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Antitrust and Innovation Competition

Daniel F. Spulber *

ABSTRACT

Innovation competition presents challenges for antitrust law and enforcement policy. Innovation has generated changes in the nature of competition as firms introduce new transaction techniques, product designs, and production processes. Innovation competition is driving the 'Business Revolution' in retail, wholesale, manufacturing, services, and financial technology. Transaction innovation in online platforms and multi-sided markets has raised antitrust concerns about anticompetitive conduct, vertical restraints, consumer privacy, and barriers to entrepreneurship. The article argues that although antitrust policy makers recognize the importance of innovation competition, they need to update their economic frameworks. Antitrust policy makers need to move beyond traditional analysis based on the twin frameworks of perfect competition and imperfect competition. The article provides an introduction to the emerging Economics of Technology & Innovation and examines some implications for antitrust policy. First, antitrust policy should shift its focus from price competition without technological change to address non-price aspects of innovation competition. Secondly, antitrust policy should apply economic analysis that recognizes the critical role of Intellectual Property and technology standards in innovation competition. Thirdly, antitrust policy toward horizontal and vertical mergers should consider developments in the economic analysis of innovation competition.

KEYWORDS: Antitrust, enforcement, competition policy, platforms, technology, innovation, non-price competition, innovation competition, market structure, competitive conduct, horizontal mergers, intellectual property, patents, technology standards
JEL CLASSIFICATIONS: K21, K20, K00, O30, O31, O33, O34

* Elinor Hobbs Distinguished Professor of International Business and Professor of Strategy, Kellogg School of Management, Northwestern University. Professor of Law (Courtesy), Pritzker School of Law, Northwestern University, USA. Email: jems@kellogg.northwestern.edu. I am grateful for research support from Qualcomm and the Kellogg School of Management. I am also grateful for the insightful and constructive comments of two anonymous reviewers that helped improve the article. Any opinions expressed are those of the author.

I. INTRODUCTION

Innovation competition plays an increasingly important role in the economy, displacing more traditional forms of price competition. Antitrust enforcement has recognized these developments and increased its focus on technological change. Antitrust policy makers are placing greater emphasis on innovation in evaluating competitive conduct, licensing of intellectual property (IP), and mergers. The issue is whether antitrust policy makers have the right tools for the job. Incorrect economic analysis of innovation competition risks impeding competition, mischaracterizing anticompetitive activities, and discouraging welfare-enhancing innovation. In this article, I point out that economic frameworks applied by antitrust policy makers have not kept up with the growth of innovation competition. I find that antitrust policy makers need to update their economic frameworks to evaluate competitive and anticompetitive conduct when there is innovation competition. I argue that antitrust policy makers should take advantage of significant developments in the Economics of Technology & Innovation that address the rise of innovation competition.

Innovation has become the dominant mode of competition, driving greater antitrust scrutiny of innovation. What I have termed the 'Business Revolution' is driving digital automation of retail, wholesale, finance, supply chains, manufacturing, services, technology transfers, and other transactions.[1] Digital platforms are improving the efficiency of transactions and creating new markets yet are raising concerns about privacy and exclusion.[2] Companies engaged in innovation competition continue to shift investment from plant and equipment toward invention and innovation. Intangible assets' contribution to the market value of leading publicly traded companies overshadows that of tangible assets, expanding from only 15 per cent of their value in the 1970s to over 90 per cent of their value.[3] A large part of the economy participates in the production and distribution of knowledge.[4] The number of specialized scientific and technical personnel engaged in Research and Development (R&D) is expanding rapidly.[5] Nearly every part of the economy benefits from advances in general purpose technologies (GPTs) such as Information and Communications Technology (ICT), mobile and broadband communications, artificial intelligence (AI), cloud computing, processing of big data, virtual and enhanced reality, robotics, Additive Manufacturing (AM), and the Internet of Things (IoT).[6]

1 Daniel F Spulber, 'Should Business Method Inventions be Patentable?' (2011) 3(1) Journal of Legal Analysis 265.

2 Daniel F Spulber, 'The Economics of Markets and Platforms' (2019) 28(1) Journal of Economics & Management Strategy 159.

3 Ocean Tomo Intangible Asset Market Value Study, 2021 <https://www.oceantomo.com/intangible-asset-market-value-study> accessed 14 May 2022.

4 This was originally noted in Fritz Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton University Press 1962).

5 Nicholas Bloom, Charles I Jones, John Van Reenen and Michael Webb, 'Are Ideas Getting Harder to Find?' (2020) 110(4) American Economic Review 1104.

6 Paul A David, 'The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox' (1990) 80(2) The American Economic Review 355; Timothy F Bresnahan and Manuel Trajtenberg, 'General Purpose Technologies: Engines of Growth?' (1996) 65(1) Journal of Econometrics 83; Susanto Basu and John Fernald, 'Information and Communications Technology as a General-Purpose Technology: Evidence from US Industry Data' (2007) 8(2) German Economic Review 146; Sumit K

Antitrust enforcement is likely to encounter innovation competition both at and within the frontiers of technological change. Antitrust policy makers view conduct that diminishes innovation as anticompetitive. For example, Microsoft's proposed acquisition of Activision Blizzard raised questions about the effects of the merger on innovation in video games and digital markets. In *Illumina*, the FTC argued against the vertical merger on the grounds that access to upstream technology would foreclose rival innovation in downstream product markets.[7] The FTC alleged that Grail would gain an advantage in the downstream market for cancer detection tests by acquiring Illumina. Illumina developed DNA sequencing technology that helps with cancer detection tests. FTC senior counsel Susan Musser pointed out that 'Grail is in an 'innovation race' to develop and market its early-detection test'.[8]

Antitrust policy makers recognize that the economic benefits of innovation can justify some anticompetitive conduct, as in *Microsoft*.[9] Conversely, antitrust policy makers can find conduct to be anticompetitive even if carried out by highly innovative firms.[10] The Department of Justice and eleven state Attorneys General considered innovation competition in their antitrust complaint against Google.[11] The complaint alleged that by favoring search advertising and its own products, Google excludes third parties because it 'raises their costs, reduces their competitiveness, and limits their incentive and ability to invest in innovations that could be attractive to users'.[12] The complaint against Google expressed concerns that the company's 'anticompetitive practices harm competition and consumers, reducing the ability of innovative new companies to develop, compete, and discipline Google's behavior'.[13] The House of Representatives offered legislative proposals collectively titled 'A Stronger

Majumdar, Octavian Carare and Hsihui Chang, 'Broadband Adoption and Firm Productivity: Evaluating the Benefits of General Purpose Technology' (2010) 19(3) Industrial and Corporate Change 641.

7 *In the Matter of Illumina, Inc, A Corporation and GRAIL, Inc*, Docket No 9401, 2021 <https://www.ftc.gov/system/files/documents/cases/redacted_administrative_part_3_complaint_redacted.pdf> accessed 14 May 2022, ('Illumina, the dominant provider of DNA sequencing, proposes to acquire Grail. If consummated, the Acquisition would substantially lessen competition in the U.S. multi-cancer early detection ("MCED") test market by diminishing innovation and potentially increasing prices and reducing the choice and quality of MCED tests. In other words, it is likely to harm U.S. consumers.').

8 Mike Scarcella, 'FTC Urges Judge to Unwind $7.1 bln Illumina-Grail Merger' (*Reuters*, 24 August 2021) <https://www.reuters.com/legal/transactional/ftc-urges-judge-unwind-71-bln-illumina-grail-merger-2021-08-24/> accessed 14 May 2022.

9 *United States v Microsoft Corp* (hereafter *Microsoft*), 253 F.3d 34 (DC Cir 2001).

10 *United States v Google LLC* (20 October 2020) <https://www.justice.gov/opa/press-release/file/1328941/download> accessed 14 May 2022, '(action under Section 2 of the Sherman Act, 15 U.S.C. § 2, to restrain Google LLC (Google) from unlawfully maintaining monopolies in the markets for general search services, search advertising, and general search text advertising in the United States through anticompetitive and exclusionary practices, and to remedy the effects of this conduct.'). See also *United States v Google LLC* and *State of Colorado v Google LLC*, Joint Status Report <https://www.justice.gov/atr/case-document/file/1463606/download> accessed 14 May 2022.

11 Justice Department Sues Monopolist Google for Violating Antitrust Laws, 20 October 2020 <https://www.justice.gov/opa/pr/justice-department-sues-monopolist-google-violating-antitrust-laws> accessed 14 May 2022.

12 DOJ Complaint, 54 <https://www.justice.gov/opa/press-release/file/1328941/download> accessed 14 May 2022.

13 DOJ, Justice Department Sues Monopolist Google for Violating Antitrust Laws, Press Release, 20 October 2020 <https://www.justice.gov/opa/pr/justice-department-sues-monopolist-google-violating-antitrust-laws> accessed 14 May 2022.

Online Economy: Opportunity, Innovation, Choice' to address market power in the digital marketplace with an implicit focus on Amazon, Apple, Facebook, and Google.[14] One of the bills, the Platform Competition and Opportunity Act, states as its purpose '[t]o promote competition and economic opportunity in digital markets by establishing that certain acquisitions by dominant online platforms are unlawful'.[15]

Antitrust policy makers unfortunately approach many of these twenty-first century technological challenges with a twentieth century economics toolbox. The early economics background of antitrust is well known. Antitrust policy relied on perfect and imperfect competition models. Antitrust policy applied the structure–conduct–performance (SCP) paradigm that mechanically predicted competitive conduct and industry performance based on market structure, that is, the number and size of firms.[16] The Chicago School challenged this approach based on economic efficiency, as illustrated by Robert Bork's highly influential book The Antitrust Paradox.[17] Applications of game theory in the field of Industrial Organization (IO) offered a better understanding of imperfect competition in the 1980s.[18] My 1989 book Regulation and Markets examined implications of advances in IO for the design of regulatory and antitrust policy.[19] Empirical studies of IO beginning in the 1990s provided antitrust policy makers with advanced techniques for estimating the effects of market power, product differentiation, market entry, and mergers.[20]

Antitrust policy cannot properly evaluate innovation competition with traditional economic concepts based only on price competition and stationary technology. Antitrust policy can cause significant efficiency losses by giving more weight to short-term consumer welfare effects and less weight to larger long-term economic benefits of innovation. To better address innovation competition, antitrust policy should reduce its reliance on the twin economic frameworks of perfect competition and imperfect competition. The perfect competition framework imposes an unrealistic ideal standard of conduct that assumes price-taking behavior and static technology. The imperfect competition framework provides inaccurate guidance based on

14 This refers to five bills drafted by the House of Representatives Antitrust Subcommittee <https://www.congress.gov/member/david-cicilline/C001084?q=%7B%22sponsorship%22%3A%22cosponsored%22%7D&pageSize=100&page=2> accessed 14 May 2022. See also House Lawmakers Release Anti-Monopoly Agenda for 'A Stronger Online Economy: Opportunity, Innovation, Choice', 11 June 2021 <https://cicilline.house.gov/press-release/house-lawmakers-release-anti-monopoly-agenda-stronger-online-economy-opportunity> accessed 14 May 2022.

15 'A Stronger Online Economy: Opportunity, Innovation, Choice', ibid.

16 See Joe S Bain, 'Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936–1940' (1951) 65(3) Quarterly Journal of Economics 293; Joe S Bain, *Barriers to New Competition* (Harvard University Press 1956).

17 Robert H Bork, *The Antitrust Paradox: A Policy at War with Itself* (Free Press 1978).

18 For an overview, see the textbook Jean Tirole, *The Theory of Industrial Organization* (MIT Press 1988).

19 Daniel F Spulber, *Regulation and Markets* (MIT Press 1989).

20 Timothy F Bresnahan, 'Empirical Studies of Industries with Market Power' in Richard Schmalensee and Robert D Willig (eds), *Handbook of Industrial Organization*, vol 2 Richard Schmalensee and Robert D. Willig (North Holland) 1011–57; Timothy F Bresnahan, and Peter C Reiss, 'Entry and Competition in Concentrated Markets' (1991) 99(5) Journal of Political Economy 977. Dennis W Carlton, 'The Relevance for Antitrust Policy of Theoretical and Empirical Advances in Industrial Organization' (2003) 12 George Mason Law Review 47.

IO models of short-term price competition, again without technological change. Antitrust policy makers cannot treat innovation competition by analogy to price competition, that is, by relabeling innovations as competitive or predatory.[21] Antitrust policy makers cannot fix this problem simply by citing Joseph Schumpeter's classic works on innovation.[22]

The shortcomings of these frameworks have led to criticism of the use of economic analysis in antitrust policy. Lina Khan, now Chairman of the Federal Trade Commission (FTC), states 'the current framework in antitrust—specifically its equating competition with 'consumer welfare', typically measured through short-term effects on price and output—fails to capture the architecture of market power in the twenty-first century marketplace'.[23] Advocates of neo-Brandeisian antitrust target big tech and mergers, echoing past characterizations of large firms as 'the curse of bigness'.[24] Tim Wu argues that the Chicago School's 'focus on "allocative efficiency" yielded almost no consideration of the "dynamic" costs of monopoly, like stagnation or stalled innovation.[25] As Daniel Sokol points out, however, 'a structural fix like Wu recommends would hurt innovation'.[26] Antitrust enforcement that abandons economic analysis protects neither competition nor innovation.

Antitrust policy makers should apply twenty-first century advances in the Economics of Technology & Innovation.[27] The present discussion of the Economics of Technology & Innovation is not meant to be complete, but rather seeks to suggest some important concepts that are helpful for antitrust policy. Innovation competition generates new forms of competitive and anticompetitive conduct. Competitive conduct involves creative non-price instruments that implement technological change. Innovation competition occurs when companies introduce something new to the marketplace, improving transaction methods, product features, and production processes.

21 See also Michael L Katz and Howard A Shelanski, '"Schumpeterian" Competition and Antitrust Policy in High-Tech Markets' (2005) 14 Competition 47; Christian Ewald, 'Competition and Innovation: Dangerous "Myopia" of Economists in Antitrust?' (2008) 4 Competition Policy International 253; Herbert Hovenkamp, 'Schumpeterian Competition and Antitrust' (2008) 4 Competition Policy International 273; Thomas K McCraw, 'Joseph Schumpeter on Competition' (2008) 4 Competition Policy International 309; Richard Gilbert and Doug Melamed, 'Innovation Under Section 2 of the Sherman Act' (2021) 84 Antitrust Law Journal 1.

22 Joseph A Schumpeter, *The Theory of Economic Development* (Harvard University Press 1934; new edition, Routledge 1980); Joseph A Schumpeter, *Capitalism, Socialism and Democracy* (Harper Perennial 1976 (1942)).

23 Lina M Khan, 'Amazon's Antitrust Paradox' (2016) 126 Yale Law Journal 710.

24 Tim Wu, *The Curse of Bigness: Antitrust in the New Guilded Age* (New Yori, Columbia Global Reports 2018). Tim Wu was named as Special Assistant to the President for Technology and Competition, see Lauren Feine, 'Big Tech Critic Tim Wu Joins Biden Administration to Work on Competition Policy' (*CNBC*, 5 March 2021) <https://www.cnbc.com/2021/03/05/big-tech-critic-tim-wu-joins-biden-administration-to-work-on-competition-policy.html> accessed 14 May 2022.

25 Wu, ibid 90.

26 D Daniel Sokol, 'Antitrust's "Curse of Bigness" Problem' (2020) 118 (6) Michigan Law Review1259.

27 See for example, Journal of Economics & Management Strategy, 2014, Special Issue on Innovation Economics, 23(1), Spring; Journal of Economics & Management Strategy, 2015, Special Issue on Innovation Economics II, 24(2), Summer; Journal of Economics & Management Strategy, 2018, Special Issue: Innovation Economics III: Patents, Trademarks, and Technology Standards Datasets, 27(3), Fall.

Economic analysis can be applied to consider the relationship between innovation competition and antitrust enforcement.[28] Economic analysis identifies how the extent of the market determines the quality of innovation.[29] Economic models examine how firms compete through R&D.[30] Innovation competition frameworks address competition among inventors and the creation of IP.[31] Innovation competition frameworks also include the explosion of the literature on digital platforms and two-sided markets.[32] Innovation competition frameworks recognize that firms are not outside the economy but rather are established by entrepreneurs, as I explain in The Theory of the Firm.[33] Innovative entrepreneurs generate startups and establish firms when incumbent firms experience inertia that limits innovation.[34] Innovative entrepreneurs also are necessary when there are significant costs of transferring IP and inventors have tacit knowledge.[35] Innovation competition frameworks acknowledge the critical importance of IP and technology markets.[36] Innovation competition frameworks include economic models of technology standards and standards development organizations (SDOs).[37]

In the present discussion, I examine various areas in which economic frameworks can help antitrust policy makers address innovation competition. First, antitrust policy makers should consider economic models that better identify anticompetitive conduct

28 Ilya Segal and Michael D Whinston, 'Antitrust in Innovative Industries' (2007) 97 American Economic Review 1703; Daniel F Spulber, 'Consumer Coordination in the Small and in the Large: Implications for Antitrust in Markets with Network Effects' (2008) 4 Journal of Competition Law and Economics 207; Daniel F Spulber, 'Unlocking Technology: Antitrust and Innovation'(2008) 4(4) Journal of Competition Law and Economics 915; Daniel F Spulber, 'Competition Policy and the Incentive to Innovate: The Dynamic Effects of Microsoft v. Commission' (2008) 25(2) Yale Journal on Regulation 247; Daniel F Spulber and Christopher Yoo, 'Antitrust, the Internet, and the Economics of Networks' in Roger Blair and Daniel D Sokol (eds) *Oxford Handbook of International Antitrust Economics*, vol 1 (OUP 2014) 380–403.

29 Daniel F Spulber, 'Innovation and International Trade in Technology' (2008) 138 Journal of Economic Theory 1–20; Daniel F Spulber, 'The Quality of Innovation and the Extent of the Market' (2010) 80 Journal of International Economics 260.

30 Glenn C Loury, 'Market Structure and Innovation' (1979) 93 The Quarterly Journal of Economics 395; Tom Lee and Louis L Wilde, 'Market Structure and Innovation: A Reformulation' (1980) 94(2) Quarterly Journal of Economics 429; Michael R Baye and Heidrun C Hoppe 'The Strategic Equivalence of Rent-Seeking, Innovation, and Patent-Race Games' (2003) 44(2) Games and Economic Behavior 217; Suzanne Scotchmer, *Innovation and Incentives* (MIT Press 2004); Ashish Arora, Andrea Fosfuri and Alfonso Gambardella, *Markets for Technology: The Economics of Innovation and Corporate Strategy* (MIT Press 2004).

31 Daniel F Spulber, 'Competing Inventors and the Incentive to Invent' (2013) 22(1) Industrial and Corporate Change 33, Daniel F Spulber, 'How Do Competitive Pressures Affect Incentives to Innovate when there is a Market for Inventions?' (2013) 121(6) Journal of Political Economy 1007.

32 Spulber (n 2); Alexei Alexandrov, George Deltas and Daniel F Spulber, 'Competition and Antitrust in Two-Sided Markets' (2011) 7(4) Journal of Competition Law and Economics 775.

33 Daniel F Spulber, *The Theory of the Firm: Microeconomics with Endogenous Entrepreneurs, Firms, Markets, and Organizations* (CUP 2009).

34 Daniel F Spulber, *The Innovative Entrepreneur* (CUP 2014).

35 Daniel F Spulber, 'How Entrepreneurs Affect the Rate and Direction of Inventive Activity' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited, National Bureau of Economic Research (NBER)* (University of Chicago Press 2012) 277–315; Daniel F Spulber, 'Tacit Knowledge with Innovative Entrepreneurship' (2012) 30(6) International Journal of Industrial Organization 641.

36 Daniel F Spulber, *The Case for Patents* (World Scientific Publishing Company 2021).

37 Daniel F Spulber, 'Innovation Economics: Technology Standards, Competitive Conduct and Economic Performance' (2013) 9(4) Journal of Competition Law and Economics 777; Daniel F Spulber, 'Antitrust Policy toward Standards' (2016) 1(3) Antitrust Chronicle, Competition Policy International 37.

and help evaluate the benefits and costs of technological change. Companies compete by developing transaction methods that lower transaction costs and improve market performance. Companies also compete by creating improved product features to achieve vertical product differentiation. In addition, companies compete by implementing more efficient production processes to achieve cost advantages.

