, then that latitude can adversely impact the incentives of other firms to

⁸⁸ Competition Directorate–General of the European Commission, *Competition Policy Brief: EU Merger Control and Innovation 2* (April 2016) (citing Carl Shapiro, *Competition and Innovation. Did Arrow Hit the Bull’s Eye?* in Josh Lerner and Scott Stern (eds), *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY REVISITED* (University of Chicago Press 2012), p. 361-410).

⁸⁹ Competition Directorate–General of the European Commission, *Competition Policy Brief: EU Merger Control and Innovation 2* (April 2016).

⁹⁰ See for example *ibid.*

⁹¹ Para 8, *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, OJ C 031, 05/02/2004, pp. 5-18. On the way in which a merger may allow the firms to internalize innovation externality see Federico, *supra* note 4.

⁹² Para 38, *Guidelines on the assessment of horizontal mergers*, *supra* note 91.

⁹³ OECD, *Roundtable on Refusals to Deal – Note by the European Commission* at para 2 (October 4, 2007), http://ec.europa.eu/competition/international/multilateral/2007_oct_refusals_to_deal.pdf.

⁹⁴ *Ibid* at para 18.

innovate. As the Commission recognizes, “consumer harm may also arise where the competitors that the dominant firm forecloses are as a result of the refusal prevented from bringing to market innovative goods or services, and the refusal to supply thus stifles follow-on innovation to the detriment of consumers.”⁹⁵

Thus, as the Commission implicitly recognized, the supply of innovation will depend not only on *contestability*, *appropriability*, and *synergies*, but also *the nature of innovation*.

Looking at the *nature of innovation*, the European Commission, as Figure 9 depicts, already distinguishes innovation along several parameters.

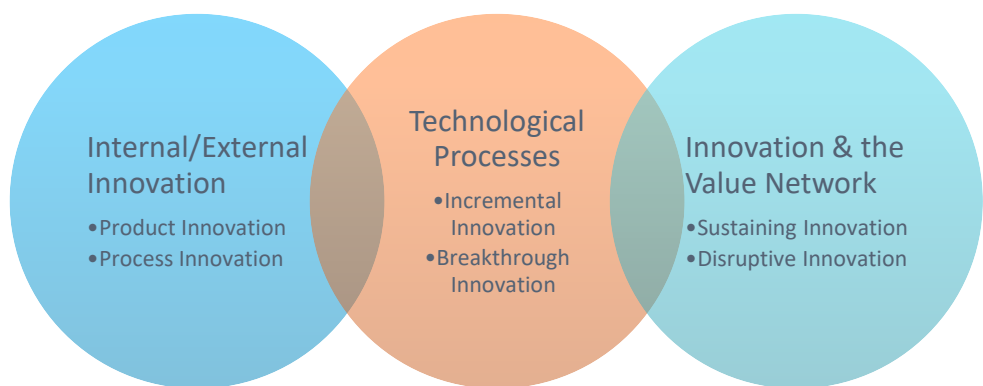


Figure 9: Nature of Innovation, per EC

First is between **internal** and **external innovation**. *Product innovation* is the introduction of goods or services that are new or significantly improved with respect to their characteristics or intended uses. *Process innovation* is the implementation of a new or significantly improved production or delivery method.

Second is between **technological processes**. *Incremental innovation* marks a small step forward – e.g., adding slow motion to a videocassette recorder (VCR) – whereas a *breakthrough innovation* involves a significant technological jump (e.g., replacing VCRs with DVDs).

Third is between an **innovation and the value network around it**. *Sustaining innovation* takes place within the value network of the established firms and gives customers something more or better in the attributes they already value (e.g., DVDs are the result of sustaining innovation). *Disruptive innovation* takes place outside that value network and introduces a different package of attributes from the one customers historically value. For instance, streaming videos over the Internet

⁹⁵ Ibid.

introduced the possibility of accessing content anywhere, although streaming performed worse in terms of the historical value of quality – at least initially.⁹⁶

In this context, to further the discussion, one may add three additional distinctions in the nature of innovation.

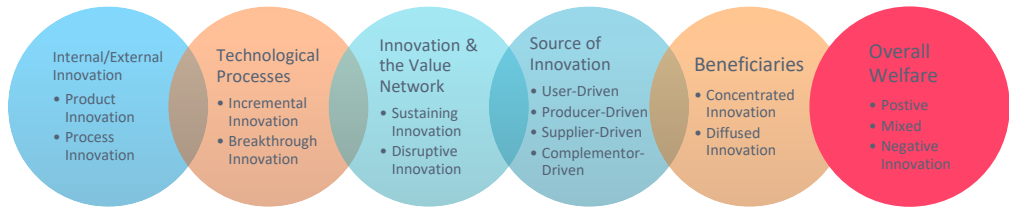


Figure 10.

Fourth is the **source of innovation**. *User-driven innovations* is where users develop and modify products and services for their own use versus *producer-driven innovations*.⁹⁷ Innovations can also come from *suppliers* and firms with complementary products (“complementors”).⁹⁸

Fifth are the **beneficiaries from the innovation**. *Concentrated innovation* primarily benefits one party, or group of market participants on a multi-sided platform, without benefitting the others (including market participants on the other side of the platform). *Diffused innovation* benefits multiple constituencies, including participants on multiple sides of a platform. Improvements in tracking users’ movements, for example, may benefit advertisers, at the expense of users’ privacy. Innovations in solar-panels, on the other hand, benefit the users and non-users (with cleaner air, less pollution, etc.).

Finally are the **overall welfare effects** from the innovation, which this Paper will later address.

Thus, one cannot say *higher levels of market concentration will (or will not) always imply lower levels of innovation*. Here we can see how market contestability, appropriability, and synergies can be of varying importance depending on the nature of innovation. One example illustrates this point.

Example One: how the innovating firm may be more concerned about appropriability and synergies than contestability in deciding to undertake the innovation.

⁹⁶ Competition Directorate–General of the European Commission, *Competition Policy Brief: EU Merger Control and Innovation 2* (April 2016).

⁹⁷ ERIC VON HIPPEL, *DEMOCRATIZING INNOVATION* 19-20 (MIT Press 2005).

⁹⁸ ADAM M. BRANDENBURGER & BARRY J. NALEBUFF, *CO-OPETITION* (Doubleday Business 1996).

As we already discussed, a firm, under a blanket duty to deal with rivals on fair, reasonable, and non-discriminatory terms, may be susceptible to free-riding. Thus, without the ability to appropriate sufficient gains, it may lack the incentive to innovate, regardless of the contestability of the relevant market.

Now let us consider how a dominant firm, in the digital economy, can chill the incentives of other firms in other markets in innovating. One potentially powerful tool that earlier monopolies lacked to quickly appropriate any gains from innovation is the “now-casting” radar. Past monopolies were less aware of what sellers, customers, and rivals were doing (or planning to do). Some digital platforms currently have a relative advantage in accessing and analyzing data to discern trends (and threats) well before others, including the government.⁹⁹ They can “nowcast,” also called “predict the present,” by using search inquiries, social network postings, tweets, and other data to discern trends.

Nowcasting can yield a competitive advantage and, at times, increase overall welfare. Nowcasting also represents a potent data-based weapon: the ability to monitor new business models in real time. The dominant platform can use its relative advantage in accessing and processing personal data, such as watching for trends in its proprietary data from posts on a social network, search queries, emails, and the like, to quickly identify (and squelch) nascent competitive threats. The dominant firm can acquire entrants before they become significant competitive threats.¹⁰⁰ Or it can blunt the entrants’ growth, by copying the innovation or promoting its own version.¹⁰¹

⁹⁹ Stucke & Grunes, *supra* note 57, at 285-87.

¹⁰⁰ Johannes Laitenberger, *EU competition law in innovation and digital markets: fairness and the consumer welfare perspective*, EUROPEAN COMMISSION (October 10, 2017), http://ec.europa.eu/competition/speeches/text/sp2017_15_en.pdf (noting how “many of today’s startup owners want to be acquired instead of growing to challenge the incumbents,” how startup owners “are faced with a stark choice: struggling to survive or pitching their business to the online giants,” and how in the last decade, “Google, Amazon, Facebook, Apple, and Microsoft made 436 acquisitions worth a total of 131 billion dollars”).

¹⁰¹ Andy Meek, *Snapchat’s New Feature Focuses on Privacy, So Facebook Probably Won’t Steal This*, BGR News (June 14, 2018), <https://finance.yahoo.com/news/snapchat-feature-focuses-privacy-facebook-probably-won-t-202229252.html> (“The dynamic between the two companies, of course, has seen Facebook — after unsuccessfully trying to buy Snap — copy and repurpose everything of its smaller rival that it possibly can, like Stories and ridiculous camera lenses.”). As Snap warned its investors,

Certain competitors, including Apple, Facebook, and Google, could use strong or dominant positions in one or more markets to gain competitive advantages against us in areas where we operate, including by:

- integrating competing social media platforms or features into products they control such as search engines, web browsers, or mobile device operating systems;
- making acquisitions for similar or complementary products or services; or
- impeding Snapchat’s accessibility and usability by modifying existing hardware and software on which the Snapchat application operates.

As a result, our competitors may acquire and engage users at the expense of our user growth or engagement, which may seriously harm our business.

As Part 7 explores, the dominant firm can make it harder for consumers to see the innovator's product (such as manipulating its search engine results to make it harder to find the original innovation or removing the innovation from its platform's app store), or degrading the rival product's functionality.

Facebook, for example, warns investors that its “[p]latform partners may use information shared by our users through the Facebook Platform in order to develop products or features that compete with us.”¹⁰² But Facebook, acquired the data-security app, Onavo, to track users' smartphone activity. This nowcasting radar

helped [Facebook] spot several potential threats, including Instagram, a photo app, which it bought in 2012; WhatsApp, a messaging service, for which it paid a stunning \$22bn in 2014; and tbh, a social-polling app, which it acquired last year [2017]. When Snapchat rebuffed it in 2013, it responded by cloning the app's most successful features.¹⁰³

Another concern is Amazon's identifying other sellers' products that are trending in popularity on its platform. Amazon, critics argue, imitates that innovation, promotes its copy-cat product, and makes its rival's product less visible on its platform.¹⁰⁴

Of course, contestability can still play a role. But the immediate issue for any app provider or seller dependent on the dominant firm's platform is the *appropriability* of the process innovations and whether any synergies exist with investments in related technologies. In short, the powerful digital platforms with their nowcasting radar system can monitor in real time competitive portals where start-ups may emerge. They can track the nascent competitive threats shortly after they take off and intercept or shoot them down long before they become visible to competition authorities and others. For start-ups, the prospect of becoming a target can chill their incentive to innovate in ways that potentially threaten a platform's power.

* * *

Accordingly, a key lesson from this Part is that the supply of innovation can depend on the *nature* of innovation, how *contestable* the market is, to what extent the innovator can *appropriate* the gains, and the *synergies* with other innovation efforts. The synthesized view echoes the complex relationship between market structure, and

Snap Inc. Annual Report (Form 10-K) at 15 (February 21, 2018), https://otp.tools.investis.com/clients/us/snap_inc/SEC/sec-show.aspx?FilingId=12569789&Cik=0001564408&Type=PDF&hasPdf=1.

¹⁰² Facebook Inc., *Annual Report* (2012), p. 15, <http://www.sec.gov/Archives/edgar/data/1326801/000132680113000003/fb-12312012x10k.htm>.

¹⁰³ Eve Smith, *The techlash against Amazon, Facebook and Google – and what they can do*, THE ECONOMIST (January 20, 2018), <https://www.economist.com/news/briefing/21735026-which-antitrust-remedies-welcome-which-fight-techlash-against-amazon-facebook-and>.

¹⁰⁴ OLIVIA LAVECCHIA & STACY MITCHELL, AMAZON'S STRANGLEHOLD: HOW THE COMPANY'S TIGHTENING GRIP IS STIFLING COMPETITION, ERODING JOBS, AND THREATENING COMMUNITIES (Institute for Local Self-Reliance Nov. 2016), https://ilsr.org/wp-content/uploads/2016/11/ILSR_AmazonReport_final.pdf.

the levels and nature of innovation. Market concentration, on its own, does not offer a conclusive indicator for the likely level and nature of innovation.

Some degree of market power, at times in some industries, serves as reward incentive which stimulates innovation (*appropriability*). Entry barriers and imports, for example, can affect *contestability* and incentives to innovate. Even in concentrated markets, the threat of *potential innovation* at times can sustain a healthy market economy. Most notable in this respect is the effect of potential disruptors. Radical breakthrough innovation, referred to as *disruptive innovation*, takes place outside the value network of the firms.¹⁰⁵ As such it differs from incremental or sustaining innovation within the market as it is external to the value network and displaces it.¹⁰⁶ The opportunity to develop disruptive innovation incentivizes entry and growth, as firms may be able to create a new value chain for themselves to lead. It also incentivizes the incumbents who continue investing in existing and disruptive technology to ensure that they will play a part in possible future markets. Indeed, as the Commission pointed out “[i]n fast-growing sectors characterised by short innovation cycles, large market shares may sometimes turn out to be ephemeral and not necessarily indicative of a dominant position.”¹⁰⁷

But while greater concentration might result from a firm’s welfare-enhancing innovation, one cannot say that increasing market concentration by itself will necessarily spur welfare-enhancing innovation. Instead, as the US courts aptly observed, “Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic, and rivalry is a stimulant, to industrial progress; that the spur of constant stress is necessary to counteract an inevitable disposition to let well enough alone.”¹⁰⁸

Innovation can continue to occur in heavily concentrated markets, but the nature of innovation might change. For example, rather than *breakthrough innovations*, the innovations might be largely *incremental* and *complementary* to the dominant platform’s technology and services (such as developing apps for a mobile operating system). Open systems, relying on *user-driven innovations*, might slowly close after a few firms dominate the industry. Users rather than develop and modify products and services for their own use, rely instead on the dominant firm’s innovations.¹⁰⁹

¹⁰⁵ Radical innovation, according to Schumpeter leads to a major disruptive changes and as such differs from incremental innovation. Joseph Bower & Clayton Christensen, *Disruptive Technologies: Catching the Wave*, HARVARD BUSINESS REVIEW (January–February 1995) at 43-53, <https://hbr.org/1995/01/disruptive-technologies-catching-the-wave>.

¹⁰⁶ Alexandre de Streel & Pierre Larouche, *Disruptive innovation and competition policy enforcement*, OECD Global Forum on Competition DAF/COMP/GF(2015)7.

¹⁰⁷ Case AT.39740 Google Search (Shopping), para 267; Case T-79/12, Cisco Systems, Inc. and Messagenet SpA v Commission, EU:T:2013:635, para 69.

¹⁰⁸ *Am. Tobacco Co. v. United States*, 328 U.S. 781, 813, 66 S. Ct. 1125, 1140–41, 90 L. Ed. 1575 (1946) (quoting *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 427 (2d Cir. 1945)).

¹⁰⁹ See, e.g., European Commission - Press release: Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications (20 April 2016),

Finally, the primary beneficiaries from the innovation might change. Innovation may simply reinforce the dominant platform's power and user lock-in: "once a certain technology becomes dominant, subsequent adoptions will most likely be of the same type enhancing its leading position."¹¹⁰ Data which conceivably could benefit multiple constituencies, including non-profit and governmental entities, now benefit primarily one party, or group of market participants (such as advertisers). The data-opoly can dictate who is granted access to the data and for what purpose, and thereby influence the nature of innovation.

7 Analytical Framework – The Demand for Innovation

Having considered in Part 6 several drivers that affect the *supply* of innovation, this Part adds another dimension to the analysis by looking at the *demand* for innovation, how it can be distorted, and subsequently affect adoption and supply of innovation.

Using five stages in the innovation-decision process, Part 7.1 first explores how some dominant platforms can influence the demand for, and rate of adoption of, different kinds of innovation. Powerful platforms can accelerate the rate of adoption for some technologies. But just as platforms can help users through the five stages in deciding to adopt an innovation, so too, as Part 7.2 explores, powerful platforms can increase barriers in one or more of these stages, thereby impeding the technology's adoption. Part 7.3 provides an example of ad blocking technology for smartphones to illustrate how dominant firms can reduce the demand for, and use of, technologies, even when they do not seek to appropriate any gains from that technology.

