



In strictest confidence

Response to CMA call for information on digital mergers

12 July 2019

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1 Introduction

1. BT Group plc is pleased to respond to the Competition and Market Authority's (CMA) call for information on digital mergers. As a leading provider of fixed, mobile and TV services in the UK and in international markets, BT is an established player in digital markets, and also interacts with other digital players across a range of different services.
2. The CMA is seeking views on a range of issues associated with the assessment of mergers in digital markets, including the key market features, the implication for possible theories of harm and determining the counterfactual.
3. BT addressed many of these questions in our response to the Digital Competition Expert Panel's consultation.¹ Our response to that consultation focused on the distinguishing characteristics of digital markets, potential theories of harm and how the competition policy regime should be updated for changes in these digital markets.
4. We also engaged Professor Robert Hahn to provide an economic perspective on competition policy, focusing on why the regulatory environment should promote dynamic efficiency rather than just static efficiency. Professor Hahn argues that the fast-moving pace of digital markets means that regulators should recognise the temporal limitations of competition policy, and ensure their analysis is forward-looking to prevent any unintended consequences of intervention.
5. Professor Hahn also notes that merger policy can be used as a tool to promote more competition, and "*polymakers may wish to take a more relaxed attitude towards proposed mergers between firms that have the capability to become competitors to incumbent firms within the digital ecosystem*".² Given the overlap in topics between that consultation and the CMA's call for information, we have attached our report and Professor Hahn's report to this response.
6. This response addresses the CMA's specific question about theories of harm that might arise when the target is active in a complementary market.

Theories of harm when target is active in a complementary market

7. For acquisitions where the target is active in a complementary or adjacent market, the competition authority needs to consider theories of harm that do not just affect the market in which the acquirer is active but also the one where the target is active. An acquirer that operates in digital markets may be uniquely positioned to leverage into adjacent markets. In these cases, the competition authority should assess whether any such leveraging could lead to consumer harm due to a significant lessening of competition.
8. We have identified three broad categories of harm a competition authority must consider when a digital firm acquires a target in an adjacent market.

¹ <https://www.gov.uk/government/consultations/digital-competition-expert-panel-call-for-evidence>

² Hahn, R (14 December 2018): "Competition policy for digital markets: An economic perspective".

Competition concerns arising from digital firms leveraging their power into adjacent markets through acquisition

9. There is a long tradition in telecoms regulation of addressing risks to competition which arise where market power is leveraged from one market to another. The focus has been wholesale market power in (typically fixed) telecoms markets being leveraged into retail markets through conduct such as margin squeeze. Various ex post investigations (and ex ante regulators) have considered this issue and put in place remedies to protect retail competition and end consumers.
10. In the digital economy there are new sources of market power arising from control over inputs, interfaces, platforms or essential information. Market power in digital markets could also arise in situations where users on a platform value other users being on the same platform creating a barrier for users to switch away, for example on social media platforms. Where firms who control these potential digital 'bottlenecks' expand into adjacent markets there may be consequences for competition in these markets that should be considered. Merger control provides an opportunity to do so where the expansion occurs through acquisition.
11. A competition authority must assess whether there is loss of dynamic competition. Digital markets often exhibit strong network effects, such that firms compete *for* the market through innovation. Once a certain scale is reached a digital firm may be able to earn supernormal profits which may be a fair reward for innovation that is valued by consumers.
12. Such digital firms can then use these supernormal profits to fund entry into an adjacent market, where that adjacent market could be one where there is competition *in* the market. Where there is competition in the market, competition authorities should consider the implications of a potential distortion of competition where some firms can set prices below cost.
13. Over time fewer firms would be able to compete regardless of how efficient or innovative they are in that market. This outcome may harm dynamic competition and ultimately consumers, who may face higher prices and less choice.
14. This strategy could be applied by large digital players in various ways, including as a new entrant in that market or through an acquisition of an existing player. In either case, the digital player may have the ability to undermine dynamic competition in the market by cross-subsidising prices.
15. Competition authorities should consider this theory of harm when assessing any merger between a digital firm and a target in an adjacent market. The authority should determine whether ex post competition law is sufficient to prevent such anticompetitive pricing, and if not, analyse whether the acquisition should be prohibited under this theory of harm.

Scrutiny of transactions (involving large digital firms) which increase the likelihood of tying or bundling where risks to competition outweigh customer benefits

16. As a leading provider of bundled services in telecommunications, we understand that consumers often value the ability to purchase multiple services

through one bundle. Customers can benefit from lower prices, improved product offerings as well as a more straightforward customer experience.

17. However, competition authorities have also looked at theories of harm related to bundling – typically exclusionary abuse – as well as possible merger effects related to the propensity of consumers to buy bundles. For example, the acquisition of EE by BT (essentially a conglomerate merger) looked at incentives for the merged entity to foreclose in one market in order to harm a rival primarily active in a different product market given a growing propensity to purchase fixed and mobile services in bundles. A detailed analysis of markets and projected purchasing trends indicated a low risk of such conduct and the transaction was cleared unconditionally.
18. Bundling may take different forms in the digital age. It will occur in different dimensions of the digital value chain and in ways that may not be as obvious to consumers as the explicitly marketed bundles that are commonplace in communications. Bundling of applications with operating systems and handsets is one such example (which has already attracted regulatory scrutiny). The effects of these new forms of bundling should be considered (including as part of merger assessments) on a case by case basis looking at both welfare-enhancing as well as potential anti-competitive effects.
19. A particular issue in digital markets is that transactions may allow a digital operator to widen a user base (potentially through bundling), with pay offs – through two-sided market structures – which are not available to traditional operators.
20. The Facebook/WhatsApp transaction, for example, is illustrative of a trend whereby communications (voice, messaging and video) form part of broader social networking platforms (a form of bundling). The synergies available by using end-user data profiles across the entirety of the bundled services and platforms gives the acquirer a stronger position in selling advertising and, in turn, the ability to offer the bundled communication services on terms which are very difficult for traditional operators to match (e.g. free messaging services).
21. Existing firms who are not in a position to bundle services and platforms across adjacent markets may be harmed and end customers may have less choice than otherwise. A competition assessment would typically assess the ability of rivals to respond and adapt to such a challenge. But a natural response of telecommunications firms to such a strategy – to create its own two-sided structure with revenue from infrastructure capacity charges funding free services to end users – is limited by net neutrality restrictions. The restrictions created by the net neutrality rules also allow large digital players to attack the traditional sources of profit for telecoms operators whilst leaving them with the significant network costs associated with gigabyte or high speed infrastructure.

Data may also be a source of strategic value that should be considered as part of transactions involving large digital players

22. A key feature of digital markets is the ability of large players to consolidate user data across platforms which are developed (or acquired) and which offer a variety of services in order to serve advertisers seeking to target these users (and to optimise the experience of users). Through transactions, digital firms

could increase their ability to leverage large datasets on users in a manner that is not possible for existing competitors. The Apple/Shazam transaction, for example, illustrates a digital merger where the acquirer, Apple, could see commercial opportunities in using Shazam's data to promote new music to its own users.