Secondly, antitrust policy makers should apply new developments in the economics of innovation by better understanding how IP affects innovation competition. Antitrust and IP policies have been at odds for well over a century.[38] Innovation competition helps reconcile the seemingly inconsistent objectives of promoting competition and promoting innovation. With innovation competition, promoting competition increases innovation and promoting innovation increases competition. Maximizing consumer welfare and economic efficiency demands greater coordination between Antitrust and IP. Harmonizing Antitrust and IP requires more than finding an optimal trade-off between competition and innovation. Antitrust should recognize that IP protections are procompetitive rather than sources of market power. Antitrust enforcement should be strengthened by addressing IP infringement as anticompetitive conduct.

Thirdly, antitrust merger policy should not simply consider the effects of mergers on market shares or investment in R&D. Antitrust policy should apply economic models that consider how mergers affect innovation competition and technological change. Economic analysis of the effects of competition on innovation can be adapted to evaluate how mergers affect incentives to invent and to innovate. When competition increases incentives to innovate, then mergers may adversely affect innovation. However, when competition decreases incentives innovate, mergers may be beneficial for innovation, generating greater consumer benefits over time. The Horizontal Merger Guidelines (HMGs) highlight innovation competition and mention innovation twenty times.[39] The HMGs consider how competition affects incentives to innovate and whether mergers will affect innovation by combining complementary capabilities.[40]

38 Willard K Tom and Joshua A Newberg, 'Antitrust and Intellectual Property: From Separate Spheres to Unified Field' (1998) 66 Antitrust Law Journal 167, 178, 170. ('Beginning with the *Bathtub* case in 1912 and the *Motion Picture Patents* case in 1917, the Supreme Court expressly recognized that intellectual property rights are subject to the "general law," including the "positive prohibitions" of the Sherman Act. For most of the period from then until the mid-1970s, there was a perceived tension between the two bodies of law.') The 'Nine No Nos' of patent licensing were articulated by Bruce B Wilson, *Patent and Know-How License Agreements: Field of Use, Territorial, Price and Quantity Restrictions, Address Before the Fourth New England Antitrust Conference* (6 November 1970) and continue into the 1990s, see Tom and Newberg, ibid. Sheila F Anthony, 'Antitrust and Intellectual Property Law: From Adversaries to Partners' (2000) 28(1) AIPLA Quarterly Journal 1, 4. ('For much of this century, courts and federal agencies regarded patents as conferring monopoly power in a relevant market.')

39 DOJ and the Federal Trade Commission (FTC), 'Horizontal Merger Guidelines' 19 August, 2010 <https://www.justice.gov/atr/merger-enforcement> accessed 14 May 2022.

40 HMGs, ibid 23–24. ('The Agencies evaluate the extent to which successful innovation by one merging firm is likely to take sales from the other, and the extent to which post-merger incentives for future innovation will be lower than those that would prevail in the absence of the merger. The Agencies also consider whether the merger is likely to enable innovation that would not otherwise take place, by bringing together complementary capabilities that cannot be otherwise combined or for some other merger-specific reason.')

The Vertical Merger Guidelines (VMGs), however, mention innovation only once. The VMGs consider whether unilateral foreclosure or raising rivals' costs would deter innovation.[41] This suggests the need for additional consideration of economic analysis of innovation competition in vertical mergers. The FTC withdrew the 2020 VMGs in 2021, highlighting the 'VMGs' flawed discussion of the purported procompetitive benefits (i.e., efficiencies) of vertical mergers, especially its treatment of the elimination of double marginalization ("EDM"), could become difficult to correct if relied on by courts'.[42]

The discussion is organized as follows. Section II finds that economic models of perfect competition and imperfect competition do not provide effective standards of competitive conduct for antitrust policy. Section III examines how economic frameworks that address innovation competition can provide antitrust policy with standards of competitive conduct. Section IV examines the relationship between antitrust and IP. Section V examines some implications of innovation competition for merger policy. Section VI concludes the discussion.

II. PERFECT COMPETITION, IMPERFECT COMPETITION, AND COMPETITIVE CONDUCT

Evaluating competitive and anticompetitive conduct is fundamental for antitrust policy. I begin by emphasizing that the textbook ideal of perfect competition does not provide an appropriate standard for conduct when evaluating innovation competition. Next, I explain why the textbook alternative of imperfect competition also does not provide an appropriate standard for anticompetitive conduct with innovation competition. The discussion suggests that economic analysis of innovation competition can be characterized as 'post-Industrial-Organization' economics. This reflects the shift from basic manufacturing toward knowledge creation that has been termed the 'post-industrial society'.[43]

41 DOJ and FTC, 'Vertical Merger Guidelines' 30 June 2020 <https://www.ftc.gov/system/files/documents/reports/us-department-justice-federal-trade-commission-vertical-merger-guidelines/vertical_merger_guidelines_6-30-20.pdf> accessed 14 May 2022, ('In identifying whether a vertical merger may diminish competition due to unilateral foreclosure or raising rivals' costs, the Agencies generally consider whether the following conditions are satisfied: (1) *Ability*: By altering the terms by which it provides a related product to one or more of its rivals, the merged firm would likely be able to cause those rivals (a) to lose significant sales in the relevant market (for example, if they are forced out of the market; if they are deterred from innovation, entry, or expansion, or cannot finance those activities; or if they have incentives to pass on higher costs through higher prices) or (b) to otherwise compete less aggressively for customers' business.') Emphasis in original.

42 Statement of Chair Lina M Khan, Commissioner Rohit Chopra, and Commissioner Rebecca Kelly Slaughter on the Withdrawal of the Vertical Merger Guidelines, Commission File No P810034, 15 September 2021, United States Federal Trade Commission, Washington, DC, <https://www.ftc.gov/system/files/documents/public_statements/1596396/statement_of_chair_lina_m_khan_commissioner_rohit_chopra_and_commissioner_rebecca_kelly_slaughter_on.pdf> accessed 14 May 2022. See also Statement of FTC Chair Lina Khan and Antitrust Division Acting Assistant Attorney General Richard A Powers on Competition Executive Order's Call to Consider Revisions to Merger Guidelines (9 July 2021) <https://www.ftc.gov/news-events/press-releases/2021/07/statement-ftc-chair-lina-khan-antitrust-division-acting-assistant> accessed 14 May 2022.

43 The term 'post-industrial society', referring to the shift from manufacturing to a service economy, is due to Daniel Bell, *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (1999 edn, Basic Books 1973). Daniel Bell observes that a 'post-industrial society rests on a knowledge theory of value.

Perfect competition as a standard for competitive conduct

The perfect competition approach can work well if technological change is limited but it is otherwise misleading because it misses non-price effects of innovation. This section argues that the perfect competition framework cannot serve as a guide to antitrust policy when firms engage in innovation competition. The perfect competition framework offers an unrealistic standard of conduct because it is frozen in time. Transactions are costless so there is no transaction innovation. Firms take their products as given because there is no product innovation. Firms are described fully by a changeless production technology, so there is no process innovation. Firms do not operate organizations so business management is absent and there is no business method innovation. Firms maximize profit by making input and output decisions guided solely by market prices, so there is no need for competitive strategy.

Antitrust traditionally has evaluated competitive conduct and market performance mostly in terms of price competition alone. Price competition has formed the basis for antitrust policy toward monopolization, collusion, and IP licensing. Antitrust based solely on price competition views market power as the ability to raise prices. Antitrust based on price competition defines market conduct and performance in comparison to competitive pricing and production costs. Price competition often guides antitrust policy toward horizontal and vertical mergers. Price competition also underlies antitrust policy toward digital platforms and two-sided markets. For example, *American Express* states 'The plaintiffs stake their entire case on proving that Amex's agreements increase merchant fees'.[44]

The perfect competition framework often serves as the main criterion for judging competitive conduct. The Chicago School of antitrust was built on neoclassical price theory.[45] The perfect competition framework, however, presumes that the economy is static and so fails to capture the dynamic aspects of technological change. Applying conduct criteria based on the perfect competition framework is subject to policy errors. The result will be to classify some procompetitive conduct as anticompetitive and some anticompetitive conduct as procompetitive.

The perfect competition framework often is said to describe a market with many small firms producing homogeneous products and taking prices as given. Although this can occur in some markets, this should not serve as a universal benchmark for antitrust. As Friedrich Hayek observes '[i]n conditions where we can never have many people offering the same homogeneous product or service, because of the ever-changing character of our needs and our knowledge, or of the infinite variety of

Knowledge is the source of invention and innovation.' Bell ibid xvii. (Knowledge 'creates value-added and increasing returns to scale and is often capital-saving in that the next substitution . . . uses less capital and produces a more than proportional gain in output').

44 *Ohio v American Express Co*, 585 U.S. (2018) (hereafter *American Express*). On platforms and product quality, see Maurice E Stucke and Ariel Ezrachi, 'When Competition Fails to Optimize Quality: A Look at Search Engines' (2016) 18 Yale Journal on Law and Technology 70.

45 Richard A Posner, 'The Chicago School of Antitrust Analysis' (1979) 127(4) University of Pennsylvania Law Review 925, 928. ('I believe Director's conclusions resulted simply from viewing antitrust policy through the lens of price theory.'); Joshua D Wright, 'Abandoning Antitrust's Chicago Obsession: The Case for Evidence-Based Antitrust' (2012) 78 Antitrust LJ 241. ('The first defining characteristic of the Chicago School is a rigorous application of economic theory, especially neoclassical price theory, to problems of antitrust analysis.')

human skills and capacities, the ideal state cannot be one requiring an identical character of large numbers of such products and services'.[46]

Perfect competition is a central description of markets in neoclassical economic theory.[47] As its name indicates, it is a theoretical ideal rather than a practical description of competition. In the basic setting, there are two types of economic agents: consumers and firms. Perfect competition describes consumers in terms of their utility functions and initial endowments and the number of consumers does not change. Consumers take prices as given and choose their consumption to maximize their utility subject to their budget constraint.

Perfect competition offers an unrealistic description of the competitive conduct of firms. Firms take prices as given and choose inputs and outputs to maximize profit subject to technological constraints.[48] With perfect competition, firms are said to have zero market power.[49] Firms rely exclusively on the information provided by market prices. Firms are not constrained in selling output or purchasing inputs so there is no need for business functions such as procurement, marketing, or sales.

The perfect competition framework provides a highly stylized view of markets. Markets are established once and for all and so the number of markets does not change. There is only one homogeneous product in each market. Transactions are costless and frictionless. A hypothetical auctioneer selects market prices to balance supply and demand. In the 'general equilibrium' version, the hypothetical auctioneer chooses prices that balance supply and demand throughout the entire economy.

The perfect competition framework suggests that zero market power should be a policy objective. The typical definition of market power is the ability of a firm to raise its prices. A firm is said to have market power if the firm can directly change its prices or indirectly change its prices by decreasing its output. Because firms take the market price as given and so do not choose prices, they have no market power in the perfect competition setting. This provides a highly questionable benchmark for competitive conduct. In practice, even the smallest firm can choose its prices or affect its prices through decisions regarding output, quality, marketing, and sales.

For a given number of firms, perfect competition identifies the ideal market price. For given prices of inputs, costs then depend on the quantity of output produced. In

46 Friedrich A Hayek, 1984, Stafford Little Lecture delivered at Princeton University on May 20, 1946, published in Friedrich A Hayek, *Individualism and Economic Order* (University of Chicago Press 1948) 92–106, reprinted in Econ Journal Watch Scholarly Comments on Academic Economics, 13, Issue 2, May 2016.

47 Alfred Marshall, Principles of Economics (8th edn, Macmillan and Co 1920) Online Library of Liberty; Léon Walras, *Elements of Theoretical Economics: Or, The Theory of Social Wealth* [Éléments d'économie politique pure, ou Théorie de la richesse sociale, 1896] (3rd edn, CUP 2014). K Arrow and F Hahn, *General Competitive Analysis* (Holden-Day 1971). G Debreu, *Theory of Value: An Axiomatic Analysis of Economic Equilibrium*, Cowles Foundation Monographs Series (Yale University Press 1972); Andreu Mas-Colell, Michael D Whinston and Jerry R Green, *Microeconomic Theory* (OUP 1995) 691–93.

48 Joan Robinson, 'What is Perfect Competition?' (1934) 49(1) The Quarterly Journal of Economics 104. ('By perfect competition I propose to mean a state of affairs in which the demand for the output of an individual seller is perfectly elastic.')

49 George J Stigler, 'Perfect Competition, Historically Contemplated' (1957) 65(1) Journal of Political Economy 1. ('If we were free to redefine competition at this late date, a persuasive case could be made that it should be restricted to meaning the absence of monopoly power in a market.').

the perfect competition setting, firms choose outputs such that their marginal cost of production equals the market price. This means that prices will equal marginal cost for every firm after the market has reached equilibrium. As a result, the perfect competition framework suggests that the performance criterion for each firm should be that price equals marginal cost.

The perfect competition framework offers a stylized model of free entry.[50] The framework assumes that firms do not face barriers to entry into the market. With 'free entry', firms enter until each earns zero profit. Because firms break even, their average cost equals the market price for their output. So, free entry implies that market prices equal average costs of producers.

The perfect competition free entry assumption provides the basis for antitrust performance criteria. According to these criteria, firms should approach break even and prices should equal average costs. Firms cannot influence prices, whether through output restrictions, product improvements, improved manufacturing, or transaction techniques. Production processes are immutable, as if the Industrial Revolution or later technological progress had not occurred.

The elements of the perfect competition setting do not provide a useful description of the economy. The perfect competition setting does not require entrepreneurship to create startups or establish new firms. In practice, entrepreneurs and managers of existing firms create startups and establish new firms.[51] The perfect competition setting does not consider firms as organizations. In practice, firms develop and manage organizations, with objectives, hierarchies, incentives, and relationships.[52] The perfect competition setting assumes that markets already exist and operate mechanically. In practice, managers of firms or associations of firms establish and operate markets.[53]

Imperfect competition as a standard for competitive conduct

Antitrust policy has applied imperfect competition as a standard for determining the absence of competitive conduct. Perfect and imperfect competition were viewed as an exhaustive classification of conduct. As with perfect competition, however, the imperfect competition framework does not address competitive conduct fully because it typically presumes a static economy without technological change. Using imperfect competition as a standard for competitive conduct also will lead to policy errors when there is innovative competition. This again can lead to classifying competitive conduct as anticompetitive and anticompetitive conduct as competitive.

As typically applied in antitrust, the perfect and imperfect competition frameworks have much in common. In addition to their focus on prices, both frameworks offer a snapshot of the industry. Neither framework addresses changes in transaction techniques, product features, or production processes. Firms do not engage in invention or innovation. There is no role for entrepreneurs or managers of organizations. In short, the perfect and imperfect competition frameworks are not well suited to address innovation competition.

50 Robinson (n 48).
51 Spulber (n 33).
52 ibid.
53 ibid.

As already noted, the standard definition of market power is the ability to affect prices. Antitrust policies traditionally contrast perfect and imperfect competition. Both frameworks revolve around prices. The basic difference is that with perfect competition firms take prices as given whereas with imperfect competition, producers have some power over price. Producers engaged in imperfect competition can either determine their prices directly or they can influence market prices by restricting their output. Greater competitive pressures move prices toward costs. This helps explain the antitrust focus on price competition.

The Sherman Act prohibitions against monopolization and collusion reflect the contrast between perfect competition and imperfect competition in a static economy without technological change. If a producer becomes a monopolist, the producer can choose the price of its products either directly or by restricting the output offered for sale. If a group of firms in a market engage in collusion to fix prices, then they can act collectively as a monopolist.

Imperfect competition has a long history. As early as 1776, Adam Smith considered monopolistic exclusion and restraints on competition.[54] The imperfect competition framework dates back at least to the Cournot model of 1838.[55] In Cournot's model, two firms offer homogeneous outputs and recognize the effects of their output on the market price. An important extension of Cournot's model considers the effects of increasing the number of firms. As the number of firms increases, the outputs of individual firms have less effect on the market price and the price approach firms' unit costs.[56]

In other words, with many firms the market begins to resemble perfect competition. This description of the imperfect competition framework formed the basis of the traditional 'structure-conduct-performance' approach to antitrust. According to this approach, a market with many small firms was perfectly competitive. With few firms, the market was concentrated and departed from the perfect competition ideal. So, a concentrated market structure implied monopolistic conduct, which in turn implied inefficient economic performance.[57] Using this simplistic but flawed approach, antitrust policy makers made predictions about firm conduct and industry performance simply by observing the number and size of firms. Measures of market concentration such as the Herfindahl index were used to predict conduct and performance.[58]

54 Neil Salvadori and Rodolfo Signorino, 'Adam Smith on Monopoly Theory. Making Good a Lacuna' (2014) 61(2) Scottish Journal of Political Economy 178.

55 Antoine Augustin Cournot, *Researches into the Mathematical Principles of the Theory of Wealth* (NT Bacon tr, Macmillan 1838 (1897)).

56 Stigler (n 49).

57 See Edward H Chamberlin, *The Theory of Monopolistic Competition* (8th edn, Harvard University Press 1965); Edward S Mason, *Economic Concentration and The Monopoly Problem* (Holiday House 1964); Joe S Bain, 'Relation of Profit Rate To Industry Concentration: American Manufacturing, 1936–1940' (1951) 65 Quarterly Journal of Economics 293; Joe S Bain, 'Barriers to New Competition: Their Character and Consequences in Manufacturing Industries' (Harvard University Press 1956); Joe S Bain, *Industrial Organization* (Chapman & Hall 1959).

58 See Carl Kaysen and Donald F Turner, *Antitrust Policy: An Economic and Legal Analysis* (Harvard University Press 1959); Harvey J Goldschmid, Harold M Mann and John F Weston, *Industrial Concentration: The New Learning* (Little Brown 1974); Leonard W Weiss, 'The Structure-Conduct-Performance Paradigm and Antitrust' (1979) 127 University of Pennsylvania Law Review 1104; Herbert J Hovenkamp, 'United States Competition Policy in Crisis: 1890–1955' (2009) 94 Minnesota Law Review 311.

Advances in economic analysis rendered the 'structure-conduct-performance' approach obsolete. Game theory, IO, and the 'Chicago School' shifted performance measures to competitive strategies and barriers to entry.[59] Policy makers recognized that market concentration and firm size were not in themselves indicators of market power. Market structure and competitive conduct affected each other and were jointly determined. Market structure alone could no longer serve as a reliable guidepost for antitrust policy.

Price competition offered a new basis for antitrust policy. This is because price competition broke the alleged causal link between market structure and competitive conduct. Even with two firms in the market, a price war would eliminate market power and drive prices toward unit costs.[60] Even with only one firm in the market, moreover, the threat of entry would be sufficient to eliminate market power and drive prices to unit costs.[61]

The antitrust contrast between perfect and imperfect competition has persisted. IO studies examined a wide variety of frictions including capacity constraints, product differentiation, search costs, switching costs, and asymmetric information.[62] Also, IO studies showed that entry costs can create barriers that diminish the threat of competitive entry. Frictions potentially reduce the beneficial effects of price competition on market power and industry performance. As a result, competing firms might choose prices greater than marginal cost. Market frictions support antitrust tests based on imperfect competition, including Critical Loss Analysis, the 'Small but Significant and Non-transitory Increase in Price' (SSNIP) Test, and upward pricing pressure (UPP). Application of these approaches has increased even with the appearance of online platforms that do not have positive prices. For example, Daniel Mandrescu notes that '[a]lthough there is no legal obligation to make use of the SSNIP test in the context of the market definition process, its growing importance in practice calls for exploring adjustment possibilities that would allow for the application of its logic even in the absence of positive prices'.[63]

Price–cost markups fail to capture the effects of innovation competition because they do not indicate technological change. Despite this fundamental problem, antitrust policy has emphasized the price–cost markup as an indicator of firm market

59 Richard A Posner, *Antitrust Law: An Economic Approach* (1st edn, University of Chicago Press 1976); Richard A Posner, 'The Chicago School of Antitrust Analysis' (1997) 127 University of Pennsylvania Law Review 925; Robert H Bork, *The Antitrust Paradox: A Policy at War with Itself* (Free Press 1978); Frank H Easterbrook, 'Vertical Arrangements and the Rule of Reason' (1984) 53 Antitrust Law Journal 135.

60 This was the great insight of Joseph Bertrand, Review of Walras's 'Théorie Mathématique de la richesse sociale' and Cournot's 'Recherches sur les principes mathématiques de la théorie des richesses' (James W Friedman tr, CUP 1883 (1988)).

61 The effect of firms competing to serve the market was recognized by Harold Demsetz, 'Why Regulate Utilities?' (1968) 11(1) The Journal of Law and Economics 55. On markets without entry barriers, see William J Baumol, John C Panzar and Robert D Willig, *Contestable Markets and the Theory of Industry Structure* (Harcourt Brace Jovanovich 1982).