7.1 How Powerful Platforms Can Influence the Innovation-Decision Process

In deciding whether to adopt an innovation, an individual, as Professor Everett Rogers describes in his seminal work, generally passes through the following five stages:¹¹¹

http://europa.eu/rapid/press-release_IP-16-1492_en.htm (discussing how Android, an open-source system, meaning that it can be freely used and developed by anyone to create a modified mobile operating system, was closed as a result of Google's "Anti-Fragmentation Agreements" which effectively prevented manufacturers from selling smart mobile devices based on a competing Android fork which had the potential of becoming a credible alternative to the Google Android operating system).

¹¹⁰ Karolina Safarzyńska & Jeroen C. J. M. van den Bergh, *Evolutionary Models in Economics: A Survey of Methods and Building Blocks*, 20 JOURNAL OF EVOLUTIONARY ECONOMICS 329-373 (June 2010), doi:10.1007/s00191-009-0153-9.

¹¹¹ EVERETT M. ROGERS, *DIFFUSION OF INNOVATIONS* 216-16 (Free Press 5th ed. 2003).

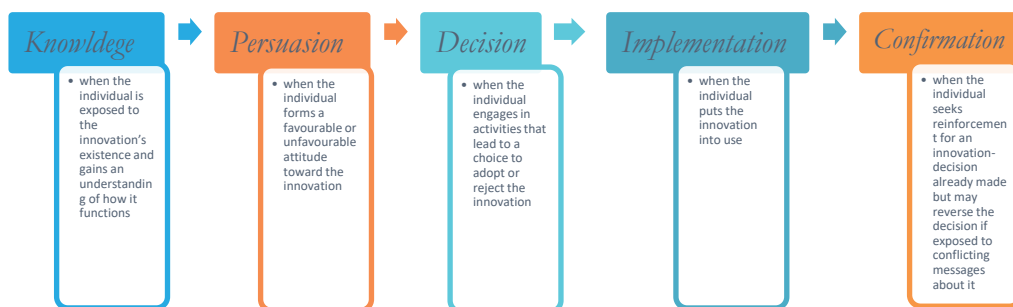


Figure 11.

To illustrate how a platform can affect the demand for innovation, suppose an innovator wants to target potential users to adopt its technology.

First is *knowledge* of the innovation and how it functions. Historically, innovators could rely in part on traditional media, such as newspapers and magazines. From their subscription data, the publishers had a good idea of who reads their publications. Today many newspapers and magazines depend on platforms, namely Facebook's and Google's, for traffic to their websites.¹¹² Both newspapers and platforms can target users with ads of the innovation. A publisher, for example, may know what articles its readers "like" using the Facebook tool. But Facebook also knows this. Moreover, Facebook can follow these users across its own platform, including WhatsApp and Instagram, and across the web to any website with embedded Facebook APIs.¹¹³

In accumulating a significant volume and variety of personal data, the platform can identify innovations that are relevant to particular needs of individuals, and which conform with the individual's pre-existing attitudes and beliefs. Thus, the personal data platforms collect can enable advertisers or the platform itself to identify likely

¹¹² Rasmus Kleis Nielsen & Sarah Anne Ganter, *Dealing with Digital Intermediaries: A Case Study of the Relations Between Publishers and Platforms*, 20 *NEW MEDIA & SOCIETY* 1600-1617 (2017), <https://doi.org/10.1177/1461444817701318> (noting how a "growing number of news organizations across the world report that only about half their online traffic comes direct to their website and app, with the rest coming from search and social referrals").

¹¹³ One 2017 study sought to identify who tracked users as they surfed the Web. The study examined over 144 million page loads in over 12 countries, including the United States, Canada, Great Britain, France, Germany, Austria and Switzerland. The study found that "at least one tracker was prowling around 77.4 percent of the tested page loads." Google and Facebook, by far, led in tracking users. Their tracking tools were found on 60.3 percent and 27.1 percent, respectively, of the websites examined. They were followed by ComScore (11.4 percent) and Twitter (10.5 percent). Cliqz & Ghostery, *Tracking the Trackers: Analyzing the global tracking landscape with GhostRank* (June 12, 2017), <https://cliqz.com/en/magazine/ghostery-study>.

adopters of the innovation, increase their awareness of the innovation, and help persuade individuals to use the innovation.

This might include highlighting an app for the individual to consider and explaining how the app can help them, with the aim of developing a favorable attitude toward the innovation. So, a significant information asymmetry arises between the digital platforms and other traditional advertising vehicles in identifying users more likely to be interested in the innovation.¹¹⁴

Next comes *persuasion*, when the individual forms a favorable or unfavorable attitude toward the innovation. An innovator will not only likely rely on the large platform to identify likely early adopters, it might also enlist the platform's help to persuade potential users to try the new product or service. Here the online platforms have blurred the functions of the "mass media channels" which historically generated general awareness of the innovation and the "interpersonal channels," where peer networks (such as one's friends) historically were more important at the persuasion and decision stages.¹¹⁵ The platform can target those most likely to initially adopt the innovation, and facilitate those early adopters to exchange information with their peers about the technology, and persuade them to adopt it. The platform, using its multiple channels with users, whether its search engine, digital personal assistant (e.g., Amazon's Alexa or Google Home), and videos, can highlight how the innovation is relevant to the particular user's needs. Thus, either through advertising or "organic" placements, innovators will likely rely on a dominant online platform to persuade users to try their products and services.

In the *decision* stage, a user experiments with the innovation on a partial basis, to decide whether to adopt or reject the innovation. Here the online platform can identify peers who tried the product, which can provide a "vicarious trial for an individual."¹¹⁶ For apps or games, it might be the recommendation of a friend on Facebook. It can also be a video on YouTube that demonstrates the use of the innovation. Moreover, users can experiment with the innovation on a trial basis.

The platform can also facilitate the *implementation* phase, where the individual puts the innovation into use. Here the innovating company will want to address any

¹¹⁴ See, e.g., Nielsen & Ganter, *supra* note 113 (noting how the divide between those who have and those who do not have access to detailed data goes not only between individual users and large technology companies but also between, for example, platforms and publishers); see also Bundeskartellamt, *Background information on the Facebook proceeding* (19 December 2017), http://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Diskussions_Hintergrundpapiere/2017/Hintergrundpapier_Facebook.pdf?__blob=publicationFile&v=6 ("Facebook has superior access to the personal data of its users and other competition-relevant data. Because social networks are data-driven products, access to such data is an essential factor for competition in the market. The data are relevant for both, the product design and the possibility to monetise the service. If other companies lack access to comparable data resources, this can be an additional barrier to market entry."); Tom Simonite, *What Facebook Knows*, MIT TECHNOLOGY REVIEW (June 13, 2012), <https://www.technologyreview.com/s/428150/what-facebook-knows/>.

¹¹⁵ Rogers, *supra* note 112, at 203.

¹¹⁶ *Ibid.* at 177.

operational issues about the technology, feedback from other users, etc. The data collected by the platform can help the innovator assess when, how, and under what circumstances, its innovation is being used, and what alternatives the users are considering or trying. The platform can also help institutionalize the innovation as part of the users' regular activities. One example would be if the platform's digital personal assistant incorporated the innovation, or developed a skill, which applies the technology (or reminds users of the technology). Indeed, the digital assistant can modify and customize the technology for that person's particular needs.

Finally, in the *confirmation* stage, the platform can help reinforce the use of the innovation. For example, the platform's digital personal assistant, using the personal data, can inform users how much money they saved in using an innovative smart-appliance. Alternatively, the digital assistant can tell users how much money they could save if they adopted the technology.

Consequently, in the digital economy, the demand for, and rate of adoption of, new technologies can accelerate. As one article noted, "It took landline telephones about 45 years to get from 5 percent to 50 percent penetration among U.S. households, and mobile phones took around seven years to reach a similar proportion of consumers. Smart phones have gone from 5 percent to 40 percent in about four years, despite a recession."¹¹⁷

We can see the adoption rates in the US for several essential household appliances and products over 120 years:

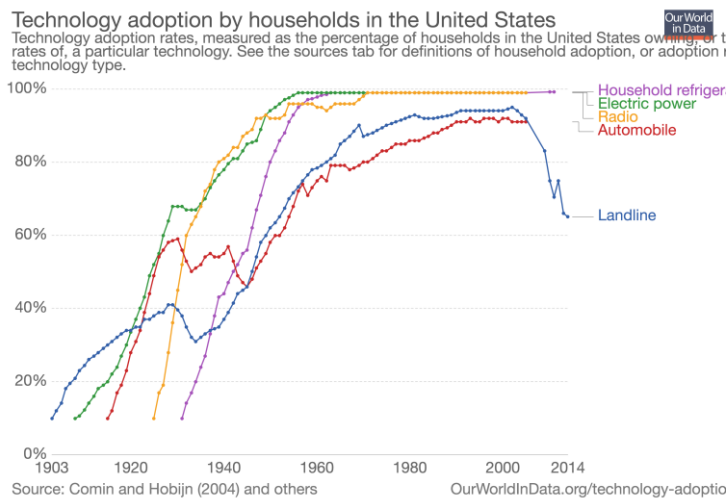


Figure 12. Source: Our World in Data, <https://ourworldindata.org/grapher/technology-adoption-by-households-in-the-united-states>

¹¹⁷ Michael DeGusta, *Are Smart Phones Spreading Faster than Any Technology in Human History?*, MIT TECHNOLOGY REVIEW (May 9, 2012), <https://www.technologyreview.com/s/427787/are-smart-phones-spreading-faster-than-any-technology-in-human-history/>.

Some technologies, like the radio, saw quick adoption, while others, like the landline phone, took decades. More recently, we saw moderately-paced adoption for computers, quicker adoption for cell phones, and even quicker adoption for tablets and social media.

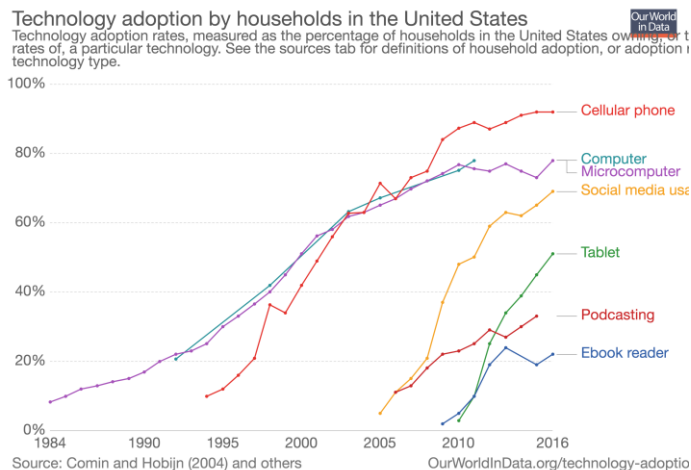


Figure 13. Source: Our World in Data, <https://ourworldindata.org/grapher/technology-adoption-by-households-in-the-united-states>

This does not mean that the demand (and rate of adoption) for new technologies will uniformly increase. The next section addresses how incremental or disruptive technologies that potentially threaten the power of dominant platforms can be impeded through manipulation of the demand for innovation.

7.2 How Powerful Platforms Can Hinder the Innovation-Decision Process

To maintain and secure fresh sources of valuable data, the platform has greater opportunities to introduce its own applications and foreclose rival applications on its platform. Some competition authorities are sensitive to vertical integration by a dominant platform operator (i.e., where it also becomes a seller on its platform). The platform’s incentives can now change, as it may earn greater profits by steering users and advertisers to its own products and services to the detriment of rival sellers (and contrary to consumers’ wishes). The platform has a “frenemy” relationship with the independent application developers.¹¹⁸ As the Organisation for Economic Co-operation and Development (OECD) warned, the platform owner “may seek to exclude third-party applications developers, either to protect its own vertically integrated applications subsidiary or to prevent the emergence of a potentially competing platform.”¹¹⁹ Just as platforms can guide users through the five stages in deciding to adopt an innovation, so too a powerful platform can

¹¹⁸ The frenemy relationship is discussed in Ezrachi & Stucke, VIRTUAL COMPETITION, *supra* note 63.

¹¹⁹ OECD, *Supporting Investment in Knowledge Capital, Growth and Innovation* (10 October 2013) at p. 173, <http://dx.doi.org/10.1787/9789264193307-en>.

increase barriers in one or more of these stages to impede a competing technology's adoption.

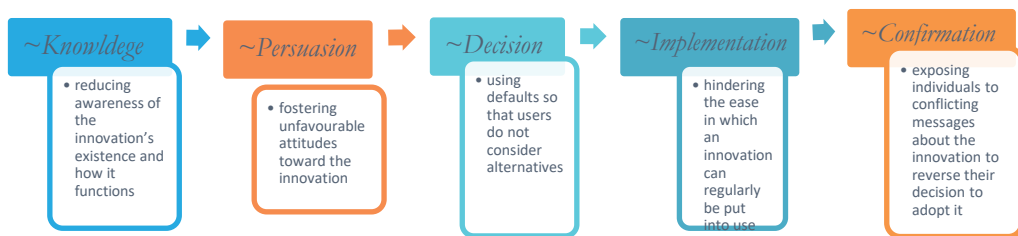


Figure 14.

First, as to *knowledge*, the powerful platform can limit the potential user's exposure to the technology. The platform, for example, can reduce or eliminate the independent app developer's ability to distribute its app by making it harder for consumers to find the app, whether on its search engine, app store, or elsewhere. This, for example, was the basis of the privacy app Disconnect's complaint filed against Google before the European Commission.¹²⁰ Smartphone users rely mostly on the app store to find apps.¹²¹ Google de-listed the app Disconnect from its app shop (Google play).¹²² The app afforded users greater control over the extent to which they were tracked while surfing on the web. It enabled users to restrict attempts by websites to harvest information or engage in invisible tracking. Arguably, in doing so the app undermined the business model on which many apps and platforms are based. When delisting the app, Google argued that it infringed its privacy rules, acted as a free-rider, and changed users' settings without their consent. Nonetheless, the delisting reduced users' awareness of the app.

Second, the powerful platform can *dissuade* users from using the innovation. It, for example, can feature negative reviews of the innovation on its platform, or give them prominence over more positive reviews. Alternatively, it can add small hurdles for the user to download and use the app.

Third, the powerful platform can use defaults, to take advantage of status quo bias. As a result, many users are unlikely to consider or *decide* to use alternatives to the default offered by the platform.¹²³ The Commission, for example, investigated whether Google "hindered the development and market access of rival mobile

¹²⁰ Noah Swartz, *Disconnect Files EU Anti-trust Complaint Against Google*, Electronic Frontier Foundation (3 June 2015), <https://www.eff.org/deeplinks/2015/06/disconnect-files-eu-anti-trust-complaint-against-google>; comScore, *The 2015 US Mobile App Report* (2015), at p. 19.

¹²¹ comScore, *The 2015 US Mobile App Report* (2015), at p. 19 (focusing on US users).

¹²² Disconnect, Inc. 2015. Complaint of Disconnect, Inc., Regarding Google's infringement of Article 102 TFEU through bundling into the Android platform and the related exclusion of competing privacy and security technology, Case COMP/40099 (Disconnect, Inc., June 2015), para. 45.

