



HM Government

Competition and Innovation in Digital Markets

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Abbreviations

CPU	Central Processing Unit
CMA	Competition and Market Authority
CRESSE	Competition and Regulation Summer School and Conference
BEIS	Department for Business, Energy and Industrial Strategy
DMU	Digital Market Unit
DVD	Digital Versatile Disc
EC	European Commission
FTC	Federal Trade Commission
GDPR	General Data Protection Regulation
GAFAM	Google (Alphabet), Apple, Facebook, Amazon, and Microsoft
ICO	Information Commissioner's Office
ICT	Information and Communications Technology
IPO	Initial Public Offering
MFN	Most Favoured Nation
Ofcom	Office of Communications
R&D	Research and Development
UKRI	UK Research and Innovation
VCR	Videocassette Recorder
WMP	Windows Media Player

Executive Summary

Digital markets have been associated with significant innovations over the past 25 years that have reshaped how we communicate, shop, socialise and do business. Recently, the observation that many digital markets are dominated by one or two firms with considerable market power, most notably Google, Apple, Facebook, Amazon, and Microsoft (the GAFAM firms), has attracted considerable attention. This has led to concerns that these firms' market power and actions may constrain innovation.

While many reports have discussed competition concerns in digital markets and potential policy responses, the present report has been commissioned by the Department for Business, Energy and Industrial Strategy (BEIS) to specifically identify and evaluate the empirical evidence on the relationship between competition and innovation in digital markets. This report considers the importance of entrants to innovation; whether dominant digital businesses would innovate more under greater competitive pressure; the impact of dominant firms' acquisitions on innovation; and appropriate competition policy and regulatory responses.

The theoretical literature on competition and innovation is well known for the variety and complexity of the incentives at play. The specific characteristics of digital markets also need to be recognised, most notably the presence of network effects, which may limit the ability of multiple firms to effectively compete within a market. Nevertheless, contestability, the ability of firms to enter a market and grow to challenge incumbents, is a key force influencing innovation. The possibility of winning profitable business is the key incentive driving innovation by entrants, and the threat of losing profitable business is a key incentive driving incumbents' innovation.

Overall, there is limited peer-reviewed empirical evidence from digital markets focussed specifically on the questions posed by BEIS. Hence, there is a clear case to pursue efforts to increase the evidence base in this area. For example, retrospective studies of the innovation impacts of competition authority decisions in abuse of dominance cases in digital markets would be valuable. We also recommend that the Competition and Markets Authority (CMA), Digital Market Unit (DMU) and BEIS work alongside researchers to identify a priority list of competition-related research questions concerning digital markets. These organisations should then work to establish a framework to minimise the risk that these projects are halted by limited access to digital platforms' data and engage with UK Research and Innovation (UKRI) to ensure funding is available to facilitate work by independent researchers.

However, policymakers need to recognise that they will likely have to rely on lower-quality evidence than peer-reviewed econometric studies when making decisions. This means they will need to balance competing risks when deciding whether or not to intervene. Also, when making these decisions policymakers need to be aware of the potential ambiguities and limitations of the data available, such as Research and Development (R&D) expenditures. For example, observing high R&D expenditures by GAFAM firms provides little or no information about whether their R&D efforts would be larger or smaller in a more competitive environment.

The usefulness of R&D data would be increased by encouraging digital platforms that are conglomerates to breakdown their R&D inputs and outputs according to their main business lines.

Nevertheless, the available empirical evidence does highlight two core issues: (i) econometric studies demonstrate the power of dominant digital businesses to shape the innovation incentives of smaller firms in their ecosystems, and (ii) descriptive statistics suggest that dominant digital businesses can harm start-up formation and venture capital financing in markets where they operate or may operate in the future. In both instances, the concern is as much about the direction of innovation as about the quantity of innovation; the worry is that incentives to pursue innovations that directly challenge incumbent firms are weaker than the incentives to pursue innovations that are complementary to incumbents' businesses.

Several policy steps may be beneficial. First, pro-competitive regulation for dominant digital businesses could help to preserve the innovation incentives of smaller 'dependent' firms, by protecting their routes to market. However, any regulatory intervention would need to be carefully designed, for example, being focussed on firms with an entrenched market position and subject to regular review. Moreover, the complexity of innovation incentives, and that they need to be considered for both dominant and dependent firms, means each proposed intervention should be subject to careful assessment before implementation. Also, implemented interventions should be subject to ex-post evaluations to maximise learning and enable the identification of policies with unintended impacts.

Second, impacts on innovation should be routinely evaluated when assessing the acquisitions of dominant digital platforms, and the CMA should continue to develop its tools to assess the innovation impacts of digital mergers. Further developing tools to identify mergers with problematic innovation impacts is important, as only a subset of past acquisitions by GAFAM firms have characteristics suggestive of negative innovation impacts. Indeed, acquisitions can have positive innovation impacts by enabling synergies in innovation efforts or by providing a way for entrepreneurs to monetise a start-up's value. As a result, a blanket ban on acquisitions by digital platforms would not be justified by innovation concerns.

Last, there is the question of how to facilitate interventions that are considered beneficial. A notable feature of many dominant digital platforms is that they are large global businesses. This suggests that an assessment should be made of whether the UK's interests are best served through unilateral initiatives or by pursuing global co-operation.

Pursuing the recommendations above should help to maximise the prospects of digital markets continuing to deliver the rapid and dramatic innovations that we have come to expect.

1. Introduction

The Government has committed to set up a Digital Market Unit (DMU) within the Competition and Markets Authority (CMA) from April 2021 to start operationalising a new ex-ante regulatory regime for digital markets. The Government will consult on the form and function of the DMU in 2021 and will legislate to put it on a statutory footing as soon as parliamentary time allows. The current report was commissioned to assist Department for Business, Energy and Industrial Strategy (BEIS) in understanding how this new regime might address any innovation problems identified in digital markets.

This think piece is designed to provide a structure to evaluate the relationship between competition and innovation in digital markets; evaluate the available evidence and discuss the room for policy interventions. It provides insights on how to move forward given the limited and mixed evidence available, including a discussion of how to improve the evidence base. The report is structured with separate sections to address the key questions identified by the BEIS, specifically:

To what extent is there an innovation problem in digital markets?

Are large dominant digital businesses innovating as much as they should be, or would be under more competitive conditions?

What role do new entrants play in driving innovation across digital markets?

Are the acquisitions of smaller companies by Big Tech negatively or positively impacting innovation in digital markets?

What role can competition policy play in increasing innovation in digital markets?

Are there specific firm behaviours or market characteristics standing in the way of effective competition and innovation, that should be the target(s) of competition policy?

To what extent are new pro-competition regulatory tools needed to boost innovation in digital markets, and what should these be?

What are the countervailing risks to innovation that might be associated with intervention by regulators? For example, might innovation be reduced by competition policy?

We address the above questions often with a focus on the very largest digital platforms, namely: Google, Apple, Facebook, Amazon, and Microsoft (the GAFAM firms). At the end of each section, a summary of conclusions is provided. Where relevant, we provide recommendations.

Before moving to the main discussion, it is useful to highlight different types of innovation and alternative ways to measure innovation.

1.1 Types of innovation

(Bourreau & de Streel, 2020) distinguish between incremental and breakthrough innovation, and between sustaining and disruptive innovation. Incremental and breakthrough technologies are separated by the magnitude of innovation, for example, adding fast forward to a VCR (Videocassette Recorder) is incremental, while moving from VCRs to DVDs (Digital Versatile Disc) is a breakthrough. Sustaining and disruptive innovations vary by their impact on the value network surrounding products: the shift from VCRs to DVDs did not alter the process of selling video content, while the shift to streaming has. Another distinction is between process innovation, which increases productivity, and product innovation, which improves existing products or brings new products to market (OECD, 2006). Also, there are growing calls to recognise “soft innovation”.¹ (NESTA, 2009) defines soft innovation as the innovation that “primarily impacts upon sensory perception, aesthetic appeal or intellectual appeal rather than functional performance”, for instance, a newly written book, a new song, or a new version of the software.

With all these alternative definitions of innovation at hand, it is worth noting that innovations are not necessarily always positive for society. For example, a firm could build Artificial Intelligence (AI) to generate fake five-star reviews or ‘deepfake’ technology can create fake videos or images.²

1.2 Measuring Innovation

One way to measure innovation is via inputs, most notably research and development (R&D) expenditures. Typically, the absolute size of R&D expenditures increases with firm size. Hence, it is better to consider firms’ R&D intensity, i.e., the proportion of revenues devoted to R&D. Nevertheless, one should recognise ambiguities with reported R&D expenditures and intensities.³ Do businesses vary in their R&D definitions? Is a broad R&D definition being used to inflate the apparent level of innovation? How should firm totals be allocated to different markets or products? Also, it is important to know that reported R&D expenditures may or may not include other costs such as engineering costs (Grassano, et al., 2020), or maybe influenced by tax minimisation incentives (Lapante, Skaife, Swenson, & Wangerin, 2019).

Crucially R&D intensity does not necessarily indicate successful innovation. It is more desirable to assess innovation outputs, for example, number of patents, number of scientific papers published, number of software updates, number of new attractive features and functionalities, number of new products, or productivity improvements. Less quantifiable outputs might include new business models. However, innovation outputs also bring their challenges, for example, how to differentiate between minor and major innovations⁴, or the

¹ See (Stoneman, 2010)

² (Mulgan, 2016) suggests a framework to distinguish between good and bad innovations.

³ See (Hernandez, et al., 2018) for a discussion of the under-reporting or over-reporting of R&D figures.

⁴ For patents and papers, one solution is the number of citations received.

issue of defensive patents.⁵ Furthermore, output measures are likely to be lagging indicators as innovations take time to develop, and this is likely to be more of an issue in rapidly evolving settings such as the digital economy. Additionally, many innovations may not be publicly identifiable via patents or papers. This is a feature of digital markets. Frequently, software code may simply be viewed as a trade secret with it being solely protected by copyright.

1.3 Relevant Recommendations

Recommendation 1: When it comes to digital markets, policymakers should be cautious about drawing conclusions solely from headline figures of R&D expenditures and patents.

⁵ (Arundel & Patel, 2003) explain that defensive patents are used solely by firms to block the patenting attempts of other firms rather than to protect an investment in actual technology.

2. Innovation in digital markets

2.1 Discussion

GAFAM firms have delivered exceptional breakthrough and disruptive innovations which have improved consumers' lives, created thousands of jobs for employees and delivered considerable value to shareholders. Digital firms also have a reputation for disrupting existing markets, for example, the taxi and hotel markets, while price comparison websites have reduced search costs and improved switching in a variety of consumer markets.⁶ These disruptive innovations have intensified competition and increased consumer welfare. The question is whether the dominant platforms that emerged through this wave of innovation are now hampering further innovation?

2.1.1 Theoretical insights on competition and innovation

That the relationship between competition and innovation is complex goes back to the early literature. (Schumpeter, 1942) argued that the key incentive to innovate is the profits from (temporary) market power resulting from delivering a superior product than rivals. These profits are required to offset the costs of innovation. Schumpeter also noted the importance of large firms to innovation. In contrast, (Arrow, 1962) showed that a monopolist has a lower incentive to deliver cost-reducing innovations than a firm in a perfectly competitive market. This is because the increase in profit from introducing innovation is smaller for a monopolist than for a firm facing competition. However, more recent papers, for example (Chen & Schwartz, 2013), show that by altering the modelling framework Arrow's conclusion about the relationship between competition and innovation can be reversed.

As explained by (Calvano & Polo, 2021), Arrow did not consider that monopolists face challenges from potential entrants. (Gilbert & Newbery, 1982) highlight that an incumbent can have an incentive to innovate to block entry through patenting to preserve monopoly profits, and that here the innovation incentive will be stronger for an incumbent than an entrant. However, this result is again dependent on the specific modelling framework. While theoretical models illustrate the key incentives driving innovation, they do not provide conclusive predictions about the relationship between competition and innovation.