23. Existing competitors face particularly high hurdles in competing against digital firms with large datasets if such data is costly to acquire. Digital firms have, at least in part, acquired data by developing innovative new platforms or services that users' value. As noted above, because these firms often operate in two-sided markets, they can often provide users access to their platform at zero price. By contrast, in the one-sided telecoms markets that BT operates in, BT can usually only acquire data about customers by selling services with a positive price. The nature of this one-sided market limits the scope and scale of data telecoms operators can acquire.
24. Digital firms are therefore in a unique position to leverage their data to target customers in adjacent markets and this has implications for competition where they enter markets (such as telecommunications) in which incumbents cannot compete effectively with this business strategy.
25. An acquisition of a player in an adjacent market can underpin data leveraging by providing a ready-made dataset of customers in the adjacent market. Competition authorities should consider potential distortions to competition arising from data combinations when assessing such acquisitions.
26. We also note that the Digital Competition Expert Panel recommended that a new Digital Markets Unit should consider remedies of data mobility and data openness for firms that have strategic market status.³ For firms that have acquired large amounts of data about users in two-sided markets, the competition authority might consider the interaction of any such policy with its assessment of proposed acquisitions by such firms of targets in an adjacent market and associated data leveraging opportunities.

Conclusions for revision of Merger Assessment Guidelines

27. We have described three broad categories of theories of harm that a competition authority must take account of when assessing a merger or acquisition of a digital firm and a firm in an adjacent market: (1) loss of dynamic competition, (2) conglomerate effects of tying or bundling, and (3) exclusionary effects of data combination.
28. In all three cases, the scale of the harm can be particularly large for acquisitions by digital firms because of their own scale and spending power. 10 of the top 20 largest publicly listed companies in the world are technology or digital services companies.⁴ Apple alone has \$237bn of cash reserves, and the likes of Facebook, Amazon, Google and Apple have global R&D budgets of \$55bn in total as of December 2018.⁵ Their global scale allows them to enter into adjacent markets rapidly through an acquisition, and whilst in many cases this

³ Digital Competition Expert Panel (March 2019): "Unlocking digital competition", p5.

⁴ PwC (31 March 2018): "Global Top 100 companies by market capitalisation", 31 March 2018 update.

⁵ Amazon Annual Report 2018, p25, Facebook 10-K for year ended December 31 2018, p43, Alphabet 10-K for year ended December 31 2018, p33, Apple 10-K for year ended December 31 2018, p27, p30.

may provide valuable disruption in these markets, in some cases it could lead to consumer harm where they compete on unfair terms.

29. In the context of assessing a merger or acquisition, competition authorities should request internal documents from the acquirer or merging parties to determine their strategy for operating in the adjacent market. These internal documents can demonstrate entry plans, what type of strategy will be adopted, the price-setting approach and the expected commercial value associated with the transaction (and key drivers). The competition authority can then make a considered judgement about whether such strategies could harm consumers in the adjacent market.
30. The competition authority also needs to ensure its market analysis during a merger assessment is forward-looking so that it captures the rapid changes that occur in digital markets. As described by Professor Hahn in the attached report, a focus on static efficiency in digital markets could sacrifice much bigger gains in terms of dynamic efficiency.
31. In the context of the Merger Assessment Guidelines, we believe the CMA should update these guidelines to reflect the theories of harm we have identified above and their application to digital markets. The CMA should set out the potential theories of harm that might be relevant to mergers or acquisition involving a digital firm, including the ones we have described in this submission.
32. Finally, we note in the context of remedies, that the Guidelines might usefully comment on possible remedies where the main asset acquired is data rather than physical assets. Further detail may also be helpful on circumstances where the competition authority might consider recommendations to other bodies to remove (or relax) barriers to more effective competition by existing players in adjacent market (for example if traditional telco regulation or net neutrality rules were identified as an impediment to rivals responding to the changed competitive dynamics brought about by the digital merger).

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Digital Competition Expert Panel

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Introduction

1. BT Group plc is pleased to respond to the Digital Competition Expert Panel's consultation into the state of competition in the digital economy. As a leading provider of fixed, mobile and TV services in the UK and in international markets, BT is an established player in digital markets, and also interacts with other digital players across a range of different services.
2. We have requested Professor Robert Hahn to provide an economic perspective to competition policy in digital markets.¹ His paper is provided alongside BT's response, and focuses on why the regulatory environment should promote dynamic efficiency, rather than static efficiency alone and why careful consideration should be given to the incentives that competition policy provides for investment and innovation.
3. Global technology firms have achieved faster growth than traditional telecommunications companies in the past decade. Large tech firms, such as Google, Facebook and Amazon have seen revenue growth of 94% in the past five years,² compared to a decline of 1% for UK telecoms companies over the same period.³ UK telecoms companies have faced increasing competitive pressure in various parts of the value chain, including from over-the-top (OTT) players, telecoms infrastructure investors and content providers.
4. Existing regulation in telecoms markets will need to adapt to these changes in digital competition. Ofcom continues to impose ex ante regulation in a number of the markets that BT serves, some of which are increasingly being disrupted by technology developments. We therefore welcome the Government's review into how competition regulation may need to adapt to take account of such changes in competition due to growth of digital markets.
5. Whilst the central focus of the panel's review is on how competition policy is suited to addressing competition issues in digital markets, we believe this review cannot simply review ex-post competition law application without also reviewing aspects of traditional ex-ante regulation. Given the interlinkages between digital markets and adjacent markets such as the telecoms sector and the degree of substitution between existing and new technologies, the panel should ensure there is a consistency in the principles applied to competition law with ex ante regulation. We understand this review is not intended to evaluate ex ante regulation in detail, but we believe the panel should

¹ Hahn, R (14 December 2018): "Competition policy for digital markets: An economic perspective", A response to the call for evidence on competition in the digital economy.

² Between 2012 and 2017, total revenues of Amazon, Facebook and Google grew by 94%. Source: Amazon, Facebook and Google 10-K filings for years ended 31 December 2012 to 13 December 2017.

³ Ofcom Communications Market Report 2018, Office for National Statistics. Note: Ofcom reported total revenues for telecoms sector is adjusted from real to nominal terms using CPI for consistency with nominal revenues for US technology firms.

undertake its review of competition policy in digital markets in the context that it is partly 'anchored' in ex ante regulated network markets.

Global technology firms place competitive constraints in adjacent markets

6. Global technology firms have achieved remarkable success in a relatively short period of time. As of March 2018, 10 of the top 20 largest publicly listed companies in the world were technology or digital services companies compared to only 2 out of 20 in March 2009.⁴ The global technology sector has seen growth in value of 322% in the last nine years, compared to 42% for the telecommunications sector.⁵
7. Part of the capital gain in the technology sector could be a justifiable reward for innovation. The technology sector typically engages in high amounts of R&D, and earns rewards by developing new products and services that consumers are quick to take up. The rewards for investors in these sectors may be seen as compensation for the high risk they often bear, because customer demand is typically highly uncertain (and innovative products can themselves be disrupted in fast moving segments).
8. The success of these firms has implications for competitive conditions in adjacent sectors. Companies earning high returns can use these funds (and customer relationships) to leverage into adjacent markets.
9. BT has already observed such disruption by global technology firms in the markets in which it currently operates:
 - **OTT players:** Over-the-top content providers are providing services that are substitutes for some of the services provided by BT. The growth of WhatsApp and VoIP services such as Skype have reduced demand for fixed and telecoms voice and messaging services. In the UK, mobile call volumes per subscription declined in 2017 for the first time in ten years and texts per subscription have declined since 2012,⁶ demonstrating the impact that OTT players have had on the market. At the same time, global technology companies are providing TV content services, including sports content in the UK, with new monetisation strategies.⁷
 - **Mobile services:** Traditional mobile companies face disintermediation and margin erosion by handset suppliers providing handsets and e-SIMs.⁸ For example, Amazon sells mobile handsets online at low prices, potentially funded through advertisements on the other side of the two-sided market that it operates in. Amazon preloads handsets sold on its website with its own apps, such as Prime

⁴ PwC (31 March 2018): "Global Top 100 companies by market capitalisation", 31 March 2018 update.