¹²³ comScore, *The 2015 US Mobile App Report* (2015), pp. 20, 55 (finding that 21% of US smartphone users have not changed their home screen, and app usage is "reflexive, habitual behavior, where those occupying the best home screen real estate are used most frequently").

applications or services by requiring or incentivising smartphone and tablet manufacturers to exclusively pre-install Google's own applications or services."¹²⁴ It preliminarily found that Google's behavior had an anticompetitive effect.¹²⁵

Likewise, Microsoft tied its media player to its operating system. This created, the General Court found, "a disincentive for users to use third-party media players and for [computer manufacturers] to pre-install such media players on client PCs."¹²⁶

Under neoclassical economic theory, it is difficult to see any significant foreclosure and resulting harm to competition. Microsoft's Windows Media Player, for example, came with the Windows operating system. But no one disputed that consumers, after unpacking the computer and starting it up, could search the Internet for the media player they want, download the software to their computer, and use that media player to stream music or videos. The Commission never argued that consumers were unaware of other competing media players. This was unlikely. Consumers presumably knew of RealNetworks' media player—it was part of Microsoft's earlier operating system. Nor were consumers or the computer manufacturers disadvantaged if they selected an alternative media player. After the US antitrust consent decree, Microsoft could not design its operating system to hamper rival media players, as it earlier did with its Internet browser. Nor could Microsoft contractually require software developers, content providers, or anyone else to distribute or promote exclusively or mainly its Windows Media Player. Microsoft's operating system could run one or more media players without affecting the media players' performance. Nor were consumers forced to use Microsoft's player. Consumers could set another media player as the default option. Consequently, how could Microsoft foreclose competition when consumers could download (often for free) Apple's and RealNetworks' alternative media players off the Internet?

As the behavioral economics literature shows, the setting of the default can often determine the outcome (even when transaction costs are nominal). Microsoft preferred having its inferior media player as the default choice, thereby requiring consumers to opt out. As Microsoft recognized, some consumers would reject the default media player and download a rival player. But many consumers would stick

¹²⁴ European Commission, *Fact Sheet, Antitrust: Commission opens formal investigation against Google in relation to Android mobile operating system* (15 April 2015), http://europa.eu/rapid/press-release MEMO-15-4782_en.htm.

¹²⁵ European Commission, *Press release, Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications* (20 April 2016), http://europa.eu/rapid/press-release IP-16-1492_en.htm. ("Google has granted significant financial incentives to some of the largest smartphone and tablet manufacturers as well as mobile network operators on condition that they exclusively pre-install Google Search on their devices. Google has thereby reduced the incentives of manufacturers and mobile network operators to pre-install competing search services on the devices they market. In fact, the Commission has evidence that the exclusivity condition affected whether certain device manufacturers and mobile network operators pre-installed competing search services.")

¹²⁶ Press and Information, CJE/07/63, Press Release No. 63/07, Judgment of the Court of First Instance [General Court] in Case T-201/04, *Microsoft Corp. v Comm'n of the European Cmtys.* (September 17, 2007).

with the default media player. Consequently, the General Court recognized that consumers “who find Windows Media Player pre-installed on their client PCs are generally less inclined to use another media player.”¹²⁷ Nor is inertia the only factor at work. Some non-computer-savvy consumers may believe that the default option represents the computer manufacturers’ choice of the superior media player. Status quo bias explains why many consumers remain with the default option, even though neoclassical theory predicts that many consumers would download superior alternative media browsers.

Fourth, even if an individual seeks out the innovation, the dominant platform can make it harder for the individual to access the innovation and put it in use. This helps the platform maintain its data-advantage and monopoly by reducing users’ likelihood of using competing apps. The platform, for example, can fuse its app with its operating system code, despite it not achieving any real integrative benefits. Microsoft devised its software so that its Media Player could override the consumer’s default setting and reappear when the consumer used Microsoft’s web browser, Internet Explorer, to access media files streamed over the Internet.¹²⁸ Likewise, a dominant search engine and browser can automatically direct users to its mapping technology, shopping interface, or other related services. Many users, as a result, will rely less frequently on other providers and technologies.

Finally, the platform can cause individuals to second-guess their continued use of the innovation. One way is to degrade the functionality of competing innovations. The FTC, for example, alleged that Intel redesigned its compiler and library software products to reduce the performance of competing Central Processing Units (CPU), which serve as the brains of the computer system.¹²⁹ Many of Intel’s design changes to its software had no legitimate technical benefit and were made only to reduce the performance of competing CPUs relative to Intel’s. The public and market participants believed that the CPU’s slower performance on Intel-compiled software applications was attributable to the CPU itself, rather than Intel’s software. Intel then misrepresented how computer programs inherently performed better on Intel’s CPUs, rather than competing CPUs, without disclosing that Intel largely caused the rivals’ innovative products to slow down. (Intel eventually settled.)

Facebook warned investors of the risk of the dominant mobile platforms inhibiting Facebook’s apps or preferring their own programs or services. So did Twitter, LinkedIn, Yelp, and smaller online platforms, like Coupons.com.¹³⁰ They all noted their dependence on the Apple and Android mobile platforms. They recognize that web usage is increasingly shifting to mobile platforms such as smart-phones and other connected devices. Their business growth and success depend on their interoperability with the popular mobile operating systems that they do not control. So one significant business risk is if the mobile super-platforms—Apple and Google

¹²⁷ CFI Microsoft, para 980.

¹²⁸ CFI Microsoft, para 974.

¹²⁹ Complaint filed in *In re Intel Corp.*, FTC Docket No. 9341 (December 16, 2009), <https://www.ftc.gov/sites/default/files/documents/cases/091216intelcmpt.pdf>.

¹³⁰ Stucke & Grunes, *supra* note 57, at 294.

(and to a much lesser extent Microsoft)—change the mobile operating systems that degrade the functionality of the independent apps and online platforms—like Twitter, Yelp, or Coupons.com—or give preferential treatment to their own similar services or competitive services. Consumers will likely blame the innovating victim, rather than the dominant firm.

7.3 Example Two: How Powerful Platforms Can Hinder the Innovation-Decision Process -- Ad Blocking Technology for Smartphones

Identifying counter-factuals for innovations that consumers wanted, but dominant firms blocked, can be challenging. But ad-blocking technology for smartphones is a good case study. Here there clearly was pent-up demand for this technology. Unwanted ads, many smartphone users complained, were annoying, consumed data, slowed down loading times, and cluttered the small screen.¹³¹ Moreover, looking at the factors affecting the supply of innovation, which Part 6 discusses, the market for ad-blocking innovations was contestable; no technology dominated the market. The developer could appropriate the gains from its technology (with user fees, add-on services, or other ways to monetize its service). Finally, synergies existed with ad blocking and privacy technologies developed for personal computers and laptops.

Although the supply and demand for the ad-blocking technology existed, nonetheless, Google (and to a lesser extent Apple) effectively hampered for many years the development and adoption rate for ad-blocking technologies for smartphones.

More people in 2017 were using ad-blocking technology on their laptops (68% of US ad blocker users) and personal computers (51%) rather than smartphones (22%).¹³² Here many smartphone users had a favorable attitude toward the technology (so the issue was not *persuasion*, the second stage of the innovation adoption process). Instead, the initial hurdle was *knowledge*. Even though many were employing this ad-blocking technology on their laptops and PCs, few were aware of whether, and how, the ad-blocking technology could be installed on their smartphones.¹³³ Neither Apple nor Google promoted the technology for the iOS or Android smartphones. In fact, Google, which relies primarily on advertising revenue, in 2013 removed some of the ad-blocking apps from its Android app store.¹³⁴

But this was not a sin of omission. Google also made it harder for users to *implement* the ad-blocking technology on their Android phones. In 2015, Apple finally announced that its new iOS 9 operating system would permit users to download ad-

¹³¹ GlobalWebIndex, *The State of Mobile Ad-Blocking in 2017* (2017), <http://insight.globalwebindex.net/hubfs/The-State-of-Mobile-Ad-blocking-in-2017.pdf>.

¹³² Ibid.

¹³³ Ibid. Of US respondents who have not blocked ads on a mobile, more than 6 in 10 said that they did not know that it was possible to block ads via their smartphone.

¹³⁴ Wladimir Palant, *Adblock Plus for Android removed from Google Play store*, Adblock Plus (March 14, 2013 09:37), <https://adblockplus.org/blog/adblock-plus-for-android-removed-from-google-play-store>.

blocking extensions through the mobile Safari browser. After Apple's Safari allowed ad-blocking extensions, many people added the technology to their iPhones.¹³⁵ But Google still did not accept ad-blocking plugins for Chrome, the default Android browser. Instead, users had to download another browser, such as Firefox, for their Android smartphone and use an ad-blocking extension.¹³⁶ A key barrier to mobile ad-blocking technology, a 2017 survey found, was the need for Android users to download an additional browser, like Firefox, to block ads.¹³⁷ Thirty-five percent of the surveyed smartphone owners said that they used their default browser and never considered using an additional browser. Only 14% of the surveyed smartphone owners used an additional browser.¹³⁸ Only in 2018 did Google enable its browser Chrome to block certain annoying ads that ran on sites that repeatedly violated standards set forth by the Coalition for Better Ads.¹³⁹

* * *

This Part illustrates how a powerful gatekeeper can influence users' adoption of innovations. Pathways for innovation, even in the digital age, can be blocked by relatively small impediments. Leading platforms may exclude consumer friendly technology that may harm their commercial interests. Powerful platforms, as the Commission's investigation of Google preliminarily found, can use multiple levers to directly and indirectly impede the users' demand for, and adoption of, innovation.¹⁴⁰

Thus, one important lesson is that one cannot consider only contestability, appropriability, and synergies that affect the supply of innovation. The supply of innovation, and the incentives to invest in that innovation, as we saw with the ad blocking technology, will likely be affected by its likely rate of adoption by users.

A second key takeaway is that dominant platforms can affect both the supply and demand of such innovations in the digital sector. Powerful platforms may seek to impede innovations, even potentially disruptive breakthrough innovations, that threaten their business model or market power. Dominant firms have multiple levers to close competitive portals to innovation. Their nowcasting radar, as Part 6

¹³⁵ Lara O'Reilly, *Ad blocker usage is up 30% — and a popular method publishers use to thwart it isn't working*, BUSINESS INSIDER (January 31, 2017), <http://www.businessinsider.com/pagefair-2017-ad-blocking-report-2017-1>.

¹³⁶ Kif Leswing, *Battle of the ad blockers: iOS vs. Android*, FORTUNE (September 22, 2015), <http://fortune.com/2015/09/22/ad-block-ios-android/>.

¹³⁷ GlobalWebIndex, *supra* note 131.

¹³⁸ *Ibid.*

¹³⁹ Tom Warren, *Google's Chrome ad blocking arrives today and this is how it works*, THE VERGE (February 14, 2018), <https://www.theverge.com/2018/2/14/17011266/google-chrome-ad-blocker-features>. Samsung in 2016 introduced ad-blocking technology for its version of the Android phone. Sarah Perez, *Following Apple's Move, Samsung Rolls Out Ad Blocking To Android Devices*, TECH CRUNCH (February 1, 2016), <https://techcrunch.com/2016/02/01/following-apples-move-samsung-rolls-out-ad-blocking-to-android-devices/>.

¹⁴⁰ European Commission, Press release, *Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications* (20 April 2016), http://europa.eu/rapid/press-release-IP-16-1492_en.htm.

discusses, can reduce firms' incentives to invest in innovation that competes with or threatens the dominant firm. As this Part addresses, in applying pressure along any of the five steps of user adoption of technologies, the dominant firm can further chill innovation.

But not all innovation will be impeded. A dominant platform, as we have also seen, will have an incentive to promote innovations, especially ones that complement its platforms' services and which increase the value of the platform itself (such as smartphones and smartphone apps). These innovations, with the help of the dominant platform, can experience quicker user adoption.

As powerful platforms can have the incentive to promote some innovations, especially those which benefit the platform or support its advertising-dependent revenue model, while hindering innovations that increase users' welfare, some innovations may be better than others.

8 Digital Markets - Nature of Innovation and its Welfare Effects

So far, we have noted the likely effects contestability, appropriability, and synergies may have on the investment for different types of innovation. We have also considered factors that stimulate or hinder users' adoption of that innovation. The underlying assumption has been that more innovation will deliver greater benefits. That is, regardless of the uncertainty as to which market structure best stimulates innovation, society would desire such an increase.

Having considered the supply and demand for innovation, this Part adds a final dimension to the analysis: a qualitative component that focuses on the nature of innovation. This angle highlights that investment in innovation does not always equate with optimal industrial policy. While the term *innovation* often implies a positive outcome such as "new and significant improved product (good or service),"¹⁴¹ the process of innovation – that is the introduction of new idea, technology, method, or product – may not necessarily increase overall welfare.¹⁴²

¹⁴¹ See the OECD definition in the Oslo Manual: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." Page 46, para 146, OECD/Eurostat (2005), Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264013100-en>; Also see Fred Gault, *Defining and Measuring Innovation in all Sectors of the Economy: Policy Relevance*, OECD Blue Sky Forum III, Ghent, Belgium, 19-21 September 2016; Fred Gault, *Defining and measuring innovation in all sectors of the economy*, 47 RESEARCH POLICY 617-622 (2018), <https://doi.org/10.1016/j.respol.2018.01.007>.

¹⁴² The positive definition of innovation suggests that any negative change should not be seen as innovation but as an external negative change. We find this normative assumption to create a false expectation that any investment in research and development would generate positive welfare effect. As we illustrate later, this is not necessarily the case. Note in this respect the OECD comment, that accepts alternative change – *new* or *improved* – to substantiate innovation. "The minimum requirement for an innovation is that the product, process, marketing method or

Innovation, like competition, is not an end by itself. Ultimately, innovation, like competition, is the means to a greater end, namely improving overall welfare. Thus, innovation, as such, is an independent variable, which with other variables, can lead to positive, negative, or mixed outcomes. As this Part explores, one should use a refined prism when analyzing innovation—namely consider how changes in market characteristics may impact the *nature of innovation* and whether the nature of ensuing innovation takes a path that benefits consumers or society overall.

The refined prism illustrates that a common normative assumption of positive change risks ignoring the possibility that implemented change could run against societal goals. For instance, *over-investment in innovation* beyond optimal levels may be used to increase market power and concentration.¹⁴³ Advanced technology, and economies of scale, may be used strategically to deter market entry. Under limited competition, innovation may be used strategically to increase product differentiation and output and push out as-efficient competitors.¹⁴⁴ Innovation, itself, may have exclusionary elements, when it is used to exclude competitors, reduce interoperability, or raise rivals' costs. Innovations may slow the rate of adoption of rival technologies. Companies may purposively innovate their products to make them harder to repair or induce consumers to buy additional products (such as new chargers). Lastly, innovation may be used to cannibalize rival innovation, when new developments are aimed at side-lining the relevance of other innovation or diminish rival's incentive to innovate.

Of course, many types of innovation are *positive*, in that the innovation, under many circumstances, will increase overall welfare by addressing outstanding societal needs or problems. However, other types of innovation are *negative*, in that the innovation, in generally working against the interests of consumers and society, reduces overall welfare. It can include exploitative elements aimed at increasing the transfer of wealth from consumers to companies. Finally, *mixed innovation* can be used in ways that benefit or harm society.

In refining our prism, we note that negative innovation can be further subdivided. Among the subsets are:

- *Exclusionary innovation*, aimed at pushing “as-efficient” competitors out of the market,
- *Cannibalistic innovation*, aimed at diminishing rivals' incentive to innovate and develop competing products and technologies, and

organisational method must be new (or significantly improved) to the firm.” Oslo Manual, *supra* note 143, at para 148.

¹⁴³ Marc Escrihuela-Villar, *Innovation and Market Concentration with Asymmetric Firms*, Center for Financial Studies Working Paper No. 2004/03 (February 2004), https://www.ifk-cfs.de/fileadmin/downloads/publications/wp/04_03.pdf.

¹⁴⁴ P. Aghion, M. Braun, & J. Fedderke, *Competition and productivity growth in South Africa*, 16 *ECONOMICS OF TRANSITION* 741–768 (2008).

- *Exploitative innovation*, aimed at exploiting customers.

To illustrate the significance of this refined prism, we note five examples of negative innovation. Importantly, these anecdotes do not imply that all innovation is necessarily negative. As noted above, innovation, often can be positive or mixed. Our purpose is to illustrate that under certain market conditions, and regardless of the level of investment in innovation, negative innovation may become more prominent, reducing overall welfare. Several of our examples involve antitrust violations. We note, however, that negative innovation does not necessarily trigger antitrust intervention and as such should not be viewed through the narrow EU and US legal prism of abuse of dominance or monopolization.