2.1.2 The importance of contestability

Building on (Gilbert & Newbery, 1982), a key defence for dominant digital businesses' innovativeness is that their positions are 'contestable', i.e., they are under the continuous threat of entry and so have to innovate to maintain their position. Hence, it is the threat of competition rather than the presence of competition that drives innovation. As a result, the question is not whether innovation would be higher with more competition, but whether innovation would be higher if markets were more contestable. (Furman, Coyle, Fletcher,

⁶ Although comparison sites can create their own competition issues. For example, the CMA found against the Most Favoured Nation (MFN) clauses of comparethemarket.com with 32 home insurers (case 50505).

McAuley, & Marsden, 2019) argue that innovation could be being dampened in digital markets, as larger companies have less to fear from entrants and dominant firms may be taking steps to further reduce this threat.

(Shapiro, 2012) provides a characterisation of the forces influencing innovation which claims to reconcile Arrow and Schumpeter based on the elements of (i) Contestability, (ii) Appropriability, and (iii) Synergies. Rather than viewing contestability as the ease of market entry and the absence of sunk costs, Shapiro defines contestability as the extent to which a firm gains profitable sales by offering greater value to customers; the higher this is the greater the incentive to innovate. Appropriability is the ability of a firm to capture the social benefits resulting from its innovation. Where it is easy to imitate innovations (appropriability is low), Shapiro suggests the importance of contestability may be limited since a firm will struggle to achieve a sustained competitive advantage. While contestability and appropriability concern the incentives to innovate, synergies concern companies' ability to innovate, in particular, that combining complementary assets across companies can help to increase innovation. Understanding how these forces play out in different settings can help to frame the potential impact of competition on innovation.

2.2 Conclusions

GAFAM firms have delivered tremendous breakthrough and disruptive innovations delivering substantial benefits to society.

The question is whether their dominance now hampers further innovation, in particular disruptive innovation.

The prospect of increased profits drives innovation and these profits result from market power.

Competitive pressures encourage innovation, either driving firms in competitive settings to innovate to gain market power or driving dominant/monopolistic firms to innovate to defend their market power.

Theoretical models highlight key innovation incentives but do not provide consistent conclusions on the relationship between market structures and innovation.

A useful way to summarise forces influencing innovation is to consider contestability, appropriability and synergies.

The contestability of markets is central to the innovation incentives of both dominant firms and entrants.

2.3 Relevant Recommendations

Recommendation 2: Since incentives for innovation are closely related to contestability, any pro-competitive regulation should be focused on firms that have an entrenched market position, i.e., where contestability is limited.

Recommendation 3: Since dominant firms' market power will decline if successful entry occurs, any proposed pro-competitive regulations should be subject to review at regular intervals, and firms subject to such codes should be able to apply for reassessment if significant market changes occur.

3. Would more competition increase dominant digital businesses' innovation?

3.1 Discussion

When assessing whether dominant digital businesses are innovating as much as they would under more competitive conditions, the challenge is that the question concerns a 'what if' scenario. That dominant digital platforms report high R&D expenditure and introduce new products/features does not answer the question of whether or not they would innovate more under more competitive conditions.

Also, if greater competition boosts innovation, is greater competition feasible in digital markets with strong network effects? Network effects favour dominant firms so that competition 'for the market' may be more feasible than competition 'in the market'. Competition 'in the market' is more common and involves multiple firms simultaneously competing to sell products/services to consumers in the same market. In specific situations, the characteristics of a product may make it difficult for multiple companies to compete simultaneously 'in' a market and, instead, there may be a natural tendency to a small number of dominant firms. Here, competition is still possible but takes a different form: multiple firms initially fight to become the dominant firm, i.e., 'for' the market.

Network effects make competition 'in' the market harder since consumers prefer using the same product/service as other consumers. This creates a dynamic where big firms are likely to get bigger and deters consumers from switching to new smaller rivals. Competition 'for the market' may nevertheless be possible either when a market first emerges, or when a rival firm delivers a disruptive innovation so that consumers switch to it.

However, (Calvano & Polo, 2021) highlight that the power of network effects may be reduced if they are "local", i.e., consumers only care about the choices of similar consumers, or multi-homing is possible so that users can use an entrant's product while remaining with an incumbents' product. The ability to multi-home may be increased if interoperability or open standards exist between platforms.

3.1.1 The importance of ecosystems

(Scott-Morton, et al., 2019) notes that strategies to maximise the success of a platform often involve innovation at an ecosystem level, i.e., not just by the platform itself but also by complementary third-party providers. A key decision for a platform operator is how to share profits with other ecosystem members, which, in turn, influences the incentives and resources for other ecosystem members to innovate. Hence, the pertinent question is often whether greater competition would increase innovation by the ecosystem as a whole? Would a platform under greater competitive pressure share a greater proportion of its profits with third parties? Would this altered allocation raise innovation overall?

3.2 Evidence

Below descriptive statistics on R&D expenditures and R&D intensities are presented. As noted above, this evidence needs to be treated cautiously. Nevertheless, we present it as it is widely discussed due to its availability.

3.2.1 Firm size

There is a need to separate the effect of firm size from competition/dominance. The size of GAFAM firms could help innovation if there are economies of scale in R&D and/or large pools of data assist innovation. However, summarising the empirical evidence across multiple industries, (Cohen, 2010) reports that R&D expenditure increases broadly proportionately with firm size, but that the number of innovations increases less than proportionately with firm size. Cohen also reports that while R&D effort is skewed towards incremental and process innovations as firm size increases. Taken at face value, these results imply that the same quantity of R&D expenditure spread over many firms would deliver greater innovation outputs than if it was concentrated in a single large firm, holding all other factors constant. However, Cohen cautions that rather than large firms being inefficient at R&D, their ability to spread R&D costs over larger sales volumes provides them with a financial incentive to pursue more marginal innovations.

3.2.2 Digital R&D as a proportion of total R&D

(Hernandez, et al., 2018) report the share of total global R&D investment accounted for by the Information and Communications Technology (ICT) services sector increased from around 11% in 2010 to 14% in 2017. However, in 2017, this share was still lower than that of (i) health industries (around 21%), (ii) ICT producers (around 24%), and (iii) automobiles and transport (around 19%), respectively.

3.2.3 Descriptive statistics on market shares and R&D

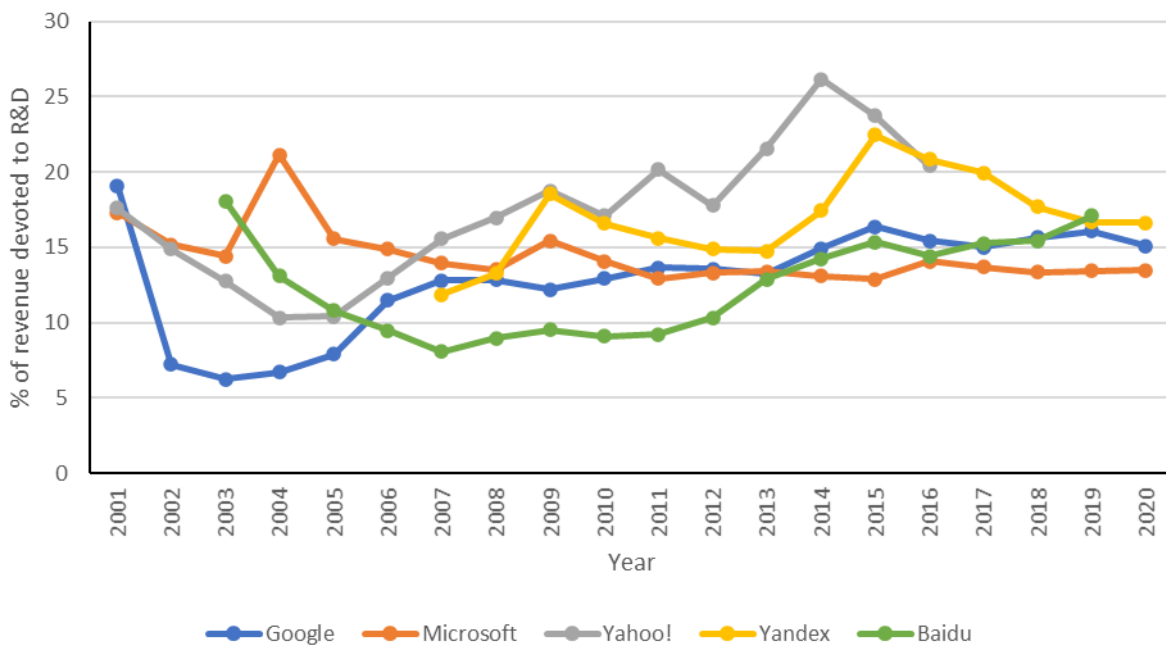
(Casanova, 2020) notes that while Google had a global market share of around 90% in online search, in China and Russia market shares suggest a more competitive national environment. Comparing indicators of innovation for search engines (other than Google) in the more competitive national markets may give a first indication of whether greater competition in search might lead to greater innovation. Also, Casanova argues for the contestability of the search market since, despite small market shares, Microsoft Bing, DuckDuckGo, Ecosia (which uses Bing's search technology), and Yahoo continue to operate. However, while the existence of competitors indicates that entry is possible, it is not sufficient to indicate that a market is contestable in the sense of entrants providing a competitive constraint on dominant firms; for this to be the case, there needs to be a real prospect that small firms can grow into a serious threat to the incumbent(s).

For a broader insight than (Casanova, 2020), we accessed the R&D expenditures and R&D intensity for the top 100 digital companies (as per Forbes' 2019 top 100 digital companies

ranking)⁷ and compared patterns in key markets for GAFAM firms relative to direct competitors among the Forbes top digital companies. The comparisons suggest that GAFAM firms dominate in terms of R&D expenditures, but not in terms of R&D intensity. Figures 1 and 2 report results for the online search market, similar trends occur when the firms being compared are selected according to their presence in other markets such as e-commerce, social networks, and cloud computing, etc.

Two interesting features of Figure 1 are that: (i) the smaller Russian firm Yandex has an average R&D intensity which is generally higher than Google, and (ii) Baidu, despite a more contested Chinese search market, often has an average R&D intensity lower than Google's. However, these figures have the limitation that they are only available for corporate groupings as a whole, rather than specifically for firms' search businesses.

Figure 1: R&D intensities of major online search providers, 2001-2020

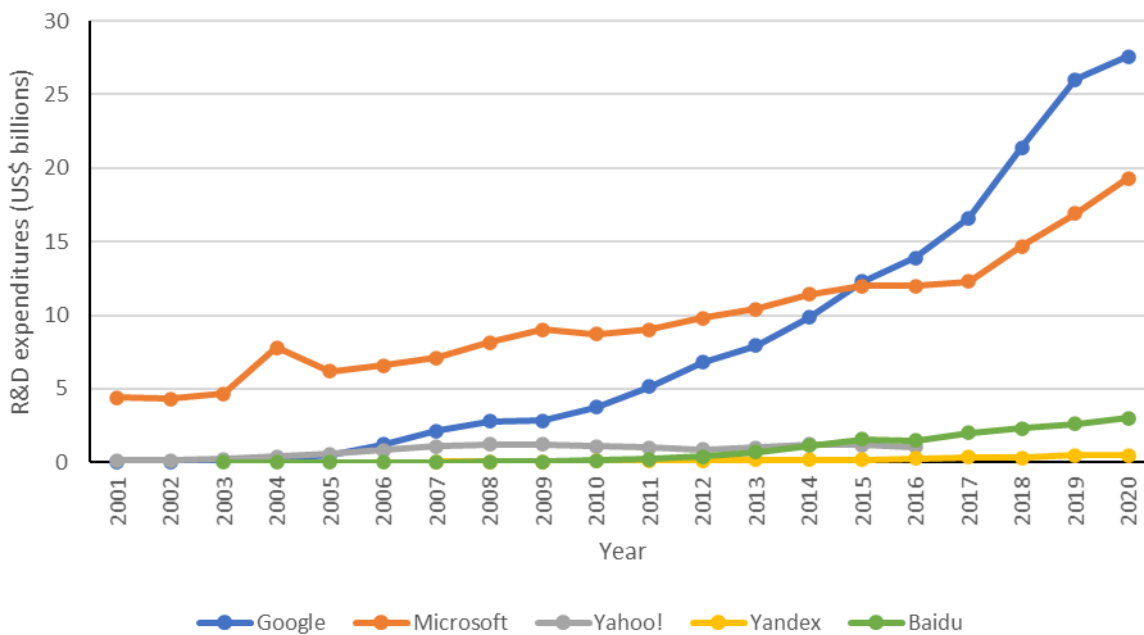


Source: Thomson Reuters Datastream. R&D data for Yahoo!, Yandex and Baidu are only available for part of the period.