62 For overviews, see Tirole (n 18); Spulber (n 19). See also Daniel F Spulber, 'Bertrand Competition when Rivals' Costs are Unknown' (1995) 43 Journal of Industrial Economics 1.

63 Daniel Mandrescu, 'The SSNIP Test and Zero-Pricing Strategies' (2018) 2 European Competition & Regulation Law Review 244, 245.

power and industry performance.[64] For example, John Kirkwood states '[m]arket power—the ability to raise price profitably above the competitive level—lies at the core of antitrust law, and by restructuring its determination, courts could increase the efficiency and accuracy of antitrust enforcement'.[65] Antitrust concern over the size of price–cost markups has grown due to empirical evidence of increasing markups in the US economy.[66]

Policy makers continue to rely on price–cost markups because they are relatively easy to measure. Prices typically are observable and average or marginal costs can be estimated. Price–cost markups also can be expressed as a relative markup, that is, the markup divided by the price (P—C)/P. A profit-maximizing monopolist chooses a relative markup equal to one divided by the elasticity of demand, which is known as the Lerner index of market power. Then, policy makers can simply observe the Lerner index an indicator of market power.

Price–cost markups are misleading for antitrust policy because they may indicate the presence of market power even when there is intense innovation competition. Antitrust policy based on price–cost markups relies on the perfect competition and imperfect competition frameworks. When there is technological change, price–cost markups generally do not provide accurate indicators of firm conduct or industry performance. The discussion in the next section will show why policy makers should consider different approaches to evaluating conduct and performance.

III. INNOVATION COMPETITION AND COMPETITIVE CONDUCT

Evaluating conduct with innovation competition poses a challenge to antitrust policy makers. As noted in the previous section, innovative competition involves conduct that may differ from both the traditional perfect competition and imperfect competition frameworks. This requires modifying antitrust standards for competitive conduct. Antitrust policy should apply economic frameworks that recognize both non-price competition and technological change. Non-price aspects of competitive conduct affect consumer welfare and economic efficiency. Innovation competition requires that antitrust policy makers take a dynamic perspective toward competitive conduct. This section considers how innovation competition in transaction methods, product features, and production processes affects standards for competitive conduct.

Innovation competition as a standard for competitive conduct

Innovation competition is likely to draw antitrust scrutiny for a variety of reasons. Technological change often generates new forms of competitive and anticompetitive conduct. Intense competition and rapidly growing firms draw the attention of consumers, investors, and public policy makers. Path-breaking technologies create

64 William M Landes and Richard A Posner, 'Market Power in Antitrust Cases' (1981) 94 Harvard Law Review 937. ('A simple economic meaning of the term 'market power' is the ability to set price above marginal cost.').

65 John B Kirkwood, 'Market Power and Antitrust Enforcement' (2018) 98 Boston University Law Review 1169.

66 Steven T Berry, Martin Gaynor and Fiona Scott Morton, 2019. 'Do Increasing Markups Matter? Lessons from Empirical Industrial Organization' (2019) 33(3) Journal of Economic Perspectives 44.

opportunities for new entrants and small and medium-sized enterprises (SMEs) and can foster new industries. The rapid diffusion of new technologies and the displacement of existing technologies may increase the growth rate of innovative firms. Technological progress can cause the decline or exit of less innovative firms. Many economic studies consider the effects of competition on incentives to innovate.[67]

Several high-profile antitrust cases illustrate how the courts have addressed innovation competition. As computers brought technological change in telecommunications, the *US v AT&T* decision points to the benefits of innovation competition.

> The decree will thus allow AT & T to become a vigorous competitor in the growing computer, computer-related, and information markets. Other large and experienced firms are presently operating in these markets, and there is therefore no reason to believe that AT & T will be able to achieve monopoly dominance in these industries as it did in telecommunications. At the same time, by use of its formidable scientific, engineering, and management resources, including particularly the capabilities of Bell Laboratories, AT & T should be able to make significant contributions to these fields, which are at the forefront of innovation and technology, to the benefit of American consumers, national defense, and the position of American industry vis-a-vis foreign competition.[68]

The entry of local exchange carriers (LECs) started new forms of competition in telecommunications and raised issues regarding access to elements of incumbent networks. Addressing these issues, the Supreme Court in *Trinko* observed that higher prices support the risk taking needed for innovation: '[t]he opportunity to charge monopoly prices—at least for a short period—is what attracts "business acumen" in the first place; it induces risk taking that produces innovation and economic growth'.[69]

67 See Jacob Schmookler, 'Bigness, Fewness, and Research' (1959) 67 Journal of Political Economy 628; Jacob Schmookler, 'Economic Sources of Inventive Activity' (1962) 22(1) Journal of Economic History 1; Zoltan J Acs and David Audretsch,'Innovation, Market Structure, and Firm Size' (1987) 69 Review of Economics and Statistics 567; Zoltan J Acs and David B Audretsch, 'Innovation in Large and Small Firms: An Empirical Analysis' (1988) 78 American Economic Review 678; Wesley M Cohen and Richard C Levin, 'Empirical Studies of Innovation and Market Structure' in Richard Schmalensee and Robert Willig (eds), *The Handbook of Industrial Organization*, vol 1 (North-Holland 1989) 1059–1107; John Sutton, *Technology and Market Structure: Theory and History* (MIT Press 1998);Ashish Arora, Andrea Fosfuri and Alfonso Gambardella, 'Markets for Technology and Their Implications for Corporate Strategy' (2001) 10(2) Industrial and Corporate Change 419; Daron Acemoglu and Joshua Linn, 'Market Size in Innovation: Theory and Evidence from the Pharmaceutical Industry' (2004) 119(3) Quarterly Journal of Economics 1049; Philippe Aghion and others, 'Competition and Innovation: An Inverted U Relationship' (2005) 120(2) Quarterly Journal of Economics 701. Xavier Vives, 'Innovation and Competitive Pressure' (2008) 56 Journal of Industrial Economics 419; Spulber 2008 (n 29), Spulber 2010 (n 29), Spulber 2013 (n 31).

68 *United States v American Tel and Tel Co*, 552 F. Supp 131 (DDC 1983) <https://law.justia.com/cases/federal/district-courts/FSupp/552/131/1525975/> accessed 14 May 2022.

69 *Verizon Communications Inc v Law Offices of Curtis V Trinko, LLP*, 540 US 398, 402 n 1 (2004) 407 (hereafter *Trinko*). See Daniel F Spulber and Christopher S Yoo, 'Mandating Access to Telecom and the Internet: The Hidden Side of *Trinko*' (2007) 107 (8) Columbia Law Review 1822–907.

Microsoft considered innovation competition in computer software.[70] The Appeals Court observed that innovation competition limits conduct remedies because it can make anticompetitive conduct obsolete and structural remedies may not work with technological change. The Appeals Court recognized that with technological change, competition for the market can displace products and standards.[71] The Appeals Court, however, continued to apply a market structure approach to conduct, rejecting competition from innovation in websites and handheld devices.[72] The Appeals Court cast doubt on investment in R&D as evidence of competition and suggested that R&D may be anticompetitive: 'innovation can increase an already dominant market share and further delay the emergence of competition, even monopolists have reason to invest in R&D'.[73] *Microsoft* stated that 'there is no consensus among commentators on the question of whether, and to what extent, current monopolization doctrine should be amended to account for competition in technologically dynamic markets characterized by network effects'. [74]

Innovation competition argues for a more complete 'rule of reason' analysis because basic price and market structure evidence is likely to be misleading with technological change. The potential benefits of innovation should be considered in evaluating the additional burdens of 'rule of reason' analysis for plaintiffs. *Microsoft* offers some principles that help address innovation competition. First, conduct must have an anticompetitive effect to be exclusionary.[75] Secondly, the burden of proof rests on the plaintiff, whether a private party or the government. Thirdly, even if the plaintiff demonstrates anticompetitive conduct, the monopolist can offer a competitive justification if innovations lead to 'greater efficiency or enhanced consumer appeal'.[76] Finally, the 'rule of reason' applies, 'the plaintiff must demonstrate that the anticompetitive harm of the conduct outweighs the procompetitive benefit'.[77]

70 *Microsoft* (n 9). ('Conduct remedies may be unavailing in such cases, because innovation to a large degree has already rendered the anticompetitive conduct obsolete (although by no means harmless). And broader structural remedies present their own set of problems, including how a court goes about restoring competition to a dramatically changed, and constantly changing, marketplace.')

71 *Microsoft*, ibid ('In technologically dynamic markets, however, such entrenchment may be temporary, because innovation may alter the field altogether.') The court cites Demsetz (n 68), and Schumpeter (n 22).

72 *Microsoft* ibid ('The structural approach, as applied by the District Court, is thus capable of fulfilling its purpose even in a changing market.')

73 ibid.

74 ibid.

75 ibid ('From a century of case law on monopolization under § 2, however, several principles do emerge. First, to be condemned as exclusionary, a monopolist's act must have an "anticompetitive effect." That is, it must harm the competitive process and thereby harm consumers. In contrast, harm to one or more competitors will not suffice.'

76 *Microsoft* ibid ('Third, if a plaintiff successfully establishes a prima facie case under §2 by demonstrating anticompetitive effect, then the monopolist may proffer a "procompetitive justification" for its conduct. See Eastman Kodak, 504 U.S. at 483, 112 S.Ct. 2072. If the monopolist asserts a procompetitive justification—a nonpretextual claim that its conduct is indeed a form of competition on the merits because it involves, for example, greater efficiency or enhanced consumer appeal—then the burden shifts back to the plaintiff to rebut that claim.')

77 *Microsoft* ibid.

Non-price instruments such as product quality, reliability, interoperability, and consumer privacy are important aspects of competitive conduct.[78] Innovation competition generates product differentiation that can improve consumer welfare even if it increases prices and market concentration. Innovation competition offers improved production processes and transaction efficiencies that can also improve consumer welfare and yet increase market concentration. Innovation competition can involve fundamental changes in competitive strategies and business models. Innovation competition can restrict competition by limiting access to data or violating data privacy. Innovation competition can generate anticompetitive restraints by affecting access to platforms and incentives to participate on platforms. These types of restraints may appear consistent with price competition and yet decrease consumer welfare.

Antitrust policy should recognize that innovation competition takes time. This limits policy makers' ability to use short-term indicators of competitive and anticompetitive conduct. Short-term measures of conduct that might be used with price competition could be misleading for innovation competition. Longer term measures of conduct provide a better picture of conduct. The relevant time frame for public policy will depend on the industry, technology, and significance of the innovation. Evaluating competition using static tools not only risks failure to identify competitive conduct, but also risks discouraging innovation. Einar Elhauge observes that the Courts' 'inability to distinguish desirable from undesirable conduct will chill desirable conduct by monopolists or-worse-firms aspiring to become monopolists through innovation or investments, which are probably the greatest engine for economic progress'.[79]

Innovation competition is an evolutionary process because it goes through four stages: (i) discovery of knowledge, (ii) creation of inventions, (iii) application of inventions to innovation, and (iv) adoption of innovations by consumers and firms. Activities at each of these stages contribute to the economic value at later stages. These activities can take place both within and outside a firm. Even though firms increasingly participate in markets for technology, innovation competition is not confined to specialized markets but takes place in every type of market.

Innovation competition begins with discovery as firms carry out basic research, gather market intelligence, and provide employee education and training. R&D requires time to design and perform experiments, gather data, interpret the data, and apply the knowledge. Acquiring and applying knowledge necessarily involves trial and error. Firms engaged in discovery may produce major advances in science and technology. The knowledge that firms obtain, however, need not be useful, novel, or nonobvious. Firms engaged in innovation competition generate, anticipate, and respond to new scientific and technological information. These decisions depend on the rate and direction of technological change and the pace of innovation by rival

78 Makan Delrahim, Assistant Attorney General, US Dep't of Justice Antitrust Div, Remarks for the Antitrust New Frontiers Conference (11 June 2019) <https://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-antitrust-new-frontiers> accessed 14 May 2022.

79 Einer Elhauge, 'Defining Better Monopolization Standards' (2003) 56(2) Stanford Law Review 253.

firms.[80] These decisions also depend on adoption of technologies by rival firms and diffusion of technologies throughout the economy.

Antitrust traditionally evaluates competitive conduct in a 'full information' world. In an economy without innovation, firms know their own technologies and those of their rivals, suppliers, and distributors. Firms also know the characteristics and preferences of their customers. Public policy makers are also fully informed about the technology of firms and customer preferences. The 'full information' world allows the application of simplistic performance criteria such as price–cost margins.

Hayek observes that competition is a 'discovery procedure' that provides information about the conduct of companies.[81] For Hayek, competition reveals the actions and activities that constitute conduct. Hayek points out that competition 'can only be justified by our not knowing the essential circumstances that determine the behavior of the competitors'.[82] Hayek distinguishes between the transitory information provided by competition and the more permanent information provided by science. Companies do not know in advance the competitive strategies of their competitors, including prices, products, manufacturing processes, distribution, marketing, transaction methods, and employee compensation. Competition helps reveal information about firms' technologies including product features and production costs.[83]

Innovation competition offers a more fundamental 'discovery procedure'. Innovation competition generates much more than information about the strategies and conduct of competitors. Innovation competition resolves not only market uncertainty but also technological uncertainty. Companies address and resolve uncertainty through scientific inquiry and technological implementation. Firms apply discoveries of basic knowledge to generate additional knowledge.[84] Innovation competition reveals information about scientific and technological change. Innovation competition does more than provide unobserved information within the frontiers of knowledge. Innovation competition extends scientific and technological frontiers.

80 Prajit K Dutta, Saul Lach and Aldo Rustichini, 'Better Late than Early: Vertical Differentiation in the Adoption of a New Technology' (1995) 4(4) Journal of Economics & Management Strategy 563. See also John Beath, Yannis Katsoulacos and David Ulph, 'Sequential Product Innovation and Industry Evolution' (1987) 97 The Economic Journal 32; Stephanie Rosenkranz, 'Innovation and Cooperation under Vertical Product Differentiation' (1995) 13(1) International Journal of Industrial Organization 1. For sequential adoption with horizontal product differentiation, see Yongmin Chen and Marius Schwartz, 'Product Innovation Incentives: Monopoly vs. Competition' (2013) 22(3) Journal of Economics & Management Strategy 513; K Sridhar Moorthy, 'Product and Price Competition in a Duopoly' (1988) 7 Marketing Science 141.

81 Friedrich A Hayek, 'Competition as a Discovery Procedure' (1968) 5 Quarterly Journal of Austrian Economics 9 (Marcellus S Snow tr, 2002) in his: 'New Studies in Philosophy, Politics, Economics and the History of Ideas' 179–90, 10. ('competition is important only because and insofar as its outcomes are unpredictable and on the whole different from those that anyone would have been able to consciously strive for; and that its salutary effects must manifest themselves by frustrating certain intentions and disappointing certain expectations.').

82 Hayek ibid 10.

83 Spulber (n 62).

84 On the knowledge production function, see Zvi Griliches, 'Issues in Assessing the Contribution of Research and Development to Productivity Growth' (1979) 10(1) The Bell Journal of Economics10(No. 1) 92. Zvi Griliches, 'Patent Statistics as Economic Indicators: A Survey' (1990) 28(4) Journal of Economic Literature 1661.

Building on discoveries, companies devote effort and investment to invention. Firm expenditures on R&D should be viewed as investments rather than as operating costs.[85] Firms invest in R&D with the intention of creating inventions. Antitrust should not interpret such R&D investments as anticompetitive behaviour. The United States Patent and Trademark Office (USPTO) criteria for granting patents provide a useful definition of invention as being useful, non-obvious, and neither laws of nature nor abstract ideas.[86] A patentable invention must be a 'new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof'.[87] Invention can be measured in terms of the output of R&D, such as the number of patented inventions, quality-weighted numbers of inventions, and revenues obtained from the licensing or assignment of patents and other IP. Invention can be measured in terms of inputs such as R&D expenditures and the number of research personnel.[88]

Firms then create innovations by applying and combining inventions. Innovation includes transaction methods, products, and production processes that are new to the market.[89] To be successful, the innovation must blaze new trails or a least offer improvements over what competitors offer. Entrepreneurs embody innovations in the activities of startups and new firms. Innovation can be measured in terms of the development of transaction methods, products features, and production processes. Innovation also can be measured in terms of the effort and expenditure made by firms. As with invention, expenditures on innovation should be viewed as investment rather than operating costs. Antitrust generally should not view investment in innovation as anticompetitive.[90]

Adoption is the final stage of the innovation process and refers to the demand side of the market for innovation. Adoption can refer to consumer adoption of new products and transaction methods. Adoption also can refer to firms adopting new production processes, products, and transaction methods. Innovation competition

85 Beginning in 2013, the US government measurement of Gross Domestic Product (GDP) treats R&D expenditures as investment in knowledge capital. See Francisco Moris, John Jankowski, Mark Boroush, Marissa Crawford, and Jennifer Lee, 'R&D Recognized as Investment in U.S. GDP Statistics: GDP Increase Slightly Lowers R&D-to-GDP Ratio' InfoBriefs, NSF 15-315, 30 March 2015 <https://www.nsf.gov/statistics/2015/nsf15315/> accessed 14 May 2022; Francisco Moris and William J Zeile, 'Innovation Related Services Trade by Multinational Enterprises Results from an Interagency Data Link Project' May 2016, BEA Briefing <https://apps.bea.gov/scb/pdf/2016/05%20May/0516_innovation_related_services_trade_by_multinational_enterprises.pdf> accessed 14 May 2022.

86 35 USC 103 <https://www.uspto.gov/web/offices/pac/mpep/s2141.html> accessed 14 May 2022.

87 35 USC 101 <https://www.uspto.gov/web/offices/pac/mpep/s2104.html> accessed 14 May 2022.

88 The Organization for Economic Cooperation and Development (OECD) provides extensive guidelines for the measurement of R&D. See Frascati Manual, *Guidelines for Collecting and Reporting Data on Research and Experimental Development* (OECD 2015) ('The defining feature of R&D in this manual is that it is carried out in order to generate new knowledge as an output, irrespective of its purpose, which could be the generation of economic benefit, addressing societal challenges or simply having the knowledge in itself.').

89 Schumpeter (n 22).

90 The OECD offers internationally recognized guidelines on the measurement of innovation. See Oslo Manual, *Guidelines for Collecting, Reporting and Using Data on Innovation* (4th edn, OECD 2018) ('An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).').

involves effort and expenditures that firms make to induce market participants to adopt innovations.[91] Companies that supply innovations encourage adoption through marketing, sales, distribution, and complementary investments. Adoption can be measured in terms of the extent of diffusion of innovations in the economy, such as the spread of broadband subscriptions or the usage of smartphones.

Innovations that enhance transaction methods, product features, and production processes can be expected to improve consumer welfare. Because technological change takes time, antitrust policymakers should evaluate conduct over time as opposed to economic snapshots. Evaluating conduct should include a consideration of dynamic interactions between invention, innovation, and adoption. A firm's innovation costs inevitably precede its revenues, so that a firm's losses will precede its profits. A firm's short-term losses or later profits thus do not indicate exclusion or monopolization. Investment in innovation in anticipation of future returns is the normal evolution of innovation competition and does not indicate that innovation is predatory.

Antitrust policy makers should recognize that providing innovations can displace competitors. Innovations should stimulate competitors to improve their technologies or exit the market. This is exactly how technological change happens. Antitrust policy makers should not impose a requirement that innovation must be profitable without harming competitors that have less efficient technologies. Such antitrust policies, sometimes referred to as the 'sacrifice test', prevent innovation competition.[92] Elhauge observes, '[u]nfortunately, the main proposal now circulating to do this job is to focus on whether the monopolist sacrificed short-run profits in order to earn long-run monopoly returns. This would provide the emperor with a suit that is ill-fitting indeed, for that test both condemns the very sort of conduct that is most desirable—investments that sacrifice short-run profits to increase the long-run efficiency of a firm—and fails to condemn the very sort of undesirable conduct that

91 Drew Fudenberg and Jean Tirole, 'Preemption and Rent Equalization in the Adoption of New Technology' (1985) 52 Review of Economic Studies 383, 383 ('social policy should consider the incentives for adopting innovations as well as incentives for their discovery') See also Bryce Ryan and Neil C Gross, 1943. 'The Diffusion of Hybrid Seed Corn in Two Iowa Communities' (1943) 8(1) Rural Sociology 15. Zvi Griliches, 1957. 'Hybrid Corn: An Exploration in the Economics of Technical Change' (1957) 25 Econometrica 501. Jennifer Reinganum, 'On the Diffusion of New Technology: A Game-Theoretic Approach' (1981) 153 Review of Economic Studies 395. Jennifer Reinganum, 'Market Structure and the Diffusion of New Technology' (1981) 12(2) Bell Journal of Economics 618, Heidrun C Hoppe, 'Second-Mover Advantages in the Strategic Adoption of New Technology Under Uncertainty' (2000) 18(2) International Journal of Industrial Organization 315; Heidrun C Hoppe, 'The Timing of New Technology Adoption: Theoretical Models and Empirical Evidence' (2002) 70(1) The Manchester School 56.