8.1 *Excluding Competitors by Pretextual Improvements to Consumer Interface*

Investment in research and development may, at times, be presented as pro-innovation and pro-consumer, while in practice being aimed at developing technologies to exclude competitors. This would be most noticeable when a company controls an interface – such as a platform – and wishes to leverage its power downstream. Such practice can have two adverse effects: First is an exclusionary effect. Competitors may be pushed out of the market despite being efficient or when they are faced with increased costs due to limited interoperability. Second is a cannibalistic effect, as the exclusion influences the path and intensity of innovation of the company and chills the incentive of others to innovate.

Importantly, not all forms of exclusion should be viewed as negative. At times, a technological change, despite excluding rivals or other technologies, may be necessary and beneficial. Here lies one of the challenges in delineating positive, mixed, and negative innovation.

In the *Google* case, the Commission accused the dominant search engine of developing search interfaces that favor its own downstream operations (Google shopping).¹⁴⁵ Google's market shares in the majority of the EU national markets for general search exceeded 90%. It was accused of abusing its dominant position on these markets by giving an illegal advantage to its comparison-shopping service. Google argued that its innovation sought "to improve the user experience."¹⁴⁶ The Commission, in rejecting Google's justification, noted that Google's conduct "is likely to reduce the incentives of Google to improve the quality of its comparison shopping service as it does not currently need to compete on the merits with competing comparison shopping services."¹⁴⁷ Moreover, the Commission did not find any

¹⁴⁵ Google Search (Shopping) Case AT.39740, European Commission, 27 June 2017.

¹⁴⁶ *Ibid* at para 345.

¹⁴⁷ *Ibid* at para 596. Other platforms are concerned of similar behavior happening to them. For example, a significant amount of traffic is directed to Expedia's travel websites through participation in pay-per-click and display advertising campaigns on search engines. Expedia warns its investors of the risk that the leading search engines "offering comprehensive travel planning, shopping or booking capabilities, or increasingly refer those leads directly to suppliers or other favored partners." This

evidence that users were aware of Google intentionally degrading its search results to favor its own service.¹⁴⁸ While Google argued that its innovation improved the quality of its search service for users and advertisers,¹⁴⁹ it does not appear from the Commission's decision that Google provided evidence to support its claim. One study found the contrary: participants preferred the content selected by Google's organic (unbiased) algorithm, rather than its biased algorithm.¹⁵⁰ So the innovation here wasn't positive (i.e., providing users with the most relevant and useful information). Instead it was negative. It extended the dominant firm's market power, with no countervailing benefits to consumers.

8.2 Technological Bundling

Another example of exclusionary negative innovation concerns the bundling of technology in a way to exclude competitors and diminish their incentive to innovate. Again, importantly, at times bundling serves legitimate goals. Few, if any, would want to search for a left shoe or sock to match the right one.¹⁵¹ Yet, at times, the innovation and technological changes are negative, with the purpose and effect of chilling innovation and competition by third parties.

In the *Microsoft* case, for example, the United States accused the dominant operating system for personal computers of investing in technology with the sole aim to exclude competitors.¹⁵² Microsoft implemented product design changes aimed at eliminating viable cross-platform threats by, among other things, overriding the users' preferences and commingling computer code for two products. Expert

could increase the cost of traffic directed to Expedia's websites, and harm its business. Expedia 2017 Annual Report, *supra* note 18, at 10.

¹⁴⁸ Google Search (Shopping) Case at para 662-3.

¹⁴⁹ *Ibid* at para 656.

¹⁵⁰ Michael Luca, Time Wu, Sebastian Couvidat, Daniel Frank & William Seltzer, *Does Google Content Degrade Google Search? Experimental Evidence*, HARVARD BUSINESS SCHOOL NOM UNIT WORKING PAPER No. 16-035 (Aug. 2016), <https://ssrn.com/abstract=2667143> or <http://dx.doi.org/10.2139/ssrn.2667143>.

¹⁵¹ The D.C. Circuit in *Microsoft* noted how bundling can save distribution and consumer transaction costs:

This is likely to be true, to take some examples from the computer industry, with the integration of math co-processors and memory into microprocessor chips and the inclusion of spell checkers in word processors. . . . Bundling can also capitalize on certain economies of scope. A possible example is the "shared" library files that perform OS and browser functions with the very same lines of code and thus may save drive space from the clutter of redundant routines and memory when consumers use both the OS and browser simultaneously. . . . Indeed, if there were no efficiencies from a tie (including economizing on consumer transaction costs such as the time and effort involved in choice), we would expect distinct consumer demand for each individual component of every good. In a competitive market with zero transaction costs, the computers on which this opinion was written would only be sold piecemeal—keyboard, monitor, mouse, central processing unit, disk drive, and memory all sold in separate transactions and likely by different manufacturers.

United States v. Microsoft Corp., 253 F.3d 34, 87 (D.C. Cir. 2001).

¹⁵² *Ibid*.

testimony revealed that Microsoft designed its web browser while linking its code to that of the operating system, in a way that integrated two distinct and separate functions: the web browser and computer's operating system.

This bundling, the US district court found, was anticompetitive. It made it harder for computer manufacturers and users to delete Microsoft's web browser without also deleting "vital operating system routines and thus cripple[ing] Windows."¹⁵³ Since computer manufacturers could not delete Internet Explorer, they had less incentive to install another competing browser, like Netscape's. Installing a second web browser would increase the equipment manufacturers' product testing and support costs.¹⁵⁴ Absent this negative innovation, the equipment manufacturers could have easily replaced Microsoft's web browser for a rival product. The US Court of Appeals noted,

As a general rule, courts are properly very skeptical about claims that competition has been harmed by a dominant firm's product design changes...In a competitive market, firms routinely innovate in the hope of appealing to consumers, sometimes in the process making their products incompatible with those of rivals; the imposition of liability when a monopolist does the same thing will inevitably deter a certain amount of innovation. This is all the more true in a market, such as this one, in which the product itself is rapidly changing...Judicial deference to product innovation, however, does not mean that a monopolist's product design decisions are per se lawful.¹⁵⁵

Tellingly, Microsoft offered no specific justification for commingling the browser and operating system code. Instead it generally claimed that its innovation substantially benefitted customers and developers. But the monopoly never substantiated its claim. One could question whether redesigning an operating system counts as innovation. But if it does, the innovation, as the court found, served no purpose other than helping Microsoft protect its operating system monopoly. Accordingly, it was illegal.¹⁵⁶

8.3 Increased Friction and Sealed Ecosystems

Breakthrough innovation (and even incremental innovations at times) can force change in strategy, business models, and market dynamics. Breakthrough innovation can also disrupt market power. The prospect of breakthrough innovation may therefore incentivize incumbents that control platforms or networks to wrest control of the innovation paths. This may be done by diverting users away from certain

¹⁵³ Ibid at 65–66.

¹⁵⁴ Ibid.

¹⁵⁵ Ibid at 65 (internal citations omitted).

¹⁵⁶ Likewise, the European Commission challenged Microsoft's bundling of its Windows Media Player with the Windows operating system. Microsoft argued that the media functionality was not a separate product from the Windows client PC operating system, but formed an integral part of that system. Here too the Commission and Court rejected this claim. *Microsoft Corp. v Commission*, Case T-201/04 General Court, [2007] 5 CMLR 11.

platforms, decreasing interoperability, or increasing the friction users face when they attempt to use different technologies.

Evidently, some innovation, by its very nature, would lead to incompatibility or friction and will likely push others out of the market. Importantly, such innovation often is positive in benefitting consumers and society. At times, however, innovation is for the sole purpose of sealing an ecosystem, creating a “kill zone” for rival technologies, and limiting the viable paths for future innovation.

One example involves Microsoft. The Commission found that Microsoft abused its market power by deliberately restricting interoperability between Windows PCs and non-Microsoft work group servers.¹⁵⁷ Microsoft’s initial policy was to disclose interoperability information, not to retain it, which, among other things, helped Microsoft to introduce its own work group server operating systems on the market. However, once its server products were sufficiently established on the market, Microsoft changed its strategy. It chose to foreclose its competitors by refusing to give them access to that information. As a result, Microsoft acquired a dominant position in the market for work group server operating systems. The Commission required Microsoft to disclose interface information so that non-Microsoft work group servers could achieve full interoperability with Windows PCs and servers. The disclosed information had to be updated each time Microsoft brought to the market new versions of its relevant products.

Noteworthy for the General Court was that Microsoft failed to show how disclosure of the interoperability information would significantly affect its incentives to innovate. Microsoft argued that its technology was secret and contained important innovations. But this alone did not justify reducing interoperability. As the Court noted, it was normal practice for operators in the industry to disclose to third parties the information which would facilitate interoperability with their products. Indeed, Microsoft itself had followed that practice until it was sufficiently established on the work group server operating systems market. Such disclosure allowed the operators to make their own products more attractive and therefore more valuable.

Similarly, the FTC alleged that Intel for many years fostered interoperability between its CPU and manufacturers of complementary products.¹⁵⁸ These interfaces were essential for such complementary products to be used in a computer. After Intel encouraged others to become reliant on that accessibility, Intel redesigned its CPU platform to selectively cut off or hinder accessibility. It sought to thwart competing innovations that threatened its monopoly power. Intel also took steps to create technological barriers to interoperability to preclude the possibility that integrated CPU chipsets could interconnect with future Intel CPUs. Intel argued that it was continually innovating. The FTC countered that Intel’s innovations sought to extend its monopoly power, rather than benefit market participants or users. As part of the

¹⁵⁷ Ibid.

¹⁵⁸ Para. 80-91 of Complaint filed in *In re Intel Corp.*, FTC Docket No. 9341 (December 16, 2009), <https://www.ftc.gov/sites/default/files/documents/cases/091216intelcmpt.pdf>.

FTC settlement, manufacturers of complementary products were assured access to Intel's CPU for six years.¹⁵⁹

In both cases, the leading platforms used their power to hinder rival technologies by reducing interoperability. When a platform serves as the sole or primary access point to an industry, it can use this power to influence the value and viability of innovation.¹⁶⁰

8.4 Innovations in Tracking, Data Gathering, and Manipulation

The gathering and use of personalized data can help generate many innovations in the digital economy. Data can help sellers identify unaddressed needs and deliver more relevant choices for individuals' needs.

Yet, alongside the beneficial aspects, one may identify companies investing in innovations to better exploit consumers. While maintaining the façade of a competitive interface, some platforms will innovate to not only track, profile, and target users, but to manipulate their emotions and behavior.

Firms may innovate to better engage in online discriminatory personalized pricing. While perfect price discrimination may be unattainable, "almost perfect" price discrimination may be within reach for dominant online platforms. The industry jargon for price discrimination is price optimization or dynamic differential pricing. Dynamic differential pricing, as MIT professor Yossi Sheffi has put it, is the "science of squeezing every possible dollar from customers."¹⁶¹ Companies maximize profits by extracting as much consumer surplus as they can - charging higher prices to people who are willing to pay more.¹⁶²

Tracking and price discrimination are not limited to the online environment. Facial recognition technology and hardware identifiers such as WiFi or Bluetooth Media Access Control (MAC) can help retailers identify and track customers both in and outside their stores.¹⁶³ In the case of smartphones, "apps and advertisers sometimes rely on MAC addresses as a mechanism to uniquely track behavior online -- thereby

¹⁵⁹ Federal Trade Commission, Press Release: FTC Settles Charges of Anticompetitive Conduct Against Intel--Provisions are Designed to Foster Competition in the Computer Chip Business (Aug. 4, 2010), <https://www.ftc.gov/news-events/press-releases/2010/08/ftc-settles-charges-anticompetitive-conduct-against-intel>.

¹⁶⁰ John M. Newman, *Anticompetitive Product Design in the New Economy*, 39 FLA. ST. U. L. REV. 681, 703 (2012) (noting how "the use of software updates to quickly, cheaply, and easily-yet effectively-redesign code-based products with an eye toward closing a network, destroying interoperability to preserve a closed-network monopoly, or otherwise excluding rivals from the market poses a distinctive threat to competition and innovation").

¹⁶¹ James Surowiecki, *In Praise of Efficient Price Gouging*, MIT TECHNOLOGY REVIEW (Aug. 19, 2014), <http://www.technologyreview.com/review/529961/in-praise-of-efficient-price-gouging/>.

¹⁶² *Ibid.*

¹⁶³ Ashkan Soltani, Chief Technologist, US Federal Trade Commission, *Privacy trade-offs in retail tracking* (April 30, 2015), <https://www.ftc.gov/news-events/blogs/techftc/2015/04/privacy-trade-offs-retail-tracking>.

providing a mechanism for linking offline (physical) and online behavior.”¹⁶⁴ Another example is Silverpush, which “makes available for application developers a ‘Unique Audio Beacon’ technology” that enables mobile applications to secretly listen to what users are watching on television, even when users are not using the particular app.¹⁶⁵ Amazon recently patented a couple of innovations: first is “Physical Store Online Shopping Control.”¹⁶⁶ The technology can determine whether a customer is searching for a competitor’s item online and take subsequent action, including fully blocking access to the content, or sending a sales representative to talk to the customer.¹⁶⁷ Amazon’s second patents would expand the listening capabilities of its voice assistants, to allow the assistant to listen in on any conversation without requiring a wake word, and “always listen for key words like ‘prefer,’ ‘like,’ and ‘love’ in conversations.”¹⁶⁸

Related examples concern innovations targeting human attention. Increasingly, companies are investing in emotion recognition (or affective computing) technologies, where artificial intelligence can better identify users’ emotions. In identifying emotions, AI can experiment in manipulating users’ emotions and behavior.¹⁶⁹ Companies can innovate to affect users’ perceptions generally, or to particular products and services. Illustrative are innovations to addict users to particular social networks, apps, or products.¹⁷⁰ These innovations, unbeknownst to users, can be algorithmically tailored to manipulate a particular person’s behavior.¹⁷¹

¹⁶⁴ Ibid.

¹⁶⁵ US Federal Trade Commission, *Press Release: FTC Issues Warning Letters to App Developers Using ‘Silverpush’ Code: Letters Warn Companies of Privacy Risks In Audio Monitoring Technology* (March 17, 2016), <https://www.ftc.gov/system/files/attachments/press-releases/ftc-issues-warning-letters-app-developers-using-silverpush-code/160317samplesilverpushltr.pdf>.

¹⁶⁶ Swapna Krishna, *Amazon has the tech to thwart comparison shoppers in its stores: Their patent to redirect and block competitor information on their own WiFi networks was approved*, ENGADGET (June 15, 2017), <https://www.engadget.com/2017/06/15/amazon-online-shopping-control-in-stores/>.

¹⁶⁷ Ibid.

¹⁶⁸ Sparks & Honey, *Truth, Trust & The Future of Commerce* 27 (June 2018), <https://reports.sparksandhoney.com/campaign/truth-trust-and-the-future-of-commerce>; United States Patent Application by Amazon Technologies, Inc., Family ID: 51229148, Appl. No. 15/620252 (filed June 12, 2017).

¹⁶⁹ See, for example, *ibid* (discussing how the blending of physical, digital and biological data in tandem with the fast-moving and growing sophistication of media and technologies can manipulate and bend reality); Didem Kaya Bayram & Furkan Akyurek, *How our voices could turn into a weapon of mass, hyper-targeted advertising*, TRT WORLD,

<https://www.trtworld.com/life/how-our-voices-could-turn-into-a-weapon-of-mass-hyper-targeted-advertising-18681>. Facebook, for example, sought to examine “emotional contagion,” whereby people transfer positive and negative moods and emotions to others. 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). This was the “first experimental evidence for massive-scale emotional contagion via social networks.” *Ibid*. See also Vinu Goel, *Facebook Tinkers With Users’ Emotions in News Feed Experiment, Stirring Outcry*, N.Y. TIMES (June 29, 2014), <https://www.nytimes.com/2014/06/30/technology/facebook-tinkers-with-users-emotions-in-news-feed-experiment-stirring-outcry.html>.