AI	Artificial Intelligence
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⁷ This ranking was constructed using a composite of sales, profits, asset growth and stock price performance.

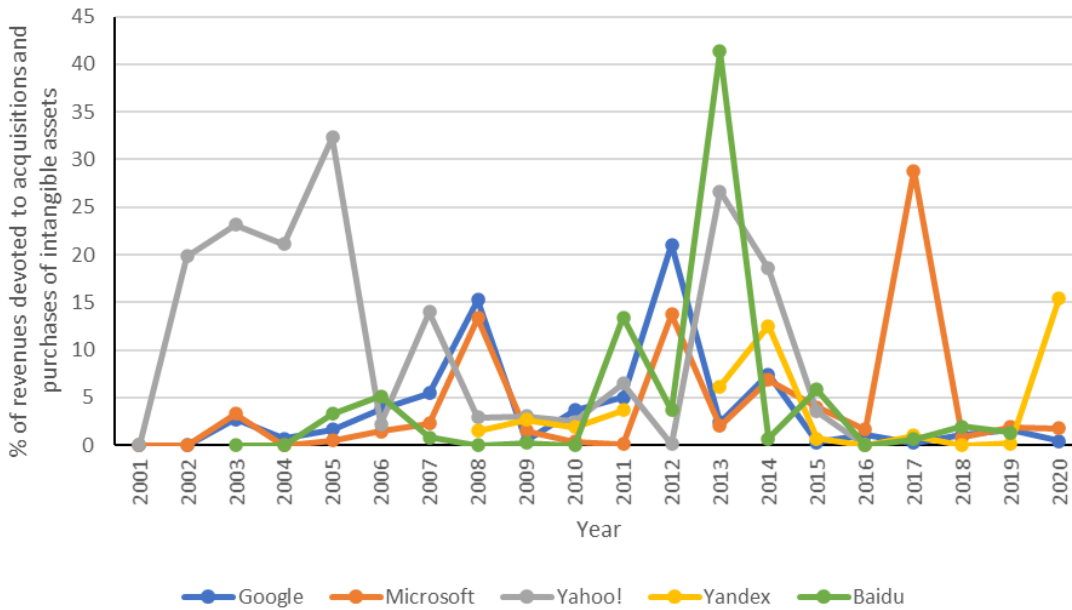
Figure 2: R&D expenditures of major online search providers, 2001-2020 (nominal prices)



Source: Thomson Reuters Datastream. R&D data for Yahoo!, Yandex and Baidu are only available for part of the period.

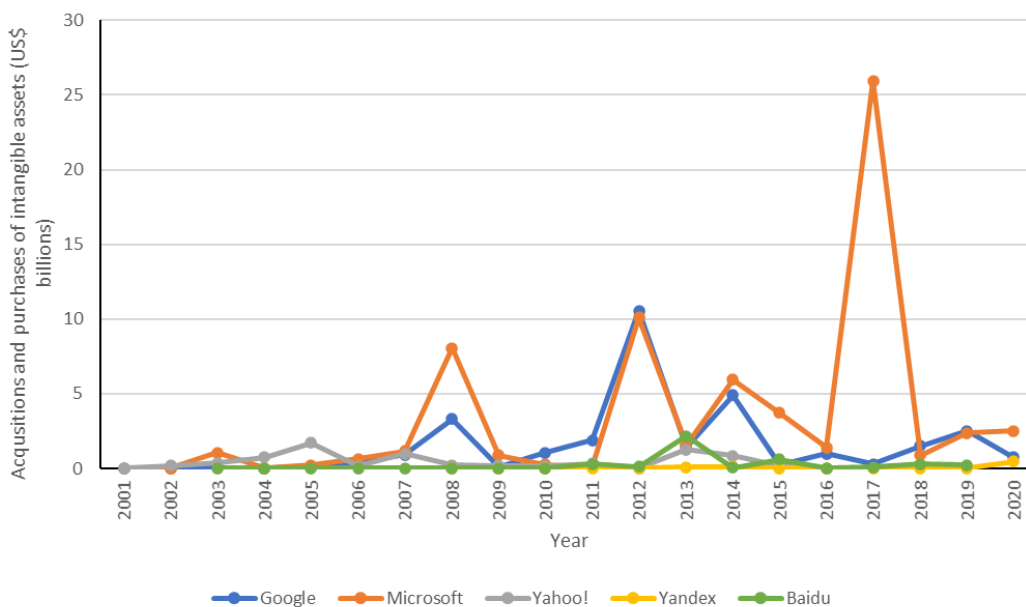
Instead of investing internally in R&D to innovate, firms can acquire new technologies via acquisitions or the purchase of intangible assets. Figures 3 and 4 illustrate the value of acquisitions and intangible assets in absolute terms, and as a percentage of revenue (intensity) for major firms in the online search market. As in Figures 1 and 2, Google and Microsoft do not generally spend a higher proportion of their revenues on acquisitions and intangible assets than other firms. However, in absolute terms, their spending (totalled across all business lines) is, with no doubts, higher.

Figure 3: Acquisitions and purchases of intangible assets as a proportion of revenues for major online search providers, 2001-2020



Source: Thomson Reuters Datastream and authors' calculation. Data for Yahoo!, Yandex and Baidu are only available for part of the period.

Figure 4: Acquisitions and purchases of intangible assets by major online search providers, 2001-2020 (nominal prices)



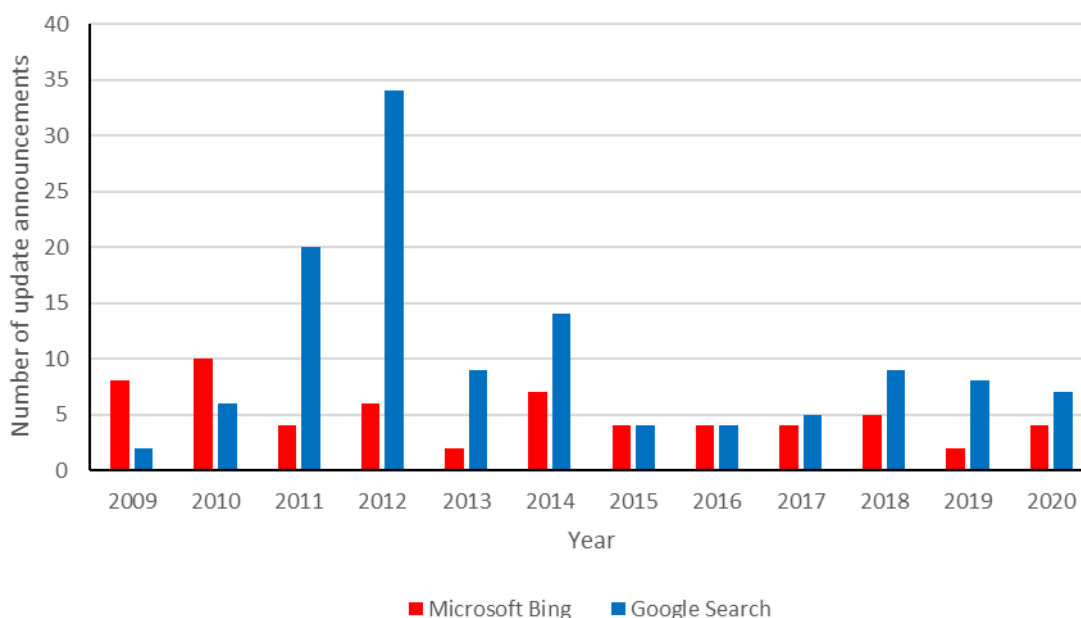
Source: Thomson Reuters Datastream and authors' calculation. Data for Yahoo!, Yandex and Baidu are only available for part of the period.

Overall, it is very difficult to say whether GAFAM firms would innovate more under greater competition. (Pollock, 2010) indicates that during 2001-2004 the online search market was more competitive, and Google had yet to become dominant. It is noticeable in Figure 1 that between 2002 and 2004 Google's R&D intensity, averaged across all business lines, was

lower than in subsequent years. However, the sharp drop off in R&D intensity between 2001 and 2002 suggests this may have been an overhang from the dotcom crash rather than being competition related. Also, except for 2004, Microsoft's R&D intensity (again averaged across all business lines) remains remarkably stable. Furthermore, looking at Figures 1, 2 and 3 together it is difficult to see a relationship between R&D expenditures/intensity and the 'spikey' spending on acquisitions and intangible assets.

Turning to innovation outputs, (Casanova, 2020) cites evidence that the number of updates to Google's search algorithm increased from 300 in 2009 to over 3,000 in 2018, although only 10-15 per year might be judged 'significant'. One may question what these figures represent, especially if most of the improvement in search algorithms arises from continuous machine learning rather than discrete code updates. Figure 5 presents the frequency of Google and Microsoft announcing significant updates and new features for their search engines. Aside from 2009 and 2010, just after Bing was launched, Google has generally issued more search engine update announcements than Microsoft. Taking this data at face value as an accurate measure of innovation (something questionable), Google appears to innovate more with its search algorithm, particularly in the early years following Bing's introduction in 2009. This would be consistent with two explanations. First, that Google has an incentive to innovate to protect its dominant position and, second, that Microsoft has less incentive to innovate because it is difficult to disrupt Google's dominance.

Figure 5: Number of update announcements by Google Search and Microsoft Bing, 2009-2020



Source: Authors' calculation based on data from moz.com and blogs.bing.com. Each announcement can combine many individual updates.

3.2.4 Competition between GAFAM firms

Another question is whether GAFAM firms provide a competitive constraint on each other's behaviour. (Petit, 2019) defines a new form of competition, labelled "moligopoly", with which he

captures the idea that large companies compete with one another across markets, including nearby markets, but not within the core markets they dominate. (Evans, 2017) details the large number of cases where the GAFAM firms offer competing products. In many instances, these product offerings are marginal, and even where there is competition it is a duopoly, potentially with a dominant firm (Petit, 2019). But it is erroneous to think that dominant players face no competitive threat. For example, Evans reports Bing vs Google in search, Chrome vs Safari vs Edge in browsers, Gmail vs Outlook in email, WhatsApp vs FaceTime vs Skype for video calls, and Siri vs Alexa in voice assistants. This argument is developed further by The Economist⁸ which argues that in several US technology markets oligopoly is a better description than a dominant firm with a tail of (very) small competitors. While The Economist's methodology is not entirely clear, it argues that between 2015 and 2020 GAFAM firms have increasingly diversified their revenue sources, with the share of their total revenue which 'overlaps' with other GAFAM firms rising from around 20% to around 40%.

Competition between GAFAM firms (and other large platforms) in adjacent/overlapping markets is potentially more feasible than relying on entirely new firms as when launching a new product, a large platform can exploit the user base of its existing ecosystem as a route to market and the complementarities these users receive by using related products from a single ecosystem. One example of this would be Microsoft's ability to encourage users of the Internet Explorer/Edge web browser to use the Bing search service, while another is Apple music service which can use its iOS base to compete with Spotify and Amazon music. Whether this type of competition is sufficient to maximise innovation is a separate question.

3.2.5 Cross-industry evidence

(Shapiro, 2012) summarises the relationship between competition and innovation when looking across industries. When viewing innovation as being represented by increased productivity, he argues that the empirical literature generally finds a positive relationship with competition, although, firm/industry heterogeneity still needs to be recognised. He also notes that the literature is less clear when innovation is assessed by R&D inputs and outputs, although results are cited suggesting an inverted-U relationship between competition and innovation when looking across industries so that innovation is highest in markets with 'moderate' competition. A widely cited paper reporting an inverted-U relationship is (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005).⁹

(Cohen, 2010) in his work also indicates that overall, the empirical relationship between market structure and R&D is unclear. Furthermore, Cohen notes the potential for competition and innovation to both be determined by a third factor or for innovation to shape the nature of competition rather than the other way round. Cohen suggests that other factors including demand, appropriability, and technological opportunity, are probably more important than competition in explaining cross-industry differences in R&D.