⁵ Ibid.

⁶ Ofcom Communications Market Report 2018, p54.

⁷ For example, Amazon has purchased UK football TV rights, entering a market previously only including Sky and BT. Amazon can bundle its sport content with its Prime TV offering, thereby expanding its 4.3m households in the UK. Source: The Guardian (3 May 2018): "Amazon Prime Video's growth outpaces Netflix in UK".

⁸ In its latest operating systems, Apple has introduced 'e-SIMs', which allow users to virtually move between different mobile network carriers. Source: <https://support.apple.com/en-gb/HT209044>

Video, channelling customers to its own services, creating a new competitive challenge for traditional mobile operators.

- **Fixed network infrastructure:** Fixed network infrastructure has historically been viewed as an input that affords operators with market power, and BT has been designated with significant market power (SMP) in a number of fixed markets. However, global technology companies have made forays into these markets. Google rolled out Fibre-to-the-Premise infrastructure in a number of US cities, including Atlanta, Nashville, Salt Lake City and Austin.⁹ The prospect of entry by digital disruptors prompted traditional telecoms operators to accelerate their own fibre investment, demonstrating the ability of global technology firms to influence the timing of telecoms operators' investment decisions.
- **IT services:** Amazon has opened data centres in a number of European countries, including the UK, principally to provide cloud computing services. Amazon Web Services' growth has been driven by virtualisation, enabling more flexible, scalable and cost effective services than traditional services. As a result, Amazon Web Services has become the market leader in cloud computing, with 33% revenue market share in 2018, overtaking historical market leaders such as IBM, which only has 8% market share.¹⁰ BT Global Services has decided to partner with Amazon Web Services to provide cloud computing. These partnership models may become more prevalent given the position that Amazon Web Services has achieved.

10. These examples of entry by digital disruptors are relatively new phenomena in telecoms markets. Prior to the emergence of global technology companies, BT principally faced competition in retail markets from other communications companies. In many wholesale markets, BT has been and continues to be regulated by Ofcom because it has been found to have SMP. However, whilst the rise of digital disruptors has often brought positive outcomes for consumers, they have created new competitive pressures and challenges for telecoms companies in both retail and potentially wholesale markets. In order to promote fair competition, this should be reflected in the market analysis undertaken by sectoral regulators and competition authorities.

Ex ante regulation in adjacent markets should be reassessed in light of competitive pressure from digital players

11. In order to impose ex ante regulation in the telecommunications sector, the European Commission recommends applying a three-criteria test which assess whether (1) there are high and non-transitory structural, legal or regulatory barriers to entry, (2) the market does not tend towards effective competition within the relevant time horizon, and (3) competition law is insufficient to adequately address the identified market failure(s).¹¹ The emergence of global technology companies and the competitive

⁹ Source: <https://fiber.google.com/about/>

¹⁰ Synergy Research Group (27 April 2018): "Cloud Growth Rate Increased Again in Q1; Amazon Maintains Market Share Dominance".

¹¹ European Commission (27 April 2018): "Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services", Commission Staff Working Document, p6-7.

pressure this creates should be assessed as part of the three criteria test, particularly on a forward-looking basis.

12. The telecoms sector has historically tended to have higher barriers to entry at the fixed infrastructure level, due to high fixed and sunk costs associated with deploying infrastructure. However, these barriers to entry are being eroded by a range of factors including the emergence of global technology firms, whose access to capital allows them to invest in network infrastructure should they see value in doing so. Google's investment into FTTP networks in the US is an example of such entry.
13. With regards to the second criterion, telecoms companies are facing greater competition from digital players whose services increasingly act as substitutes to their products. The growth in data messaging services such as WhatsApp have come partly at the expense of traditional fixed and mobile voice and messaging services, which brings into question whether telecoms companies hold market power in these segments. So far Ofcom has disregarded data messaging and VoIP services as a competitive constraint on fixed and mobile services, relying principally on historical trends to come to its conclusion.¹²
14. Part of the challenge for regulators is to reframe their analysis to take account of the fast pace of change in digital markets. The European Commission's SMP guidelines state that "*market characteristics should be analysed not only in a static but also in a dynamic and forward-looking manner*".¹³ In order to do so, regulators should place greater emphasis on future trends in how the market could evolve, in particular, the capacity for disruption of traditional markets by global technology companies who are constantly innovating including by expanding into adjacent markets in order to build customer relationships.
15. The European Commission recommends that "*anticipated events must be expected within a precise timeframe and on the basis of concrete elements...rather than something which may be only theoretically possible*".¹⁴ In digital markets, regulators face a challenge in anticipating innovation because, by its nature, innovation involves creating products and services that are not easily conceivable today.
16. Innovation in digital markets (and its likely impacts) cannot easily be predicted over specific time horizons or based on concrete elements in the manner the Commission describes, and yet digital players still place competitive constraints on existing suppliers. Regulators should take a broader view of how a market may tend towards effective competition encompassing competitive constraints arising from digital competition. For example, regulators could consider how these constraints trigger responses from

¹² Ofcom (30 November 2017): "Narrowband Market Review: Statement - Markets, market power determinations and remedies for wholesale call termination, wholesale call origination and wholesale narrowband access markets", paragraphs 4.58-4.59, p60-61; Ofcom (28 March 2018): "Mobile Call Termination Market Review 2018-2021 – Final Statement", paragraphs 3.45-3.49, p27-28.

¹³ European Commission (9 October 2014): "Commission Staff Working Document Explanatory Note accompanying the document Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, p9.

¹⁴ Ibid, p10.

existing firms with regards to changes in their business models and/or more investment in research and development, instead of just a focus on changes in price and quality of existing products and services.¹⁵

17. The final criterion states that ex ante regulation should only be imposed where competition law remedies are insufficient to address the competition problem identified. In Professor Robert Hahn's paper accompanying this response, he notes that in digital markets an ex post approach has some advantages over ex ante regulation because of the difficulties of identifying market failures on a forward-looking basis.