¹⁷⁰ Tristan Harris, *How a handful of tech companies control billions of minds every day*, TED TALK (April 2017),

These negative innovations can have significant implications on privacy, autonomy, well-being, and the democratic process. Illustrative are ranking bias, search suggestion, and search engine manipulation effect, which have recently attracted attention due to the possible use to change the outcome of elections.¹⁷² Advanced manipulation through *filtering* and *ordering* may remain largely undetected.¹⁷³ Similarly, we witness increased use of manipulation of news feeds, posting on social networks, and purchasing.¹⁷⁴

The use of artificial intelligence to manipulate emotions and behavior illustrates the negative side of innovation. While innovation in computing power and the rise of artificial intelligence can benefit society and the economy, some innovations are inherently negative, designed for the purpose of manipulating users and discrimination, to benefit the firms, and not the users. These trends will likely intensify as innovators exploit the gaps in data protection and privacy laws and as users remain unaware of the increasing analytical capabilities, knowledge and capabilities of the firms' stealth technologies. The increased reliance on digital

https://www.ted.com/talks/tristan_harris_the_manipulative_tricks_tech_companies_use_to_capture_your_attention/transcript; Tim Wu, *Blind Spot: The Attention Economy and the Law*, ANTITRUST L.J. (forthcoming 2018), <https://ssrn.com/abstract=2941094>; Betsy Morris, *The New Tech Avengers*, WALL ST. J. (June 29, 2018, 8:10 PM), <https://www.wsj.com/articles/the-new-tech-avengers-1530285064>; Nellie Bowles, *Early Facebook and Google Employees Form Coalition to Fight What They Built*, N.Y. TIMES (Feb. 4, 2018), <https://www.nytimes.com/2018/02/04/technology/early-facebook-google-employees-fight-tech.html>; Letter from Campaign for a Commercial-Free Childhood, to Mark Zuckerberg, CEO, Facebook (Jan. 30, 2018), <http://www.commercialfreechildhood.org/sites/default/files/develop/gaw/FBMessengerKids.pdf>.

¹⁷¹ Sparks & Honey, *supra* note 170 (discussing rise of data-opolies; how they are harnessing data, which “reveals where you are, where you live, how you live, with whom, and even use your emotional state and unique biology for hyper-personalized manufacturing, distribution, pricing, services, experiences, content and more”, and the proliferation of cognitive modeling technology, or “brain hacks,” in which the messages delivered to each consumer emphasize vulnerabilities in that individual’s belief space); Paul Lewis, *Our minds can be hijacked: the tech insiders who fear a smartphone dystopia*,

THE GUARDIAN (6 Oct 2017 01.00 EDT), <https://www.theguardian.com/technology/2017/oct/05/smartphone-addiction-silicon-valley-dystopia>

¹⁷² Robert Epstein & Ronald E. Robertson, *The search engine manipulation effect (SEME) and its possible impact on the outcomes of elections*, PNAS (Aug. 18, 2015). 112 (33) E4512-E4521; published ahead of print August 4, 2015. <https://doi.org/10.1073/pnas>; Gillian Tett, *Facebook or Google — which should worry us more?*, FINANCIAL TIMES MAGAZINE (2 May 2018), <https://www.ft.com/content/7dc8eae4-4d99-11e8-97e4-13afc22d86d4>;

¹⁷³ Greg Ip, *How Google and Facebook Are Monopolizing Ideas*, WALL ST. J. (4 July 2018), <https://www.wsj.com/articles/how-google-and-facebook-are-monopolizing-ideas-1530713153>; David Dayen, *Google Is So Big, It Is Now Shaping Policy to Combat the Opioid Epidemic. And It’s Screwing It Up*, INTERCEPT (17 Oct. 2017), <https://theintercept.com/2017/10/17/google-search-drug-use-opioid-epidemic/>.

¹⁷⁴ François Chollet, *What worries me about AI*, <https://medium.com/@francois.chollet/what-worries-me-about-ai-ed9df072b704>; Indictment filed in U.S. v. Internet Research Agency, Case 1:18-cr-00032-DLF (D.D.C. Feb. 16, 2018), <https://www.justice.gov/file/1035477/download>.

personal assistants and digital feeds, controlled by a handful of providers, will likely increase users' susceptibility to negative innovations.¹⁷⁵

8.5 Scraping and Cannibalism

Using advanced scraping technology, some platforms can harvest information and content from third parties' websites. At times such innovations are positive. Some of Google's web scraping innovations, for example, help it collect information, which is later used to identify and rank webpages in response to search queries (for example, which websites have the relevant information on a particular person).

At other times, however, firms develop scraping technology to quickly harvest and copy relevant data from others and pass it along as their own. Google, for example, blocked in 2017 over 12,000 websites for "scraping," duplicating and copying content from other sites, an increase from 10,000 websites in 2016.¹⁷⁶

But what happens when a leading platform develops scraping technologies to simply divert (or keep) users to its own websites? The dominant platform can use its control over the interface and the users to force the victims to align with the platform's own strategic goals (or risk being delisted from its search results or ignored by its digital personal assistant). Many websites, for example, rely on the dominant search engine for traffic and visibility. To improve traffic, they need to make all of their content available for the search engine to crawl. Websites that are

not crawled will not be included in the search engine's index, and will not show up in users' search results. So the websites are vulnerable to the dominant firm's anticompetitive scraping tools.

The US Federal Trade Commission, for example, investigated allegations that Google "unfairly 'scraped,' or misappropriated, the content of certain competing websites, passed this content off as its own, and then threatened to delist these rivals entirely from Google's search results when they protested the misappropriation of their content."¹⁷⁷ Although the FTC legal team recommended prosecuting Google, the FTC closed the investigation. Nonetheless, the Bureau of Competition's internal memorandum, which was inadvertently disclosed, discussed the anticompetitive effects of Google's scraping.¹⁷⁸ In addition to the technology being used as part of a

¹⁷⁵ Ezrachi & Stucke, *VIRTUAL COMPETITION*, *supra* note 63; Maurice E. Stucke & Ariel Ezrachi, *How Digital Assistants Can Harm Our Economy, Privacy, and Democracy*, 32 *BERKELEY TECHNOLOGY L. J.* 1239 (2017).

¹⁷⁶ Google reportedly removed over 3.2 billion ads in 2017 for violating its policies. tvnews4uon (March 17, 2018), <https://tvnews4u.com/google-removed-3-2-billion-ads-2017for-violating-policies/>.

¹⁷⁷ Statement of the Federal Trade Commission Regarding Google's Search Practices In the Matter of Google Inc., FTC File Number 111-0163 (January 3, 2013), https://www.ftc.gov/system/files/documents/public_statements/295971/130103googlesearchstmttoftcomm.pdf.

¹⁷⁸ Fed. Trade Comm'n Bureau of Competition, Report re Google Inc. at 40 (Aug. 8, 2012), <http://graphics.wsj.com/google-ftc-report>. There are a few caveats about this report, which the FTC released (mistakenly) under the Freedom of Information Act to the Wall Street Journal. First, only

strategy to harvest information created by third parties, the FTC Bureau of Competition found that it chilled innovation by others, as “the natural and probable effect of Google’s conduct is to diminish the incentives of [rivals] to invest in, and to develop, new and innovative content, as the companies cannot fully capture the benefits of their innovations.”¹⁷⁹ One complainant, Getty Images, noted in its complaint how scraping chilled innovation: “Artists need to earn a living in order to sustain creativity and licensing is paramount to this; however, this cannot happen if Google is siphoning traffic and creating an environment where it can claim the profits from individuals’ creations as its own.”¹⁸⁰

the Report’s even-numbered pages were released, so the missing odd-numbered pages may have contained important qualifications. Second, other reports, including any prepared by Google, were not released. Third, although the Competition Staff recommended that the FTC sue Google, the Commissioners elected not to. Google responded to the Report’s disclosure:

We understand that what was sent to the Wall Street Journal represents 50% of one document written by 50% of the FTC case teams. Ultimately both case teams (100%) concluded that no action was needed on search display and ranking. Speculation about consumer or competitor harm turned out to be entirely wrong. On the other issues raised, we quickly made changes as agreed with the FTC.

The FTC Report on Google’s Business Practices, WALL ST. J. (March 24, 2015), <http://graphics.wsj.com/google-ftc-report/>.

¹⁷⁹ Three Commissioners found the record evidence “to support strong concerns” about Google’s scraping. But in an unorthodox move, the FTC closed its investigation in early 2013 after Google voluntarily promised, among other things, to stop scraping. Then-FTC Chairman Jon Leibowitz and Commissioner Julie Brill, in a press release expected the FTC “to enforce vigorously” Google’s voluntary commitment not to scrape. Statement of the U.S. Federal Trade Commission regarding Google’s search practices *In re Google, Inc.*, FTC File No. 111-0163 (January 3, 2013), https://www.ftc.gov/system/files/documents/public_statements/295971/130103googlesearchstmtofcom.pdf [hereinafter *FTC Google Statement*]. Both have left the FTC. Google reportedly continued to scrape. Maxwell Tani, *Read Yelp’s full letter to the FTC accusing Google of violating its deal with the government*, BUSINESS INSIDER (September 12, 2017), <http://www.businessinsider.com/yelp-google-ftc-full-letter-2017-9>. Two Commissioners, on the other hand, questioned whether the scraping was illegal. As one Commissioner said:

I am not aware of any evidence that the alleged scraping resulted in either a decline in traffic from Google to the parties complaining about the scraping or any reduction in innovation by existing or potential rivals of Google. In fact, some of the complainants in this matter demonstrated significant growth both during and after the alleged scraping took place. Further, the investigation revealed that most websites appear to approve of Google’s use of their content in Google’s vertical properties because it leads to increased traffic to their sites. Moreover, the likelihood of possible future harm to competition or consumers from such conduct appears highly remote, particularly given the enormous growth of the use of apps to access rivals’ sites or services directly.

Google Inc., Closing Letter and Statement of Commissioner Rosch and Commissioner Ohlhausen, FTC File No. 111 0163, Announced January 3, 2013, Trade Reg. Rep. para. 16875.

¹⁸⁰ Samuel Gibbs, *Getty Images files antitrust complaint against Google*, THE GUARDIAN (April 27, 2016), <https://www.theguardian.com/technology/2016/apr/27/getty-images-files-antitrust-google>; David Dayen, *Big Tech: The New Predatory Capitalism*, AMERICAN PROSPECT (Winter 2018). In 2018, Google and Getty entered into a licensing agreement. See Chris O’Brien, *Getty Images and Google Declare a Truce with New Image Licensing Partnership*, VENTURE BEAT (February 9, 2018),

As this Part illustrates, firms may engage in negative innovation aimed at attaining or maintaining significant market power, or to profit in exploiting consumers. The investment in this innovation, from a societal perspective, is not only wasteful, but potentially detrimental. One can quibble whether negative innovation counts as innovation. Regardless of the taxonomy, identifying whether an innovation is positive, negative, or mixed can be challenging for policy makers.

One key takeaway from this Part is that increasing the overall level of innovation will not necessarily increase overall welfare. Second, while policy makers generally do not want to chill the incentives to innovate, some types of innovation (negative and mixed innovation used for anticompetitive or exploitive purposes) should be chilled. Third, policy makers cannot assume that market forces or regulators will generally deter negative innovation. Some types of negative innovation may be beyond the scope of antitrust, privacy, or consumer protection law. Even when they aren't, enforcers may be overly deferential to the claimed innovation.¹⁸¹ Finally, developing the tools to determine when innovation is positive, negative, or mixed, what conditions foster the myriad forms of negative innovation, and implementing policies to deter negative innovation will be critical. This challenge in distinguishing between socially beneficial and harmful innovation is accentuated for novel goods and services that are still under development and have not reached the market.¹⁸²

No simple recipe exists to reduce the incentives/payoffs to engage in negative innovation, while not chilling the incentives to invest in innovations that promote overall welfare. The next Part, however, offers policy makers several insights.

9 Enforcement Challenges and Policy Implications

Ideally, market dynamics and competitive pressure would optimize the supply, demand, and adoption of innovations that maximize overall welfare while deterring negative innovation. However, at times, welfare-enhancing innovation will be either delayed or lost entirely, and policy intervention will be needed.

This Part examines several policy and legal instruments currently used to facilitate innovation. Inevitably, the level, nature, and direction of innovation may be

<https://venturebeat.com/2018/02/09/getty-images-and-google-declare-a-truce-with-new-image-licensing-partnership/>.

¹⁸¹ See, e.g., FTC Google Statement, *supra* note 174 (“Challenging Google’s product design decisions in this case would require the Commission – or a court – to second-guess a firm’s product design decisions where plausible procompetitive justifications have been offered, and where those justifications are supported by ample evidence.”). The European Commission, however, found from the evidence, including Google’s internal documents that these design decisions with respect to search degradation harmed competition.

¹⁸² Josef Drexler, Real Knowledge Is to Know the Extent of One’s Own Ignorance: On the Consumer Harm Approach in Innovation-Related Competition Cases, 76 Antitrust L.J. 677, 698 (2010).

influenced by a variety of regulatory policies, including in the digital economy, privacy, consumer protection, competition and state aid, education, taxation, property and intellectual property law, and labor issues. Thus, boosting positive innovation will require a comprehensive policy approach.

One should note that the varying regulatory frameworks can have several challenging effects. Existing regulations, in protecting consumers, existing producers, or current business models can hinder valuable disruptive innovation.¹⁸³ Regulation, when overly burdensome, may chill the incentives to innovate and push away investment. It may disproportionately burden smaller companies that are ill-equipped to deal with the expense and resources to navigate a byzantine regulatory maze, and thus favor larger incumbents. Another challenge in applying static regulation to dynamic markets is the regulation's possible failure to take account of likely changes within the sector, advancements in technology, changes in use, and the rise of alternative markets. While valuable in many instances, regulation is a tool, which optimizes when used to set up ground principles and limits, but which may cut too deep into the market dynamics and chill innovation when used to control market behavior.

As the OECD noted,

Many new/disruptive business models do not fit into existing regulatory frameworks and this may call for the adoption of new and flexible regulatory frameworks to cover these new forms of competition. Competition agencies can play an important role in advising regulators in this process and allow pro-competitive reforms across markets and sometimes across borders.¹⁸⁴

Disruptive innovation can also affect existing regulations, as an OECD hearing discussed, by “liberalising markets or some parts of them by bypassing the regulation that hindered competition.”¹⁸⁵

As one explores these instruments, one must be mindful of how non-intervention and any form of intervention can impact market dynamics, the competitive balance, the closing or widening of competitive portals, the paths of future innovation, and the risk in chilling innovation. Any regulatory intervention, in affecting markets and incentives, can thereby influence the likely winners and losers. It encourages innovation in some areas while discouraging disruption by others. To the same extent, non-intervention should not be seen as benign. It too reflects a policy decision on the likely winners and losers under the status quo. One should recall that either

¹⁸³ OECD, Directorate for Financial and Enterprise Affairs, Competition Committee, *Key Points of the Hearing on Disruptive Innovation 16-18 June 2015* (11 May 2017), [https://one.oecd.org/document/DAF/COMP/M\(2015\)1/ANN8/FINAL/en/pdf](https://one.oecd.org/document/DAF/COMP/M(2015)1/ANN8/FINAL/en/pdf) [hereinafter OECD Hearing on Disruptive Innovation].

¹⁸⁴ Ibid.

¹⁸⁵ Ibid.

over- and under-intervention at times can reduce overall welfare. Regulation should therefore be appraised while taking note on its impact on innovation, investment, and market forces. While command-and-control regulations at times are needed, the regulatory framework should be designed to provide the necessary scaffolding, while retaining competitive portals to enable experimentation, freedom of operation, and development of new technologies and business models.