⁸ 'Collusion and collisions: The new rules of competition in the technology industry', The Economist, 27 February 2021.

⁹ The authors exploit a panel of 2-digit standard industrial classification (SIC) industries over the period 1973 to 1994. They measure innovation by the industry weighted average (by citations) number of patents; they measure competition by the price-cost margin.

The feasibility of achieving competition 'in the market' may be limited by network effects, and so competition 'for the market' may be more realistic in digital markets.

3.3 Conclusions

High innovation expenditures by GAFAM firms do not indicate whether innovation would be higher or lower if there was more competition.

The key question is whether greater competition would increase total innovation by the whole ecosystem that operates around key platforms.

R&D expenditures increase broadly proportionately with firm size, but numbers of innovations increase less than proportionately, and innovation becomes skewed towards process and incremental innovation at larger firms.

Comparisons of R&D intensity are likely more informative than absolute R&D expenditures as the former takes into account differences in the size of firms.

Looking at national markets where market shares differ from those at the global level may provide information on innovation in digital markets that are more competitive, although, the number of these cases may be limited, and market-specific factors may be at play.

While GAFAM firms have very large R&D expenditures, the proportion of revenues they devote to R&D is less exceptional, although, these statistics should be treated with caution.

That GAFAM firms provide some competitive pressure to each other in specific markets should be recognised.

Looking across industries, the overall empirical evidence is mixed regarding the relationship between competition/market structure and innovation, despite studies reporting an inverted-U relationship receiving considerable attention.

3.4 Relevant Recommendations

Recommendation 4: Dominant digital platforms should be encouraged to provide a more detailed breakdown of their R&D expenditures. In particular, it would be useful for the data to be broken down by key business lines, and for information on the types of expenditures reported as R&D.

Recommendation 5: Research should be undertaken to understand how innovation has played out in digital market segments where the extent of competition has changed over time and/or in specific national markets where there is greater competition than at the global level.

4. New entrants' role in innovation across digital markets

4.1 Discussion

At any point in time, it will be possible to identify a new digital entrant that has delivered a breakthrough or disruptive technology, potentially creating an entirely new market in the process. The real questions are: (a) whether entrants would play a greater relative role in innovation if there was more competition, and (b) whether this would increase total innovation. Also, as discussed above, the (threat of) entry of firms generates pressure for incumbent firms to innovate.

When discussing new entrants, one must recognise that: (a) all firms are new entrants at some point in their history, (b) there is a distinction between a 'new firm' and a 'new entrant'. A new entrant may be an established firm, for example, Google developing Android or Apple developing iTunes. This distinction is particularly relevant to digital markets since the large digital platforms are conglomerates. As discussed above, a related question is how frequently GAFAM firms enter each other's core markets as direct competitors.

4.1.1 Factors favouring digital conglomerates

(Bourreau & de Stree, 2019) note that there are various reasons for dominant digital platforms may enter markets beyond their core businesses and the only one is to extend market power. Another reason is spare resources (they report that Amazon cites spare data centre capacity as leading to its cloud services) and another is internal capital markets which make it easier to reallocate capital within a firm than to obtain capital from external sources. (Bourreau & de Stree, 2019) add that within the digital economy two further factors favour conglomerates: (i) strong economies of scope from harnessing the 'modular' nature of hardware and software, and (ii) consumption synergies from consumers purchasing within product ecosystems. As evidence of economies of scope regarding data, (Zhu & Liu, 2018) find that Amazon chooses to enter those product categories which are most popular on Amazon.com, information which Amazon has easily to hand.¹⁰

4.1.2 Entrants and disruptive innovation

Anecdotes that new entrants deliver breakthrough and disruptive innovations may result from what (Calvano & Polo, 2021) term the 'incumbency advantage'. An incumbency advantage exists if an entrant with a higher quality/cheaper product fails to gain a significant market share. In platform markets this is often associated with network effects, i.e., consumers gain from the large number of consumers purchasing the incumbent's product and this benefit offsets the slightly better intrinsic characteristics of the entrant's product. As noted in (Scott-Morton, et al., 2019), this implies that an entrant's product must have significant intrinsic advantages if it is to

¹⁰ Whether Amazon acts in an anti-competitive manner regarding its product entry decisions is a separate issue.

succeed. In other words, the only entrants that receive attention are those offering breakthrough or disruptive innovations. Avoiding an incumbency advantage is a potential reason for small firms to innovate in entirely new product categories. However, it has to be acknowledged that incumbency advantage can act as pull factor as it means a large reward in case of successful innovative disruption.

4.2 Evidence

While Schumpeter's idea of 'creative destruction' implies new entrants are essential to innovation, (Shapiro, 2012) suggests that empirical evidence of a positive relationship between entry and innovation may not be demonstrating that entry causes increased innovation, but that innovation and entry are both higher in industries where there are greater opportunities to innovate.

To assess the level of innovation by new entrants, potential proxies are the venture capital available or the rate of start-up formation, as suggested by (Scott-Morton, et al., 2019). The detail of this evidence and the impact of GAFAM acquisitions on start-up incentives is discussed fully in Section 5. In broad terms, the evidence shows that subsectors close to the activities and acquisitions of GAFAM firms receive less venture capital funding than other subsectors. This can be viewed as evidence that the role of start-ups in driving innovation in social platforms, internet software, and internet retail is lower than in other areas of software.

4.2.1 Entrants' innovation direction

Within platforms' ecosystems new entrants may steer their innovation efforts according to the decisions and actions of platforms, notably the Google and Apple app stores. Several papers explore how app store rules shape innovation incentives. (Leyden, 2020) considers how Apple's policy of resetting an app's customer rating after every update incentivised a reduction in the frequency of updating for higher quality apps and an increase in the frequency of updating for low-quality apps. Leyden indicates there is suggestive evidence that Apple's policy not only delayed innovation but also resulted in lost innovations. In contrast, (Comino, Manenti, & Mariuzzo, 2019) suggest that apps update frequently to generate 'buzz' to remain at the top of the download list rather than to improve product quality. While (Wen & Zhu, 2019) find that when there is the threat of entry by Google into a particular type of app, app developers reduce the frequency of updates for affected apps and appear to shift their innovation efforts to unaffected apps.

4.3 Conclusions

New entrants not only undertake innovation but also provide pressure for incumbent firms to innovate.

The key question is whether shifting innovation incentives in favour of new entrants increases innovation overall.

There is a distinction between new firms and new entrants. GAFAM firms are entrants when they move into markets beyond their existing markets.

Economies of scope in data, advantages of internal capital markets, spare resources, and consumption complementarities explain why GAFAM firms have become conglomerates.

Entrants may be associated with breakthrough and disruptive innovations simply because only radical innovations can overcome the incumbency advantage of existing platforms.

Empirical evidence shows how rule changes by the Apple and Google app stores can steer the direction of entrants' innovation efforts.

4.4 Relevant Recommendations

Recommendation 6: Since firms with an entrenched market position in one activity can be important entrants in another activity, any proposed pro-competitive regulations should avoid placing undue constraints on firms' activities in markets where a rival firm has an entrenched market position.

5. The impact of Big Tech acquisitions on innovation

5.1 Discussion

One feature of digital markets is the large number of acquisitions targeting innovative start-ups. GAFAM firms bought 175 companies between 2015 and 2017 (Gautier & Lamesch, 2021); very few of these acquisitions were investigated by competition authorities, and none of them was blocked.

There is intense debate about whether frequent acquisitions stimulate or hinder innovation in digital markets. As Table 1 indicates, theory and intuition suggest that acquisitions can have both positive and/or negative impacts on innovation. Evidence suggests that while killer acquisitions are possible, only a small number of completed acquisitions fall into this category, although, this is sensitive to how 'killer acquisitions' are identified.¹¹

¹¹ (Cunningham, Ederer, & Song, 2021) define "killer" acquisitions as acquisitions that serve the sole purpose of shutting down the target's innovation project and eliminating future competition.

Table 1: Potential effects of acquisitions on innovation in digital markets

Positive impacts	Negative impacts
The acquirer further develops the target's innovation and delivers it to a larger pool of users.	Less innovative effort occurs as either: (i) the acquirer kills the innovation project of the target (killer acquisitions) or (ii) the acquirer kills its innovation effort (reverse killer acquisitions).
Synergies occur between the acquirer's and target's innovation capabilities (e.g., skills/ideas, assets, and funding) leading to more/better innovation outputs.	Venture capital funding and start-ups can be deterred from entering the core businesses of GAFAM firms or their acquisitions (kill zones).
The prospect of acquisition stimulates start-up entry and venture capital funding. A buyout price may be higher than the expected profits of a start-up 'going it alone'.	Innovation is directed towards maximising the value from acquisition leading to either: (i) incremental innovations beneficial to dominant firms (complementary innovations can displace substitute innovations), or (ii) opportunistic 'me too' products solely intended to stimulate an acquisition to remove their competitive threat.
Acquisition enables the transfer of innovations that cannot be patented and licensed.	The loss of start-ups may reduce the diversity of innovation and quantity of disruptive innovation.
	A long-term loss of competition in innovation between rival firms.
	The identity of the acquirer can matter. A target acquired by a GAFAM firm blocks an alternative purchaser from making an acquisition that may have a less anti-competitive impact. ¹²

¹² (Furman, Coyle, Fletcher, McAuley, & Marsden, 2019) recommend that merger assessment should consider a counterfactual where the target is purchased by an alternative buyer. For example, in the Google/Waze merger case, one might have considered the consequences of Waze being purchased by Apple.

5.2 Evidence

When assessing acquisition behaviour by GAFAM firms it is important to note that it may change over time and respond to the likelihood of antitrust enforcement. Analysis using a short time of data may be particularly influenced by this e.g., (Gautier & Lamesch, 2021).

5.2.1 Killer acquisitions

(Cunningham, Ederer, & Song, 2021) report evidence from the pharmaceutical market that acquirers are more likely to shut down innovation projects of a target if they overlap with their existing projects, but that only 6.4% of pharmaceutical mergers are likely 'killer acquisitions'. While (Cunningham, Ederer, & Song, 2021) suggest killer acquisitions may occur in other markets, they are likely harder to identify in the digital space than in pharmaceuticals where substitutes can be defined by molecule and therapeutic class. (Igami & Uetake, 2020) point out that mergers in the Hard Drive Disk (HDD) industry occur to kill competitors as to acquire the tacit knowledge that these have. They provide evidence of an inverted-U shape between competition and the incentive to kill. Part of the debate around Facebook's acquisitions of Instagram and WhatsApp concerns market definition: whether fast-growing firms in markets close to Facebook's core business should have been viewed as future direct competitors? Equally, there are many examples of GAFAM firms purchasing complementary rather than rival products/services, for instance, Google/Android or Facebook/Oculus. As (Petit, 2019) puts it, the moligopolists first moat their core markets and then, risk investing in technological frontiers, hoping to be the winners of important discoveries of the future.

(Gautier & Lamesch, 2021) analyse 175 mergers by GAFAM firms from 2015 to 2017 and conclude that only the acquisition of Masquerade by Facebook should be viewed as a potential killer acquisition. (Latham, Tecu, & Bagaria, 2020) perform a similar analysis using a sample of 409 acquisitions by Google, Amazon, Facebook, and Apple between 2009 and 2020. Filtering by acquirer's market power, the target's competitive threat, and the purchase price, they find that out of the 117 acquisitions where purchase price data was available, up to 16 could be considered as potential killer acquisitions.