Competition law and regulation must place greater emphasis on quality rather than solely price

18. In general terms, we agree with the current principle-based analytical framework applied in competition law and used as a foundation for SMP regulation. That principle-based system has evolved transparently through EU and UK administrative and judicial proceedings to provide a flexible yet predictable analytical framework. We would caution against changes to those principles and are concerned that well-meaning changes might have unintended consequences beyond the scope of this review.¹⁶ Rather, we think it would be more appropriate to focus on the application of these principles to digital technology companies specifically, in particular to market analysis. In this regard, it is especially important for the application of the competition law principles to be forward-looking and take into account the dynamism in relevant digital markets.
19. In this regard, market definition is an important first step in any discussion of competition concerns (whether in a competition law or SMP regulation context), and can be particularly challenging in digital markets. The purpose of market definition is "identifying the competitive constraints acting upon a supplier of a given product or service".¹⁷ The ease with which consumers can switch to substitute products and the constraints placed by other competitors in the market define the relevant product market over which market power can be assessed.
20. Market definition is often assessed by reference to a conceptual framework which posits a Small but Significant Non-transitory Increase in Price test (SSNIP test). Under this test, a market is defined as a group of products or services across which a hypothetical monopolist could profitably impose a SSNIP (i.e. without this being undermined due to volume losses). The SSNIP test provides a useful tool for market definition where

¹⁵ Telecoms operators have accelerated investment in recent years in areas where the digital economy may make a difference, including BT's partnerships with university research facilities and Deutsche Telekom's investment in data analytics, cloud disruptions and network asset utilisation. Source: Copenhagen Economics (20 September 2017): "Review of SMP guidelines", A study prepared for ETNO, p21-22.

¹⁶ For completeness, we note that we would be particularly concerned about any change to the standard of review for appeals of competition law decisions. The current full merits review for Chapter 1/Article 101 and Chapter 2/Article 102 infringements is important to ensure robust decision making and protection of the rights of undertakings given the quasi-criminal nature of any breach finding.

¹⁷ Office of Fair Trading (2004), "Market Definition - Understanding competition law", OFT Competition Law Guidelines, paragraph 2.1.

changes in price are the key instrument by which a hypothetical monopolist could exercise market power.

21. However, in digital markets, the traditional SSNIP may not identify appropriate product markets for a number of reasons.
22. Firstly, digital markets are often two-sided, with suppliers interacting on both sides of the platforms with users and advertisers. A supplier's optimisation decision would take into account the profits from both sides of the market. Therefore, the SSNIP test may need to consider changes in price on both sides of the market and consider the demand-side and supply-side response on both sides simultaneously.
23. However, in digital markets, users on one side of the market often do not pay a monetary price. Users of Facebook, Google, Instagram, Youtube and other social media platforms and search engines do not typically pay for the service. With a zero price, conducting a SSNIP test is not viable for defining the relevant market. In such digital markets, users effectively pay for their use of the platform by providing their personal data, which can be monetised by the other side of the market, usually advertisers. For example, users of Google provide data about their preferences based on their search queries, which advertisers are then able to use to provide targeted goods and services.
24. In this setting, market definition may need to consider how a *change in the amount and/or quality of data* that is provided by users affects the demand-side and supply-side response on both sides of the market. This would provide a more complete view of the ability of the hypothetical monopolist to profit, taking into account all of the tools it has to exploit any market power.
25. Expanding the use of the traditional SSNIP test to changes in quality has been considered by China's Supreme Court in *Tencent vs Qihoo*, where the Supreme Court noted the inadequacy of traditional analysis based on changes in price. The Supreme Court discussed the use of changes in quality being used to define the product market, but found that the exercise could only be conducted in qualitative terms. The difficulty in quantifying changes in the quantity and/or quality of data supplied by users may mean that demand and supply side responses can only be assessed in qualitative terms.
26. A second challenge with market definition in digital markets is that consumers often regard services and products with differing capabilities as being viable substitutes. Users can migrate to different digital platforms, switching their attention, even though the platforms may provide different services under strict product market definitions. For example, the growing use of Snapchat has coincided with declining use of Facebook by younger users, as their attention has switched due to innovations by Snapchat. Although Facebook and Snapchat offer differentiated services across multiple dimensions including text updates, news content and advertising, the two platforms may constrain each other to some extent through the measures they use to seek users' attention.
27. We therefore believe competition and regulatory authorities should take a wider view of market definition in digital markets, recognising the practical constraints placed by users, who often view products with different capabilities as substitutes. Greater analysis of switching behaviour across adjacent product markets, customer surveys and

recognition of quality as well price factors will enable authorities to better define appropriate product markets.

Competition and regulatory authorities should ensure a level playing field in the ability to accumulate data across industries and the use of that data

28. The Digital Competition Expert Panel has requested responses on whether the concentration of data within a small number of firms has an impact on competition. Companies such as Google and Facebook collect data about their users, and in some cases, this data accumulation may constitute a barrier to entry for other firms. The accumulation of data has been likened to the high fixed costs associated with fixed infrastructure, which could result in findings of market power. We agree that the accumulation of such data and the subsequent use of that data (e.g. whether it is used to embed or leverage market power) is an important area of focus for competition and regulatory authorities.
29. The majority of the data that users of digital platforms provide tends to be highly personalised and have a limited shelf-life. Clicks on online shopping websites, likes on social media platforms and views on online video channels all represent the preferences and choices of the users at the point in time in which they are made. Digital players value this data highly at the point in time in which they gather it, because it is more likely to be monetised, for example through targeted advertising to induce further consumer spending. Over time, the value of such data declines because user preferences and choices change, and the data cannot be monetised so easily.
30. Because such data decays in value over time, digital players constantly adapt their operating models to engage their users such that they continue to supply their data. Facebook's move towards video content, Instagram's 'Stories' feature and Snapchat's filters feature are all innovations that consumers value enough to continue supplying their data to the platforms. Failure to keep users' attention may lead to users switching to alternative suppliers, providing strong incentives for the digital players to innovate and provide services that users continue to value. The rapid decline of MySpace provides an example of a digital platform failing to maintain user attention, and, as a result, losing market share.
31. As discussed earlier, users in such two-sided platforms in effect pay for their use of the platforms using their data. Constraining their ability to do so could prevent users from benefitting from services they currently value (often at zero price) and may undermine the incentive to create new services.
32. These principles apply more generally. For example, in telecoms markets, firms may also collect data about their customers, including the amount of data they consume, the type of content they prefer and time at which they consume services. In addition, telecoms markets are highly competitive at the retail level, which means firms are competing to

attract customers, and one such competitive dimension could be the amount of data that is supplied in return for valuable communications services.

33. We therefore believe a consistent approach should be applied when considering concentration of data in different sectors. Allowing firms in one sector to collect user data, but not firms in other sectors creates competitive distortions that harm overall consumer welfare.¹⁸ Similarly, any regulatory efforts to promote consumer switching should not be restricted to individual sectors, and should also consider switching behaviour in digital markets. BEREC is currently consulting on such issues, including on fostering interoperability obligations and data portability.¹⁹
34. We recognise consumer concerns about privacy and the way that their data is handled. Digital players and firms in all sectors have a responsibility to ensure that consumers' rights to data privacy are protected and consumers are provided information on how their data is used. We believe such data privacy issues are best addressed outside of the competition regime, and through consumer policy. Measures such as GDPR are an example of how regulators can protect consumers without resorting to competition regulation, which is not the appropriate tool for addressing consumer concerns about data privacy.

¹⁸ For example, telecoms operators can provide valuable digital security services by collecting data about their customers' mobile phone locations when they withdraw funds from a bank account. Restricting telecoms operators from collection and use of data limits such innovation in digital security, thereby harming consumer outcomes in the long-run.

¹⁹ BEREC Public Consultation on the data economy, 4 October 2018.