92 Douglas Melamed, 'Exclusionary Conduct Under the Antitrust Laws: Balancing, Sacrifice, and Refusals to Deal' 20 Berkeley Technology Law Journal 1247, 1255. ('the sacrifice test asks whether the allegedly anticompetitive conduct would be profitable for the defendant and would make good business sense even if it did not exclude rivals and thereby create or preserve market power for the defendant. If so, the conduct is lawful. If not—if the conduct would be unprofitable but for the exclusion of rivals and the resulting market power—it is anticompetitive.') Melamed argues that the 'sacrifice test' is a 'sensible middle ground' 1266. See also Gregory J Werden, 'Identifying Exclusionary Conduct Under Section 2: The "No Economic Sense" Test' (2006) 73 Antitrust Law Journal 413, 414.

most needs deterrence—conduct that undesirably excludes rivals in a way that is profitable from the get-go'.[93] Mark Popofsky points out that 'the profit-sacrifice test might condemn as predatory merely investing in research that generates better products'.[94]

Antitrust policy makers also should have a dynamic perspective on conduct because industry leadership can change hands over time.[95] Innovation competition suggests that differences between firms that are industry leaders and followers can affect competitive conduct. Iain Cockburn and Rebecca Henderson study the pharmaceutical industry and find evidence for differences in the innovative strategies of firms rather than simple racing to invent.[96] Ronald Goettler and Brett Gordon study dynamic competition between AMD and Intel in microprocessors.[97] Vincenzo Denicolò and Piercarlo Zanchettin find evidence that both market leaders and their competitors invest in R&D.[98] Firms compete for market dominance using innovation strategies such as choosing the riskiness of R&D projects.[99] Phillipe Aghion et al. find that 'competition may increase the incremental profit from innovating, labeled the 'escape-competition effect,' but competition may also reduce innovation incentives for laggards, labeled the 'Schumpeterian effect"'.[100] Minjae Song examines personal computers and distinguishes entry of new brands from entry of new products.[101]

93 Elhauge 343. Elhauge adds ('And efforts to salvage this test by excluding profits earned from undesirable conduct or by making the test inapplicable to desirable conduct, achieve a better fit only by depriving the test of all content.')

94 Mark S Popofsky, 'Defining Exclusionary Conduct: Section 2, The Rule of Reason, and the Unifying Principle Underlying Antitrust Rules' (2005) 73 Antitrust Law Journal 435, 463. Emphasis in original.

95 Christopher Budd, Christopher Harris and John Vickers, 'A Model of the Evolution of Duopoly: Does the Asymmetry between Firms Tend to Increase or Decrease?' 1993 60 Review of Economic Studies 543; Luis MB Cabral and Michael Riordan, 'The Learning Curve, Market Dominance and Predatory Pricing' (1994) 62 Econometrica 1115; Tor Jakob Klette and Zvi Griliches, 'Empirical Patterns of Firm Growth and R&D Investment: A Quality Ladder Model Interpretation' (2000) 110(463) The Economic Journal 363; Susan Athey and Armin Schutzler, 'Investment and Market Dominance' (2001) 32 RAND Journal of Economics 1; Luis MB Cabral, 'Increasing Dominance with No Efficiency Effect' (2002) 102 Journal of Economic Theory 471; Federico Etro, 'Innovation by Leaders' (2004) 114(495) The Economic Journal 281; Daniel Garcia-Macia, Chang-Tai Hsieh and Peter J Klenow, 'How Destructive is Innovation?' (2019) 87(5) Econometrica 1507. Competition with vertical product differentiation also is sensitive to differences in preferences among consumers, see Xavier Wauthy, 'Quality Choice in Models of Vertical Differentiation' 1996 44(3) The Journal of Industrial Economics 345.

96 Iain Cockburn and Rebecca Henderson, 'Racing To Invest? The Dynamics of Competition in Ethical Drug Discovery' (1994) 3(3) Journal of Economics & Management Strategy 481.

97 Ronald L Goettler and Brett R Gordon, 'Does AMD Spur Intel to Innovate More?' (2011) 119(6) Journal of Political Economy 1141.

98 Vincenzo Denicolò and Piercarlo Zanchettin, 'Leadership Cycles in a Quality-Ladder Model of Endogenous Growth' (2012) 122(561) The Economic Journal 618. ('there is ample empirical evidence that while outsiders are responsible for many innovations, incumbents account for a sizeable share of the research done and often innovate repeatedly in the same industry.')

99 Luis MB Cabral, 'R&D Competition When Firms Choose Variance' (2003) 12 Journal of Economics & Management Strategy 139; Axel Anderson and Luis MB Cabral, 'Go for Broke or Play it Safe? Dynamic Competition with Choice of Variance' (2007) 38 RAND Journal of Economics 593.

100 Aghion and others (n 67) 720.

101 Minjae Song, 'A Hybrid Discrete Choice Model of Differentiated Product Demand with an Application to Personal Computers' (2015) 56(1) International Economic Review 265.

Antitrust policy makers often are concerned about the market power of dominant firms. Innovation competition suggests that large market shares need not indicate anticompetitive conduct. Because industry leadership changes hands over time, market shares do not provide evidence of monopolization or exclusionary conduct. The proposed American Innovation and Choice Online Act (AICOA) targets specific companies based on their size.[102] The AICOA defines a 'covered platform' as a digital platform that has 50 million monthly users in the USA, 100 thousand monthly business users in the USA, or a market capitalization of over $550 billion.

Technological change can lead to changes in industry leadership. The size and market power of dominant firms is mitigated when innovative small and medium-sized firms (SMEs) and new entrants can challenge and displace industry leaders. Schumpeter emphasized such 'creative destruction' as an important source of innovation.[103] Innovation competition suggests that antitrust policy makers cannot rely exclusively on short-term measures of firm size and market concentration. Innovation competition promotes adoption of innovations, preventing lock-in of inefficient technologies.[104]

Innovation competition implies that antitrust policy makers should place greater emphasis on anticompetitive conduct that excludes innovative competitors and deters innovative entrants. Innovative entrants that are successful may seek to exclude future challengers. Antitrust policy should be less concerned about the size and market power of industry leaders because they can be successfully challenged by innovative competitors. Ryan Bourne examines historical case studies that show the temporary nature of market dominance: Great Atlantic and Pacific Tea Company, Myspace, Nokia, Kodak, Apple's iTunes, and Microsoft's Internet Explorer.[105]

Innovation competition arises in almost any marketplace. Innovation competition emerges in practically any industry because it involves new types of transaction mechanisms and market platforms. Innovation competition appears in product markets where innovations are embodied in new types of goods and services. Innovation competition happens in input markets when innovations are embodied in new types of capital equipment, parts, and components. Innovation competition can involve new types of firms and novel business strategies.

So, antitrust policy should not consider innovation competition as confined to specialized markets. This would narrow the definition of the market for technology and provide incorrect signals about monopoly and monopolization. The IP Guidelines specify three categories of markets: goods, technology, and R&D.[106] In the IP Guidelines, goods markets include final and intermediate products and productive inputs, technology markets refer to IP licensing, and R&D markets refer to assets

102 US Senate Judiciary Committee, The American Innovation and Choice Online Act, s 2292, 117th Congress s (h)4.

103 Joseph A Schumpeter, *Capitalism, Socialism and Democracy* (Routledge 1994 [1942]) 82–83.

104 Spulber (n 28), Daniel A Skog, Henrik Wimelius and Johan Sandberg, 'Digital Disruption' (2018) 60(5) Business & Information Systems Engineering 431.

105 Ryan Bourne, 'Is This Time Different? Schumpeter, the Tech Giants, and Monopoly Fatalism' June 18, Policy Analysis, CATO Institute <https://www.cato.org/publications/policy-analysis/time-different-schumpeter-tech-giants-monopoly-fatalism> accessed 14 May 2022.

106 The Guidelines 2.

involved in generating new products or production processes.[107] Innovation competition affects competitive conduct and industry performance in all of these markets.

Innovation competition involves greater uncertainty than other forms of competition. Inventors and innovators enter uncharted territory. Investments in invention and innovation thus will tend to be riskier than other types of investments. Implementing technological change requires investing in human capital and capital equipment. Technological uncertainty increases the risks of a firm's other investments. Companies face risk when investing in complementary activities to provide new products, production processes, and transaction techniques. Taking risks is costly, so that antitrust policy makers should recognize that losses can be the result of risky projects rather than predation. Also, profit can reflect returns to successful but risky projects rather than monopolization or exclusionary conduct.

Transaction innovation, digital platforms, and competitive conduct

Transaction innovation created the 'Business Revolution' by enhancing individual decision making while decreasing drudgery in managerial and commercial activities.[108] Firms develop new transaction methods that offer market participants greater convenience and effectiveness than those of competitors. Transaction innovation has generated many improvements in transaction efficiency. Transaction innovation involves digital platforms, multi-sided online markets, and networks.[109]

Antitrust policy should evaluate competitive conduct with transaction innovation by applying the growing economics literature on platforms.[110] Antitrust policy should avoid regulating big tech based simply on size and market shares. The House Report on Competition in Digital Markets, focusing on Amazon, Apple, Facebook, and Google, found that 'online platforms' dominance carries significant costs. It has diminished consumer choice, eroded innovation and entrepreneurship in the US economy, weakened the vibrancy of the free and diverse press, and undermined Americans' privacy'.[111] A survey of reports from eighteen antitrust authorities observes that '[m]arkets with 'tipping effects' normally witness strong competition 'for the market' in the beginning—that is, competition to become the leading provider in that market—which then develops into a long period of weak competition where the winner/monopolist extracts rents associated with its market

107 ibid 8–9.

108 Spulber (n 1).

109 Spulber (n 2); Daniel F Spulber and Christopher S Yoo, 2009, Networks in Telecommunications: Economics and Law, Cambridge: Cambridge University Press; Spulber and Yoo (n 28).

110 Spulber (n 2). See also Hanna Hałaburda and Yaron Yehezkel, 'Platform Competition under Asymmetric Information' (2013) 5(3) American Economic Journal: Microeconomics 22. Alexei Alexandrov and Daniel F Spulber, 'Sufficient Decisions in Multi-Sided and Multi-Product Markets' (2017) 65(4) Journal of Industrial Economics 739; Feng Zhu, 'Friends or Foes? Examining Platform Owners' Entry into Complementors' Spaces' (2019) 28(1) Journal of Economics & Management Strategy 23; Hanna Halaburda and Yaron Yehezkel, 'Focality Advantage in Platform Competition' (2019) 28(1) Journal of Economics & Management Strategy 49; Luís Cabral, 'Towards a Theory of Platform Dynamics' (2019) 28(1) Journal of Economics & Management Strategy 60.

111 House of Representatives, Subcommittee on Antitrust, Commercial, and Administrative Law of the Committee on the Judiciary, Majority Staff Report and Recommendations, Investigation of Competition in Digital Markets, 2020 (hereafter House Report) <https://judiciary.house.gov/uploadedfiles/competition_in_digital_markets.pdf> accessed 14 May 2022.

power'.[112] The Antitrust Division opened a review of leading platforms in search, social media, and retail services.[113]

The House of Representatives proposed a set of bills under the title 'A Stronger Online Economy: Opportunity, Innovation, Choice' (hereafter the Acts).[114] The Acts apply to a 'covered platform', which is to be defined in terms of the platform's size and dominant position in a market. H.R. 3816, the American Choice and Innovation Online Act, defines 'unlawful discriminatory conduct' as an action that: 'advantages the covered platform operator's own products, services, or lines of business over those of another business user'; 'excludes or disadvantages the products, services, or lines of business of another business user relative to the covered platform operator's own products, services, or lines of business'; or 'discriminates among similarly situated business users'.[115]

Innovation competition may transform transaction techniques and decrease transaction costs. Ronald Coase introduced the concept of transaction costs to explain why activities are either inside the firm or in the marketplace.[116] Transaction costs are the economic costs of using markets. These include the costs of searching for trading partners, communicating between buyers and sellers, negotiating contracts, monitoring performance, making payments, and recording the terms of exchange. Firms produce economic transactions by managing their purchasing and sales and providing transaction services to their suppliers and customers.

Most markets would not exist without being established and operated by firms. Firms create markets and manage price setting and market clearing to improve transaction efficiency or lower transaction costs.[117] Elsewhere, I introduce the 'intermediation hypothesis' to explain why firms provide intermediation services between market participants.[118] The 'intermediation hypothesis' states that firms provide intermediation services when intermediated transactions are more effective than direct exchange between market participants.

112 Filippo Maria Lancieri and Patricia Sakowski, 'Competition in Digital Markets: A Review of Expert Reports' (2021) 26 Stanford Journal of Law, Business, and Finance 65.

113 Justice Department Reviewing the Practices of Market-Leading Online Platforms, 23 July 2019 <https://www.justice.gov/opa/pr/justice-department-reviewing-practices-market-leading-online-platforms> accessed 14 May 2022.

114 See H.R. 3843, the Merger Filing Fee Modernization Act of 2021; H.R. 3460, the State Antitrust Enforcement Venue Act of 2021; H.R. 3849, the Augmenting Compatibility and Competition by Enabling Service Switching Act of 2021 or the ACCESS Act of 2021; H.R. 3826, the Platform Competition and Opportunity Act of 2021; H.R. 3816, the American Choice and Innovation Online Act; and H.R. 3825, the Ending Platform Monopolies Act <https://judiciary.house.gov/calendar/eventsingle.aspx?EventID=4601> accessed 14 May 2022.

115 The Acts, ibid.

116 See Ronald H Coase, 'The Nature of the Firm' 1937 4(16) Economica 386. Ronald H Coase, *The Nature of the Firm: Origins, Evolution, and Development* (OUP 1993). A firm's 'make-or-buy' decisions affect the scope of the firm's activities. Firms make efficient combinations of internal activities and market transactions. According to the 'internalization hypothesis', firms compare the costs of managing activities within the organization with the transactions costs of using markets.

117 Spulber (n 33).

118 ibid.

Transaction innovation presents major challenges to antitrust in the 'new economy'.[119] Innovation competition is significant for digital platforms and multisided markets.[120] Antitrust policy toward digital platforms has focused on price competition. Innovation competition, however, often involves offering improved transaction methods. Competition through new types of transaction methods differs from basic price competition.

For example, the Court in *American Express* observed that '[s]triking the optimal balance of the prices charged on each side of the platform is essential for two-sided platforms to maximize the value of their services and to compete with their rivals'.[121] The Court pointed out that American Express used a different business model to counter the competitive advantages of the market leaders Visa and Mastercard. American Express' business model involves greater rewards for customers but higher fees for merchants as compared to its competitors. The court noted that '[a]lthough this business model has stimulated competitive innovations in the credit-card market, it sometimes causes friction with merchants'.[122] The Court found that American Express' anti-steering provisions were not a Sherman Section 1 violation. The Court considered both sides of the credit-card market—cardholders and merchants—as part of a single market for the purpose of understanding innovation competition.

Platforms offer innovative transactions and serve as intermediaries for other innovators, such as app developers. This raises issues regarding the relationship between transaction innovation and product innovation. In *Apple Inc v Pepper et al*, the Supreme Court held that buyers of apps could sue the Apple platform for markups on apps provided by developers, going against the pass-through principles in *Illinois Brick*.[123] Although this decision addresses the narrow question of the ability to sue, it has implications for transaction innovation because the platform provides transaction services.

Digital platforms compete in many other dimensions besides prices. Platforms offer innovative products to coordinate participation by buyers and sellers.[124]

119 Richard A Posner, 'Antitrust in the New Economy' (2001) 68(3) Antitrust Law Journal 925; David Lucking-Reiley and Daniel F Spulber, 'Business-to-Business Electronic Commerce' (2001) 15 Journal of Economic Perspectives 55; William D Nordhaus, 'Productivity Growth and the New Economy' No w8096. National Bureau of Economic Research, 2001; Matti Pohjola, 'The New Economy: Facts, Impacts and Policies' (2002) 14(2) Information Economics and Policy 133; and William J Baumol and Daniel G Swanson, 'The New Economy Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power' (2003) 70 Antitrust Law Journal 661. Klaus Schwab, 'The Fourth Industrial Revolution: What It Means and How to Respond, Foreign Affairs' 12 December 2015 <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution> accessed 14 May 2022 (the 'Fourth Industrial Revolution' (4IR) is 'characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.'). See also Klaus Schwab, *The Fourth Industrial Revolution* (Penguin Group 2017).

120 Howard A Shelanski, 'Information, Innovation, and Competition Policy for the Internet' (2013) 161 University of Pennsylvania Law Review 1663, 1684 ('If there is any single force that best characterizes digital platform markets, it is probably the intensive and continuous investment in research and development to improve existing products and develop new platforms and applications.')

121 *Ohio et al v American Express Co et al* (hereafter *American Express*) 585 U.S. ___ (2018).

122 ibid 2 (n 121).

123 *Apple Inc v Pepper et al*, 139 U.S. 1514 (2019). *Illinois Brick Co v Illinois* 431 U.S. 720 (1977).

124 Daniel F Spulber, 'Solving the Circular Conundrum: Communication and Coordination in Two-Sided Networks' (2010) 104(2) Northwestern University Law Review 537.

Platforms coordinate participation of buyers and sellers to take advantage of network effects, that is, participation by one side of the market attracts participation by other sides of the market.[125] Platforms may invest in first-party content to induce buyer participation, which in turn attracts sellers.[126] For example, Microsoft offered the Halo videogame to encourage buyers to purchase its Xbox game console. Alternatively, platforms may invest in services to encourage seller participation, which in turn attracts buyers. Platforms invest in attracting third-party content from developers by providing 'self-contained tasks with well-specified interfaces; standards; organizational structures (such as help desks); software development kits (SDKs), which create specialized development environments; and application programming interfaces (APIs), which improve platform modularity'.[127]

Product innovation and competitive conduct

Firms engaged in innovation competition typically offer vertically differentiated products. 'Vertical product differentiation' refers to differences in the quality or performance of products. This contrasts with 'horizontal product differentiation', which refers to variations in product characteristics that are more a matter of taste.[128] Even if consumers agree that the new product is better than an existing product, consumers can differ in terms of how they benefit from improvements in product quality. Some consumers may have a greater willingness to pay for higher quality product than do other consumers.[129] Alternatively, consumers can have income differences that affect how they evaluate improvements in product quality.[130]

Innovation competition with vertical product differentiation has important implications for competitive conduct. Innovation competition can increase prices because new products may be better than existing products. This contrasts with 'perfect competition' where products are homogeneous, and prices tend toward marginal costs.

125 Spulber (n 2).

126 Andrei Hagiu and Daniel F Spulber, 'First-party Content and Coordination in Two-sided Markets' (2013) 59(4) Management Science 933.

127 Burcu Tan, Edward G Anderson, Jr and Geoffrey G Parker, 'Platform Pricing and Investment to Drive Third-Party Value Creation in Two-Sided Networks' (2020) 31(1) Information Systems Research 217, 218.

128 With horizontal product differentiation, consumers differ in terms of their most-preferred goods even if those goods have similar prices. Technological change can generate horizontal product differentiation because technological advances allow expansion of product variety. In practice, product markets are likely to involve combinations of vertical and horizontal product differentiation.

129 See Michael Mussa and Sherwin Rosen, 'Monopoly and Product Quality' (1978) 18 Journal of Economic Theory 301; Tirole (n 18) 296–298; David P Baron, 'Vertical Differentiation, Product Innovation, and Dynamic Competition' (2020) 29(3) Journal of Economics & Management Strategy 635; David P Baron, 'Dynamic Positioning, Product Innovation, and Entry in a Vertically Differentiated Market' (2021) 30(2) Journal of Economics & Management Strategy 287.

130 See Jean J Gabszewicz and Jacques-Francois Thisse, 'Entry (and Exit) in a Differentiated Industry' (1980) 22 Journal of Economic Theory 327; Jean J Gabszewicz and Jacques-Francois Thisse, 'Price Competition, Quality and Income Disparities' (1979) 20(3) Journal of Economic Theory 340; Avner Shaked and John Sutton, 'Relaxing Price Competition Through Product Differentiation' (1982) 49 Review of Economic Studies 3; Avner Shaked and John Sutton, 'Natural Oligopolies' (1983) 51 Econometrica 1469; Avner Shaked and John Sutton, 'Product Differentiation and Industrial Structure' (1987) 36 Journal of Industrial Economics 131; John Sutton, 'Vertical Product Differentiation: Some Basic Themes' (1986) 76(2) American Economic Review 393.