5.2.2 Reverse killer acquisitions

Reverse killer acquisitions are defined by (Caffarra, Gregory, & Valletti, 2020) as a situation where an acquirer is already undertaking innovation, but after an acquisition, it absorbs the target's technology, and the acquirer kills its innovation effort to avoid duplication. The authors give the Amazon/Deliveroo, Sabre/Farelogix, and Paypal/iZettle acquisitions as examples.

5.2.3 Fostering innovation via technology transfer, synergies, and efficiencies

As an example of acquisitions' positive effects, (Kenedy, 2020) notes that after the acquisition of Keyhole, a company developing a street-level map, Google invested billions to improve and expand the mapping coverage before offering it to consumers for free as Google Maps. Regarding synergies, (Bennato, Davies, Mariuzzo, & Ormosi, 2020) provide a retrospective analysis of mergers in the hard disk market finding evidence of a significant increase in R&D

productivity and new product introductions following the acquisition of Seagate by Samsung, but not following the merger between Western Digital and HGST. (Kleer & Wagner, 2013) also find evidence that mergers and acquisitions by semiconductor firms lead to an increase in overall industry innovation as measured by patents. Synergies also occur when big tech firms acquire talented employees via acquisitions (“acqui-hire”) and provide them with resources to pursue their innovative ideas. For instance, Fabien Curto Millen, Director of Economics at Google, stated that: “[acquisition] is about getting an innovative group of people, who have [a] proven track record of working and innovating together and bring them into space ...”.¹³ However, (Ng & Stuart, 2019), analysing over 30 million public LinkedIn individual profiles, question the effectiveness of this strategy noting that acquired employees have a significantly higher departure rate than organically hired employees and a much higher probability of returning to the start-up sector.

5.2.4 Stimulating innovative entry

The prospect of being acquired by a dominant firm can encourage innovative entrants to invest in innovation. For instance, based on data from almost 13,000 firms across 181 industry categories, (Phillips & Zhdanov, 2013) provide evidence that mergers and acquisitions have significant positive impacts on R&D activity by small firms. The possibility of acquisition is also a key motivator for venture capital investment in digital markets, as it provides the main exit route for investors rather than Initial Public Offerings (IPOs) (Cremer, de Montjoye, & Schweitzer, 2019). However, the dominance of acquisitions over IPOs as an exit route does not indicate that this balance is socially optimal, rather it shows that there are risks to limiting acquisitions

5.2.5 The direction of innovation

Big Tech acquisitions in digital markets can, not only affect the level of innovation, but also the direction of innovation (Bourreau & de Streel, 2020). Theoretical work by (Bryan & Hovenkamp, 2020) suggests that it is profitable for the new entrants to distort innovation towards the dominant firms to achieve higher buy-out deals. Therefore, acquisitions can encourage start-ups to invest in incremental innovation, which provides improvements to incumbents’ existing products, rather than disruptive innovation where a start-up would compete head-to-head with the dominant firm. This view is shared by (Cabral, 2018) who shows that a restrictive merger policy would encourage radical innovation and discourage incremental innovation. Furthermore, (The U.S. House Committee on the Judiciary, 2020) cites Paul Arnold, an early-stage investor and founder of Switch Ventures, as stating that: “Venture capitalists are less likely to fund start-ups that compete against monopolies’ core products ... As a start-up investor, I see this often. For example, I will meet yet another founder who wants to disrupt Microsoft’s LinkedIn. They will have a clever plan to build a better professional social

¹³ The 15th Annual Competition and Regulation Summer School and Conference 2020 (CRESSE) Special Policy Session 1: “Controlling Pre-Emptive Mergers: In Need of a New Approach?”. A recording can be viewed at <https://www.competitionpolicyinternational.com/session-1-controlling-pre-emptive-mergers-in-need-of-a-new-approach-cresse-2020/>.

network. I always pass on the investment. It is nearly impossible to overcome the monopoly LinkedIn enjoys. It is but one example of an innovation kill zone.”

5.2.6 Kill zones for start-ups

Some researchers have challenged the view that acquisition promotes innovative entry. (Kamepalli, Rajan, & Zingales, 2020), using Pitchbook data, examine the effect of Facebook and Google acquisitions and find that venture capital funding and the number of funding deals for start-ups similar to acquired companies dropped by 46% and 50%, respectively, in the three years after an acquisition occurred. In the same vein, (Koski, Kassi, & Braesemann, 2020) employ richer data from the Crunchbase website for the period 2003-2018. Their difference-in-difference estimates indicate that GAFAM acquisitions reduce start-up entry and funding in the target firm’s product market. Also, looking across the wider economy, (Akcigit & Ates, 2019) report that firm entry rates and technology diffusion in the US fell dramatically between 1990 and 2010.

In contrast, (Williams & Sivalingam, 2018) (in a report commissioned by Facebook) suggest that the presence of Facebook, Google, and Amazon does not dampen venture capital investment in the technology sector relative to other sectors. However, as (Hathaway, 2018) explains, this analysis is potentially misleading, since it aggregates across the whole tech sector. Hathaway analyses a similar dataset but considers the sub-sectors associated with each firm: social platforms (Facebook), internet software (Google), and internet retail (Amazon), and finds the opposite trend: first financing investment for start-ups in these sub-sectors declines at a faster rate than the rest of the technology sector.

Collectively, these findings likely reflect start-ups/venture capitalists rationally responding to the threat of entry by a GAFAM firm making particular market segments less appealing. ‘Kill zones’ would appear most concerning in segments where, post-acquisition, a dominant firm does not deliver a new product to market, since the innovation efforts of other firms also being deterred.

5.3 Conclusions

The acquisition of a small firm by a dominant firm can have positive and/or negative impacts on innovation (see Table 1).

While killer acquisitions are possible in digital markets, existing evidence suggests they are rare, although, this will depend on the precise criteria used to define killer acquisitions.

As only some acquisitions are killer, emphasis should be placed on establishing principles to separate problematic from non-problematic acquisitions.

That acquisitions are a key route for start-up investors to exits highlights potential risks to limiting acquisitions

There is evidence that Big Tech acquisitions reduce start-up activity and venture capital funding in particular market segments.

Evidence to assess how blocking acquisitions might alter innovation is difficult to construct as so few digital acquisitions have been blocked.

The debate on start-up kill zones uses venture capital funding and/or start-up entry as proxies for innovation. It is an open question of whether indicators like total R&D expenditure or patents in relevant product segments would show similar impacts.

5.4 Relevant Recommendations

Recommendation 7: Since only a subset of dominant platforms' acquisitions are likely to be problematic, and some acquisitions can boost innovation, an assessment of acquisitions by dominant platforms should occur on a case-by-case basis. A blanket ban on acquisitions by dominant platforms would not be justified by innovation concerns.

Recommendation 8: Given the importance of innovation to digital markets, assessments of acquisitions by dominant digital platforms should routinely consider their impact on innovation.

Recommendation 9: The CMA should continue to develop its tools to assess the innovation impacts of digital mergers.

6. Can competition policy increase innovation in digital markets?

6.1 Discussion

While competition and competition policy can influence innovation in significant ways, the mixed and limited evidence above limits our recommendations for policy interventions and, instead, we focus on how to structure thinking on salient issues and how to improve the evidence base.

6.1.1 Decision making with limited evidence

One challenge of assessing innovation as part of competition policy is the uncertainty regarding where innovation will occur, and which innovations will succeed. Another is the limited empirical evidence from digital markets to assess key competition policy questions. The highest-quality evidence is detailed empirical studies that have passed peer review in well-regarded journals. However, the publication of such studies takes significant time, not least because several years of data is required after an event of interest has occurred. Separately, a lack of access to suitable data can also limit such studies, a point raised by (Valletti, 2019).

At the same time, innovation in digital markets, and the resulting impacts on competition, are thought to occur at a faster pace than in other sectors. Hence, policymakers facing particular competition decisions will probably lack evidence reaching the highest quality standards. Decisionmakers will have to inform their decision by critically analysing alternative sources of information that provide less conclusive evidence. Table 2 describes the types of evidence available and factors to consider when using them.

Another option is to use economic theory to guide decision-making. However, as discussed above, economic theory also presents a mixed picture of the relationship between competition and innovation. Nevertheless, theory can, and should, help with decisions. While conclusions may differ across theories, some theories rely on more realistic assumptions than others, and some assumptions are a better fit for certain market conditions or structures. Understanding the assumptions and limitations of theories is essential to the good use of them.

Based on the evidence available a policymaker will have to balance competing risks when making a decision. If a policymaker thinks the evidence implies a case for intervention, the two risks take the following form: (i) when accepting conclusions from limited evidence the risk is that higher-quality evidence emerges in the future that indicates non-intervention would have been correct, and (ii) when rejecting conclusions from the limited evidence the risk is that the evidence is confirmed as correct, but no action was taken.

A further implication of the limited evidence available is that it may be difficult (impossible) to meet the legal standards of proof in competition policy frameworks. While there are good reasons to require high legal standards in competition cases, in digital markets there may be

occasions where a policymaker views the balance of competing risks are in favour of intervention but using existing competition law instruments to carry out the intervention would be impossible.

Table 2: Types of evidence available for decision making

Type of Evidence	Comments on the use	Example
Economic theory	This requires a good understanding of theories' assumptions, their limitations, and in which circumstances the theory could be valid. There is no general theory.	(Gilbert & Newbery, 1982) on the incentives of monopolists to innovate to patent and block entry.
Peer-reviewed econometric studies on digital markets of specific interest	Highest quality evidence, but only available with a time delay limiting the availability for many policy questions.	(Wen & Zhu, 2019) on the innovation incentives of app developers.
Descriptive statistics on digital markets	Indicate correlation rather than causation and there may be multiple explanations for the observed correlations.	(Hathaway, 2018) on start-up financing in sub-sectors close to GAFAM businesses.
Econometric studies from other industries	The characteristics of the studies' industries need to be compared with digital markets to determine if the results are still likely to hold.	(Cunningham, Ederer, & Song, 2021) on killer acquisitions in the pharmaceuticals sector.
Econometric studies of the whole economy	One has to assume the results for the economy as a whole remain valid within specific digital markets.	(Aghion, Bloom, Blundell, Griffith, & Howitt, 2005) on the relationship between competition and innovation across multiple industries.
Econometric studies from different digital/ICT markets in the past	The characteristics of the studies' markets need to be compared with the current market of interest to determine if the results are still likely to hold.	(Goettler & Gordon, 2011) on the impact of competition between Intel and AMD on CPUs (Central Processing Units) innovation.
Collations of legal cases, case studies, and anecdotal evidence	Considering multiple cases studies is important to avoid focusing on unrepresentative issues.	Microsoft/Internet Explorer, Google Android, Google Shopping and Amazon e-book cases.

6.1.2 Developing the Digital Markets Unit

Despite, and in response to, the limited evidence of the effect of competition policy on innovation in digital markets, in March 2020 the CMA, together with Office of Communications (Ofcom) and the Information Commissioner's Office (ICO), established the Digital Markets Taskforce to advise Government on how to secure competition in digital markets. The Taskforce endorsed the recommendation of the Furman Report to establish a DMU to promote competition and innovation. Among the roles of the unit, there is a request to protect innovative competitors against possible unfair practices that they may face from dominant digital platforms.

That the relationship between competition and innovation is often complex means one cannot assume that the DMU will never face trade-offs between its competition and innovation objectives. In regulated sectors, such as energy, it is recognised that giving multiple objectives to a regulator can create issues around how to balance competing objectives, especially when it implies unelected regulators are making subjective value judgements. For example, see (Harker, Reader, & Errington, 2018). Nevertheless, it is likely that in the majority of cases the DMU's competition and innovation objectives will be aligned.

6.1.3 Producing additional evidence

Given the limited econometric evidence found, the DMU could establish a pipeline of research to generate evidence on questions where it is currently lacking.

With so much at stake, much of the evidence received by the DMU will be from parties with powerful interests in policy outcomes. All evidence should be evaluated on its merits and be open to critique, whatever its source. The more significant challenge is if the body of evidence, rather than individual studies, is skewed. This could occur if, for example, access to the data is only provided by corporations to projects that are unlikely to challenge their direct interests. To address this, the DMU could canvas stakeholders about research questions that remain unexplored because of data access issues. A priority list of projects could be established for the DMU to use its investigatory powers to access the necessary data.