Conclusion

35. Growth in digital markets has undoubtedly created new challenges for firms in adjacent sectors, customers, and competition and regulatory authorities. BT is facing new forms of competitive threat across a range of its products and services, including OTT content, mobile handsets, fixed network infrastructure and IT services. In each of these areas, the pace and materiality of disruption has been far in excess of what has been observed historically. Regulatory authorities have so far been slow to adapt regulatory models in the face of this digital disruption, and have continued applying ex ante regulation in telecoms markets despite increasing competitive constraints from digital disruptors.
36. The services provided by digital firms include OTT voice calls, data messaging services and video sharing, which all act as substitutes to traditional fixed and mobile services offered by telecoms companies. This market convergence has so far been given little weight in telecoms regulation, partly because of a tendency to focus on historical trends rather than future competitive constraints. A greater emphasis on how markets are evolving (and the pace of change) will help to ensure that competitive constraints across adjacent markets are recognised.
37. This does not mean that the current principle-based analytical framework needs to be changed. Rather, we think it would be more appropriate to focus on the application of these principles to digital technology companies specifically, in particular to market definition assessments. In this regard, it is especially important for the application of the competition law principles to be forward-looking and take into account the dynamism in relevant digital markets.
38. With regards to market definition, traditional tools may need to be adapted, for example a hypothetical monopolist test for two-sided markets which captures the demand-side and supply-side response on both sides of the market. Incorporating a qualitative assessment of responses to changes in quality is important to achieve, a more appropriate assessment of substitutes. A broader approach to market definition also has implications in adjacent markets such as telecoms, where it will allow regulators to recognise how new digital services are widening product markets.
39. Finally, we do not see the accumulation of data by a few firms necessarily results in greater market power, as the value of data is time-limited such that firms are constantly innovating to encourage users to willingly supply data. This property of data means the accumulation of such an asset should not necessarily be seen as a barrier to entry. However, we note that this applies in a number of sectors, and not just in digital markets, so regulators should be conscious of applying regulations in one sector that prevent a level playing field in the use of data to provide valuable services to consumers. We believe concerns associated with data privacy are best addressed through consumer protection policy rather than competition policy.

Competition policy for digital markets: An economic perspective

14 December 2018

Robert Hahn*

A response to the call for evidence
on competition in the digital economy

* I have done work for several companies in the information technology space outside of the UK, and have also provided advice to governments. In the UK, I have worked for British Telecom, which is funding this effort. I would like to thank Jesper Akesson, Sam Ashworth-Hayes and Jay Chakravarti for helping with this submission. The views in this submission reflect my own, independent assessment, and do not necessarily reflect the views of the institutions with which I am affiliated.

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Competition policy for digital markets: An economic perspective

Robert Hahn

1. Introduction

I have been asked by British Telecom (BT) to provide input into the review of the state of competition in the digital economy. My submission primarily covers questions 7 and 10 in the call for evidence.¹

I am a visiting professor, and former director of economics, at Oxford University's Smith School of Enterprise and the Environment. I have also served on the faculty of Harvard University, and directed the AEI-Brookings Joint Center for Regulatory Studies. My research has covered a number of issues in competition policy. I include a bio in Appendix A and a Curriculum vitae in Appendix B.

I will argue for a regulatory environment that places greater weight on dynamic efficiency than on static efficiency. Static efficiency refers to the state of affairs that maximises current economic welfare; dynamic efficiency refers to the path of states over time that maximises long-run economic welfare. Dynamic efficiency is a particularly relevant welfare concept in digital markets, as they are subject to significant change over time.

In this spirit, I will argue that regulators should generally take an ex-post approach to regulation, acting once market failures are clearly identified and defined, rather than acting before the fact (ex-ante).

My submission is organised into four parts. Section 2 discusses the appropriate goal for competition policy and identifies some key constraints. Section 3 explores different frameworks for thinking about the digital economy. Section 4 outlines some initial lessons for competition policy in this space. Finally, Section 5 concludes.

2. Objectives and constraints

I am interested in providing some important lessons for competition policy in the digital economy. Before doing so in Section 3, it is useful to define the goal of competition policy, and identify key constraints faced by regulators.

The primary goal of competition policy should be to promote long-term economic efficiency (Heyer, 2006). That means maximising the sum of producer and consumer surplus over time, appropriately discounted (Carlton and Perloff, 2005). The key phrase here is 'long-term'. Practically speaking, it means giving careful consideration

¹ These questions are: "What tools does competition policy need to deal with issues in the digital economy in a sufficiently timely, effective and far-sighted manner?; To what extent are these in place in the UK?"; and "Are there other issues you consider that the review should be considering, given its focus on competition in the digital economy?".

to the incentives that competition policy provides for investment and innovation.

An important constraint upon the ability of regulators to achieve long-term efficiency in digital markets is that economists do not understand them very well. While we have stylised models of ‘equilibrium’ behaviour that provide some important insights for how certain kinds of digital markets may operate (see, e.g., Rochet and Tirole, 2003), we lack a solid theoretical understanding of the dynamics of digital competition (Smith, 2007). This is concerning, as it could be argued that at least some, and perhaps much, behaviour that we observe in digital markets does not take place at an economic equilibrium.

Because these markets are fast-moving and poorly understood, regulators should recognise the temporal limitations of competition policy (Hahn, 2001). Government does not run on internet time. By the time regulations are put in place, the original problem may well have been resolved within the market, or considerable progress in that direction may have been made.

A classic example concerns the AOL-Time Warner merger, where American authorities feared that AOL’s instant messaging service could become so dominant that no other party could compete with it (Crandall, 2018). In the end, no intervention was made, and other messaging services emerged.

Furthermore, the speed of movement within digital markets can leave both regulatory decisions and legislation looking out of date. Distinctions between long-distance and local calls, for instance, have been rendered largely meaningless by the development of Voice over IP. Regulatory action should be reserved for cases when a dynamic analysis illustrates that problems are likely to be both longstanding and unlikely to resolve themselves.

To summarise, digital markets are dynamic and move quickly. This means that regulation often lags changes in the market, and that static models of competition are insufficient. Attempting to achieve the best outcome in a static framework could impose significant costs in the long term, as these actions will not consider the incentives for investment and innovation that drive long-term growth.

These market characteristics suggest that a suitable philosophy of regulation might be “first, do no harm”. When a market is poorly understood, even the best-intentioned regulation can have negative effects. Until there is compelling evidence and understanding that suggests a course of action, regulators would be best advised to monitor the situation. When an intervention is made, it should be as narrowly defined as possible. Regulators should treat the diagnosed problem with the minimum intervention needed for success.

This does not mean that there is no role for intervening in, or regulating, the competitive aspects of the digital economy. Instead, it means acknowledging the limitations on our knowledge and ability. With this in mind, I would like to present some rules of thumb for thinking about competition policy in the digital economy.

3. How to think about the digital economy²

For the purposes of this paper, one can think of the digital economy as encompassing large technology firms, such as Google and Amazon, and smaller firms that are part of the Internet ecosystem. Before making recommendations on how to regulate these markets, I will briefly list some important considerations when analysing the behaviour of these firms.

While some digital markets resemble conventional ones, many others display a more complicated structure, such as firms providing platforms that bring together buyers and sellers. A number of features differentiate digital markets that are particularly relevant to our analysis.