With these risks and challenges in mind, it seems preferable to focus future intervention on *ex-ante measures* – aimed at creating a regulatory and economic landscape, which helps open competitive portals for positive and welfare-enhancing mixed innovation. *Ex-post, case-by-case intervention* should be limited primarily to instances when companies (and their negative innovations) clearly violate existing legal norms, such as competition, privacy, consumer protection, or intellectual property laws. We will next explore several key legal instruments to promote innovation. We also consider access to capital and one important, yet unsettled, legal issue that can affect the innovation path of artificial intelligence:

9.1 Competition Law: Ex-Post Enforcement

The competitiveness of markets is one driver that affects innovation. As such, competition law has a role to play in preserving competitive portals, whereby entrants and existing firms can experiment and innovate.¹⁸⁶ In Europe, competition law “is not only aimed at practices which may cause damage to consumers directly, but also at those which are detrimental to them through their impact on an effective competition structure.”¹⁸⁷ In *T-Mobile*, the Court of Justice elaborated that European competition law “is designed to protect not only the immediate interests of individual competitors or consumers but also to protect the structure of the market and thus competition as such.”¹⁸⁸ The protection of an “effective market structure” draws attention to the competitive process *as such* and has led to the condemnation of conduct that impairs genuine undistorted competition.¹⁸⁹ As such, ex post enforcement of EU competition law can be used to ensure undistorted competition that can facilitate welfare-enhancing innovation and deter collusion, negative innovations, and other abuses by dominant firms.

Given the role of data in promoting innovation in the digital economy, policy makers cannot assume that market forces will efficiently allocate personal or non-personal

¹⁸⁶ Paras 119-122, *Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements*, OJ C 11, 14.1.2011, pp. 1-72.

¹⁸⁷ Case 6-72 *Europemballage Corporation and Continental Can Company Inc. v Commission* [1973] ECR-215, para 26; Case C-95/04 *British Airways Plc v Commission* Court of Justice, [2007] ECR I-2331, para 106; Case T-340/03 *France Telecom SA v Commission* [2007] ECR II-107, para 266; Case C-52/09 *TeliaSonera* [2011] ECR I-527, para 24; Joined Cases C-468 to 478/06 *Sot. Lélou kai Sia and Others* [2008] ECR I7139, para 68; and Case C-280/08 P *Deutsche Telekom v Commission* [2010] ECR I-9555, para 176.

¹⁸⁸ Case C-8/08 *T-Mobile* [2009] ECR I-4529, para 38.

¹⁸⁹ In the context of Article 102 TFEU, note the special responsibility on dominant undertakings repeatedly recalled by the Court of Justice. See, e.g., Case C202/07 P *France Télécom v Commission* [2009] ECR I2369, para105; C-52/09 *TeliaSonera* [2011] ECR I-527, para 24.

data. So three areas of intervention that deserve greater attention are (i) how data spurs innovations in the digital economy, (ii) the role of competition policy in promoting the free flow of data, and (iii) how market power can impede the flow of that data.

A key challenge in protecting an “effective market structure” is the often static and price-centric approach taken by many competition authorities and the fact that this approach may fail to adequately reflect effects on present and future innovation, in terms of scope and nature. Normally when competition officials think of market power they think of prices, namely a firm’s ability to raise price above the competitive level. Focusing primarily on price competition in the digital economy is akin to monitoring city roads only for speeding, and not for other dangers, such as drunk driving, running a red light, or driving on the wrong side of the road.

In the digital economy where the price is often ostensibly free for consumers, firms can engage in abuses to secure a data-advantage, thwart rivals, and hinder innovations that threaten their business model. Firms can exercise market power by collecting more data than they otherwise could at a lower price than what they would otherwise pay, and they could also restrict others from accessing this data.¹⁹⁰

Thus competition enforcers must extend their sights beyond price effects. They should also look beyond lock-in effects. Their aim should be to minimize anti-competitive distortions in the marketplace that chill the demand or supply of welfare-enhancing innovations. With this broader view, competition officials can identify and possibly remedy impediments hindering welfare-enhancing innovation in the digital economy.

First are abuses by dominant firms. Dominant firms, for example, in hoarding data and using exclusionary means to prevent others from accessing the data, can affect the level and nature of innovation. Suppose farmers confront a few powerful farm equipment manufacturers and agro-chemical firms. Farmers create the raw data, but the data automatically flows to the dominant equipment manufacturer’s and agro-chemical firm’s silos. The rival agro-chemical firms and equipment manufacturers would need access to not only to public data (such as satellite pictures and weather data), but also private data collected from the farmers’ fields. The private data helps train the agro-chemical firms’ algorithms to provide farmers recommendations on how to best manage their fields (e.g., how many seeds to use, and on how much and when to use pesticide and fertilizer). Without this data, rival agro-chemical firms and equipment manufacturers cannot provide innovative solutions that address the farmer’s particular needs. Competition and innovation in digital farming are stifled.

Second are vertical private restraints, where manufacturers limit the extent to which others in the supply chain can distribute non-personal data. Farmers, for example,

¹⁹⁰ Maurice E. Stucke, *Should We Be Concerned About Data-opolies?* (March 19, 2018), Georgetown Law Technology Review (Forthcoming), <https://ssrn.com/abstract=3144045> or <http://dx.doi.org/10.2139/ssrn.3144045>.

can only provide their non-personal data to the tractor manufacturers and no one else.

Third are anti-competitive actions by key gatekeepers that chill firms' incentives to innovate, such as scraping and other negative innovations. This will be particularly important with the rise of digital personal assistants. The leading assistant will be a key gatekeeper of the data collected from the smart technologies in millions of homes. One risk is the platform favoring some smart appliance manufacturers (in affording them greater access to the data) over others. Moreover, the digital personal assistant can use its now-casting radar to thwart users' adoption of innovations that threaten its dominance.

Fourth are market forces, which limit the free flow of data. One example we saw in Part 4 are data-driven network effects. Data-driven network effects are not necessarily bad, as users' utility increases as others use the product. But with these data-driven network effects, strong firms can become even more powerful until they dominate the industry. While competition enforcers should not fault a firm for getting larger because of these network effects, they must still explore how they can promote innovation and the free flow of data necessary for innovation in markets with these data-driven network effects.

Moreover, given the role of path dependencies and chance in the success or failure of innovations, agencies cannot reliably conclude that market forces over the long term will necessarily correct their actions or inactivity. It is doubtful that antitrust enforcers or critics could have predicted how the perceived "failed" antitrust investigation of IBM opened a competitive portal for Microsoft, among others. Nor can policy makers reliably estimate the harm cause by foregone or lost innovations due to the anticompetitive actions of today's monopolies. Consequently, despite the importance of dynamic efficiency, antitrust enforcers still lack adequate tools to measure it or assess the long-term effects of many restraints on dynamic efficiency. Even when they identify risk to future innovation, they may find it hard to satisfy the standard of proof necessary to act on such concern.¹⁹¹

With that in mind, a clear risk for over- or under-intervention emerges. By its nature, evidence-based enforcement of competition law may be limited in its ability to consider technological and market changes and accurately assess future competitive constraints. Also challenging is the ability to identify and differentiate between positive and negative innovation.¹⁹² The latter, even when implemented by a dominant company, may not always amount to an abuse within the scope of Article 102 of the Treaty on the Functioning of the European Union.¹⁹³

¹⁹¹ Richard M. Brunell, *Appropriability in antitrust: how much is enough?*, 69 ANTITRUST L.J. 1-42 (2001).

¹⁹² Note on this point proposal by Thibault Schrepel to introduce a legal category specifically dedicated to anti-competitive effects linked to innovation: Thibault Schrepel, *Predatory Innovation: The Definite Need for Legal Recognition* (July 2017) SMU SCIENCE AND TECHNOLOGY L. REV. (forthcoming), <https://ssrn.com/abstract=2997586>.

¹⁹³ Article 102 provides:

This may explain the hesitation with which competition agencies approach the issue of dynamic efficiencies, the difficulty in establishing future harm, and their desire to avoid affecting the course of innovation or declare tomorrow's winners or losers. Intervention risks chilling innovation and should be carefully approached. In that respect, clear indications as to the scope of legality and the nature of anticompetitive activities is key. Those influenced by the Schumpeterian vision of innovation and creative destruction, would favor restricted intervention to stimulate investment in innovation.¹⁹⁴

But this does not mean competition officials should sit idly by, under the belief that self-correcting forces will yield an "effective market structure." This paper has outlined how the digital economy, with data-driven network effects, can breed powerful, more durable platforms. Moreover, this paper has identified how these platforms can inhibit the supply and demand for positive innovation, while promoting negative innovation. Moreover, competition enforcement is already suboptimal. As we saw in Part 3, many markets today may not be as innovative (or competitive) as their current potential. Consequently, among the challenges for competition officials going forward is in identifying and deterring these restraints that inhibit the incentives to innovate (as illustrated in Part 6) and users' adoption of positive innovations (as illustrated in Part 7).

9.2 Competition Law: Ex-Ante Enforcement

Another way to safeguard the competitive portals is to prevent mergers to monopolies, or mergers that expand or help maintain monopolies. Ensuring that

Any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market in so far as it may affect trade between Member States.

Such abuse may, in particular, consist in:

- (a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;
- (b) limiting production, markets or technical development to the prejudice of consumers;
- (c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
- (d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

¹⁹⁴ See discussion by Pierre Larouche and Maarten Pieter Schinkel, *Continental Drift in the Treatment of Dominant Firms: Article 102 TFEU in Contrast to § 2 Sherman Act*, TILEC Discussion Paper No. 2013-020 (May 2013), <https://ssrn.com/abstract=2293141> or <http://dx.doi.org/10.2139/ssrn.2293141> including references to J. Gregory Sidak & David J. Teece, *Dynamic Competition in Antitrust Law*, 5 J COMP L & ECON 581 (2009), David S. Evans & Keith Hylton, *The Lawful Acquisition and Exercise of Monopoly Power and Its Implications for the Objectives of Antitrust*, 4 COMP POLICY INT'L 203 (2008), Geoffrey Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J COMP L & ECON 153 (2010), Douglas H. Ginsburg & Joshua D. Wright, *Dynamic Analysis and the Limits of Antitrust Institutions*, 78 ANTITRUST L.J. 1 (2012).

viable innovators can access markets is a key goal of merger control.¹⁹⁵ This goal, which the Horizontal Merger Guidelines effectuate,¹⁹⁶ has gained increased prominence in recent decisions by the European Commission.¹⁹⁷ The US FTC and DOJ 2010 Merger Guidelines likewise provide additional guidance of when mergers are likely to “diminish innovation competition by encouraging the merged firm to curtail innovative efforts below the level that would prevail absent the merger.”¹⁹⁸

Nonetheless, both the EU and US Merger Guidelines leave many issues on evaluating a merger’s impact on innovation unresolved. Typically, the agencies assess a merger’s likely impact in a relevant product and geographic market. But how does one define a market for innovating activity, for which no goods or services yet exist? In the 1990s, the US antitrust agencies offered a narrow view of an “innovation market,” namely “research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development.”¹⁹⁹ But this assumes that the input—specialized research and development (R&D) assets or characteristics of specific firms—is a good proxy for the output, socially beneficial innovation. There are also problems in using outputs to measure innovation. Patents and copyrights are both under-inclusive in measuring innovation (in not capturing processes and products not subject to intellectual property protection) and over-inclusive (not every patent or copyright, as we have seen, is socially beneficial). Further, due to the nature of dynamic efficiency and the uncertainty surrounding

¹⁹⁵ See, e.g., *United States v. Anthem, Inc.*, 236 F. Supp. 3d 171, 221 (D.D.C. 2017) (merger in reducing the number of national carriers from four to three decreases the number of potential joint partners for the innovative “new entrants” in the industry); *Brown Shoe Co. v. United States*, 370 U.S. 294, 321–22, 82 S. Ct. 1502, 1522, 8 L. Ed. 2d 510 (1962):

Congress indicated plainly that a merger had to be functionally viewed, in the context of its particular industry. That is, whether the consolidation was to take place in an industry that was fragmented rather than concentrated, that had seen a recent trend toward domination by a few leaders or had remained fairly consistent in its distribution of market shares among the participating companies, that had experienced easy access to markets by suppliers and easy access to suppliers by buyers or had witnessed foreclosure of business, that had witnessed the ready entry of new competition or the erection of barriers to prospective entrants, all were aspects, varying in importance with the merger under consideration, which would properly be taken into account.

¹⁹⁶ Paragraphs 37–38, *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings* OJ C 31, 5.2.2004, pp. 5–18.

¹⁹⁷ Carles Esteva Mosso, *Innovation in EU Merger Control*, REMARKS PREPARED FOR THE 66TH ABA SECTION OF ANTITRUST LAW SPRING MEETING, Washington, 12 April 2018, http://ec.europa.eu/competition/speeches/text/sp2018_05_en.pdf.

¹⁹⁸ DOJ & FTC, *Horizontal Merger Guidelines*, § 6.4 (2010), <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010>.

¹⁹⁹ DOJ & FTC, *Antitrust Guidelines for the Licensing of Intellectual Property*, § 3.2.3 (1995).

disruptive innovation, it is less clear whether competition law can provide an effective tool to ensure competition for future markets (innovation for markets).²⁰⁰

In its merger analysis, the European Commission has attempted to improve its “appraisal horizon” and evaluate the likely future effects transactions may have on innovation. Such approach may include detailed consideration of pipeline innovation, overlaps in innovation spaces, and future incentives to innovate. Included are data-driven mergers that help a firm attain or maintain its dominance. These would include mergers by GAFA (Google, Apple, Facebook and Amazon) in acquiring data-rich firms in markets in which they don’t compete (such as Facebook’s acquisition of Instagram, Google’s acquisition of YouTube, Amazon’s acquisition of Whole Foods, and Apple’s proposed acquisition of Shazam). A notable challenge of such extended horizon, is the ability to accurately predict whether mergers promote or hinder innovation. While some innovation cycles may be predictable,²⁰¹ others are not.

To illustrate the extended horizon used to assess overlapping innovation, let us look at the recent *Dow/DuPont* decision,²⁰² where the European Commission assessed the merger’s price and innovation effects. The Commission noted that “the Parties hold important lines of research and early pipeline products targeting the same product markets that, if developed and brought to the market, would compete head-to-head against each other.” It added that “the Transaction would reduce innovation competition between the Parties, resulting in the discontinuation, deferment or redirection of competing lines of research and early pipeline products.”²⁰³

Accordingly, the Commission considered whether elimination of overlap of research paths may significantly impede effective competition. The clearance decision was conditioned on significant divestitures including research and development operations. In a statement released following the decision, Commissioner Vestager referred to the significance of innovation in the agro-chemical industry and the subsequent measures the Commission took to safeguard it:

Both companies have a number of similar projects under way to develop new products. These could ultimately compete head-to-head. The new pesticides would work against the same problems. These projects are very costly. And our investigation showed that after the merger, the companies would have wanted to pull the plug on some of these projects. More broadly, they would have incentives to reduce their effort to develop new products. So we could not approve this merger in its original form. We were only able

²⁰⁰ Josef Drexler, *Anti-Competitive Stumbling Stones on the Way to a Cleaner World: Protecting Competition in Innovation without a Market*, 8 JOURNAL OF COMPETITION LAW AND ECONOMICS 507-542 (2012).

²⁰¹ Tommaso Valletti, the Chief Competition Economist, noted in a speech that “we cannot predict the winner of the World Cup, but we do want to make sure that the tournament remains competitive.” (Malina McLennan, *Valletti Attack on Innovation Myths*, GCR REPORT (13 March 2018)).

²⁰² Case M.7932 Dow/DuPont Case European Commission, [2017] OJ C353/9.