6.1.4 Going it alone vs International co-operation

There is also the question of how to implement policies, in particular, whether to 'go it alone' or to pursue international co-operation, such as through the OECD. This is a relevant question given the size of the GAFAM firms and their connection to the US. Table 3 compares the benefits and costs of each approach.

Table 3: The advantages and disadvantages of ‘going it alone’ vs pursuing regulatory changes via international co-operation

‘Going it alone’ approach	International cooperation
Advantages:	
Can tailor regulations to UK needs, e.g., to suit companies where the UK has strengths.	Less credible for firms to threaten withdrawal from multiple markets simultaneously.
Can use ‘regulatory competition’ to attract firms from other jurisdictions.	Less likely that international avoidance mechanisms develop.
Regulatory competition may improve regulation globally over time.	Firms may value a common set of international rules, e.g., lower compliance costs.
Changes can be introduced according to the UK’s timetable.	
May benefit local innovation by smaller UK players while being unlikely to inhibit global innovation by dominant players.	
Disadvantages:	
Firms can threaten to stop operating in the UK or restrict their services, e.g., Facebook temporarily removing news content in Australia. ¹⁴	The UK may need to adopt compromises to reach an international agreement.
Other countries may react creating a ‘global race to the bottom’.	Reaching an agreement may take time.
Inconsistency of approach across jurisdictions runs a greater risk of unintended negative side effects.	

One question is whether the UK should show any preference towards the GAFAM firms or innovative entrants when designing regulation, based on the nature of firms currently located in the UK and the likelihood of other firms moving here. For the largest global firms their overall innovation incentives will be driven by the policies of the largest jurisdictions (the US, EU, and China) and it is the firms’ global innovation efforts that likely determines the products UK

¹⁴ See ‘Facebook reverses Australia news ban after government makes media code amendments’ by Amanda Meade, Josh Taylor and Daniel Hurst, The Guardian, Tuesday 23 February 2021, <https://www.theguardian.com/media/2021/feb/23/facebook-reverses-australia-news-ban-after-government-makes-media-code-amendments>

consumers receive. Hence, there is the possibility that the UK could adopt policies to attract innovative small- and medium-sized firms to the UK, while only having a limited impact on the quantity of innovation occurring globally. However, one might question the extent to which competition and a regulatory regime could create real incentives to locate in the UK if in other jurisdictions firms have to comply with local regulations.

6.2 Conclusions

Peer-reviewed empirical evidence on the precise topics of interest to a policymaker will rarely be available in a timely fashion for many decisions.

Policymakers must instead critically engage with other evidence which may be considered of lower quality.

When taking decisions policymakers must balance the competing risks of taking action vs not taking action. Choosing not to take action due to limited information itself carries a risk.

Given the limited empirical evidence currently available, there is a clear case to pursue efforts to increase the available evidence base.

Policymakers should be conscious that issues, such as data availability, could skew the overall balance of evidence available.

In environments where limited evidence is available, legal standards of proof may prevent interventions under competition law, even if a policymaker believes the available evidence warrants intervention.

There are multiple pros and cons to consider when deciding whether the UK should make policy interventions unilaterally or pursue international co-operation.

Policymakers may find it useful to clarify the end objective(s) they are trying to achieve and rank objectives if there are multiple objectives. Do UK objectives conflict or complement those of other countries? Is consumer welfare the end objective or is weight placed on growing UK-based tech companies? Are the interests of consumers and innovative entrants aligned or in conflict?

6.3 Relevant Recommendations

Recommendation 10: In consultation with academic researchers, the CMA, DMU and BEIS should establish a priority list of competition-related research projects related to digital markets that need to be undertaken.

Recommendation 11: The CMA and DMU should engage with UK Research and Innovation (UKRI) to collectively ensure that funding is available to undertake the priority competition-related digital markets research projects that have been identified.

Recommendation 12: The DMU should canvas stakeholders on areas of competition-related research that have been hindered by a lack of access to digital platforms' data.

Recommendation 13: If data access is an impediment to research, the DMU should investigate options to create a framework enabling independent researchers to access relevant data from digital platforms in a controlled manner to answer competition-related questions.

Recommendation 14: As digital markets can be global, the DMU should be able to request data from firms at the global level, where relevant.

Recommendation 15: An investigation of the pros and cons of having the attraction of innovative firms to the UK as an explicit aim of digital markets regulation should be undertaken.

Recommendation 16: Given that many dominant digital platforms are global, a detailed assessment of whether the UK's interests are best served through unilateral initiatives or global co-operation should be conducted.

Recommendation 17: If international co-operation appears desirable, the UK should seek to build consensus among governments with similar interests on the competition measures to be pursued.

7. Firm behaviours and market characteristics for competition policy to tackle in digital markets

7.1 Discussion

A range of firm behaviours suggest a risk that dominant firms could abuse their position, one of which being their acquisition strategies. Strong network effects, substantial economies of scale and scope, and the apparent benefits from conglomeration complicate the functioning of competition in digital markets. As a result, in many markets, there is a tendency to a single dominant firm, and competition is 'for' the market rather than 'in' the market. When data is a key resource, privacy concerns and data protection law are further complicating factors influencing the ability to move data between firms.

7.1.1 Contestability

Questions of contestability are central to both those arguing that there is a need for more competition in digital markets and those arguing that dominant incumbents are effective innovators as they need to defend themselves from future competition. Also, since contestability is likely to be a spectrum, the question becomes whether one should increase contestability. The impact of increasing contestability is likely to have a mixed effect on innovation incentives. For example, the significant profits from replacing the incumbent as a dominant firm in a market motivate small innovative firms. Competition rules increasing contestability will heighten the probability that these firms will beat the incumbent, but potentially reduce the expected profits from 'winning' as once they are the incumbent, they will face an increased threat of entry.

7.1.2 Routes to market

For innovation, within ecosystems, the ways platforms shape the revenues of associated firms is key, as these revenues provide the incentive to innovate. Platforms like the Apple App Store can, potentially, shift revenues away from firms like Spotify and Peloton etc. in four ways. First, they can take a slice of the revenue as a fee.¹⁵ Second, they can introduce a direct competitor to an app.¹⁶ Third, after offering a competing service, they can 'self-preference' via the platform's design to reduce traffic to rivals. Finally, they can change interoperability standards. The evidence in section 4.2.1 shows platforms' choices can have a significant impact on individual app developers' innovation decisions. The concern is that platforms may set their

¹⁵ The European Commission has started to investigate the use of this type of agreement by Apple. See https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1073.

¹⁶ Apple launched its own music streaming app in 2015 to compete with the Spotify app, and its own fitness streaming service app, Apple Fitness+, to compete with Peloton. See https://en.wikipedia.org/wiki/Apple_Music and [https://en.wikipedia.org/wiki/Fitness_\(Apple\)](https://en.wikipedia.org/wiki/Fitness_(Apple)).

policies in a socially sub-optimal way, as they may not fully internalise the social benefits of innovations by associated firms.

7.1.3 Competition policy decisions

European competition cases show that a significant concern is the connection between abuse of dominance and innovation, in particular the foreclosure of potential rivals at different levels of a vertical relationship. First, innovation itself can be a tool for foreclosure. Here the question is whether a dominant firm must disclose innovation details to avoid excluding rivals. The second issue is when abuse of a dominant position limits market access for smaller firms, reducing the incentive, and potentially the ability, of the smaller firms to innovate.

In the Microsoft case¹⁷, the European Commission (EC) found both issues were at play and that Microsoft had abused its dominant position by: (1) refusing to grant licenses for interoperability information (using innovation to foreclose) and (2) tying a downstream product to Windows (limiting gains to potential innovators). By failing to provide interface information to rivals in the server market, consumers had artificially altered their purchases in favour of Microsoft, while the EC found that tying Windows Media Player (WMP) to Windows reduced the incentives of rivals to develop their own media players. As well as imposing a substantial fine, the EC required Microsoft to provide interface documentation whenever it introduced new versions of its servers, and to offer a version of Windows without WMP to PC manufacturers, while offering manufacturers no incentives to select the version of Windows that included WMP. (Kuhn & Reenen, 2009) provide a comprehensive discussion of the case.

In 2013, in the Microsoft/Internet Explorer case, the EC fined Microsoft €561 million for failing, with Windows 7, to comply with its commitment not to tie Internet Explorer to Windows.¹⁸ The EC saw tying as offering an advantage for Microsoft over other competing web browsers. In turn, tying was seen as hampering innovation by reducing rival browsers' potential market and distorting the incentive to innovate by software developers, and content creators, towards products designed primarily for Internet Explorer.

In the Google Android case¹⁹, the EC alleged that Google had breached EU antitrust rules by: (i) requiring smartphone manufacturers to install Google Chrome and set Google Search as the default search service if they were to access the must-have Google Play app store; (ii) preventing manufacturers from selling devices using competing operating systems based on the open-source Android code (anti-forking provisions); and (iii) giving financial incentives to firms that only pre-installed Google Search on their devices. The EC viewed Google as having a dominant position in internet search, licensable smart mobile operating systems, and app stores for Android, and that Google's practices limited consumer choice and innovation in these areas. Again, the logic for Google's practices harming innovation was that they limited

¹⁷ Case T-201/04, Microsoft Corp. v Comm'n, 2007 E.C.R. II-3601, [2007] 5 C.M.L.R. 11 (CFI). Commission case number IP/04/382.

¹⁸ Commission case number 39530.

¹⁹ Commission case number 40099.

the potential market of competing services, thereby reducing the potential revenues of competitors and, in turn, lowering the incentives and resources for rivals to innovate.

In the Google Shopping case²⁰, the EC objected to the self-preferencing of Google Shopping results within Google's search results. The preliminary conclusion of the EC was that Google's actions would artificially divert traffic from rival comparison-shopping services, with innovation being stifled as consumers would not necessarily see the most relevant results to queries, once more limiting the revenues to potentially innovative rivals. In 2017, the EC imposed a €2.42 billion fine on Google for abusing its dominant position in the search engine market by giving an illegal advantage to another Google product.

In the Intel case, the EC found that Intel was abusing its dominant position in CPUs by giving computer manufacturers rebates that would cease if they bought CPUs from Intel's rival AMD. AMD's Athalon processor was the superior product at the time. Hence, one could see Intel's actions as reducing the market available for an innovative product. There is a debate in the literature about the merits of the EC's decision. (Goettler & Gordon, 2011) construct a structural model to simulate a counterfactual scenario where Intel is a monopolist. Using this model, Goettler and Gordon find that innovation in product quality would have been higher if Intel were a monopolist, but that higher prices would mean overall consumer surplus would fall. In a hypothetical scenario, Goettler and Gordon find that innovation is maximised when AMD is foreclosed from half the market. The paper shows that there may be a trade-off between higher prices today and greater innovation leading to consumer benefits in the future. However, Goettler and Gordon are careful to note that results are likely to vary by industry.

In the 2017 Amazon e-book decision, the EC raised concerns about Amazon abusing its dominant position in the retail distribution of e-books by requiring e-book suppliers to notify Amazon of the Most Favoured Nation (MFN) conditions they offered to other retailers.²¹ The Commission saw these restraints as affecting e-book suppliers' incentives to invest in innovative business models. Amazon committed to address the Commission's competition concerns. Competition issues around e-book distribution were previously investigated in the US by the Second Circuit Court which found Apple guilty under a per se rule of conspiring with five book publishing companies to fix prices.²² In a description of the case, (Gilbert, 2015) distinguishes between the wholesale pricing model adopted by Amazon and the agency model implemented by Apple, emphasising the relative benefits for publishers of these alternative pricing systems for vertical chains. The decision by the Second Circuit Court to follow a "per se rule" rather than a "rule of reason" is criticised by (Klein, 2017), who served as an economic expert for Apple.

Last, in December 2020, the Federal Trade Commission (FTC) sued Facebook for its anticompetitive conduct and unfair methods of competition.²³ The FTC claims that the acquisitions of Instagram in 2011 and WhatsApp in 2014 have harmed competition as these

²⁰ Commission case number 39740.