- **Economies of scale in production:** Average costs often fall as output increases. In software, for example, it typically costs millions to produce the first unit of the finished product, but negligible amounts for additional units.
- **Complementarities across products:** The value of a product increases as other products related to its use are developed. For example, as software applications are written for a computer operating system, the operating system becomes more valuable to consumers.
- **Network effects:** Adding another person to a telephone, email or social media network makes the network more valuable to other users in the absence of significant congestion effects. Similarly, the value of many software products increases with the number of users who can open the files they produce.
- **The pace of change:** Software markets can change dramatically over short periods. A relatively short time ago, AOL Instant Messenger and MySpace were considered to be market leaders. New products emerge continually, adding competition to existing markets and creating new ones.

Because of the features of supply and demand in some digital markets, there is not always a clear competitive benchmark against which to judge the exercise of market power. Indeed, the way to price in these markets is not always clear. Companies often need to charge above marginal cost to recoup their investments, and the difference between price and marginal cost is often not a good measure of market power.

Rochet and Tirole (2003), in a seminal paper, present a useful way of thinking about some of these digital markets. They frame their analysis in terms of two-sided markets, which involve two sets of agents interacting on a platform. In this framework, decisions by one set of agents directly affect the welfare of the other set of agents, often as a result of an externality (Rysman, 2009).

In this setting, pricing is more complicated than in traditional 'one-sided' markets. To

² This section draws from Hahn (2001) and from ongoing work I am undertaking with Scott Wallsten.

quote Rysman (2009, p. 129):

In a one-sided market, we can characterise the price–cost mark-up in terms of elasticity of demand and the marginal cost. But in a two-sided market, pricing decisions will also include the elasticity of the response on the other side and the mark-up charged to the other side.

For an intuitive example from the non-digital world, we can consider the behaviour of bars. It is not uncommon for bars to run promotions offering discounts to female patrons. This pricing structure is the result of a two-sided market where two sets of agents (men and women) can be viewed as benefitting from each other's presence to different degrees. To attract an appropriate mixture of both, pricing may need to be different for the two sexes.

In the digital world, there are many examples. Facebook, for example, does not charge everyday users, but does charge advertisers. Google does the same for search. Amazon and eBay do not charge buyers explicitly for the right to use basic features of their platforms, but sellers are charged.

This two-sided structure makes decisions on competition policy more complicated when we consider attaining static efficiency. The structure of these markets also makes decisions more difficult for matters of dynamic efficiency.

The changing nature of competition in the digital economy can also make it challenging to define the relevant market for competition policy. Firms can enter new markets at startling speed. Historical market shares can be misleading, while changes in technology are constantly redefining which products can be substituted for which others. When considering the need for ex ante or ex post interventions in a market, regulators should take into account real-world patterns of substitution, and the distortions that can occur by differential regulatory treatment of closely-related products.

Another way in which many companies in the digital market differ from more 'traditional' firms is their heavy reliance on "big data". The use of this data is often opaque to the end user, and consumers may not understand the true 'cost' of using platforms, such as Facebook. Firms may be able to compete on this dimension, and increase the attractiveness of their services by being more transparent about how they process data. In addition, we may see the gradual introduction of markets that pay customers for having access to certain kinds of data.

One related issue is the extent to which firms should be required to share their data. In thinking about regulating this issue, regulators need to take into account a range of benefits and costs. If, for example, firms are required to share data sets that they have invested in developing, this could diminish their incentive to develop them in the first place. At the same time, it may be desirable for consumers to be allowed to exercise greater control over how and where their data are used.

It is in the nature of some of these markets that only a few players may be viable, or

in the extreme, only one. The rise of winner-take-most markets makes it harder to identify illegitimate monopoly power and predatory conduct. If competition in some parts of the digital economy yields one or two industry giants, it is hard to say whether the battle was fair and foul. The existence of large profits and market shares can also be viewed as an incentive for firms to provide better services. Firms might compete to ‘capture’ the market, and then continue to innovate to fend off potential competitors.

Regulators should be aware that by providing a fix to the static competitive effects of an undesirable activity, they are reducing the profits available to a firm willing to provide a market alternative by introducing a service or product that undercuts the incumbent firm. This is not to say that regulators should not take action; it is simply to note that there is a trade-off.

Regulators should also be aware that digital markets have the capacity to affect the level of competition within other markets in dramatic ways. Amazon, for example, continues to exert competitive pressure on “big-box” retailers; in addition, many bookstores have found they could not compete with Internet sales. These are just two examples of a broader trend in favour of ecommerce, which has changed the way consumers search for and buy goods and services.

Note that entry and competition in these markets does not always require that the digital firm provide a product of the same sort. It can instead offer a close substitute. For example, WhatsApp, Facebook Messenger, and iMessage substitute for texts; Skype for phone calls; and Netflix for video stores (Wadhwa, 2017).

In the telecommunications industry, some of the digital leaders have helped transform this market. Amazon and eBay have, for example, made it easier to sell handsets independent of telecom companies. This makes it more difficult for operators to attract customers to long-term phone plans using deals on handsets. Moreover, Google is directly competing with incumbent telecom companies in the US by rolling out Fibre-to-the-Premise infrastructure in a number of cities.

The bottom line is that digital markets should not exclusively be analysed with the tools that we use for static analysis. One example of a problematic tool is the ‘small but significant and non-transitory increase in price’ (SSNIP) test. The SSNIP test is particularly inadequate in two-sided markets, as it fails to take into account how changing the price on one side of the market affects revenues gained from the other side. As Coyle (2018) points out, “the prices set by the platform on each of its ‘sides’ cannot be considered in isolation”. Moreover, the multidimensional nature of products means that the monetary cost may not be the correct concept. The regulator may want to consider the trade-offs between quality, privacy, and price when evaluating market power.

Digital markets display different combinations of features, and should be analysed on a case-by-case basis. The challenge for policymakers is understanding both which framework is appropriate for each market, and the links between them – for instance,

between Google's web browser business, its search engine offering, and its email service. The central challenge, however, is the simple lack of operational models that capture the dynamics of competition.

4. Lessons from competition policy

Progress in digital markets takes place through innovation – the improvement of existing technologies, the development of new products, and the creation of new markets. The rate of innovation should in turn be viewed as the primary driver of long-run consumer welfare.

While tools and techniques aimed at static analysis may suffice in traditional markets – where the model of competition and the product provided are well-defined – they are likely to fall short in more dynamic contexts, such as digital markets. The faster-moving the market, the greater the need to focus on problems related to encouraging innovation.

In my view, regulators should pay attention to the following set of principles when regulating digital markets:

4.1 Focus on dynamic efficiency

Regulators should use a framework that focuses on dynamic efficiency. Static measures of competition and consumer welfare are generally uninformative in markets where progress largely takes place through innovation.

The real issue is what kinds of dynamic measures to use. Some scholars have called for a new economics to deal with these dynamic issues. While this would be useful, regulators do not have the luxury of waiting. The only realistic alternative, in my view, is to apply the tools and techniques we already possess in a dynamic context. One plausible measure, related to the idea of fragility, is the extent to which output and pricing decisions of the company are constrained by potential or actual competition.

4.2 Think outside the box on mergers and acquisitions in the digital economy

One concern voiced by some commentators and scholars is that some tech firms in the digital economy may have gotten too big (e.g., Wu, 2018). There are even acronyms that label these mega-firms at the top, such as GAFAM (Google, Apple, Facebook, Amazon and Microsoft).