This also differs from 'imperfect competition' with horizontal product differentiation, where increased competition tends to lower prices.

With innovation competition, there is no basis for reviving the SCP paradigm. The relationships between market structure, industry performance, and competitive conduct with innovation competition are if anything more complex than with price competition. With innovation competition, economic efficiency does not mean that all competitors must remain in business. Firms may invest in R&D in a race to develop a particular invention, with only a few firms achieving success.[131] Innovation competition can lead to changes in industries that have been characterized as an 'endless race'.[132] Innovative firms can displace less innovative incumbent firms by producing better transaction methods, products, or production processes. These dynamic effects differ significantly from views of competitive conduct based on identical firms and barriers to entry.

Innovation competition can increase market concentration.[133] This can occur because firms with better products can expand their market share relative to firms with inferior products. Product differentiation can occur over time as new products are introduced.[134] Innovative entrants can increase concentration by replacing incumbent firms. This differs from markets with homogeneous products and static technology where entry reduces concentration.[135] This also differs from markets with imperfect competition and horizontally differentiated products in which entry also decreases concentration.[136]

Price–cost markups should not be the main guide for antitrust policy because innovation competition involves significant non-price competition. Despite their ease of use, price–cost markups may lead to incorrect characterizations of market power and industry performance. With technological change, firms employ various competitive instruments that do not translate into price–cost markups. This implies that price–cost markups need not provide reliable indicators of market power. Increases in price–cost markups, therefore, do not indicate greater monopolization or anti-competitive behavior.

Comparisons of price–cost markups implicitly presume that products and transaction methods are the same across the industry. In addition, production technologies

131 Baye and Hoppe (n 30).

132 Reiko Aoki 'R&D Competition for Product Innovation: An Endless Race' (1991) 81 American Economic Review 252; Johannes Hörner, 'A Perpetual Race to Stay Ahead' (2004) 71(4) The Review of Economic Studies 1065.

133 John Sutton, 'Vertical Product Differentiation: Some Basic Themes' (1986) 76(2) The American Economic Review 393, 397 ('a firm which can provide a product better in some regard, than those of its rivals, with a limited increase in its unit variable costs, can thereby capture a significant share of the market.')

134 Jonathan B Baker, 'Product Differentiation Through Space and Time: Some Antitrust Policy Issues' (1997) 42(1) The Antitrust Bulletin 177, 196 ('we must proceed with caution and care in applying the antitrust laws in this area, especially when the R&D or new product marketing investments at issue produce demonstrable benefits to consumers.') See also Baker 194 ('courts are reluctant to find that a firm misused its monopoly power through the introduction of any innovation that lowers cost, improves quality or performance, or is otherwise desirable to consumers, even if the innovation creates incompatibilities or otherwise raises costs to rivals.')

135 Spulber (n 19).

136 ibid.

and the resulting production costs are similar as well. With technological change, there will be differences in product features that affect quality, durability, ease of usage, switching costs, and complementarity with other products.[137] There will be differences in the features of transaction methods, including information, communication, convenience, security, and privacy. Firms will have different production costs due to technological variations in capital equipment, ICT, quality control, cycle time, automation, AI applications, network connectivity, interoperability, and risk mitigation. To address concerns about privacy and use of information about consumers, the FTC studied social media and video streaming firms Facebook, WhatsApp, Snap, Twitter, YouTube, ByteDance, Twitch, Reddit, and Discord.[138]

The policy maker should compare the current value of gains with the current value of losses to determine whether policies generate net benefits. Consumers would not benefit from a short-term gain that is outweighed by a larger long-term loss. Antitrust policy makers' balancing mechanisms will be flawed with a focus on short-term prices rather than consideration of the benefits of future innovations. Consider for example a market with a single consumer. A particular antitrust policy results in a gain of $1 in the current year and a loss in the following year with a current value of $100.[139] The policy should not be followed because it would result in a current value loss of $99. Considering only the current gain of $1 is not only short sighted but inefficient. The long-term losses from the policy would outweigh the short-term gains.

Innovations generally are welfare enhancing to induce adoption by consumers and firms. Innovations that diffuse widely are welfare enhancing because they offer benefits in comparison to existing technologies and innovations offered by rival firms. A longer-term approach is needed to evaluate the benefits and costs of innovation. Just as innovations can have long term benefits, so innovations can cause long-term harm if manufacturers fail to test products properly or are negligent in manufacturing. Innovations also may not be welfare enhancing if firms exclude

137 See Timothy F Bresnahan, 'Competition and Collusion in the American Auto Industry: The 1955 Price War' (1987) 35 Journal of Industrial Economics 457; Steven T Berry, 'Estimating Discrete-choice Models of Product Differentiation' (1994) 25(2) The RAND Journal of Economics 242; Steven T Berry and Philip Haile, 'Identification in Differentiated Products Markets' (2016) 8 Annual Review of Economics 27; Steven T Berry and Philip A Haile, 'Identification in Differentiated Products Markets Using Market Level Data' (2014) 82(5) Econometrica 1749; Simulation results suggest that discrete choice approaches perform better than hedonic analysis in a single market, see Maureen L Cropper and others, 'Valuing Product Attributes Using Single Market Data: A Comparison of Hedonic and Discrete Choice Approaches' (1993) 75(2) The Review of Economics and Statistics 225; Otto Toivanen and Michael Waterson, 'Empirical Research on Discrete Choice Game Theory Models of Entry: An illustration' (2000) 44(4–6) European Economic Review 985.

138 Joint Statement of FTC Commissioners Chopra, Slaughter, and Wilson Regarding Social Media and Video Streaming Service Providers' Privacy Practices, Commission File No P205402, 14 December 2020 <https://www.ftc.gov/system/files/documents/reports/6b-orders-file-special-reports-social-media-video-streaming-service-providers/joint_statement_of_ftc_commissioners_chopra_slaughter_and_wilson_regarding_social_media_and_video.pdf> accessed 14 May 2022.

139 The gains and losses are in current value terms so they can be compared. To illustrate this, suppose that the interest rate is 5 per cent. Discounting a future loss of $105, would be a loss in current value terms of 105/1.05, that is, $100. The current value of losses of $100 would outweigh the current value of gains from the policy of $1.

potential competitors for their innovative products or exclude suppliers of complementary products.

Innovative products need not be welfare enhancing if firms conceal quality or safety problems or engage in deceptive advertising. For example, customers may not be able to observe accurately the safety or effectiveness of innovative products such as pharmaceuticals or medical devices. Innovative products such as electric automobiles or autonomous vehicles may be welfare reducing if they have hidden risks. Customers of innovative digital platforms such as search engines may not be aware of the value of their personal data revealed to the platform or the costs they might incur from violation of their privacy by the platform.[140] Innovative products need not be welfare enhancing if consumer buy them in error when firms misrepresent prices of complementary products, such as ink for printers.[141]

When there is innovation competition, price–cost markups need not be the best measure of consumer welfare and economic efficiency. Many economic forces other than market power can generate increases in price–cost markups. As Chad Syverson observes, '[e]mpirical investigations have found broad growth in measured profit rates, price-cost margins, and market concentration since at least as far back as 2000, if not earlier'.[142] From an economy-wide perspective, Syverson finds that 'the sources of the patterns are multicausal—some combination of greater intangible intensity, changing product-market substitutability, greater scale economies, and higher entry costs, all with potential implications for market power (though in possibly different directions)'.[143]

Product innovation can improve consumer welfare by improving product performance and availability of products. Consumer welfare can improve even if the price–cost margin increases. With innovation competition, a firm that introduces a new product can increase the price and still make consumers better off. Estimating the contribution of product improvements to consumer welfare and producers' surplus indicates the extent of innovation.[144] For example, Manuel Trajtenberg considers the effects of improvements in the features of medical CT scanners.[145] Aine Driscoll

140 Daniel F Spulber, 'The Map of Commerce: Internet Search, Competition, and the Circular Flow of Information' (2009) 5(4) Journal of Competition Law and Economics 633; James C Cooper, 'Privacy and Antitrust: Underpants Gnomes, the First Amendment, and Subjectivity' (2012) 20 George Mason Law Review 1129.

141 Glenn Ellison, 'A Model of Add-on Pricing' (2005) CXX Quarterly Journal of Economics 585; Xavier Gabaix and David Laibson, 'Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets' (2006) 121(2) The Quarterly Journal of Economics 505.

142 Chad Syverson, 'Macroeconomics and Market Power: Context, Implications, and Open Questions' (2019) 33(3) Journal of Economic Perspectives 23, 23.

143 ibid 41.

144 Manuel Trajtenberg, 'The Welfare Analysis of Product Innovations, With an Application to Computed Tomography Scanners' (1989) 97(2) Journal of Political Economy 444, 446 ('the question 'how much innovation took place' in a certain field over a certain period of time can be interpreted only as asking "how much additional consumer and producer surplus was generated by technical advance in that field and time."') See also Timothy F Bresnahan, 'Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services' (1986) 76 American Economic Review 742, Daniel A Ackerberg and Marc Rysman, 'Unobserved Product Differentiation in Discrete-Choice Models: Estimating Price Elasticities and Welfare Effects' (2005) 36(4) RAND Journal of Economics 771.

145 Trajtenberg, ibid.

et al. examine demand for electric vehicles based on various features such as range and emissions.[146]

Antitrust policy seeks to promote consumer welfare and economic efficiency.[147] Technological change significantly impacts both consumer welfare and economic efficiency.[148] The increasing importance of innovation competition suggests applying measures of market performance that reflect technological change.

Economic efficiency requires maximization of economic benefits to consumers net of production costs.[149] The efficiency criterion helps explain why antitrust policy makers should consider both benefits and costs of economic activities.[150] Maximizing consumers' surplus instead of social welfare will cause efficiency losses. Individuals in the economy will ultimately bear those losses. If policy makers did not consider the production costs of a particular product, maximizing consumer benefits would call for unlimited expansion of output. It is not possible for policy makers to

146 Áine Driscoll and others, 'Simulating Demand for Electric Vehicles Using Revealed Preference Data' (2013) 62 Energy Policy 686. On Discrete Choice, see Steven T Berry, 'Estimating Discrete Choice Models of Product Differentiation' (1994) 25(2) Rand Journal of Economics 242; Simon P Anderson, André De Palma and Jacques-Francois Thisse, 'Demand for Differentiated Products, Discrete Choice Models, and the Characteristics Approach' (1989) 56(1) The Review of Economic Studies 21; Simon P Anderson, Andre De Palma and Jacques-Francois Thisse, *Discrete Choice Theory of Product Differentiation* (MIT Press 1992).

147 The economic measure of consumer welfare is consumers' surplus, which equals consumer benefits net of payments to producers. Total surplus provides a measure of social welfare that can be used to evaluate how alternative policies and outcomes affect economic efficiency. Total surplus is the sum of consumers' surplus and producers' surplus. Producers' surplus equals payments to producers' net of their production costs. See Robert H Bork, *The Antitrust Paradox: A Policy at War with Itself* (Basic Books 1978); Douglas H Ginsburg, 'Judge Bork, Consumer Welfare, and Antitrust Law' (2008) 31(2) Harvard Journal of Law & Public Policy 449; Dennis W Carlton, 'Does Antitrust Need to Be Modernized?' (2007) 21(3) Journal of Economic Perspectives 155; Gregory J Werden, 'Monopsony and the Sherman Act: Consumer Welfare in a New Light' (2007) 74 Antitrust Law Journal 707; Oliver E Williamson, 'Allocative Efficiency and the Limits of Antitrust' (1969) 59 American Economic Review 105. There continues to be some discussion as to whether antitrust seeks to maximize consumers' surplus or total surplus; see Barak Y Orbach, 'The Antitrust Consumer Welfare Paradox' (2011) 7(1) Journal of Competition Law and Economics 133.

148 Some argue that antitrust law includes both efficiency and equity. The equity perspective considers the effect of prices on income transfers. See for example, Robert H Lande, 'Chicago's False Foundation: Wealth Transfers (Not Just Efficiency) Should Guide Antitrust' (1989) 58(2) Antitrust Law Journal 631. Antitrust laws are not the best mechanism for addressing equity. Antitrust laws that cause inefficiency in pursuit of equity are likely to cause more economic distortions than other mechanisms such as taxes and subsidies. Achieving economic efficiency is best left to competitive markets. Antitrust policy makers and courts lack the knowledge needed to achieve efficient outcomes. It is difficult in practice for policy makers to precisely estimate consumer benefits and producer costs. For this reason, antitrust policy should focus on promoting competition as a means of achieving economic efficiency, rather than trying to hit the efficiency target directly by managing the economy. Central planning is likely to create economic distortions that depart from efficiency.

149 The total of consumers' surplus and producers' surplus is equivalent to consumer benefits net of production costs. This is because payments that consumers make to producers exactly equal payments received by producers, so these payments cancel when adding consumers' surplus and producers' surplus.

150 Individuals in an economy ultimately bear the costs of economic activities even if those costs are directly incurred by firms. Consumer surplus alone cannot be a feasible efficiency criterion because at least some firms must remain viable. This means that revenues must cover costs. Firms that cannot recover their costs will exit the market. If antitrust policy causes the exit of firms that would other be viable, consumers will be deprived of the consumers' surplus from the activities of those firms.

rob Peter to pay Paul and conclude that social welfare is improved by ignoring the cost to Peter.

The total surplus measure provides guidance for evaluating the economic performance of companies and industries. To illustrate this, consider a market with a representative consumer and a representative producer. Suppose that the consumer purchases one unit of a good from the producer and the producer manufactures one unit of that good. Consumers' surplus is the consumer's benefit net of the price, V—P. Producers' surplus is the producer's revenue net of the cost of producing the good, P—C. Adding consumers' surplus and producers' surplus, and cancelling the consumer's payment to the producer, gives consumer benefit net of production cost, V—C. So, economic efficiency calls for maximizing benefits net of costs.

This has implications for examining the efficiency effects of technological change. To illustrate this, suppose for example that with an initial technology, the production cost is $C = 8$, the price is $P = 10$, and the representative consumer's benefit is $V = 30$. Suppose that with a new technology the production cost is $C^* = 20$, the price is $P^* = 35$, and the representative consumer's benefit is $V^* = 65$. Evaluating market performance based on the price–cost markup would indicate that the innovative good decreases performance. The market outcome with the initial technology would appear to be better than the new technology because the initial price–cost markup P—C equals 2, whereas with the new technology the price–cost markup $P^* - C^*$ equals 15. This conclusion would be misleading because the consumer is better off with the new technology. Consumer welfare with the innovative product increases from V—P = 20 to $V^* - P^* = 30$. The consumer is better off because the benefit from the new product outweighs the price increase.

The new technology in this example increases economic efficiency as well. The market performance criterion should determine whether net benefits from the new technology $V^* - C^*$ are greater than the net benefits from the initial technology V—C. Net benefits increase from V—C = 22 to $V^* - C^* = 45$. Economic efficiency increases because the additional consumer benefit from the new product outweighs the increase in production cost. This can also be achieved by transaction innovations that allow new activities with higher net benefits that were not achievable with existing transaction technologies. There also is increased efficiency with a process innovation that lowers costs without necessarily changing benefits.

Economists make inferences about consumer preferences based on information revealed by purchasing decisions.[151] To illustrate the importance of consumer benefits, consider an early effect of the switch from 4G to 5G technology in mobile phones. According to a report by Eric Zeman:

151 See Paul A Samuelson, 'Consumption Theory in Terms of Revealed Preference' (1948) 15(60) Economica 243; Hal R Varian, 'Revealed Preference' in Michael Szenberg, Lall Ramrattan and Aron A Gottesman (eds), *Samuelsonian Economics and the Twenty-First Century* (OUP 2006) 99–115; Sydney N Afriat, 'The Construction of Utility Functions from Expenditure Data' (1967) 8 International Economic Review 67; Hendrik S Houthakker, 'Revealed Preference and the Utility Function' (1950) 17(66) Economica 159; Richard Blundell, 'How Revealing is Revealed Preference?' (2005) 3(2–3) Journal of the European Economic Association 211.

> The Samsung Galaxy S10 range is a pricey lot. The Galaxy 10e, which Samsung insists is not a 'budget' phone, starts at $749. The S10 costs a bit more at $899, and the S10 Plus carries a premium price tag of $999. The 5G variant of the phone comes in at $1299.99.[152]

Using the Samsung Galaxy S10 and the Samsung Galaxy S10 5G, the price difference P*—P is equal to $1299—$899 = $399. The approximately $400 price difference provides an indication of the increased benefits from the 5G innovation in comparison to 4G. A consumer will choose a 5G handset rather than a 4G handset only if the 5G handset generates an increase in consumers' benefits greater than or equal to $400. The price difference is less than or equal to the benefits that some consumers derive from the increased quality and performance of the handset.

The prices of 5G and 4G handsets in this illustration are for different generations or vintages of a comparable good. This means that the prices will not be independent. The introduction of 5G technology will impact the prices of the 4G handsets. The companies choosing prices of the 5G handsets consider the prices of 4G handsets. Also, the prices of 5G handsets change over time, typically decreasing after the introduction of the new technology.

The benefits of the 5G technology relative to the 4G technology are greater than the handset price difference. This price difference is a reference point for obtaining estimates of the effects of technological change. The market price difference provides an indication of the contribution of the patented technologies. The price difference controls for the effects of the brand of the original equipment manufacturer (OEM). The price difference also controls for the effects of product design that are common to the two versions of the product.

The observed handset price difference can be viewed as a lower bound for the incremental willingness to pay for all customers that choose to purchase a 5G handset rather than a 4G handset. The handset price difference provides an indicator of purchasers' incremental value of the quality and performance of the 5G handset in comparison with the initial handset. This implies that with some additional restrictions, the overall demand for the 5G handset will depend on the price difference. The market price difference P* – P can then be used as an indication of the lowest bound of the value of the technology to customers purchasing 5G handsets.

The innovative product can increase consumer benefits sufficiently to compensate for the price increase relative to that of the existing product. Such a price premium is consistent with an increase in consumer welfare. This implies that price increases need not imply that a firm has monopoly power because innovative products must compete with existing products. Price increases need not be indicators of monopolization because they can result from introducing innovative products that compete with existing products. This also differs from product differentiation based on marketing and product positioning.[153]

152 Eric Zeman, 'Samsung Galaxy S10, S10 Plus, S10e, and S10 5G are here!' (Android Authority, 20 February 1919) <https://www.androidauthority.com/samsung-galaxy-s10-plus-879600> accessed 28 June 2020.

153 Danny Miller, 'Configurations of Strategy and Structure: Towards Synthesis' (1986) 7(3) Strategic Management Journal 233. Asim Ansari, Nicholas Economides and Avijit Ghosh, 'Competitive Positioning in Markets with Nonuniform Preferences' (1994) 13(3) Marketing Science 248.

Process innovation and competitive conduct

Innovation competition with process innovation generates differences in productive technologies among firms in an industry. Process innovation is perhaps the least contentious form of innovation competition. This is because process innovation is comparable to improvements in productive efficiency. Firms develop new production processes that lower their production costs and potentially give them a cost advantage over competitors. Policy makers can observe competitive conduct by determining whether firms have introduced new production processes that lower costs of production.

Evaluating process innovation can involve both quantitative and qualitative approaches. Quantitative evaluation of new production processes could include lower unit costs, increased speed, improved workplace health and safety, and enhanced environmental quality. For example, companies offering cloud computing services innovate by lowering their costs of providing storage, processing, and other services. Other useful quantitative measures include improvements in labor productivity and increases in total factor productivity.[154] Qualitative evaluation of process innovation includes characterizing new production processes that apply new materials, automation, robotics, artificial intelligence (AI), the Industrial Internet of Things (IIoT), and mobile communications.

Process innovations can increase the price–cost margins of innovative firms for a given market price. This need not indicate anticompetitive conduct but rather reflects returns to technological improvements. As efficient firms expand and less efficient firms either implement new production processes or decrease production, market prices can fall over time. Antitrust policy toward markets with process innovation must recognize that short-run increases in price–cost margins provide incentives for invention and innovation. Short-run increases in price–cost margins make possible later reductions in prices that increase consumer welfare.

Process innovation should not be viewed as predatory or exclusionary. Process innovation improves economic efficiency and promotes competition. Process innovation puts pressure on less efficient firms that can stimulate their incentives to invest in invention and innovation. Process innovation also can provide gateways for innovative entrants to challenge entrenched incumbents. Less efficient firms may complain about lower prices made possible by rivals that implement process innovations.