²⁰³ *Ibid* at para 1955.

to agree to it, because the companies offered to sell off a significant part of their business, to preserve effective competition.²⁰⁴

In the Bayer/Monsanto merger, which was also cleared on the condition of divestitures, including research and development operations, the European Commission sought to keep the competitive portals open in the emerging digital agriculture sector.²⁰⁵ Here we see the important role of data and algorithms in helping to develop integrated solutions for farmers. The merger would have resulted in the loss of potential competition in Europe between Bayer's recently launched digital platform and Monsanto's platform, which was already the leading platform worldwide, and was about to be launched in Europe. Ultimately, Bayer agreed to divest its global digital agriculture portfolio and pipeline of products to BASF. The remedy sought to "ensure that the race to become a leading supplier in Europe in this emerging field remains open."²⁰⁶

Despite these advances, an associated problem is the speculative nature of such approach that moves beyond product and pipeline overlaps, to examine overlapped investment in future technology. Key challenges include the ability of the enforcer to predict technological changes and synergies in assessing the future pro- and anti-competitive effect of a transaction.

One example as to the complex nature of forward-looking analysis may be found in the *Facebook/WhatsApp* transaction.²⁰⁷ In its appraisal, the Commission considered the possibility of Facebook implementing automated matching between Facebook and WhatsApp users' accounts. Facebook informed the Commission that a reliable automated matching would not be possible. Nonetheless, in August 2016 the companies announced the possibility of linking WhatsApp users' phone numbers with Facebook users' identities. The Commission subsequently found, contrary to Facebook's statements in its notification of the transaction, that the technical possibility of automatically matching already existed in 2014 at the time of notification. In 2017, the Commission fined Facebook €110 million for providing incorrect or misleading information during its investigation.²⁰⁸ The case highlights the limitations in the enforcer's ability to accurately predict technological changes and their significance. It also illustrates the asymmetric information available at the time of the appraisal, as companies often benefit from first-hand knowledge as to technology and markets. Also noteworthy is the difficulty to predict whether the merger will yield negative or positive innovation.

²⁰⁴ Statement by Commissioner Vestager on a Commission decision approving the merger between Dow and DuPont, subject to conditions Brussels, 27 March 2017, STATEMENT/17/775.

²⁰⁵ European Commission, Press release, Mergers: Commission clears Bayer's acquisition of Monsanto, subject to conditions (21 March 2018), http://europa.eu/rapid/press-release_IP-18-2282_en.htm.

²⁰⁶ Ibid.

²⁰⁷ Facebook/WhatsApp Inc. Case COMP/M.7217 European Commission, C(2014) 7239 final.

²⁰⁸ In its fining decision, it noted that the misleading information had no impact on the clearance decision, as at the time it carried out an "even if" assessment that assumed user matching as a possibility.

Consequently, competition officials largely rely on price-centric tools in a digital economy where price is less meaningful. Even with their price-centric tools, the agencies struggle in predicting whether prices will increase due to tacit or express collusion post-merger. As a result, the agencies more often assess whether the merging firms have the incentive and ability to raise price unilaterally within a couple years after the merger. At times, the competition agencies, as part of their competitive effects analysis, predict higher prices and less innovation post-merger.²⁰⁹

Given the difficulties in measuring and predicting dynamic efficiencies, the agencies seldom challenge mergers solely on dynamic efficiency grounds. Noteworthy in this respect is a Feasibility Study on the impact of competition enforcement on innovation, published by the European Commission.²¹⁰ The Study explores the impact of merger transactions on firms' innovation activities. It notes the difficulty in assessing the true impact of competition policy intervention, or lack of it, on firms' innovation activities. The study proposes a methodology for evaluation and applies it, ex-post, to two transactions.²¹¹ Through more post-merger reviews and market studies, the agencies can learn how to better assess data-driven mergers that can impede the free flow of data, or mergers that chill welfare-enhancing innovation or promote negative innovation.

Here again the agencies cannot afford to focus on the few mergers where their price-centric tools provide a robust conclusion. Merger control remains an important policy tool to preserve an effective market structure and safeguard competitive portals to innovation. With this in mind, the creation of new thresholds for pre-merger notification that are not turnover based is significant. It enables competition agencies to review large transactions that bring together significant market actors, even when the companies generate limited turnover within the jurisdiction. Take for example the amendment to the German²¹² and Austrian merger laws,²¹³ which introduced in 2017, a transaction-value based threshold to supplement turnover thresholds.

Finally, it bears noting that competition law promotes other important economic, social, and political values.²¹⁴ For example, the competition agency, in preventing media industries from becoming too concentrated, may sacrifice some positive

²⁰⁹ For theoretical analysis of effects of horizontal mergers and market power on innovation, see for example: Giulio Federico, Gregor Langus and Tommaso Valletti, *Horizontal Mergers and Product Innovation* (February 2018), <http://dx.doi.org/10.2139/ssrn.2999178>.

²¹⁰ Peter Ormosi, Anna Rita Bennato, Steve Davies, & Franco Mariuzzo, *Feasibility study on the microeconomic impact of enforcement of competition policies on innovation* (December 2017), <https://publications.europa.eu/en/publication-detail/-/publication/67521c90-e6d0-11e7-9749-01aa75ed71a1/language-en>.

²¹¹ Ibid.

²¹² German Act against Restraints of Competition (German Competition Act – GWB) available online: <https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Others/GWB.html?nn=3590470>.

²¹³ Kartell- und Wettbewerbsrechts-Änderungsgesetz 2017 – KaWeRÄG 2017 (1522 d.B.), <https://www.parlament.gv.at/PAKT/VHG/XXV/II/01522/index.shtml>.

²¹⁴ Ariel Ezrachi, *EU Competition Law Goals and the Digital Economy* (June 6, 2018), <https://ssrn.com/abstract=3191766>.

innovations by the merging media firms to promote a robust marketplace of ideas necessary for a democracy.²¹⁵

9.3 Data Protection, Privacy Rules, and Increasing Portability for Personal Data

Data and privacy regulations provide a valuable tool to empower consumers, allow better control over their personal data and privacy, and foster greater accountability. Notable in this space are the EU's General Data Protection Regulation (GDPR)²¹⁶ and forthcoming ePrivacy Regulation. In a digital economy, data and privacy regulations can also affect the innovation landscape.

Let us consider, for example, the potential effects of the GDPR. To begin with, the GDPR may help align the activities of providers with the interests of consumers, and in that respect, innovation linked to such activities. The limitations on the use of data in the GDPR can support positive innovation and reduce incentives for negative innovation, to the extent that such innovation paths stand in conflict with the new regime. The GDPR seeks to limit the scale of undetected stealth tracking, data collection, and analysis by third parties. This will likely affect providers of advanced profiling and personal discriminatory pricing. At the same time, it is likely to stimulate innovation in data protection provisions and technology.

The change to the data landscape and the empowerment of users may directly affect the paths of innovation and competitive dynamics.²¹⁷ In that respect, it is important to acknowledge how a regulatory change could impact the market participants' bargaining position and market power. With data scarcity, data-related innovation will be more easily developed by powerful platforms whose volume and variety of personal data, and the velocity in which they collect and use that data, provide them a significant competitive advantage. These dominant platforms and publishers now must gain consent from users, or those parties that operate as data controllers.²¹⁸ The regulatory changes may affect not only the targeted advertising industry, but innovation in privacy and blocking technology or otherwise support "privacy by design" with the consumers' interest at heart.

The GDPR allows individuals to obtain and reuse their personal data, which they provided to a controller, for their own purposes across different services. Such data includes collected data from observation of the individual's activities, traffic and

²¹⁵ Allen P. Grunes & Maurice E. Stucke, *Plurality of Political Opinion and the Concentration of the Media*, in GENERAL REPORTS OF THE XVIIIITH CONGRESS OF THE INTERNATIONAL ACADEMY OF COMPARATIVE LAW (Karen B. Brown & David V. Snyder eds., Springer 2012).

²¹⁶ Replacing the Data Protection Directive 95/46/EC.

²¹⁷ Note for example comments by Isabelle de Silva, head of the French competition authority: "It's interesting to see the importance of privacy rules shape the way the market is working." GCR Live: 7th Annual Telecoms, Media & Technology," London, May 4, 2018.

²¹⁸ On the friction between publishers and Google, see for example Natasha Lomas, *Google accused of using GDPR to impose unfair terms on publishers*, TECH CRUNCH (1 May 2018), <https://techcrunch.com/2018/05/01/google-accused-of-using-gdpr-to-impose-unfair-terms-on-publishers/>.

location data, and data from wearable devices and smart appliances. It has to be provided in a structured, commonly used, and machine-readable format. Data portability is often considered as essential to enable users to exercise better control over the use of their information and to prevent them from being locked-in with a single service provider.

Naturally such provisions can also influence the competitive dynamics, incentives to innovate, and users' adoption of innovations, where data-driven network effects play a significant role. As the EDPS wrote, data portability could release synergies between competition law and data protection law in at least two ways. First, it could help avoid consumer lock-in problems, similar to the benefits of number portability provided for in telecommunications law. Second, it could empower consumers to take advantage of third-party value-added services while facilitating competitors' access to the market, for example, through the use of product comparison sites or of companies offering energy advice based on smart metering data.²¹⁹

Data portability, coupled with interoperability, can also increase the competitive pressure on existing service providers and encourage them to continue to innovate in ways that benefit consumers.²²⁰ Effective data portability should take account of switching costs and the need to keep intact the innovation incentives of the incumbents and challenging party.

One interesting question concerns the transfer of data analytics and the dividing line between data mobility and data sharing. The latter raises potential concerns as to adverse effects on the incentive to collect and analyze data and its impact on innovation and investment. In contrast, the former focuses on the user's freedom to choose. With this in mind, the GDPR does not require the transfer of data created based on the data an individual has provided.

Nonetheless open issues remain. With respect to personal data, the law in many jurisdictions remains unsettled as to who owns the data, and the scope of the property interest users have on data collected about them.

Also, data portability may be less relevant at times. First, data portability won't help when companies need a significant volume and variety of data to innovate (i.e., need access to the entire pool of data). Second, data portability won't help when the

²¹⁹ Eur. Data Prot. Supervisor, *Privacy and Competitiveness in the Age of Big Data: The Interplay Between Data Protection, Competition Law and Consumer Protection in the Digital Economy* (preliminary opinion March 2014), at 36 (footnotes omitted).

²²⁰ See, e.g., Comments of the Staff of the Federal Trade Commission's Bureau of Consumer Protection and Office of Policy Planning before the Department of Commerce, National Telecommunications & Information Administration, *In re the Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things*, Docket No. 160331306-6306-01 (June 2, 2016) (noting how with the Internet of Things, interoperability might foster data portability so that, for example, consumers can move their fitness tracker data from one device to another; under these types of circumstances, interoperability standards can create value for consumers by increasing competition, innovation, product quality, data portability, and choice).

innovation requires instantaneous access to data. For example, the fact consumers can port their historic geolocation data will be less relevant to a mobile navigation app, which needs current data to identify traffic patterns and the fastest route. So one thing policy makers should consider in markets where velocity in accessing the data is key is to shift from an ex-post to an ex-ante framework. Policy makers, for example, can consider creating data lockers, where individuals can elect ex-ante the simultaneous collection of their data from their data locker to multiple apps.

9.4 Increasing Portability of Non-Personal Data

To the extent data is non-rivalrous, businesses, non-profit organizations, scholars, governments, and individuals can potentially use data to glean insights and innovate. Privacy concerns, while limiting the free flow of personal data, may not apply for truly non-personal data. Although there may be greater benefits in sharing non-public data, the obligation to share cannot be unlimited. Firms must be able to appropriate the gains from their welfare-enhancing innovations. Moreover, imposing data portability on small companies' non-personal data can be quite costly relative to the benefits. Thus balancing is required.

Policy makers should first consider removing welfare-reducing governmental restraints on the free flow of non-personal data. One concern is data localization. Policy makers want to ensure that any current or new data location restriction is justified. Toward that end, policy makers should inquire: first, whether the national government's expressed interest is substantial; second, whether the state action directly promotes that substantial interest; and third, whether the state action is more extensive than necessary to promote that substantial interest.

Data portability and interoperability can also be critical for governments. Governmental agencies, for example, will "require the flexibility to change cloud providers in the future when beneficial to the taxpayer."²²¹ Policy makers will want to ensure that government contractors, when competing for a cloud contract or other data storage or processing services, address data portability and interoperability issues.²²²

While policy makers have stressed data portability of late to promote innovation and competition, one important caveat is needed. The ultimate aim is not to improve the free flow of data per se but to improve overall welfare. Policy makers must also consider the potential risks in increasing the free flow of data.

²²¹ David Gallacher & Townsend Bourne, *Federal cloud computing strategy—First-generation challenges to government cloud migration efforts*, in CLOUD COMPUTING LEGAL DESKBOOK § 11:3 (June 2018 Update).

²²² *Ibid* (noting that issues include "Cloud infrastructure and data transparency; Data assurances regarding ownership, access to data, disposition of data upon request or termination, and data storage location; and Contract renewal and termination options and obligations (e.g., notice requirements)").

One concern is that promoting the free flow of personal information can facilitate negative innovations, such as behavioral discrimination. Increasing the free flow of ordinary non-personal market data in some industries can also facilitate negative innovations, such as pricing algorithms design to promote tacit collusion.²²³ Tacit collusion is beyond the reach of EU and US competition law. It is also quite profitable. Thus, in concentrated industries ripe for tacit collusion, companies would have significant incentives to develop pricing algorithms for that purpose.²²⁴ As a result of this negative innovation, consumers would end up paying more or getting less than they would otherwise get in a competitive market. So policy makers want to ensure that the free flow of data ultimately promotes welfare, and that the company's interests in collecting and using the data are aligned with society's interest.

9.5 Intellectual Property Rights

Patent protection has been traditionally used to empower the innovator and safeguard it from free riders. In a fast-moving digital environment, one needs to ensure that the system will effectively protect real innovators, while not protecting those who abuse it.²²⁵

In a fast-moving digital environment, the use and significance of patents have gone through transition, eroding their significance. "Patent trolls," for instance, may call for ongoing adjustments to the level of protection awarded by the patent system. At the same time, any such adjustment should consider powerful "efficient infringers" that may disregard the intellectual property right rules, scrape content, and quash the incentives to smaller innovators. Changes to the protection awarded to small innovators can impact their incentives to innovate and ability to advance viable technological change.

More generally, IP licensing and the treatment of standard-essential patents are central for ongoing innovation. Intellectual property law and balanced competition enforcement may be used to open competitive portals and ensure essential patents

²²³ Ezrachi & Stucke, *VIRTUAL COMPETITION*, *supra* note 63; Organisation for Economic Co-operation and Development, Directorate for Financial and Enterprise Affairs, Competition Committee, Roundtable on Algorithms and Collusion, DAF/COMP/WD(2017)25 (21-23 June 2017).

²²⁴ See, e.g., Daniel Mandrescu, *When Algorithmic Pricing Meets Concerted Practices-the case of Partneo*, CoRe Blog (June 7, 2018), <http://coreblog.lexxion.eu/when-algorithmic-pricing-meets-concerted-practices-the-case-of-partneo/> (discussing the car makers' use of Accenture's car part pricing algorithm, Partneo, which was "designed to identify the maximum price consumers would be willing to pay for (visible) cars parts such as fenders or bumpers where there is almost no inter or intra brand competition" and how during the period of 2008 to 2013 the five major carmakers "boosted their revenues by more than 1 billion dollars thanks to using Partneo, which increased the prices of their inventory with 15% on average"); Tom Bergin & Laurence Frost, *Software and stealth: how carmakers hike spare parts prices*, REUTERS (June 4, 2018), <https://www.reuters.com/article/autos-software-pricing/rpt-insight-software-and-stealth-how-carmakers-hike-spare-parts-prices-idUSL5N1T60H9>. No formal findings, however, have been found against the carmakers or Accenture.