I believe that regulators should be willing to think outside the box in terms of promoting greater competition in this sector. Policy could restrict the large tech firms in a few ways, ranging from breaking them up to setting behavioural rules. One of the most common proposals is that GAFAM should face stricter conditions on their ability to acquire other firms. Shapiro (2017), for example, when arguing for such an approach, noted “As a general principle, the greater and more durable is the market power of an incumbent firm, the larger is the payoff from preventing that firm from acquiring the smaller firms that, if left to grow on their own, would become its strongest challengers.”

This approach has two potential problems. First, it is difficult to know which small firms might become strong challengers. For example, how might YouTube have changed the Internet ecosystem if it had not been purchased by Google?

Second, the possibility of being acquired is in itself a reason entrepreneurs start companies in the first place. Allowing such a purchase could reduce the static level of competition within a market; however, it provides a considerable incentive for entrepreneurs to take risk, and thus could increase dynamic efficiency. The ‘prize’ for successful innovation is often being bought out by a major tech company. Thus, allowing a dominant firm in a market to buy out smaller firms could counterintuitively increase the dynamic efficiency of the market.

Still, economists may want to explore ways of carefully balancing the trade-offs between restricting large tech firm purchases and potentially unintended consequences. An alternative to restricting large tech firm purchases is to use merger policy as a mechanism for promoting more competition in this space. Policymakers may wish to take a more relaxed attitude towards proposed mergers between firms that have the capability to become competitors to incumbent firms within the digital ecosystem.

A good example is the recent AT&T–Time Warner merger, which is still being challenged by the U.S. Department of Justice. A key claim that AT&T made was that the merger would make it easier to compete with some of the larger tech firms in areas such as advertising and the distribution of programming – for example, to compete with Netflix (Financial Times, 2018). To the extent such claims are credible, they should be considered in a positive light in merger proceedings if the aim is to inject more competition into areas where the large tech firms currently dominate.

4.3 Reconsider the ex-ante and ex-post approaches to mergers and regulation more generally

In a working paper with Lewis Evans (Evans and Hahn, 2010), I discuss optimal regulation in fast moving markets. While my specific concern was telecoms, many of the arguments we use apply to digital markets.

Regulatory policy can be viewed as falling into two categories: ex-ante, and ex-post. Ex-post regulation seeks to deal with problems as they emerge and places a great deal of emphasis on maintaining a competitive market. Competition law is generally ex-post. Ex-ante regulation, on the other hand, seeks to replicate the circumstances such a market would achieve using regulation. A simple example would be price reviews, which set prices within a market.

The problem for ex-ante regulation in digital markets is that the market is not only often out of equilibrium, but that the equilibrium it tends towards is also shifting. This means that seemingly sensible ex-ante regulation can often find itself out of date and holding back investment. In such cases, the dynamic costs of regulations have the potential to be much larger than the initial static gains from making firms adopt a particular price.

Moreover, ex-ante regulation is not only likely to be left out of date by the progress of the market. It may also be rendered unnecessary by the development of substitutes or rival products. This may be true in fast-changing markets, such as telecom and video services, where customers have more and choices as technology evolves. Regulating, for instance, the price of text messaging in a telecoms market could be an example of unnecessary ex-ante regulation. Furthermore, regulating traditional landline telephone service, with the possible exception of providing “lifeline” service for low-income customers, may no longer be necessary.

In contrast, a significant benefit of ex-post regulation is that it provides a greater degree of flexibility for firms to innovate than they would have under ex-ante regulations. Rather than simply fixing an outcome that firms must adhere to, regulators can examine issues on a case-by-case basis. This is likely to mean greater dynamic efficiency, and consequently also greater long run economic welfare. These arguments do not just apply to the obvious digital markets – online shopping, search, advertising, and so on – but also to other firms that compete in the digital space.

This is not to say that ex-ante regulation does not have a role to play. As Coyle (2018) notes, it can assist in helping to set a competitive playing field. To the greatest extent possible, innovators should be able to build on existing frameworks. Further, regulators could also examine the possibility of setting open technical standards, which encourage firms to produce hardware and software that are compatible with offerings from rival firms. Similarly, allowing customers to take their data with them when they leave a service – data portability – could well be something regulators wish to encourage.

What is less appropriate is trying to prescribe particular competitive outcomes. When regulators believe an intervention of this sort is warranted, they should be sensitive to the point that market structures are not fixed. Furthermore, regulators should consider including mechanisms by which regulations could be reviewed at regular intervals and removed if no longer necessary. It is important to provide firms with stability for investment decisions, so such reviews and mechanisms should be clearly set out.

5. Conclusion

Digital markets are both dynamic and poorly understood. While regulators should not shy away from appropriate interventions, they need to be clear on what shape such interventions should take.

To incentivise investment and innovation, it would be better for regulators to focus on ex-post regulation rather than ex-ante in most situations. Further, regulators should focus on the attainment of dynamic efficiency rather than short-term static gains, and should be willing to bend their usual approach to mergers and other issues of competition policy in promoting dynamic efficiency.

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Appendix A – Short biography

Robert Hahn is a visiting professor and former director of economics at the Smith School of Enterprise and the Environment, Oxford University, and a senior policy scholar at the Georgetown University Center for Business and Public Policy. He has served on the faculties of Harvard and Carnegie Mellon, and has also had senior appointments at AEI and Brookings. Bob co-founded and directed the AEI-Brookings Joint Center for Regulatory Studies, a leader in policy research in law and economics, regulation, and antitrust. Previously, he worked for the U.S. President's Council of Economic Advisers and was the chief economist on the White House drafting team for the 1990 Clean Air Act Amendments. His responsibilities included helping to design the innovative cap-and-trade system for limiting smokestack sulfur emissions.

Bob is currently conducting several economics experiments aimed at improving productivity, and promoting growth and sustainability. He also continues to do research on competition policy, government regulation, Internet policy, and understanding the benefits of breakthrough innovations. He served as a commissioner on the U.S. Commission on Evidence-Based Policymaking and is currently working with key decision makers on ways to promote evidence-based policy. Furthermore, Bob is the co-founder of two London-based companies, The Behaviouralist and Signal.

Appendix B – Curriculum vitae

Robert W. Hahn

Smith School of Enterprise and the Environment
University of Oxford
OUCE South Parks Road
Oxford OX1 3QY

EDUCATION

- 1977-81 California Institute of Technology, Pasadena, California
M.S., 1979, Ph.D., Social Science, 1981
- 1976-77 Stanford Graduate School of Business, Stanford, California
- 1971-75 Brown University, Providence, Rhode Island
B.A., Mathematical Economics, 1975
M.A., Economics, 1975
Languages: Spanish
Honors: Phi Beta Kappa

EMPLOYMENT

- 2018- Visiting Professor, Smith School, University of Oxford
- 2013- Senior Research Fellow, Institute for New Economic Thinking, Oxford Martin School
- 2009- Senior Fellow, Center for Business and Public Policy, Georgetown University, Washington, D.C.
- 2012-17 Professor and Director of Economics, Smith School, University of Oxford
- 2016-17 Commissioner, U.S. Commission on Evidence-Based Policymaking
- 2011-18 Associate Member, Nuffield College, University of Oxford
- 2014-18 Non-resident Senior Fellow, Brookings Institution, Washington, D.C.
- 2013-15 Robert Schuman Fellow, Global Governance Programme, EUI
- 2015 Simon Fellow, Property and Environment Research Center
- 2011-12 Director of Economics, Smith School, Oxford
- 2008-10 Senior Visiting Fellow, Smith School, University of Oxford
- 2008-10 Visiting Fellow, Nuffield College, University of Oxford

2003-08 Executive Director, AEI-Brookings Joint Center for Regulatory Studies, Washington, D.C.