Process innovation can increase market concentration because more efficient firms expand and less efficient firms either improve their technologies or exit the market. More efficient firms may acquire less efficient firms as a mechanism for technology transfer, again resulting in increased concentration. Process innovation also may increase the efficient scale of firms, so that expansion or consolidation may be driven by new economies of scale. So, with substantial process innovation, increased market concentration need not indicate monopolization or anticompetitive behaviour. Rather, increased market concentration resulting from process innovation reflects technological change that lowers industry costs and generates price reductions.

154 Chad Syverson, 'What Determines Productivity?' (2011) 49(2) Journal of Economic literature 326.

IV. INNOVATION COMPETITION AND INTELLECTUAL PROPERTY

The relationship between antitrust policy and IP demonstrates why antitrust would benefit from economic frameworks that address innovation competition. Antitrust laws and IP laws have different stated objectives—antitrust laws protect competition whereas IP laws protect innovation. These objectives are converging because of the growing importance of innovation competition. Antitrust laws can protect innovation competition by supporting incentives for invention and innovation. Antitrust laws also can protect innovation competition by recognizing infringement as anticompetitive conduct.

Reconciling antitrust laws and IP laws

Harmonization of antitrust and IP is feasible even though the two sets of laws stem from different parts of the US Constitution. The antitrust laws draw authority from the Commerce Clause of the Constitution.[155] The Sherman Act of 1890 seeks 'to protect trade and commerce against unlawful restraints and monopolies'.[156] IP laws derive from Article I, Section 8, Clause 8 granting Congress the power '[t]o promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries'. The antitrust statutes are written in general terms and their applications evolve like the common law.[157] The IP laws are primarily federal statutes, although at the state level IP laws tend to evolve like the common law.[158]

Innovation competition is not confined to specific markets for technology but transforms all aspects of the economy. Technology can be embodied in goods and services, manufacturing processes, transaction techniques, and new types of firms and competitive strategies. Innovation includes creation, acquisition, commercialization, and application of IP. Companies obtain and transfer disembodied technologies through licensing, cross-licensing, patent assignments, mergers and acquisitions (M&A), R&D outsourcing contracts, and R&D consortia. Companies exchange ideas through management consulting, bundles of patents with products and services, and transfers of 'know-how' and 'show-how'.

Antitrust policy has made progress toward better understanding of markets for technology. The DC Court of Appeals in *Microsoft* rejected the *per se* approach in *Jefferson Parish*, applying a rule-of-reason test that took into account innovation, 'In fact there is merit to Microsoft's broader argument that Jefferson Parish's consumer demand test would "chill innovation to the detriment of consumers by preventing

155 The Commerce Clause, art I, s 8, Clause 3, grants Congress the power '[t]o regulate commerce with foreign nations, and among the several states, and with the Indian tribes.'

156 26 Stat. 209 15 U.S.C. s 1.

157 See William F Baxter, 'Separation of Powers, Prosecutorial Discretion, and the Common Law Nature of Antitrust Law' (1982) 60(4) Texas Law Review 661; Keith N Hylton, *Antitrust Law: Economic Theory and Common Law Evolution* (CUP 2003).

158 Douglas G Baird, 'Common Law Intellectual Property and the Legacy of International News Service v. Associated Press' (1983) 50(2) The University of Chicago Law Review 411. Shyamkrishna Balganesh, 'The Pragmatic Incrementalism of Common Law Intellectual Property' (2010) 63 Vanderbilt Law Review 1543, 1544. ('there exists a rather robust body of state law that is almost entirely the creation of state courts and is directed at creating entitlements in information, ideas, expression, goodwill, one's image, and other related intangibles.')

firms from integrating into their products new functionality previously provided by standalone products-and hence, by definition, subject to separate consumer demand"'.[159] The Supreme Court eliminated the presumption that a patent confers monopoly power in the landmark 2006 *Illinois Tool Works v Independent Ink Inc* (hereafter *Independent Ink*).[160] This decision overturned the long-standing monopoly presumption in *Jefferson Parish*. The presumption of market power was based on the patent misuse doctrine, particularly when a patent is used in tying.[161] According to *Independent Ink*, it must be shown that a company has market power in the tying product, not simply that the company has patents related to the tying product. *Independent Ink* has the effect of removing the presumption that companies acquiring patents, licensing patents, or generating patented inventions through R&D are attempting to monopolize markets.

Antitrust courts and agencies have traditionally treated the interests of consumers and companies as if they were opposed to the interests of inventors and innovators.[162] The policy debate between advocates of competition and advocates of IP goes back at least to the mid-nineteenth century.[163] Myriad critics of IP have suggested that invention and innovation are anticompetitive and lead to monopoly due to IP exclusions and network effects.[164] Some argue that the conflict between

159 *Microsoft* (n 9). See also *Jefferson Parish Hospital Dist No 2 v Hyde*, 466 US 2 (1984), hereafter *Jefferson Parish*.

160 547 US 28 (2006).

161 *Independent Ink* 1. ('This presumption of market power, applicable in the antitrust context when a seller conditions its sale of a patented product (the "tying" product) on the purchase of a second product (the "tied" product), has its foundation in the judicially created patent misuse doctrine.')

162 Richard J Gilbert and Steven C Sunshine, 'Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets' (1995) 63 Antitrust Law Journal 569, 573. ('For many years, innovation shared the general neglect bestowed by antitrust authorities on other forms of nonprice competition.'); Sheila F Anthony, 'Antitrust and Intellectual Property Law: From Adversaries to Partners' (2000) 28 AIPLA Quarterly Journal 1, 4. ('For much of this century, courts and federal agencies regarded patents as conferring monopoly power in a relevant market. . . . The thinking that patent law and antitrust worked toward opposite purposes had another effect. In any given case, courts and the agencies had to find that one or the other concept took precedence.'); Daniel J Gifford, 'The Antitrust/Intellectual Property Interface: An Emerging Solution to an Intractable Problem' (2002) 31(2) Hofstra Law Review 363, 364. ('The relationship of the antitrust laws to the patent, copyright and other intellectual property laws has perplexed antitrust scholars and practitioners since the beginning of the twentieth century. The problems the intellectual property laws are designed to create exclusive rights—exclusive rights that sometimes rise to the level of monopolies—in order to encourage innovation and creativity. The antitrust laws are designed to foster competition and to prevent the formation of monopolies.'); Herbert Hovenkamp, 'The Intellectual Property-Antitrust Interface', in *3 Issues in Competition Law and Policy 1979* (ABA Section of Antitrust Law 2008). ('The relation between intellectual property (IP) and antitrust policy has always been unstable and problematic.')

163 Fritz Machlup and Edith Penrose, 'The Patent Controversy in the Nineteenth Century' (1950) 10(1) The Journal of Economic History, 1, 1. ('In actual fact, the controversy about the patent of invention is very old, and the chief opponents of the system have been among the chief proponents of free enterprise.')

164 Robert Pitofsky, 'Challenges of the New Economy: Issues at the Intersection of Antitrust and Intellectual Property' (2000) 68 Antitrust Law Journal 913; Robert Pitofsky, 'Antitrust and Intellectual Property: Unresolved Issues at the Heart of the New Economy' (2001) 16 Berkeley Technology Law Journal 535, 538. ('Because of the nature of competition in markets characterized by intellectual property, there is a tendency to drift toward single-firm dominance and even monopoly.'); Dennis W Carlton and Robert H Gertner, 'Intellectual Property, Antitrust, and Strategic Behavior' (2003) 3

antitrust and IP requires weakening IP rights to strike a 'balance' between competition and innovation.[165] Some legal scholars argue that antitrust protection of IP decreases innovation competition.[166]

Antitrust animosity toward innovation reflected conditions in the marketplace during much of the twentieth century. Innovation has been a critical aspect of competition at least since the Industrial Revolution, but it did not occupy a central position. John Jewkes et al observed in 1959 '[f]uture historians of economic thought will doubtless find it remarkable that so little systematic attention was given in the first half of this century to the causes and the consequences of industrial innovation'.[167] Established companies relied more on prices, product market positioning, sales efforts, and marketing messages than on invention and innovation. Managers of incumbent firms experienced various difficulties in responding to what they saw as 'disruptive innovation'.[168] Companies invested much more in manufacturing facilities and equipment and distribution, than in establishing and operating laboratories. Companies obtained IP protections for inventions and trademarks but the market for technology transfers was limited in size.

Creating, owning, and commercializing IP help to promote competition and need not indicate monopolization. IP gives owners the right to exclude others from using the IP but does not exclude competitors from the market. Excluding usage of IP does not indicate market power or barriers to entry in the market. Protections for IP rights preserve incentives for companies to engage in invention and innovation. Deterring infringement creates incentives for competitors to license existing

Innovation Policy and the Economy 29. ('Intellectual property (IP) policy (patents, copyrights, trademarks, trade secrets) conveys market power to developers of IP. Antitrust policy determines, in large part, the constraints society places on companies with extensive market power. This creates a potential fundamental conflict between IP policy and antitrust policy.'); Herbert Hovenkanp, *The Antitrust Enterprise: Principle and Execution* (Harvard University Press 2005) 250. ('While the idea that the IP laws overprotect and reflect significant interest-group capture originated with the IP "left", today it has become mainstream and even counts some members of the Chicago School among its adherents.')

165 FTC Report, To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy, October 2003, 1<https://www.ftc.gov/sites/default/files/documents/reports/promote-innovation-proper-balance-competition-and-patent-law-and-policy/innovationrpt.pdf> accessed 14 May 2022 ('Both competition and patent policy can foster innovation, but each requires a proper balance with the other to do so.') Hovenkamp, ibid 255. ('But this conflict [between antitrust and IP] is largely illusory because when legal policy is not behaving myopically, then everyone should want the same thing, namely, the optimal balance between competition and protection for innovation.')

166 Herbert Hovenkamp, 'Antitrust and Innovation: Where We Are and Where We Should Be Going' (2010) 77 Antitrust Law Journal 749. ('antitrust law and intellectual property law for large parts of their history have worked so as to undermine innovation competition by protecting too much.')

167 John Jewkes, David Sawers and Richard Stillerman, *The Sources of Invention* (St Martin's Press 1959) 3.

168 William J Abernathy and Kim B Clark, 'Innovation: Mapping the Winds of Creative Destruction' (1985) 14(1) Research Policy 3; Michael Tushman and Philip Anderson, 'Technological Discontinuities and Organizational Environments' (1986) 31(3) Administrative Science Quarterly 439; Rebecca M Henderson and Kim B Clark, 'Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms' (1990) 35(1) Administrative Science Quarterly 9. Clayton Christensen, *The Innovator's Dilemma* (Harvard Business School Press 1997); Henry Chesbrough, 'Assembling the Elephant: A Review of Empirical Studies on the Impact of Technical Change upon Incumbent Firms' in Henry Chesbrough and Robert A Burgelman (eds), *Comparative Studies of Technological Evolution*, vol 7 (Research on Technological Innovation, Management and Policy 2001) 1–36. Rebecca Henderson, 'The Innovator's Dilemma as a Problem of Organizational Competence' (2006) 23(1) Journal of Product Innovation Management 5.

technologies or to develop new technologies. Generating more inventions and innovations provides competitive alternatives and increases competition.

Antitrust policy should support IP protections because IP provides incentives for innovation competition. In *FTC v* Qualcomm, the Ninth Circuit Court clarified antitrust policy toward innovation competition and licensing of IP.[169] The Ninth Circuit Court observed that contract or tort law, rather than antitrust law, should be sufficient to address patent disputes and any alleged breach of contractual commitments to standards organizations. The Ninth Circuit Court concluded that '[a]nticompetitive behavior is illegal under federal antitrust law. Hypercompetitive behavior is not'.[170]

Competition in licensed products is another important aspect of innovation competition. The Supreme Court in *Leegin* applied the rule of reason approach to resale price maintenance for licensed products.[171] The Court overruled the 1911 decision in *Dr. Miles.*[172] The Court emphasized consistent treatment of vertical price and non-price restraints, noting that 'vertical nonprice restraints may prove less efficient for inducing desired services, and they reduce intrabrand competition more than vertical price restraints by eliminating both price and service competition'.[173]

Innovation competition has changed the nature of firms, affecting their organization and activities. Antitrust policymakers recognize intangible assets as being among the most valuable assets in the global economy.[174] Intangible assets include IP such as patents, trademarks, copyrights, trade secrets, and know-how. The market for IP provides an important foundation for innovation competition. Investment in IP exceeds one-third of non-residential investment in the USA.[175] Intangible assets offer a way to measure a 'technological revolution'.[176] Intangible assets reflect capital investment in invention and innovation.[177] Also, companies are increasingly investing in human capital and organizational capital.[178] As already noted, intangible assets

169 *Federal Trade Commission v Qualcomm Incorporated*, United States Court of Appeals for the Ninth Circuit, 19-16122, 11 August 2020. (Appeal from the United States District Court for the Northern District of California, Lucy H. Koh, District Judge, Presiding) (hereafter *FTC v Qualcomm*). The decision was made by a panel consisting of Johnnie B Rawlinson and Consuelo M Callahan, Circuit Judges, and Stephen J Murphy, III, District Judge. For additional information see <https://www.ca9.uscourts.gov/content/view.php?pk_id=0000001003>

170 ibid.

171 *Leegin Creative Leather Products v PSKS*, 551 US 877 (2007) (hereafter Leegin).

172 *Dr Miles Medical Co v John D Park & Sons Co*, 220 US 373 (1911) (hereafter *Dr Miles*).

173 551 US 877 (2007).

174 Makan Delrahim 'The Long and Winding Road: Convergence in the Application of Antitrust to Intellectual Property' (2004) 13 George Mason Law Review 259.

175 According to the US national income accounts, investment in IP products is about $1 trillion and non-residential investment is 2.878 trillion (1/2.878 = 34.7%).

176 Carol A Corrado and Charles R Hulten, 'How Do You Measure a "Technological Revolution"?' (2010) 100(2) American Economic Review 99.

177 Michael Ewens, Ryan H Peters and Sean Wang, 'Measuring Intangible Capital with Market Prices' available at SSRN https://ssrn.com/abstract=3287437 or http://dx.doi.org/10.2139/ssrn.3287437; Michael Ewens, Ryan H Peters and Sean Wang, 'Acquisition Prices and the Measurement of Intangible Capital' (June 2019) NBER Working Paper No w25960. Available at SSRN <https://ssrn.com/abstract=3405147>

178 Andrea L Eisfeldt and Dimitris Papanikolaou, 'Organization Capital and the Cross-Section of Expected Returns' (2013) 68(4) The Journal of Finance 1365.

account for over 90 per cent of the market value of leading publicly traded companies, whereas only a few decades ago, tangible assets were the main source of the market value of companies. [179]

Antitrust policies should reflect competitive strategies observed in the marketplace. Antitrust policies that seek to promote competition will have unintended negative consequences if they support outdated strategies and deter innovative strategies. According to the Economic Report of the President, 'Effective antitrust enforcement takes account of the evidence and economics appropriate to particular markets, and in turn adapts to innovation and development in the markets over time'.[180]

Some legal decisions continue to apply antitrust laws in ways that weaken IP rights and are inconsistent with innovation competition. *FTC v Actavis* illustrates potential conflicts between IP protections and innovation competition.[181] The decision noted 'this Court's precedents make clear that patent-related settlement agreements can sometimes violate the antitrust laws'.[182] The Supreme Court introduced the rule of reason to address reverse payments in pharmaceutical settlements, thus addressing possible tradeoffs between innovation and competition.[183] Chief Justice Roberts dissenting observed 'The majority today departs from the settled approach separating patent and antitrust law, weakens the protections afforded to innovators by patents, frustrates the public policy in favor of settling, and likely undermines the very policy it seeks to promote by forcing generics who step into the litigation ring to do so without the prospect of cash settlements'.[184]

The Supreme Court in *eBay* made it more difficult to seek permanent injunctions for infringement of IP.[185] This decision not only affects parties to patent disputes but weakens incentives for all technology adopters to obtain patent licenses. The decision weakens innovation competition by decreasing incentives to innovate and by decreasing incentives of adopters to obtain licenses or find alternatives to infringement. The decision diminishes IP rights because it limits

179 Tangible assets include buildings, production facilities, capital equipment, vehicles, land, natural resources, and product inventories.

180 Economic Report of the President Together with The Annual Report of the Council of Economic Advisers, February 2020, 201–202 <https://www.whitehouse.gov/cea/economic-report-of-the-president> accessed 14 May 2022.

181 *Federal Trade Commission v Actavis, Inc* 570 US 136 (2013) (hereafter *FTC v Actavis*). See Michael A Carrier, 'The Rule of Reason in the Post-Actavis World' (2018) 2018(1) Columbia Business Law Review 25; Glynn S Lunney Jr, '*FTC v Actavis*: The Patent-Antitrust Intersection Revisited' (2014) 93 North Carolina Law Review 375; Michael Clancy, Damien Geradin and Andrew Lazerow, 'Reverse-Payment Patent Settlements in the Pharmaceutical Industry: An Analysis of U.S. Antitrust Law and EU Competition Law' (2014) 59(1) Antitrust Bulletin 153; Joshua P Davis and Ryan J McEwan, 'Deactivating Actavis: The Clash between the Supreme Court and (Some) Lower Courts' (2015) 67(3) Rutgers University Law Review 557.

182 *FTC v Actavis*, ibid.

183 ibid. ('the likelihood of a reverse payment bringing about anticompetitive effects depends upon its size, its scale in relation to the payor's anticipated future litigation costs, its independence from other services for which it might represent payment, and the lack of any other convincing justification. The existence and degree of any anticompetitive consequence may also vary as among industries.')

184 ibid.

185 *eBay Inc v MercExchange, LLC* 47 US 388 (2006) (hereafter *eBay*).

patent remedies in pursuit of alternative social objectives.[186] *eBay* discourages innovation competition by increasing the risk of *de facto* compulsory licensing.[187]

Innovation competition and technology standards

Innovation competition has implications for antitrust policy toward conduct evaluated under Section 1 of the Sherman Act. Markets with more innovation competition may exhibit greater cooperation among firms than markets with less innovation competition. Antitrust should recognize that much of this cooperation is pro-competitive and not the result of collusion.[188] Industries form standards organizations to develop and promulgate technology standards. Patent holders and technology adopters transfer technology by negotiating IP license and cross-license agreements. Patent pools coordinate licensing and decrease transaction costs by offering 'one-stop shopping'. Companies form R&D consortia to transfer knowledge, increase invention, and share R&D costs.

Antitrust policy toward technology standards illustrates the need to update economic frameworks to address innovation competition. Antitrust policy should recognize that cooperative agreements for standardization can be procompetitive. Antitrust authorities in the USA, the European Union, and the UK have suggested interventions in technology markets that would interfere with private negotiation of IP licenses.[189] These antitrust actions would decrease incentives to invent and innovate and would reduce participation in standards organizations.

Antitrust policy makers should avoid the incorrect presumption that technology standards confer market power on patent holders. I have referred to this presumption the 'standards-conduct-performance' approach.[190] It is now widely accepted that market structure does not predict competitive conduct or economic performance, so that antitrust moved away from the 'structure-conduct-performance' approach. In the same way, economic analysis shows that technology standards do not predict either market power or inefficient industry performance.[191]

Standards organizations enhance competition by involving many companies in technology standards development and consensus approval of those standards. Standards organizations and technology standards increase competition by promoting technological

186 Cotropia, Christopher Anthony, 'Compulsory Licensing Under TRIPS and the Supreme Court of the United States' Decision in eBay v. MercExchange' in Toshiko Takenaka and Rainer Moufang (eds), *Patent Law: A Handbook Of Contemporary Research* (Edward Elgar Publishing Co.2008).

187 Andrew Beckerman-Rodau, 'The Supreme Court Engages in Judicial Activism in Interpreting the Patent Law in eBay. Inc. v. MercExchange, LLC' (2007) 10 Tulane Journal of Technology and Intellectual Property 165.

188 Thomas M Jorde and David J Teece, 'Innovation, Cooperation and Antitrust: Balancing Competition and Cooperation' (1989) 4 High Technology Law Journal 1. ('Innovation requires cooperation as well as competition. Our antitrust laws have evolved so that they permit cooperation achieved administratively within a firm but often not contractually between firms.')

189 <https://www.justice.gov/opa/pr/public-comments-welcome-draft-policy-statement-licensing-negotiations-and-remedies-standards, accessed 14 May, 2022; https://ec.europa.eu/growth/news/commission-seeks-views-and-input-fair-licensing-standard-essential-patents-2022-02-15_en, accessed 14 May 2022; https://www.gov.uk/government/consultations/standard-essential-patents-and-innovation-call-for-views/standard-essential-patents-and-innovation-call-for-views> accessed 14 May 2022.