²¹ Commission case number 40153.

²² *United States v. Apple, Inc.*, 791 F. 3d 290, 297 (2d Cir. 2015), *aff'd*, 952 F. Supp. 2d 638 (S.D. N.Y. 2013), cert. denied, No. 15-565, 2016 WL 854227 (S. Ct. Mar. 7, 2016)

²³ See 'FTC Sues Facebook for Illegal Monopolization, 9 December 2020, <https://www.ftc.gov/news-events/press-releases/2020/12/ftc-sues-facebook-illegal-monopolization>

were threats to Facebook's dominant position in the market for personal social networking. The FTC views additional competitors as leading to additional innovation, quality improvements, and/or increased consumer choice. The European Competition Commission has also looked into the acquisition of WhatsApp by Facebook.²⁴ In 2017, The Commission imposed a €110 million fine on Facebook for supplying incorrect/misleading information during the investigation of the WhatsApp acquisition.

7.2 Conclusions

Network effects and substantial economies of scale and scope potentially limit the extent of competition 'in' digital markets and mean markets tend towards dominant firms.

Where competition occurs, it is likely to be 'for' the market and so maintaining contestability is important. The question is whether increasing contestability beyond its current level would be beneficial.

European legal cases indicate that a key issue is the abuse of dominance by platforms. Here either innovation itself can be used as a tool to eliminate competitors by foreclosing markets or the foreclosure of markets can reduce the innovation incentives of non-dominant firms.

There are also legal cases in the US, including retrospective action by the US FTC regarding completed mergers.

While acquisitions by dominant platforms can alter the innovation incentives of entrants, whether innovation would increase following intervention is harder to assess.

7.3 Relevant Recommendations

Recommendation 18: Retrospective studies should be undertaken to understand the impact on innovation of competition authorities' decisions involving an abuse of a dominant position in digital markets.

Recommendation 19: Pro-competitive regulation for dominant platforms offers a way to ensure their dealings with 'dependent' firms are neither abusive nor unduly limit competition. However, before specific regulatory measures are introduced, there should be a careful assessment of their likely positive and negative effects.

²⁴ Commission case number M. 8228.

8. The role of new regulatory tools to increase innovation in digital markets

8.1 Discussion

(Aghion, Antonin, & Reenen, 2021) have studied the impact of regulation on innovation, although, their empirical analysis is limited to labour regulation in France. Their findings suggest that labour regulation reduced innovation overall, with fewer incremental innovations occurring, but radical innovations were unaffected.

Many authors provide suggestions for increasing competition in digital markets.²⁵ The challenge is to provide evidence allowing one to discriminate between promising and problematic ideas. As already discussed, there is limited econometric evidence concerning competition and innovation in digital markets, hence, policy decisions will involve balancing competing risks over intervention and non-intervention, and alternative intervention designs. Different decision-makers may make different choices regarding the risks to take. Furthermore, the complexity of innovation incentives suggests market by market assessments of potential interventions are likely to be warranted.

The case for new regulatory tools being required is based on the observation that digital markets change rapidly, and the slow pace of legal cases makes it difficult for conventional competition enforcement to deliver timely interventions. Regulatory tools also potentially provide policymakers with more options when the standards of proof in competition law combine with high uncertainty to make enforcement cases hard to pursue.

8.1.1 Mergers and acquisitions

One reason for limited evidence to assess the effect of competition policy on innovation in digital markets is that very few mergers in digital markets have been blocked. Only with a greater number of blocked mergers would evidence on potential counterfactuals be available to make it possible to assess how innovation plays out after competition decisions are taken. With a greater range of merger decisions, one could compare 'marginal' cases where the decision to block or allow a merger was finely balanced.

Using other sectors to identify the likely counterfactual in merger cases may be problematic due to the presence of network effects in digital markets and differences in the use of patents across industries.

8.1.2 Stable and open interoperability standards/rules for routes to market

As highlighted in section 7.1.3, legal cases illustrate how innovation can be harmed through foreclosure. The question is whether these legal decisions suggest advantages to formal

²⁵ See for example, (Scott-Morton, et al., 2019), (Furman, Coyle, Fletcher, McAuley, & Marsden, 2019), and (Cremer, de Montjoye, & Schweitzer, 2019), (Competition and Markets Authority, 2020), and (Baker, 2019).

regulation of dominant platform behaviour or whether the case law itself is sufficient. For example, is it desirable to have standardised rules for providing interoperability information, and rules to avoid sudden and unexpected changes in interoperability standards? The greater the differences in circumstances across digital markets the more likely it becomes that market specific rules will be required.

8.1.3 Increasing contestability through data access

One suggestion to increase contestability is to open incumbents' datasets to new entrants. (Calvano & Polo, 2021) highlight that here a key question is whether incumbents' data is substitutable or whether it constitutes an 'essential facility'. An essential facility is a resource that a potential competitor cannot replicate, but which is essential for a firm to enter a market, hence, denying access to the facility preserves the incumbent's market power. Influencing whether substitutable data sources exist are: (i) data complementarity, i.e., whether combining data of different users/products gives an advantage, and (ii) returns to scale, i.e., at what point increasing the size of a dataset stops improving the predictions generated from it.

Even if data is an essential resource, in a frictionless environment one would expect data to be traded if this increases total welfare. (Calvano & Polo, 2021) suggest that privacy rules are one such friction that, when combined with incomplete contracting²⁶, stop such trading from occurring. However, if the barriers to trading data are high, these barriers may also present a challenge to data sharing imposed via regulation.

A comprehensive discussion of data and contestability is provided by (Kramer, Schnurr, & Micova, 2020). They identify two obstacles to using data sharing to challenge dominant incumbents. First, accessing 'deep' personal data requires explicit user consent and, second, data rarely constitutes an essential facility. Lacking proprietary data limits the competitiveness and innovation of entrants, but it does not stop their entry. Rather than relying on data sharing/trading, an alternative approach is to encourage increased data portability so that consumers themselves are in control of transferring data, thereby addressing concerns about consent.

(Calvano & Polo, 2021) cite papers considering how data availability influences prediction accuracy. The cited papers suggest that incumbency advantages from data may only exist in particular dimensions and may have limits. For example, using Amazon product data, (Bajari, Chernozhukov, Hortaçsu, & Suzuki, 2019) find that prediction improves when data is available for a longer period of time, but that adding information on additional products does not improve prediction. However, (Kramer, Schnurr, & Micova, 2020) cite papers suggesting that using data across products may be beneficial. In particular, (Salinas, Flunkert, Gasthaus, & Januschowski, 2020) (a group of Amazon researchers) highlight the advantages of a model combining data from many related products.

²⁶ Incomplete contracting refers to the common situation where a written legal contract cannot cover all the possible outcomes that can occur in the real world. For example, there may be future uses of data that cannot be foreseen today.

The CMA's report on digital advertising (Competition and Markets Authority, 2020) stresses the significance of unequal access. The CMA ran the same search requests through Bing and Google's search engines and found that in response to rarely occurring requests a large proportion of Bing's responses were also found by Google, but that Bing identified only a small proportion of Google's responses.

Both (Lambrecht & Tucker, 2017) and (Chiou & Tucker, 2017) present evidence suggesting the incumbency advantage of data may be overplayed. (Lambrecht & Tucker, 2017) note that many forms of data are available via data brokers, while (Chiou & Tucker, 2017) find little evidence that historical data improves search accuracy. Also, (Neumann, Tucker, & Whitfield, 2019) find that when assessing the ability to target specific demographics, data brokers with large datasets do not necessarily perform better. In contrast, (Schaefer, Sapi, & Lorincz, 2018), using observational data from Yahoo.com, find evidence that the availability of personal information (e.g. individual-specific browsing histories) can increase the speed of learning, something consistent with an incumbency advantage. They also find that more data increases prediction accuracy in line with statistical theory.

8.2 Conclusions

Using evidence to assess different policy interventions is challenging when historically only limited intervention has occurred.

Given the limited available evidence on digital markets, decisions of whether to intervene will depend on judgements regarding the balance between competing risks.

European competition cases highlight the potential importance of protecting routes to market and interoperability standards for firms associated with dominant platforms. The key question is whether regulation offers benefits over existing case law.

The evidence is mixed on whether sharing data is likely to improve contestability significantly, and the power of policies to increase data sharing are likely to be weakened by the need to maintain users' data privacy.

8.3 Relevant Recommendations

Recommendation 20: Access to data is a key factor ensuring the contestability of digital markets, however, protecting personal data is also a key concern. The CMA and DMU should engage with the Information Commissioner's Office to ensure a mutual understanding exists regarding the competition and innovation implications of applying data protection law in particular ways.

9. Potential side effects of competition policy on innovation in digital markets

9.1 Discussion

While there are calls for tighter competition policy/regulation for digital markets, policymakers need to be conscious of the risk of inappropriate interventions, which could harm innovation. Below we discuss the possible risks of intervention. However, given minimal intervention in digital markets up to this point, there is little empirical evidence to sit alongside the intuitive and theoretical insights.

9.1.1 Restrictive merger control

The recent wave of acquisitions by Big Tech and empirical evidence of ‘kill zones’ for start-ups has raised concerns that current merger controls are insufficient and/or inappropriate for digital markets.²⁷ A key risk of tighter merger control is that mergers or acquisitions beneficial to innovation might be blocked. Unless merger analysis tools can separate mergers with different innovation impacts, the positive impacts of acquisitions on innovation detailed in Table 1 may be lost. Specifically, these include synergies between firms’ innovation efforts, incentives for start-up creation and venture capital funding, routes to take small firms’ innovative products to more consumers, and mechanisms to transfer innovations not protected by patents. Tighter merger control may also steer start-ups away from incremental innovations that appeal to GAFAM firms towards more disruptive innovations.

(Fumagalli, Motta, & Tarantino, 2020) provide a theoretical model where acquisition can relax the financial constraints of the acquired firm. In their setting, a ‘strict’ merger policy that prohibits acquisitions after a project has been developed or allows only ‘low value’ acquisitions before a project is developed has the advantage of steering incumbent firms to only purchase start-ups facing financial constraints. However, highlighting the complexity of the incentives involved they show that under certain conditions allowing post-development acquisitions can be optimal as post-development acquisitions can help to ease financing constraints for start-ups.

9.1.2 Regulation of data and algorithms

Reflecting the concern that access to data represents a significant incumbency advantage, some suggest that innovation may be increased by mandating access to incumbent data by “approved businesses”.²⁸ One possible concern is that the ready availability of data will reduce the incentive of firms to develop their datasets because competitors can free ride on their

²⁷ See (Scott-Morton, et al., 2019), (Cremer, de Montjoye, & Schweitzer, 2019), (Furman, Coyle, Fletcher, McAuley, & Marsden, 2019), and (Argentesi, Buccirosi, Calvano, Duso, & Marrazzo, 2021).

²⁸ See (Furman, Coyle, Fletcher, McAuley, & Marsden, 2019) page 76.

investments. This could reduce firms' incentives to develop innovative products that win consumers' attention and, as a by-product, facilitate data collection.

A more general point is that, if data is viewed as a key input for developing new products and services, regulations that increase data protection requirements and user privacy may reduce the rate of innovation if they decrease the quantity/types of data available. (Martin, Matt, Niebel, & Blind, 2019), via semi-structured interviews with 19 German intermediaries and start-ups, investigated the impact of the EU General Data Protection Regulation (GDPR) on start-up innovation. They found that while firms innovated to become compliant with GDPR and developed products to help other firms become compliant, interviewees reported that GDPR had led to the abandonment of some planned products/services/features, the collection of data was less expansive, and was viewed as an additional burden for entrepreneurs.

The development of algorithms and AI have given firms powerful tools to extract valuable information from data, enabling data-driven innovation to develop and improve products. If regulations constrain the use and nature of algorithms and AI, there is the possibility that innovation may be constrained. Yet to develop effectively algorithms and AI need access to data. (Condorelli & Padilla, 2020) argue that the possibility of sharing data across markets facilitates the envelopment strategies of a conglomerate platforms and may impede competition in markets targeted by them since rival non-conglomerate firms lack the data to compete effectively. (Condorelli & Padilla, 2020) suggest one regulatory solution would be to limit a firm's ability to combine data from the different services they provide. However, such an approach risks reducing efficiency and stopping innovations reliant on large and rich datasets.