1998-02 Co-founder and Director, AEI-Brookings Joint Center for Regulatory Studies, Washington, D.C.

1999-08 Non-resident Senior Fellow, Brookings Institution, Washington, D.C.

1989-07 Resident Scholar, American Enterprise Institute, Washington, D.C.

1997-02 Research Associate, Harvard University, Cambridge, Massachusetts

1990-01 Adjunct Professor of Economics, Carnegie Mellon, Pittsburgh, Pennsylvania

1991-94 Adjunct Research Faculty, Harvard University, Cambridge, Massachusetts

1987-89 Senior Staff Economist, Council of Economic Advisers, Washington, D.C.

1985-90 Associate Professor of Economics, Carnegie Mellon, Pittsburgh, Pennsylvania

1982-85 Assistant Professor of Economics, Carnegie Mellon, Pittsburgh, Pennsylvania

1981-82 Research Fellow, California Institute of Technology, Pasadena, California

1981 Instructor, Pitzer College, Claremont, California

1978 Economist, Council on Environmental Quality, Washington, D.C. (summer)

1976 Economist, World Bank, Washington, D.C. (summer)

1975-76 Division Staff, MITRE Corporation, McLean, Virginia

1973-75 Math Teacher, Transitional High School, Providence, Rhode Island

PUBLIC SERVICE AND ACADEMIC ACTIVITIES

1983- Co-founder of the Community Preparatory School, Providence, Rhode Island

2011- Editorial Board – *Oxford Review of Economic Policy*

2016- Board of Scholars, American Council for Capital Formation

2016- Academic Advisory Board, Technology Policy Institute

2016- Board of Directors, Long-term Education Investment Fund

2010-15 Defra/GES Environmental Economics Academic Panel

2010-11 World Economic Forum, Consumer Industry Agenda Council

- 2009- Editorial Board - *Journal of Benefit-Cost Analysis*
- 2009- Editorial Board - *Journal of Prediction Markets*
- 2008- Editorial Board - *Policy and Internet*
- 2006- Editorial Board - *Review of Environmental Economics and Policy*
- 2005-11 Columnist - *Economists' Voice*
- 2000- Editorial Board - *Milken Review*
- 2000- Research Advisory Board - Committee for Economic Development
- 2001- Editorial Advisory Board - *Regulation*
- 1994-99 Board of Directors, Annapolis Center
- 1989-93 Editorial Council - *Journal of Environmental Economics and Management*
- 1990-92 Cochairman of the U.S. Alternative Fuels Council

PROFESSIONAL AFFILIATIONS

American Economic Association

Association for Public Policy Analysis and Management

Association of Environmental and Resource Economists

AWARDS

American Association for the Advancement of Science Fellowship

Barr Award for Outstanding Research in Applied Public Economics

Brookings Fellowship

Caltech McDonnell Award for best graduating student in Social Science

Premier's Fellowship, New South Wales, Australia

SELECTED RESEARCH PROJECTS AND FOUNDATION SUPPORT

Agency for International Development, "Government Regulation of the Marketing and Processing of Crops in Uganda"

Electric Power Research Institute, "Organizational Aspects of Power Pooling"

Electric Power Research Institute, "Markets in Transferable Property Rights"

Environmental Protection Agency, "An Examination of EPA's Controlled Trading Options"

Environmental Protection Agency, “An Evaluation of Mechanisms for Complying with the Ozone Standard”

Environmental Protection Agency, “Designing Markets in Tradable Allowances for Reducing Acid Deposition”

Environmental Protection Agency, “Promoting Conservation Through Price Rationalization”

Environmental Protection Agency, “Evaluation of Economic Incentives for Hazardous Waste Management”

Environmental Protection Agency, “Economic and Environmental Analysis of Alternative Fuels”

Matsushita Foundation, “Educational Development”

Mott Foundation, “AEI-Brookings Joint Center for Regulatory Studies”

National Science Foundation, Decision, Risk and Management Science, “The Emergence of Markets for Controlling Risks”

National Science Foundation, Regulation and Policy Analysis, “Spot Markets for Electricity”

National Science Foundation, Decision, Risk and Management Science, “Markets for Controlling Environmental Risks”

New South Wales Government, Australia, “Economic Approaches for Protecting Environmental and Natural Resources: From Theory to Practice”

Office of Technology Assessment, “Designing Economic Incentives for the Clean Air Act”

Rhode Island Foundation, “Options for Alternative Education”

Smith Richardson Foundation, “AEI-Brookings Joint Center for Regulatory Studies”

World Bank, “The Benefits and Costs of Regulation in Developing Countries”

World Bank, “Application of Economic Incentives to Environmental Problems in Developing Countries”

SELECTED PUBLICATIONS³

Working Papers and Work in Progress

“Using Big Data to Estimate Consumer Surplus: The Case of Uber,” with Peter Cohen, Jonathan Hall, Steven Levitt, and Robert Metcalfe, NBER working paper, September 2016, under revision.

“The Ridesharing Revolution: Economic Survey and Synthesis,” with Robert Metcalfe, forthcoming in Oxford University Press book.

³ Many of my scholarly publications can be found at www.ssrn.com.

“The Economics of Water Security,” with Dustin Garrick, proposal accepted by *Review of Environmental Economics and Policy*, under revision.

“Estimating the Trade-off between Efficiency and Equity from Energy Subsidies,” with Robert Metcalfe, under revision, *AER*.

Friend of the Court Brief on Climate Change for the U.S. Supreme Court, with Tom Schelling and Vernon Smith, May 2013.

“Refer-a-friend Economics: A Theoretical and Experimental Analysis,” with, Jonathan Davis, John List, Robert Metcalfe and Michael Price, draft.

“Regulating the Tech Titans” with Scott Wallsten outline submitted to JEP.

“The Behavioralist as Policy Designer: The Need to Test Multiple Treatments to Meet Multiple Targets,” with Robert Metcalfe, David Novgorodsky and Michael Price, NBER working paper, under review *JAERE*.

“Overconfidence in Future Behaviors: Getting Customers to Use an Online Platform for Water and Energy Management” with Robert Metcalfe and Dmitry Taubinsky, in preparation.

“Getting Students to the College Entrance Test on Time: Can Incentives Help?,” with Ty Cruce, Amos Dupuich, and Robert Metcalfe, in preparation.

“Understanding the Effectiveness of Bill Tracker Alerts on Energy Consumption,” with Robert Metcalfe and Florian Rundhammer, in preparation.

“How Urban Mass Transit can Reduce Congestion: A Natural Field Experiment with BART,” with Robert Metcalfe and Eddy Tam, in preparation.

Journals

“Promoting Customer Engagement: A New Trend in Utility Regulation,” with Robert Metcalfe and Florian Rundhammer, *Regulation and Governance*, 2018, forthcoming.

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