190 Spulber (n 37).

191 ibid.

change, interoperability, and quality. Interoperability facilitates competitive entry at every stage of the industry value chain. Technology standards promote competition by facilitating implementation and adoption of new technologies. Technology standards also promote competition by helping many companies develop technologies that conform to the standards. Technology standards also are procompetitive because standardization decreases market transaction costs among firms and between firms and consumers.

Antitrust policy makers would benefit from applying economic analysis that considers how technology standards are developed.[192] These economic frameworks will help policy makers identify the beneficial effects of technology standardization and the technological contributions of Standard Essential Patents (SEPs). Also, economic analysis of technology standards illustrates the success of license negotiation between IP holders and implementers in competitive markets.

There should not be a presumption of either market power or monopolization by companies that have SEPs.[193] The technologies provided by SEP holders make technology standards feasible. Technology standards do not call for heighted antitrust scrutiny of SEP license agreements. Technology standards increase innovation competition because they stimulate invention, innovation, and adoption.

Some standards organizations require holders of SEPs to make commitments to offer licenses with terms that are Fair, Reasonable and Non-Discriminatory (FRAND). FRAND commitments are clearly defined by three main institutions.[194] First and foremost, the vast number of licensing agreements between SEP holders and implementers define FRAND commitments. Second, standards organizations define FRAND commitments, typically describing them in a general fashion and deferring to private licensing agreements to specify the particulars of FRAND commitments. Finally, courts help specify the meaning of FRAND commitments when patent disputes arise, although negotiated license agreements far outnumber legal disputes.

Innovation competition depends on the development and implementation of technology standards. These standards affect the efficiency of global supply chains, international trade, and industry performance in the world economy.[195] The US Patent & Trademark Office (USPTO), the National Institute of Standards and Technology (NIST), and the US Department of Justice, Antitrust Division (DOJ) issued a policy statement in 2019 that reversed antitrust policy toward technology standards.[196] The earlier antitrust policy sought to limit remedies in disputes involving SEPs. The 2019 policy emphasized reliance on bilateral negotiation and legal

192 Daniel F Spulber, 'Standard Setting Organizations and Standard Essential Patents: Voting and Markets' (2018) 129(619) The Economic Journal 1477.

193 Spulber (n 37).

194 Daniel F Spulber, 'Licensing Standard Essential Patents with FRAND Commitments: Preparing for 5G Mobile Telecommunications' (2020) 18(1) Colorado Technology Law Journal 79.

195 Valentina Pop, Sha Hua and Daniel Michaels, 'From Lightbulbs to 5G, China Battles West for Control of Vital Technology Standards' (2021) Wall Street Journal, 7, https://www.wsj.com/articles/from-light-bulbs-to-5g-china-battles-west-for-control-of-vital-technology-standards-11612722698, accessed 14 May, 2022.

196 USPTO, NIST, and DOJ, Policy Statement on Remedies for Standards-Essential Patents Subject To Voluntary F/Rand Commitments, 19 December 2019 <https://www.justice.gov/atr/page/file/1228016/download> accessed 14 May 2022.

remedies rather than antitrust intervention to restrict negotiation or remedies.[197] The DOJ proposed to reverse course in a 2021 Draft Policy Statement.[198] The 2021 Draft Policy Statement concluded '[t]he Agencies encourage parties engaged in SEP licensing negotiations to reach consensus on F/RAND terms or on a path to determine disputed F/RAND terms or related issues, including by seeking an alternative dispute resolution mechanism or judicial F/RAND determination in a mutually agreeable forum'.[199]

Antitrust policy should not attempt to limit the exercise of IP rights, including those of SEP holders. The opportunity to seek injunctive relief through the courts is an important aspect of enforcing IP rights of patent holders and is consistent with FRAND commitments. The 2021 Draft Policy Statement proposes conditions on injunctive relief beyond those established by courts, particularly in *eBay*.[200] According to the 2021 Draft Policy Statement '[w]here a potential licensee is willing to license and is able to compensate a SEP holder for past infringement and future use of SEPs subject to a voluntary F/RAND commitment, seeking injunctive relief in lieu of good-faith negotiation is inconsistent with the goals of the F/RAND commitment'.[201] A potential licensee claiming to be willing to license and able to compensate a SEP holder for past infringement and future use of SEPs fails to protect IP rights if the potential licensee engages in hold-out and does not negotiate in good faith.[202]

Antitrust policy should not be used to regulate patent license negotiations, including patents that are SEPs subject to FRAND commitments. Rather, patent license negotiations should continue within the context of private bargaining in the competitive marketplace, IP rules established by standards organizations, and court decisions. For this reason, the Draft Statement should not seek a framework for good-faith F/RAND licensing negotiations, nor should antitrust establish such frameworks. The DOJ should avoid making rules that would limit injunctions, specify license offers by SEP holders, or advise inventors and implementors on how to conduct IP license negotiations. Negotiation between patent holders and technology implementers alleviates a broad range of concerns about economic inefficiencies in royalties and terms of license agreements.[203]

197 ibid. ('Steps that encourage good-faith licensing negotiations between standards essential patent owners and those who seek to implement technologies subject to F/RAND commitments by the parties will promote technology innovation, further consumer choice, and enable industry competitiveness. When licensing negotiations fail, however, appropriate remedies should be available to preserve competition, and incentives for innovation and for continued participation in voluntary, consensus-based, standards-setting activities.')

198 Draft Policy Statement on Licensing Negotiations and Remedies for Standards-Essential Patents Subject to Voluntary F/Rand Commitments, 6 December 2021, The U.S. Patent & Trademark Office (USPTO), the National Institute of Standards and Technology (NIST), and the U.S. Department of Justice, Antitrust Division (DOJ), Washington, DC <https://www.regulations.gov/docket/ATR-2021-0001> accessed 14 May 2022.

199 ibid 11.

200 *eBay* (n 185).

201 Draft Statement (n 198) 4.

202 This discussion draws from Daniel F Spulber, Comments on Draft Policy Statement on Licensing Negotiations and Remedies for Standards Essential Patents Subject to Voluntary F/Rand Commitments, Submitted to DOJ, 3 February 2022.

203 Daniel F Spulber, 'Antitrust Policy toward Patent Licensing: Why Negotiation Matters' (2021) 22(1) Minnesota Journal of Law, Science and Technology 83.

Antitrust intervention is not necessary to enforce FRAND commitments by SEP holders. As the Court of Appeals observed in *FTC v Trinko*, contract or tort law, rather than antitrust law, would be sufficient to address any alleged breach of contractual commitments to standards organizations.[204] FRAND commitments are contractual commitments with third-party beneficiaries.

Despite *Independent Ink*, the market power presumption has crept back into antitrust policy toward holders of SEPs.[205] Technology standards provide cover for antitrust policy directed against IP generally. SEPs are likely to be valuable because they provide inventions that underlie technology standards. Antitrust restrictions that target SEPs then are particularly harmful because they address some of the most valuable inventions. These restrictive policies include limits on injunctions and damages for infringement. Such antitrust policies not only discourage invention and innovation, but also can diminish incentives to participate in technology standardization.

Technology standards are said to confer market power on SEP holders according to advocates of holdup theory.[206] This theory is based on extreme assumptions that did not reflect institutions in the market for technology. Holdup theory assumes that patent holders make take-it-or-leave-it royalty demands rather than negotiating patent license agreements with technology adopters.[207] Economic analysis does not support either the analysis or the conclusions of holdup theory.[208] Holdup theory in its various forms gained considerable influence in antitrust and IP disputes with little if any supporting evidence.[209]

Assistant Attorney General Makan Delrahim commented '[t]oo often lost in the debate over the hold-up problem is recognition of a more serious risk: the hold-out problem'.[210] Delrahim observes that '[t]he hold-out problem arises when implementers threaten to under-invest in the implementation of a standard, or threaten not to take a license at all, until their royalty demands are met'.[211] Delrahim pointed out that hold-out takes advantage of inventors' investments in creating new technologies. According to Delrahim, '[t]here is a growing trend supporting what I would view as a misuse of antitrust or competition law, purportedly motivated by the fear of so-called patent hold-up, to police private commitments that IP holders make in order to be considered for inclusion in a standard'.[212]

204 Bruce H Kobayashi and Joshua D Wright, 'Federalism, Substantive Preemption, and Limits on Antitrust: An Application to Patent Holdup' (2009) 5(3) Journal of Competition Law & Economics 469.

205 See for example, FTC, 'The Evolving IP Marketplace: Aligning Patent Notice and Remedies with Competition' (2011) 22–23 <https://www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-remedies-competition-report-federal-trade/110307patentreport.pdf>, accessed 14 May 2022.

206 Spulber (n 203).

207 ibid.

208 ibid.

209 See J Gregory Sidak, 'Is Patent Holdup a Hoax?' (2018) 3 The Criterion Journal on Innovation 401, 477.

210 Assistant Attorney General Makan Delrahim Delivers Remarks at the USC Gould School of Law's Center for Transnational Law and Business Conference Los Angeles, CA, 10 November 2017 <https://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-usc-gould-school-laws-center> accessed 14 May 2022.

211 ibid.

212 ibid.

There has been an increase in antitrust actions involving SEP licensing with FRAND commitments.[213] Delrahim points out that '[i]njecting antitrust or competition law remedies into these disputes makes matters worse'.[214] In a joint Policy Statement, the USPTO, NIST and the DOJ affirmed the importance of negotiation in patent licensing,

> Steps that encourage good-faith licensing negotiations between standards essential patent owners and those who seek to implement technologies subject to F/RAND commitments by the parties will promote technology innovation, further consumer choice, and enable industry competitiveness.[215]

The joint policy statement added '[w]hen licensing negotiations fail, however, appropriate remedies should be available to preserve competition, and incentives for innovation and for continued participation in voluntary, consensus-based, standards-setting activities'.[216] The joint Policy Statement emphasized that SEP licensing should not be treated differently from patent licensing generally.[217]

Patent pools for SEPs also should not be treated differently from patent pools in general. Avanci operated a patent pool for 2G, 3G, and 4G mobile communication SEPs and established a patent pool for SEPs for 5G technologies related to the automobile industry. The DOJ found in a Business Review Letter that 'Avanci's proposed 5G Platform is unlikely to harm competition'.[218] According to the DOJ's Statement of Interest in *Continental v Avanci*,

> Recognizing a Section 2 cause of action premised on alleged violations of commitments to offer patent licenses at rates that are FRAND would (1) run contrary to the policies underlying the antitrust laws that encourage market-based pricing; (2) risk distorting licensing negotiations for standard-essential patents ('SEPs'); and (3) threaten to deter procompetitive or competitively neutral conduct.[219]

213 Douglas H Ginsburg, Koren W Wong-Ervin and Joshua D Wright, 'The Troubling Use of Antitrust to Regulate FRAND Licensing' (2015) 10 *Competition* Policy International Antitrust Chronicle 2, 2.

214 Assistant Attorney General Makan Delrahim, 'Don't Stop Thinking About Tomorrow': *Promoting Innovation by Ensuring Market-Based Application of Antitrust to Intellectual Property* (Department of Justice, 6 June 2019) <https://www.justice.gov/opa/speech/assistant-attorney-general-makan-delrahim-delivers-remarks-organisation-economic-co [https://perma.cc/2HHJ-8F5N], accessed 14 May 2022>.

215 The U.S. Patent & Trademark Office (USPTO), the National Institute of Standards and Technology (NIST), and the U.S. Department of Justice, Antitrust Division (DOJ), Policy Statement on Remedies for Standards-Essential Patents Subject to Voluntary F/Rand Commitments, 19 December 2019 1 (hereafter Joint Policy Statement).

216 ibid 1–2.

217 ibid 7. ('courts, the U.S. International Trade Commission, and other decision makers in their discretion should continue to consider all relevant facts, including the conduct of the parties, when evaluating the general principles of law applicable to their remedy determinations involving standards-essential patents.')

218 Assistant Attorney General Makan Delrahim, DOJ Business Review Letter, 20-7 Avanci, 28 July 2020 <https://www.justice.gov/atr/business-review-letters-and-request-letters#page-2020> accessed 14 May 2022.

219 DOJ Statement of Interest, *Continental Automotive Systems, Inc v Avanci, LLC*, et al. (hereafter *Continental v Avanci*) Case No 3:19-cv-02933, Doc No 316 at 12–13 (ND Texas, 10 September 2020) 2.

The DOJ further noted '[a]lthough patent law anticipates a judicial role in determining reasonable royalties in an infringement action, and contract law permits a court to determine damages for the breach of a licensing agreement, the antitrust laws contain no such mandate'.[220]

The antitrust agencies' IP guidelines

The DOJ and FTC Antitrust Guidelines for the Licensing of Intellectual Property (hereafter 'IP Guidelines') also do not presume that IP creates market power.[221] Antitrust law now considers various patent licensing practices under the rule of reason rather than as per se violations.[222] The Court of Appeals for the Ninth Circuit in *FTC v* Qualcomm addressed whether an antitrust duty to deal should apply to IP licensing. The Supreme Court in *FTC v Actavis* considered possible tradeoffs between competition and innovation by applying the rule of reason to reverse payments in pharmaceutical settlements.[223]

The IP Guidelines state '[t]he intellectual property laws and the antitrust laws share the common purpose of promoting innovation and enhancing consumer welfare'.[224] According to the IP Guidelines, '[t]he intellectual property laws provide incentives for innovation and its dissemination and commercialization by establishing enforceable property rights for the creators of new and useful products, more efficient processes, and original works of expression. In the absence of intellectual property rights, imitators could more rapidly exploit the efforts of innovators and investors without providing compensation'. The IP Guidelines set forth three general principles that should be helpful for guiding antitrust policy toward innovation competition.

First, the IP Guidelines address competitive conduct: 'for the purpose of antitrust analysis, the Agencies apply the same analysis to conduct involving intellectual property as to conduct involving other forms of property, taking into account the specific characteristics of a particular property right'. The IP Guidelines recognize the 'ease of misappropriation' that distinguishes IP from other forms of property.[225]

Secondly, the IP Guidelines 'do not presume that intellectual property creates market power in the antitrust context'.[226] The IP Guidelines observe that 'there will often be sufficient actual or potential close substitutes . . . to prevent the exercise of market power'. [227]

220 ibid 24.

221 Department of Justice (DOJ) and FTC, Antitrust Guidelines for the Licensing of Intellectual Property, 12 January 2017, 2 <https://www.ftc.gov/system/files/documents/public_statements/1049793/ip_guidelines_2017.pdf> accessed 14 May, 2022.

222 Daniel P Homiller, 'Patent Misuse in Patent Pool Licensing: From National Harrow to "The Nine Nonos" To Not Likely' (2006) 5(1) Duke Law & Technology Review 1; Herbert Hovenkamp, 'Antitrust and the Patent System: A Reexamination' (2015) 76 Ohio State Law Journal 467.

223 *Federal Trade Commission v Actavis et al*, 570 US 136 (2013), hereafter *FTC v Actavis*.

224 DOJ and FTC, 'Antitrust Guidelines for the Licensing of Intellectual Property' 12 January 2017, 2 <https://www.ftc.gov/system/files/documents/public_statements/1049793/ip_guidelines_2017.pdf> accessed 14 May 2022.

225 IP Guidelines 3.

226 ibid 2.

227 ibid 4.

Thirdly, the IP Guidelines 'recognize that intellectual property licensing allows firms to combine complementary factors of production and is generally pro-competitive'.[228] The IP Guidelines express concerns that some IP items can 'block' others. The IP Guidelines acknowledge that '[f]ield-of-use, territorial, and other limitations on intellectual property licenses may serve procompetitive ends by allowing the licensor to exploit its property as efficiently and effectively as possible'. [229]

The IP Guidelines identify various antitrust concerns as they apply to three types of markets: goods, technology, and R&D. In goods markets, the antitrust agencies will define markets as in the HMGs. In technology markets, the antitrust agencies will consider the availability of substitute technologies, citing among other cases *Apple v. Samsung*.[230] The IP Guidelines define R&D markets as 'the assets comprising research and development related to the identification of a commercializable product, or directed to particular new or improved goods or processes, and the close substitutes for that research and development'.[231]

The IP Guidelines affirm that most IP licensing arrangements are evaluated based on the rule of reason. Anticompetitive effects should be weighed against procompetitive effects.[232] In horizontal relationships, licensing arrangements should not be a means of collusion or monopolization. Licensing arrangements may promote competition from 'economies of scale and the integration of complementary research and development, production, and marketing capabilities'.[233] In vertical relationships, licensing arrangements should not restrict competition at the level of either party. The agencies generally will apply the rule of reason to IP licensing involving minimum resale price maintenance, tying arrangements, exclusive dealing, cross licensing and pooling arrangements, and grantbacks.

Independent Ink found that '[m]any tying arrangements, even those involving patents and requirements ties, are fully consistent with a free, competitive market'. As the Court observed, 'Congress, the antitrust enforcement agencies, and most economists have all reached the conclusion that a patent does not necessarily confer market power upon the patentee. Today, we reach the same conclusion, and therefore hold that, in all cases involving a tying arrangement, the plaintiff must prove that the defendant has market power in the tying product'.[234]

Intellectual property and the antitrust duty to deal

The IP Guidelines address the antitrust duty to deal.[235] The IP Guidelines emphasize that the 'antitrust laws generally do not impose liability upon a firm for a unilateral refusal to assist its competitors, in part because doing so may undermine incentives for investment and innovation'. The IP guidelines cite the Supreme Court's *Trinko*

228 ibid 2.
229 ibid.
230 *Apple Inc v Samsung Electronics Co*, No 11-CV-01846, 2012 US Dist LEXIS 67102, 19–23 (N.D. Cal. 14 May 2012) (hereafter *Apple v Samsung*).
231 IP Guidelines 11.
232 ibid 17.
233 ibid 26.
234 *Independent Ink* 16.
235 *Trinko* 540 US 398 (n 69).

decision on the issue of the duty to deal. *Trinko* states that 'there is no duty to aid competitors' although '[u]nder certain circumstances, a refusal to cooperate with rivals can constitute anticompetitive conduct and violate § 2'. [236]

As applied to IP, *Trinko* limits IP holders' duty to deal with competitors. IP should not be viewed as an essential facility. As Christopher Yoo and I point out, *Trinko*

> represents a sweeping acknowledgement of how compelling access to bottleneck facilities may impair economic efficiency. When alternative sources of supply exist, simply allocating the resource that exists is not the best solution. The better course is to allow any supracompetitive returns to serve as the signal and the incentive for others to develop independent sources, which in turn will provide sustainable benefits to consumers without the continuing oversight of the terms and conditions of sharing by antitrust courts.[237]

Pac Bell points out that *Trinko* 'holds that a defendant with no antitrust duty to deal with its rivals has no duty to deal under the terms and conditions preferred by those rivals'.[238] This implies that IP holders with no antitrust duty to deal with rivals do not have a duty to deal under the terms preferred by potential licensees.

These issues arose in *FTC v* Qualcomm. The FTC alleged that Qualcomm engaged in 'unfair methods of competition' in IP licensing that violated section 5(a) of the FTC Act (15 USC section 45(a)) as well as sections 1 and 2 of the Sherman Act and section 5 of the FTC Act.[239] The FTC claimed that 'Qualcomm harmed competition in two markets for baseband processors, also called modem chips, through a set of interrelated Qualcomm practices'.[240] The District Court in *FTC v* Qualcomm ruled that the company should license to rival modem chip suppliers based on an antitrust duty to deal. A three-judge panel of the US Court of Appeals for the Ninth Circuit in 2020 vacated the decision and the injunction regarding Qualcomm's business practices.[241]

The District Court decision in *FTC v* Qualcomm applied antitrust law against IP licensing practices and imposed extensive judicial regulation of IP licensing.[242] The District Court's theory of exclusion was based on the company not licensing patents to rival modem chip suppliers.[243] According to the District Court '[i]n sum, Qualcomm's refusal to license has prevented rivals' entry, impeded rivals' ability to sell modem chips externally or at all, promoted rivals' exit, and delayed rivals' entry'.[244] The District Court further stated that this exclusion has 'limited OEMs' chip

236 ibid 411.
237 Spulber and Yoo (n 69) 1867.
238 *Pac Bell Tel Co v linkLine Commc'ns, Inc*, 129 S.Ct. 1109 (2009) (hereafter *Pac Bell*) citing *Trinko*, 540 US, 409–10.
239 *FTC v Qualcomm*, District Court, 1.
240 ibid.
241 *FTC v Qualcomm Inc*, 969 F.3d 974 (9th Cir. 2020)
242 *FTC v Qualcomm*, District Court.
243 *FTC v Qualcomm*, District Court, see particularly 114–24.
244 *FTC v Qualcomm*, District Court, 124.

supply options'.[245] The District Court addressed 5G mobile telecommunications before the technologies were developed or implemented.