²²⁵ Patent trolls etc.

are not misused to foreclose markets through refusal to license or excessive fees.²²⁶ In its 2017 communication on Standard Essential Patents (SEPs), the European Commission noted:

The interplay between patents and standards is important for innovation and growth. Standards ensure that interoperable and safe technologies are widely disseminated among companies and consumers. Patents provide R&D with incentives and enable innovative companies to receive an adequate return on investments...Standards support innovation and growth in Europe, in particular providing for interoperability of digital technologies that are the foundation of the Digital Single Market (DSM)...The evidence however suggests that the licensing and enforcement of SEPs is not seamless and may lead to conflicts. Technology users accuse SEP holders of charging excessive licensing fees based on weak patent portfolios and of using litigation threats. SEP holders claim that technology users 'free ride' on their innovations and consciously infringe intellectual property rights (IPR) without engaging in good faith licensing negotiations.²²⁷

The Commission pointed to the significance of information transparency on SEPs exposure, the need to facilitate licensing negotiations, and provide clear interpretation of fair, reasonable, and non-discriminatory licensing terms.²²⁸

9.6 Access to Capital

Access to capital is crucial for many start-ups and innovators. Availability of funds and a supportive environment can help move ideas into the innovation pipeline and market. One of the main sources of funding is leading incumbents that benefit from deep pockets and interest in new technology. Such investment can help fast forward innovation. At times, however, such investment is used to strip the target company from its assets, innovation, or technology. Fear from such action may undermine the operation of capital markets.

In a buoyant digital economy, venture capitalists can play an important role in supporting innovation. But many venture capitalists in the US “no longer provide money and mentoring to the proverbial inventor working out of her garage.”²²⁹

²²⁶ Note for example enforcement by the European Commission – case COMP/38.636 Rambus [2010] OJ C 30/17; Case AT.39985-Motorola - Enforcement of GPRS standard essential patents [2014]; Case AT.39939-Samsung - Enforcement of UMTS standard essential patents [2014]; Furthermore the possible utilization of compulsory patent licensing, outside the competition law arena, and its chilling effect on innovation, should be observed. – Note Article 31 of the TRIPS: Article 31 - Other Use Without Authorization of the Right Holder - Agreement on Trade-Related Aspects of Intellectual Property Rights.

²²⁷ Communication from the commission to the European parliament, the council and the European economic and social committee - Setting out the EU approach to Standard Essential Patents - Brussels, 29.11.2017 - COM(2017) 712 final.

²²⁸ Ibid.

²²⁹ Brian K. Krumm, *Fostering Innovation and Entrepreneurship: Shark Tank Shouldn't Be the Model*, 70 ARK. L. REV. 553 (2018).

Instead, they primarily invest in companies “that are already established and generating revenue” that are generally located in California, New York, and Massachusetts.²³⁰ When they fund, the venture capitalists’ interests may conflict with the investors’ strategic interest.²³¹ Illustrative is Amazon’s possible use of its Alexa Fund to access information and designs of young start-up companies in which the fund invests. To alleviate such concerns, Amazon clarified that a “firewall” existed between the company and fund.²³² But concerns still exist that overall information sharing cannot be avoided, to the detriment of target companies.

Such risks, which are inherent in any investment by corporate venture funds, may increase in a digital economy controlled by few gatekeepers. These risks are seemingly accepted by market players as part of reality and a price one pays for the support of a leading fund. As James Siminoff, CEO of Ring, noted:

To say Amazon will not compete with you is lunacy because they compete with everybody... They’re like nuclear power. They are very, very powerful and you can get amazing, clean energy from them but there’s also the possibility of getting human radiation if you’re not careful.²³³

To ensure the operation of capital markets promotes welfare-enhancing innovation, attention and protection to trade secrets and information should be taken into account. Parent companies should be separated by a firewall which provides certainty as to the nature of information shared and enable continuous competitive and innovative pressure among all involved.

In general, one would expect public companies to have better access to capital and therefore be better placed to invest in innovation. Interestingly, the relationship has been shown to be more complex. Public listing of companies has been shown to lead to a decline in investment in innovation novelty. A study by Bernstein identified a 40% decline in innovation novelty measured by patent citations. At the same time there has been no decline in the scale of innovation. This interesting, and somewhat counterintuitive, observation indicated a shift to conventional projects once a firm becomes public. The repositioning of the investment portfolio is often supplemented by acquisitions on additional companies. Through these expansions, the public firm get ahold of substantial number of patents of higher quality than those registered by the firm following it going public. The results may be explained as a manifestation of an agency problem, or the focus on commercialization processes.²³⁴

²³⁰ Ibid. at 566.

²³¹ Ibid. at 570-74 (discussing the inherent conflicts of interest between the entrepreneur and venture capital firm).

²³² Eugene Kim, *Amazon wants to invest in start-ups, but some are nervous about taking the money*, CNBC (13 Sept 2017), <https://www.cnbc.com/2017/09/13/amazon-reassured-alexa-fund-start-ups-about-competition.html>.

²³³ Ibid.

²³⁴ Shai Bernstein, *Does going public affect innovation?*, 70 JOURNAL OF FINANCE 1365-1403 (2015), <https://doi.org/10.1111/jofi.12275> (including references to additional literature).

More generally, facilitating access to capital markets may call for legislative reform to increase small innovative companies' access to, and reduce regulatory limitations on, crowdfunding and other means to raise capital.²³⁵ The state has an important role to play in addressing information asymmetry and uncertainty which may undermine access to capital and subsequently, truly disruptive welfare-enhancing innovation.²³⁶ In facilitating these financing vehicles, policy makers should also consider mechanisms to ensure that the vehicles include “dedicated experienced investors willing to contribute not only their money, but also their time, effort, and expertise.”²³⁷

9.7 Consumer Protection and Empowerment

Consumer protection laws can limit the incentive to invest in, and the payoffs from, negative innovation. Effective consumer protection can help align the innovators' incentives with the consumers' interest and chill attempts to exploit consumers. The significance of consumer protection increases, in particular, when market forces, on their own, do not encourage positive innovation.

Consumer protection, coupled with privacy regulations, can address strategies in the growing “attention economy” which utilize advanced algorithms and real time experiments to increase usage and income. Consumer protection is often used to improve information flows. By imposing duties on companies, it can help reduce the information asymmetries and transparency deficit that characterize many markets.²³⁸ Information about data collection and data analytics can potentially empower users to make educated decisions. Consumer protection, and privacy by design, may also be used to deter misleading information and exploitation. As such, it can serve to address behavioral discrimination and manipulation – either by better informing consumers, or by limiting the use of such strategies.

Imbedded in the discussion of consumer protection is the idea of consumer empowerment. Shifting more control to consumers, in theory, should enable them to determine the use of data or utilization of AI. Empowerment implies an ex-ante approach which reduces the need for state intervention.

One problem, as we saw, is when the supply and demand of such consumer-friendly technologies, such as ad blockers on mobile phones, exist but powerful platforms inhibit the ease in adopting that technology.

Another problem, as evident by the short-comings of the notice-and-consent privacy regimes, is that simply providing consumers with information (such as lengthy privacy notices) may not actually promote their privacy and consumer protection

²³⁵ John Armour & Luca Enriques, *Financing Disruption* (Working paper).

²³⁶ *Ibid.*

²³⁷ Krumm, *supra* note 236, at 608.

²³⁸ For a detailed account of transparency deficit in consumer data, see Which? *Control, Alt or Delete? The future of consumer data* (June 2018), <https://www.which.co.uk/policy/digitisation/2659/control-alt-or-delete-the-future-of-consumer-data-main-report>.

objectives. For example, people are profiled every day based on the behavior and data of *other people*. They are unaware how they are being profiled, in which category they are placed, and to what extent that classification affects the advertisements, news, and products they see. So when individuals consent, they are not only consenting to the use of their data to profile themselves, but the use of their data to make inferences about other people. Indeed, with innovations, such as facial recognition software, users' privacy interests may be implicated simply by walking down the street.

Thus, consumer protection policies must ultimately coordinate with privacy and competition policies to provide the necessary preconditions for effective privacy competition, whereby consumers can better harness technology and innovation to serve their own goals, and to minimize the incentives in promoting exploitative negative innovations. Beyond the clear benefit to consumers, such rules, when effectively enforced, help outline the acceptable boundaries of fair and inclusive competition and subsequently desired innovation.

9.8 Liability for One's Algorithms

The data-driven economy will be influenced by innovations in artificial intelligence and machine-learning. One open issue in the digital economy is the extent to which a company can be liable for the action of self-learning algorithms.

The European Commission, among others, is grappling with this issue. It noted how more autonomous decision-making may "conflict with the current regulatory framework which was designed in the context of a more predictable, more manageable and controllable technology."²³⁹ It recommended clarifying and, if necessary, adapting the legislative framework. Among the legal approaches the Commission considered in 2017 were:

- a strict liability regime,
- a liability regime based on a risk-generating approach (whereby "liability would be assigned to the actors generating a major risk for others and benefitting from the relevant device, product or service"), and
- a risk-management approach (whereby "liability is assigned to the market actor which is best placed to minimize or avoid the realisation of the risk or to amortize the costs in relation to those risks").²⁴⁰

Germany's Federal Court of Justice tackled the issue of whether Google could be liable when its search engine's auto-complete function infringes personality rights.²⁴¹

²³⁹ European Commission, *Commission Staff Working Document on the free flow of data and emerging issues of the European data economy Brussels*, SWD(2017) 2 final, at 43.

²⁴⁰ *Ibid.* at 45. As a complement to the above, the Commission also was entertaining voluntary or mandatory insurance schemes for compensating the parties who suffered the damage.

As the court held, Google need not monitor its algorithm to remove all predictions infringing personality rights. Nor is Google liable per se for developing and using the algorithm. Nor must Google check in advance the search suggestions suggested by its software for possible infringements. Google, however, is potentially liable once it learns about the unlawful violation of the personality right. Under German law, if the affected parties notify the company that its autonomous algorithm violated their personal rights, then the operator must prevent such injuries in the future. Whether or not other jurisdictions follow this approach, the legal approach they adopt will affect the nature of innovation.

Another example, of current concern to many competition officials, is if companies adopt pricing algorithms with the intent of fostering tacit collusion. As discussed earlier, this innovation may exploit a gap in the current legal regime. (If the companies have not “agreed” to collude or use similar algorithms, their pricing interdependence, while anticompetitive, is legal.)

One significant obstacle with a risk-based approach for algorithmic tacit collusion is our ability to understand the magnitude and likelihood of risk and the actuality of harm. When a self-driving car hits a human, the harm is clear. But for decades, antitrust enforcers (even with an attractive leniency policy) have had a hard time detecting express collusion. Detecting tacit collusion is often more difficult (especially when interdependence can appear in competitive markets). Moreover, pricing algorithms can evince “mixed” innovations, where depending on market characteristics, pricing algorithms can increase or lessen competition.

Thus, the legal framework must take account of negative innovation (such as pricing algorithms designed to foster tacit collusion) while not deterring welfare-enhancing innovations in artificial intelligence.

10 Concluding remarks

One key takeaway from this Paper is that promoting positive innovation is not reduceable to an easy recipe. One cannot assume in the digital economy that market forces will yield the optimal level of innovation. Nor is there a simple rule, such as avoid regulations whenever possible, and rely on ex-post enforcement to target egregious cases.

First, a lot remains unknown. While there are indications that markets are becoming more concentrated and innovation levels appear sub-optimal, it is worth recalling at the outset, the complex and uncertain nature of innovation, the unsettled relationship between market structure and innovation, and the difficulty in identifying some

²⁴¹ Bundesgerichtshof, Bundesgerichtshof entscheidet über die Zulässigkeit persönlichkeitsrechtsverletzender Suchergänzungsvorschläge bei "Google", Nr. 87/2013 (May 14, 2013), <https://juris.bundesgerichtshof.de/cgi-bin/rechtsprechung/document.py?Gericht=bgh&Art=pm&Datum=2013&Sort=3&nr=64071&pos=0&anz=86>.

forms of negative innovation. Competition officials, for example, often do not know when a merger may promote or hinder innovation. This isn't attributable to inattention. Rather the unknowns are attributable, the OECD found, to "the uncertainty inherent in innovative activity regarding its cost, timing, and the likelihood and extent of its commercial success, difficulties in measuring innovation itself, the problem of how to conceptually transform innovation into some measure of welfare, and informational asymmetry between the merging parties and the enforcement agencies."²⁴²

Second, even if one could develop an innovation recipe, it likely would need to be regularly updated in dynamic markets. The rise of dominant platforms and their disruptive technologies, one OECD hearing noted,

have affected traditional merger control and led merging parties, to raise the "...but there's Amazon" defence in retail markets or the "...but there is Google" defence in newspaper and local radio markets in many jurisdictions. According to this defence, online disruptors are exerting such a huge competitive pressure on traditional industries that parties argue to clear (the 3-2 or 2-1) transactions that will be presumably otherwise prohibited within a framework of a traditional merger control review.²⁴³

The Amazon or Google defense may or may not have merit. Nonetheless, the dynamic disruption that comes with these platforms does require the policy maker to revisit their existing regulatory frameworks.

Third, any cohesive strategy to promote positive innovation in the EU or other democracies would be challenging, given the often fragmented regulatory setting where power is dispersed across, and within, many member states. A powerful innovation czar could, in theory, rove the country to squelch anti-innovation measures (such as local ordinances that inhibit a disruptive technology or platform) and commandeer resources to promote innovation. An innovation czar could actually breed anti-democratic measures. It is worth repeating here, that innovation, like competition, is not an end itself. Citizens may sacrifice innovation, at times, to further other, more important, values.

Fourth, even if one appointed an innovation czar, the factors that affect the supply and demand for positive innovation in today's digital economy often extend across jurisdictions. On the one hand, the anticompetitive practices of today's dominant platforms in one market can help them maintain their dominance in multiple markets, thereby chilling the incentives to innovate in multiple jurisdictions. For example, Google's search degradation against a German comparative shopping website could chill a French, American, or British company from investing in a better comparative shopping service.

²⁴² OECD, *Policy Roundtables: Dynamic Efficiencies in Merger Analysis* 10 (2007).

²⁴³ OECD Hearing on Disruptive Innovation, *supra* note 186.

On the other hand, regulations can thwart welfare-enhancing innovations. As one US Department of Justice official noted:

Anticompetitive government regulations are like thousands of Lilliputian threads that tie down economies and stifle creativity. Those countries that have designed their laws and regulations to promote innovation and foster competition are the beneficiaries of innovation arbitrage. Entrepreneurs naturally will embrace warmer climates and avoid the islands of Lilliput that overflow with red tape.²⁴⁴

The challenge is to support an innovative economy that benefits society and do so in the face of possible “innovation arbitrage.” Nonetheless, at times, entrepreneurs, in order to achieve scale in the data-driven economy, cannot avoid the islands of Lilliput that overflow with red tape. And these islands can chill welfare-enhancing innovation elsewhere.

Consequently, competition, privacy, consumer protection, and IP authorities should co-ordinate their efforts not only internally, but also with their counterparts in other jurisdictions. When they do coordinate, they should consider innovation from the multiple angles outlined herein, and mechanisms to improve their policy tools to promote positive innovations that promote an inclusive economy and overall welfare. In the end, the policy makers’ goal should not be simply to maximize the number of cloud service providers or super-platforms. Rather the goal should be to promote a data economy, that is inclusive, protects the privacy interests of the citizens, and fosters innovations that promote citizens’ overall well-being.

²⁴⁴ Roger Alford, Deputy Assistant Attorney General, Antitrust Division, US Department of Justice, Speech: *The Role of Antitrust in Promoting Innovation*, Presented at King’s College, London, United Kingdom (February 23, 2018), <https://www.justice.gov/opa/speech/file/1038596/download>.

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Innovation is generally seen as good. Promoting innovation especially in the digital economy is often deemed vital. Increasing the level of innovation, after all, can promote sustainable development, economic growth, prosperity, and citizens' overall welfare. So how can policy makers spur innovation in the digital economy? While there is no simple recipe, this study explores the interplay between innovation and the digital economy from the following seven angles: 1. Theoretical economic literature; 2. Macro view of current innovation levels; 3. Emerging trends in the digital economy; 4. Implications of sub-optimal innovation levels; 5. Variables that affect the supply of innovation; 6. Variables that affect user adoption of innovation. 7. Nature of innovation: positive, negative, and mixed.

Studies and reports