9.1.3 Compulsory interoperability/interconnection standards

Faced with strong incumbency advantages due to network effects, one option for policymakers would be to establish interoperability/interconnection standards across platforms, allowing users to interact with users on other platforms. As well as reducing the incumbency advantage, such an approach would also maximise network effects across all platforms. However, (Bourreau & Perrot, 2020) suggest that when a market is immature and rival platforms are competing aggressively for the market, imposing interoperability may stifle competition and innovation by reducing the incentive to win new customers. (Prieger, 2002) claims that in the telecoms sector compulsory interconnection, enabling competitors to provide similar services, can significantly increase the cost of introducing new services and, thus, discourage firms from launching them. The paper estimates that telecom companies would have introduced 62% more services in the absence of regulatory delay and restrictions resulting from interconnection requirements for new services. An additional risk of introducing common standards is that they may reduce the incentive to develop new standards.

9.1.4 Structural separation

Debate has also considered whether the GAFAM firms should be broken up according to the different services they provide.²⁹ Just as tougher merger enforcement risks blocking future

²⁹ For example, see Elizabeth Warren, "How we can break up big tech," available at <https://elizabethwarren.com/plans/break-up-big-tech>.

synergies from combining firms' innovation efforts, structural separation could put at risk the existing innovation synergies of integrated firms. Some innovations might also be hampered if large pools of data are separated.

While recognising that telecoms have differences to digital markets, (Gilbert, 2021) gives the example of AT&T's break-up, or the restrictions imposed on the resulting companies' activities, as impediments to innovation. At the break-up, the separate local natural monopolies were prohibited from participating in potentially competitive areas such as long-distance telecoms and value-added information services. Gilbert argues that these 'lines of business restriction'³⁰ hindered innovation where it required coordination between complementary businesses. Gilbert cites (Hausman, 1997) as providing evidence of the resulting delays to the introduction of information services such as voice messaging. Hausman states that voice messaging was delayed for over ten years because of AT&T's structural separation and the prohibitions on it offering information services.

As policy interventions can pose risks to innovation, and there are generally multiple factors to consider when assessing whether a particular activity boosts or hinders innovation, it seems desirable that decisions to intervene, and the design of interventions, occur on a market-by-market basis. If a market is still at the stage of platforms competing aggressively 'for' the market, the risk of over-enforcement is likely to be larger than the risk of under-enforcement, and policymakers should be more cautious about intervening. Whereas, in markets where competitive constraints on a dominant platform are limited, it is more likely that policy intervention will promote competition and innovation.

9.2 Conclusions

All competition policy and regulatory interventions in any market have to weigh the competing risks of under-enforcement vs over-enforcement.

The key risks of a tougher merger regime are: (a) it stops post-merger innovation synergies from occurring, and (b) it removes the possibility for acquisitions to reward innovation by start-ups and their funding by venture capitalists.

An implication of viewing data as a key input for innovation is that efforts to limit the quantity and nature of data collection for privacy reasons are likely to reduce innovation.

A risk of structural separation is that it removes the existing innovation synergies that occur within large integrated firms.

³⁰ See (Pike, 2020) for a detailed discussion about this type of regulatory restriction.

9.3 Relevant Recommendations

Recommendation 21: Ex-post studies of the impact of regulatory interventions made by the DMU should be routinely undertaken. These studies should include an assessment of the interventions' effects on innovation.

Recommendation 22: When pro-competitive regulatory interventions are implemented, where possible, an explicit part of the intervention should be to make the data required for an effective ex-post evaluation available.

10. Conclusions

The market power of dominant digital platforms, most notably the GAFAM firms, has attracted considerable attention with one concern being that it may constrain innovation. This report has considered the empirical evidence relating to this concern. When doing so it is important to recognise that there are different types of innovation, both in terms of the magnitude of technological progress (incremental vs breakthrough innovations) and their impact on existing business models (sustaining vs disruptive innovations).

Assessing the empirical evidence is important as theoretical work on the relationship between competition and innovation shows multiple incentives are at play and the overall relationship is complex, with it depending on market-specific factors. Nevertheless, it is the profit motive that incentivises innovation and competition can encourage innovation in two ways, either by driving firms in competitive settings to innovate to escape their competitors or by encouraging dominant firms to innovate to defend their position against potential rivals. The contestability of markets provides an incentive for both entrants and incumbents to innovate.

When assessing GAFAM firms' innovative efforts, their current levels of R&D spending or innovation outputs, such as patents and scientific papers, tell us very little about the level of innovation that would occur if they faced greater competition. Further, when assessing these firms' innovation activity, it is important to account for their large size; doing so, such as by considering R&D intensity, makes them appear less exceptional. The limitations and ambiguities of headline figures of R&D inputs and outputs also need to be recognised by policymakers.

Turning to the importance of new entrants, they not only drive innovation directly through their own efforts but also create a pressure for incumbents to innovate. Equally, a new entrant in one market may be an established firm in another market, so that new entrants may not always be new firms. The challenge for all new entrants is that existing firms, especially in digital markets, can have significant incumbency advantages, such as network effects and access to data. The need to overcome these incumbency advantages is potentially why entrants are associated with breakthrough and disruptive innovations: entrants only gain our attention when they achieve success and overcoming incumbency advantages requires radical innovations.

Rather than supplanting incumbents, entrants can alternatively provide innovations that are complementary to incumbents, such as when contributing to the ecosystems surrounding many digital platforms. In these settings, the evidence shows that platforms' decisions and behaviours can influence the direction of innovation pursued by smaller 'dependent' firms. In these settings pro-competitive regulation could help protect innovative firms' routes to market and studying European abuse of dominance cases in digital markets may help to inform policy options. However, any proposed intervention would need to be subject to a careful assessment of its strengths and weaknesses.

The likelihood of acquisition, including by the dominant digital platforms, also shapes the incentives of entrants to innovate, including by the dominant digital platforms. Again, entrants

targeting a buyout may seek to develop innovations that compliment, rather than challenge, the dominant digital platforms. However, acquisitions can have both positive and negative impacts for innovation, and so should be assessed on a case-by-case basis. For example, post-merger innovation synergies may occur. The two main concerns around acquisitions and innovation in digital markets are that acquisitions can lead to innovation projects being 'killed' and that start-ups being deterred or starved of capital in areas close to the dominant digital platforms' acquisitions. To address 'killer acquisitions' and 'reverse killer acquisitions' the key need is to identify the subset of acquisitions that are likely to be problematic for innovation. Regarding the suppression of start-up activity in market segments close to GAFAM firms, descriptive statistics suggest these segments are less appealing to venture capitalists than other segments.

Overall, when looking specifically at digital markets, there is limited peer-reviewed econometric evidence addressing the relationship between competition and innovation. Policymakers need to recognise that when taking decisions in this space they will need to utilise lower quality evidence and balance competing risks around interpreting this evidence. At present, the available empirical evidence focuses on potential issues hindering or distorting innovation rather than enabling one to differentiate between the detailed merits of different policy options.

Direct evidence from digital markets on the impacts of proposed regulatory interventions is currently limited because many proposed interventions are novel at a global level. Despite this, there is considerable value in seeking to expand the available evidence base. Here retrospective studies of dominance cases in digital markets and investigations of innovation in market segments where competition has changed over time would be useful. More generally, it would be beneficial for BEIS, the CMA and the DMU to work with researchers to identify priority pieces of research, and then establish a framework to enable this research by addressing questions of data access and funding.

The characteristics of many digital markets, namely network effects and significant economies of scale and scope, often mean that they will tend towards dominant firms. Competition 'for' the market will often be more workable than competition 'in' the market. In turn, this suggests the importance of increasing digital markets' contestability to boost competition and, hopefully, innovation. However, specific steps to increase contestability, such as interoperability or data access remedies, have multiple impacts that need to be assessed, often extending beyond innovation. Indeed, the impact of increased contestability itself on the incentive to innovate is not entirely certain since besides increasing the probability of an entrant 'winning' a market, it will also increase the probability of a successful entrant itself being deposed from a dominant position. These risks should be assessed when any specific regulatory intervention is proposed.

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Appendix: Collated Recommendations

Recommendation 1: When it comes to digital markets, policymakers should be cautious about drawing conclusions solely from headline figures of R&D expenditures and patents.

Recommendation 2: Since incentives for innovation are closely related to contestability, any pro-competitive regulation should be focused on firms that have an entrenched market position, i.e., where contestability is limited.

Recommendation 3: Since dominant firms' market power will decline if successful entry occurs, any proposed pro-competitive regulations should be subject to review at regular intervals, and firms subject to such codes should be able to apply for reassessment if significant market changes occur.

Recommendation 4: Dominant digital platforms should be encouraged to provide a more detailed breakdown of their R&D expenditures. In particular, it would be useful for the data to be broken down by key business lines, and for information on the types of expenditures reported as R&D.

Recommendation 5: Research should be undertaken to understand how innovation has played out in digital market segments where the extent of competition has changed over time and/or in specific national markets where there is greater competition than at the global level.

Recommendation 6: Since firms with an entrenched market position in one activity can be important entrants in another activity, any proposed pro-competitive regulations should avoid placing undue constraints on firms' activities in markets where a rival firm has an entrenched market position.

Recommendation 7: Since only a subset of dominant platforms' acquisitions are likely to be problematic, and some acquisitions can boost innovation, an assessment of acquisitions by dominant platforms should occur on a case-by-case basis. A blanket ban on acquisitions by dominant platforms would not be justified by innovation concerns.

Recommendation 8: Given the importance of innovation to digital markets, assessments of acquisitions by dominant digital platforms should routinely consider their impact on innovation.

Recommendation 9: The CMA should continue to develop its tools to assess the innovation impacts of digital mergers.

Recommendation 10: In consultation with academic researchers, the CMA, DMU and BEIS should establish a priority list of competition-related research projects related to digital markets that need to be undertaken.

Recommendation 11: The CMA and DMU should engage with UKRI to collectively ensure that funding is available to undertake the priority competition-related digital markets research projects that have been identified.

Recommendation 12: The DMU should canvas stakeholders on areas of competition-related research that have been hindered by a lack of access to digital platforms' data.

Recommendation 13: If data access is an impediment to research, the DMU should investigate options to create a framework enabling independent researchers to access relevant data from digital platforms in a controlled manner to answer competition-related questions.

Recommendation 14: As digital markets can be global, the DMU should be able to request data from firms at the global level, where relevant.

Recommendation 15: An investigation of the pros and cons of having the attraction of innovative firms to the UK as an explicit aim of digital markets regulation should be undertaken.

Recommendation 16: Given that many dominant digital platforms are global, a detailed assessment of whether the UK's interests are best served through unilateral initiatives or global co-operation should be conducted.

Recommendation 17: If international co-operation appears desirable, the UK should seek to build consensus among governments with similar interests on the competition measures to be pursued.

Recommendation 18: Retrospective studies should be undertaken to understand the impact on innovation of competition authorities' decisions involving an abuse of a dominant position in digital markets.

Recommendation 19: Pro-competitive regulation for dominant platforms offers a way to ensure their dealings with 'dependent' firms are neither abusive nor unduly limit competition. However, before specific regulatory measures are introduced, there should be a careful assessment of their likely positive and negative effects.

Recommendation 20: Access to data is a key factor ensuring the contestability of digital markets, however, protecting personal data is also a key concern. The CMA and DMU should engage with the Information Commissioner's Office to ensure a mutual understanding exists regarding the competition and innovation implications of applying data protection law in particular ways.

Recommendation 21: Ex-post studies of the impact of regulatory interventions made by the DMU should be routinely undertaken. These studies should include an assessment of the interventions' effects on innovation.

Recommendation 22: When pro-competitive regulatory interventions are implemented, where possible, an explicit part of the intervention should be to make the data required for an effective ex-post evaluation available.

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