The District Court in *FTC v* Qualcomm cited the Supreme Court's *Aspen Skiing* decision regarding duty to deal.[246] In *Aspen Skiing*, the company ended long-standing cooperation with a rival firm. The Court found that 'the evidence supports an inference that Ski Co. was not motivated by efficiency concerns and that it was willing to sacrifice short-run benefits and consumer goodwill in exchange for a perceived long-run impact on its smaller rival'.[247] The District Court also cited the Supreme Court's *Trinko* decision stating that 'there is no duty to aid competitors' although '[u]nder certain circumstances, a refusal to cooperate with rivals can constitute anticompetitive conduct and violate § 2'.[248] The District Court viewed not licensing to rivals as anticompetitive but at the same time was critical of patent license royalties. The District Court decision stated that 'the "all-in" price of any modem chip sold by one of Qualcomm's rivals effectively included two components: (1) the nominal chip price; and (2) Qualcomm's royalty surcharge'.[249] This description would apply to any patent license royalties charged to rival suppliers of modem chips.

As interpreted by the District Court in *FTC v* Qualcomm, *Aspen Skiing* was indeed a slippery slope. *Aspen Skiing* was not directly applicable to IP licensing in this case. Qualcomm's licensing agreements with modem chip suppliers were limited and ended years ago. Technological change in the mobile telecommunications industry implied that patent licensing agreements can change. Past licensing arrangements with rival modem chip producers need not imply a perpetual antitrust duty to deal.

The Court of Appeals in *FTC v.* Qualcomm found that 'Qualcomm's practice of licensing its SEPs exclusively at the OEM level did not amount to anticompetitive conduct in violation of § 2, as Qualcomm is under no antitrust duty to license rival chip suppliers'. The Court of Appeals gave three reasons why *Aspen Skiing* did not apply. During the time at issue there was no evidence that Qualcomm 'ever had a practice of providing exhaustive licenses at the modem chip level rather than the OEM level'.[250] Secondly, Qualcomm's OEM-level licensing was not a sacrifice of short-term profit for long-term exclusion, but rather was profitable in both the short term and the long term regardless of effects on competition. Third, 'Qualcomm applies its OEM-level licensing policy equally with respect to all competitors in the modem chip markets and declines to enforce its patents against these rivals even though they practice Qualcomm's patents (royalty-free)'. [251]

245 ibid.

246 *Aspen Skiing Co v Aspen Highlands Skiing Corp*, 472 US 585 (1985) (hereafter *Aspen Skiing*) 601. ('The absence of a duty to transact business with another firm is, in some respects, merely the counterpart of the independent businessman's cherished right to select his customers and his associates. The high value that we have placed on the right to refuse to deal with other firms does not mean that the right is unqualified.')

247 ibid 611.

248 *Trinko* 411.

249 *FTC v Qualcomm*, District Court 185.

250 *FTC v Qualcomm*, Court of Appeals 15.

251 *FTC v Qualcomm*, Court of Appeals 35.

The Court of Appeals in *FTC v* Qualcomm found the company did not violate the Sherman Act in licensing to OEMs.[252] The Court of Appeals pointed out that the company is not an OEM in terms of mobile phones or smart cars so that 'it does not "compete"—in the antitrust sense—against OEMs like Apple and Samsung in these product markets. Instead, these OEMs are Qualcomm's customers'.[253] The Court of Appeals observed 'Qualcomm's royalties are "chip-supplier neutral" because Qualcomm collects them from *all* OEMs that license its patents, not just 'rivals' customers'.[254] The Court of Appeals noted 'in order to make out a § 2 violation, the anticompetitive harm identified must be to *competition itself*, not merely to competitors'. [255]

The Court of Appeals emphasized that '[a]ntitrust law, like patent law, is 'aimed at encouraging innovation, industry and competition'.[256] The Court of Appeals determined that 'Qualcomm's patent-licensing royalties and "no license, no chips" policy did not impose an anticompetitive surcharge on rivals' modem chip sales'.[257] The Court of Appeals cited *Trinko* regarding market power: '[t]he opportunity to charge monopoly prices—at least for a short period—is what attracts 'business acumen' in the first place; it induces risk taking that produces innovation and economic growth'.[258]

The Court of Appeals in *FTC v.* Qualcomm addressed the important issue of where to apply patent license royalties in the mobile phone value chain. The District Court had found that it was anticompetitive or unreasonable to apply royalties at the level of the mobile phone. It suggested that the mobile phone was not the smallest salable patent-practicing unit ('SSPPU'). Regardless of what is the SSPPU, the Court of Appeals rejected this conclusion: 'No court has held that the SSPPU concept is a per se rule for "reasonable royalty" calculations'.[259] The Court of Appeals pointed out that antitrust law does not prohibit companies such as Qualcomm from 'licensing their SEPs independently from their chip sales and collecting royalties', and/or 'limiting their chip customer base to licensed OEMs'. [260]

The issue of where to license SEPs along the value chain is particularly contentious. In ICT, this problem was solved in part by licensing at the handset. Mobile communications, however, are no longer confined to smartphones. Many industries require advanced communications for applications such as the connected car, mobility as a service, transportation, the IoT and the industrial IoT, medical care, and smart cities.

The best place to license along the value chain is likely to vary by application but economics suggests some general principles. Licensing at the final product avoids

252 *FTC v Qualcomm*, Court of Appeals 15.
253 ibid.
254 *FTC v Qualcomm*, Court of Appeals 36.
255 *FTC v Qualcomm*, Court of Appeals, emphasis in original, 37.
256 *FTC v Qualcomm*, Court of Appeals, 21. The Court of Appeals cited '*Atari Games Corp v Nintendo of Am, Inc*, 897 F.2d 1572, 1576 (Fed. Cir. 1990) (citing *Loctite Corp v Ultraseal Ltd*, 781 F.2d 861, 876–77 (Fed. Cir. 1985)).'
257 *FTC v Qualcomm*, Court of Appeals 56.
258 *FTC v Qualcomm*, Court of Appeals 25.
259 ibid.
260 *FTC v Qualcomm*, Court of Appeals 50.

transaction costs associated with dispersion of licensing along the value chain, which would increase the number of contracting parties and the need for more negotiation. Licensing at the final product stage facilitates consolidation of licensing across patent holders through patent pools. Licensing at the final product stage best reflects the market knowledge of OEMs regarding the contribution of the patented technology to market value. Licensing at the final product stage does not increase royalties to patent holders in comparison to licensing to input suppliers because it does not affect the technological contribution or market power of patent holders.

V. INNOVATION COMPETITION AND MERGER POLICY

Antitrust should view horizontal mergers in the context of technological change. Innovation competition calls for increased attention to the effects of mergers on non-price competition. The HMGs recognize the critical importance of innovation competition for merger policy. In contrast, the traditional economic analysis of horizontal mergers emphasizes their price effects.

Innovation Competition and the Horizontal Merger Guidelines

Competition based on innovation appeared in the 1990 FTC consent order for the merger between Genetech and Roche.[261] Antitrust authorities have expressed concerns that mergers could impede innovation using earlier concepts of an 'R&D market' and an 'innovation market'.[262] Ilene Knable Gotts and Richard Rapp suggest that instead of markets for innovation, antitrust should instead consider the effects of innovation as entry in future goods markets.[263] Robert Hoerner objects to the concept of innovation markets: '[w]hat has happened is clear. By a change in rhetoric the agencies are attempting to broaden the bases on which they can attack nonhorizontal and nonvertical mergers'.[264]

The HMGs recognize that competition occurs 'along multiple dimensions'.[265] The antitrust agencies state 'a merger may increase prices in the short term but not raise longer-term concerns about innovation, either because rivals will provide

261 Roche Holdings Ltd, 113 FTC 1086.

262 Richard T Rapp, 'The Misapplication of the Innovation Market Approach to Merger Analysis' (1995) 64 Antitrust Law Journal 19. ('the definition of an innovation market as a relevant market for antitrust purposes has an antecedent in the 'R&D market' concept that appeared in the 1984 National Cooperative Research Act [15 U.S.C. § 4302 (1984)] and in the 1988 International Guidelines.') Rapp notes '[w]ith the enactment of the 1984 NCRA, Congress sought to encourage certain cooperative research endeavors and dispel uncertainties for market competitors by defining protected joint R&D activities and acceptable conduct, standards of review, and limitations on antitrust civil remedies (in particular, actual versus treble damages) if the venture is properly disclosed but later determined to violate the law.' Rapp cites the US Department of Justice Antitrust Enforcement Guidelines for International Operations (1988), reprinted in 4 Trade Reg Rep (CCH) 11, 13, 109.

263 Ilene Knable Gotts and Richard T Rapp, 'Antitrust Treatment of Mergers Involving Future Goods' (2004) 19 Antitrust 100.

264 Robert J Hoerner, 'Innovation Markets: New Wine in Old Bottles' (1995) 64 Antitrust Law Journal 49. Landman argues that innovation markets are a myth, Lawrence B Landman, 'Competitiveness, Innovation Policy, and the Innovation Market Myth: A Reply to Tom and Newberg on Innovation Markets as the Centerpiece of New Thinking on Innovation' (1998) 13 John's Journal of Legal Commentary 223.

265 FTC DOJ HMGs 20.

sufficient innovation competition or because the merger will generate cognizable research and development efficiencies'.[266] The antitrust agencies express concerns about mergers that 'diminish innovation competition': either 'by encouraging the merged firm to curtail its innovative efforts below the level that would prevail in the absence of the merger' or 'by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction'.[267] The antitrust agencies also consider mergers that 'enable innovation that would not otherwise take place, by bringing together complementary capabilities that cannot be otherwise combined or for some other merger-specific reason'. [268]

Market definition is an important aspect of merger policy and is closely related to price competition.[269] The HMGs represented a shift of emphasis from market definition toward price competition with differentiated products.[270] The HMGs include Upward Pricing Pressure (UPP).[271] Reviewing the decade after the HMGs, however, Dennis Carlton and Mark Israel express concern that '[t]he problem of over-reliance on market definition—even where it gets in the way of direct evidence on competitive effects—may grow in importance with the increase in litigation that involves two-sided 'markets,' where market definition remains a murky and confused exercise for courts'.[272]

Mergers can affect the incentives to compete of the merged firm (unilateral effects) or the incentives to compete of firms in the industry (coordinated effects). According to Gregory Werden, since the early 1990s, most antitrust merger challenges have involved a mixture of unilateral and coordinated effects.[273] Merger

266 ibid.

267 ibid 23.

268 ibid.

269 Franklin M Fisher, 'Economic Analysis and "Bright-Line" Tests' (2008) 4 Journal of Competition Law of Economics 129, 132; Franklin M Fisher, 'Horizontal Mergers: Triage and Treatment' (1987) 1 Journal of Economic Perspectives 23; Adriaan Ten Kate and Gunnar Niels, 'The Relevant Market: A Concept Still in Search of a Definition' (2009) 5 Journal of Competition Law and Economics 297; Gregory J Werden, 'Market Delineation and the Justice Department's Merger Guidelines' (1983) 1983 Duke Law Journal 514; Jonathan B Baker and Timothy F Bresnahan, 'Empirical Methods of Identifying and Measuring Market Power' (1992) 61 Antitrust Law Journal 3; Jonathan B Baker and Timothy F Bresnahan, 'Estimating the Residual Demand Curve Facing a Single Firm, (1988) 6 International Journal of Industrial Organization 283; Louis Kaplow, 'Why (Ever) Define Markets?' (2010) 124 Harvard Law Review 437; Gregory J Werden, 'Why (Ever) Define Markets: An Answer to Professor Kaplow' (2012) 78 Antitrust Law Journal 729.

270 Tomasso Valletti and Hans Zenger, 'Mergers with Differentiated Products: Where Do We Stand?' (2021) 58 Review of Industrial Organization 179, 181. ('One of the most prominent contributions of the 2010 Guidelines was to de-emphasize the prior focus on market shares for assessing competitive effects in differentiated product markets.')

271 Dennis W Carlton and Mark A Israel. 'Effects of the 2010 Horizontal Merger Guidelines on Merger Review: Based on Ten Years of Practical Experience' (2020) 58 Review of Industrial Organization 213.

272 ibid 215.

273 Gregory J Werden, 'Unilateral Competitive Effects of Horizontal Mergers I: Basic Concepts and Models' in *Issues in Competition Law and Policy* (ABA Section of Antitrust Law 2008) 1319. ('Since early 1990s, few merger challenges by the federal enforcement agencies were based entirely on coordinated effects'.)

analyses typically apply the imperfect competition framework to examine the effects of reducing the number of firms in the industry.[274]

In the Cournot model mentioned previously, products are homogeneous, and each firm chooses how much output to produce. A reduction in the number of firms in the industry decreases total output and increases the market price. This is because firms choose outputs based on profit maximization without considering the effects of their output on the profit of other firms in the industry. An increase in the output of a firm increases total industry output, which lowers the market price and decreases the profit of other firms in the industry. Merger analyses also apply models of price competition with differentiated products. In these models, a reduction in the number of firms also increases prices.[275] In some analyses, the merged firm offers two products and coordinates the prices for those products. This gives the merged firm an incentive to increase the prices of both of its products, which also gives other firms in the industry incentives to increase their prices.

Empirical analyses of mergers generally examine price effects.[276] For example, Orley Ashenfelter et al. examine how the merger of brewers Miller and Coors affected prices.[277] Nathan Miller and Matthew Weinberg study MillerCoors, a joint venture that combined brewing operations of SABMiller PLC and Molson Coors Brewing.[278] They find that after the joint venture, prices of firms in the industry, such as MillerCoors, Anheuser-Busch InBev (ABI) and others, were 6–8 per cent higher than they would have been with differentiated products competition.

Horizontal mergers and incentives to innovate

Antitrust merger policy considers the effects of mergers on innovation competition.[279] The HMGs examine whether the merger increases efficiency in innovation: 'the Agencies consider the ability of the merged firm to conduct research or development more effectively. Such efficiencies may spur innovation but not affect short-term pricing'.[280] The HMGs examine whether the merged firm may have greater incentives to innovate: '[t]he Agencies also consider the ability of the merged firm to appropriate a greater fraction of the benefits resulting from its innovations. Licensing and intellectual property conditions may be important to this enquiry, as they affect the ability of a firm to appropriate the benefits of its innovation'.[281]

274 See Gregory J Werden and Luke M Froeb, 'Unilateral Competitive Effects of Horizontal Mergers' in Paolo Buccirossi (ed), *Advances in the Economics of Competition Law* (MIT Press 2005); Werden, ibid.

275 See Werden and Froeb, ibid, Werden (n 273).

276 See the overview in Orley Ashenfelter, Daniel Hosken and Matthew C Weinberg 'Did Robert Bork Understate the Competitive Impact of Mergers? Evidence from Consummated Mergers' (2014) 57(S3) Journal of Law and Economics S67.

277 Orley Ashenfelter, Daniel Hosken and Matthew C Weinberg, 'Efficiencies Brewed: Pricing and Consolidation in U.S. Brewing' (2015) 46(2) RAND Journal of Economics 328.

278 Nathan H Miller and Matthew C Weinberg, 'Understanding the Price Effects of the MillerCoors Joint Venture' (2017) 85(6) Econometrica 1763.

279 Michael L Katz and Howard A Shelanski, 'Mergers and Innovation' (2007) 74 Antitrust Law Journal, 1; Shelanski (n 120).

280 Merger Guidelines 31 ('Research and development cost savings may be substantial and yet not be cognizable efficiencies because they are difficult to verify or result from anticompetitive reductions in innovative activities.')

281 ibid.

According to Nicolas Petit, '[s]ince 2004, the U.S. agencies have identified innovation concerns in approximately one-third of their merger challenges, and innovation challenges are raised in approximately 80 percent of the cases concerning high R&D industries. In the European Union, 10 of the 73 remedied cases over the period 2015-2017 involved allegations of harm to innovation'.[282] Petit observes that '[i]n both the European Union and the United States, innovation competition is traditionally assessed by reference to R&D activities with ties to specified product markets, current or future'.

The European Commission (EC) has developed a merger policy known as the 'innovation theory of harm' (IToH).[283] The EC required divestiture of innovative capacity in the merger between Dow Chemical Co and EI du Pont de Nemours and Co.[284] The EC decision defines technology markets, R&D markets, and innovation spaces.[285] The EC approach to the merger stated: 'the assessment of innovation competition requires the identification of those companies which, at an industry level, do have the assets and capabilities to discover and develop new products which, as a result of the R&D effort, can be brought to the market'.[286] Ioannis Kokkoris and Tommaso Valletti note that '[b]etween 2015 and 2017, the Commission intervened in 73 cases out of 1070 merger notifications with innovation concerns being identified in 10 cases, usually in addition to static price concerns. In this limited, albeit influential case law, we can identify an innovation theory of harm'.[287] The EU policy treats the effects of horizontal mergers on innovation in terms of unilateral effects and potential innovation of the merged firm.[288]

Merger policy directed at innovation competition should look beyond inputs to R&D. The objective of antitrust should not be to maximize investment in R&D or to preserve R&D assets. Economic efficiency suggests that merger policy should consider the trade-off between the benefits and costs of innovation.[289] Antitrust merger policy should evaluate whether innovations increase or decrease social welfare, as discussed previously. Mergers may enhance economic efficiency by combining complementary R&D investments, avoiding duplication of substitutable R&D investments, and consolidating R&D investments to achieve economies of scale and scope in invention and innovation. Mergers also may enhance efficiency by combining invention and innovation with other complementary assets.

282 Nicolas Petit, 'Innovation Competition, Unilateral Effects and Merger Policy' (2018) 8(3) Antitrust Law Journal 873, 874. ('the Commission's decision marks a conspicuous attempt to shoehorn theories of harm to innovation competition within the unilateral effects model conventionally applied in horizontal merger cases'.)

283 Vincenzo Denicolò and Michele Polo, 'The Innovation Theory of Harm: An Appraisal' (2019) 82(3) Antitrust Law Journal 921.

284 Commission Decision of 27March 2017 declaring a concentration to be compatible with the internal market and the EEA Agreement, Case COMP/M.7932-Dow/DuPont, Comm'n Decision ¶3297 (27 March 2017) <ec.europa .eu/competition/mergers/cases/decisions/m7932_13668_3.pdf> accessed 14 May 2022.

285 EC decision, ibid 44.

286 ibid.

287 Ioannis Kokkoris and Tommaso Valletti, 'Innovation Considerations in Horizontal Merger Control' (2020) 16(2) Journal of Competition Law & Economics 220.

288 Petit (n 282).

289 ibid.

Antitrust analyses of mergers should consider the effects of innovation competition. If competition enhances firms' incentives to innovate, then mergers may decrease incentives to innovate, and conversely, if competition decreases incentives to innovate then mergers may increase incentives to innovate. More generally, the relationship between competition and innovation may be very complicated and dependent on industry structure and competitive strategies. Using the Lerner index as a measure of competition and patents as a measure of incentives to innovate, Aghion et al. find that competition increases and then decreases innovation, generating an 'inverted-U shape'.[290]

Economic analysis of how competition affects incentives to invent is relevant for merger policy. Consider industries in which R&D and production are not vertically integrated activities. When there are markets for technology, competition among technology providers and competition among technology implementers can affect incentives to invent. Kenneth Arrow showed that competition among implementers increases incentives to invent for a monopoly technology provider.[291] Competition among implementers also increases incentives to invent when there are multiple technology providers with substitute technologies.[292]

Next, consider competition among inventors when there are markets for technology. Greater competition among inventors with substitute technologies can increase incentives for invention.[293] The reason for this is that average returns among inventors are greater than incremental returns for a monopolist inventor with many projects. Competition among inventors also affects incentives to invent when multiple inventions are combined to create complex innovations such as smartphones, computers, or connected cars.[294] Increased competition among inventors to obtain patents for similar technologies also impacts incentives to invent.[295]

These economic analyses suggest that mergers of producers can affect incentives to invent when R&D and production are not vertically integrated. Horizontal mergers in product markets may decrease competitive pressures and diminish returns to inventors providing technology to the downstream market.[296] Horizontal mergers of specialized inventors also can decrease incentives to invent because the merged firms consider the incremental returns to invention rather than the average returns to invention. Horizontal mergers of specialized inventors can increase incentives to invent when the merged firm benefits from cost efficiencies in R&D and sharing of

290 Aghion (n 67).

291 Kenneth J Arrow, 'Economic Welfare and the Allocation of Resources for Invention' in *The Rate and Direction of Inventive Activity* (Princeton University Press 1962 (for NBER), Universities-National Bureau Committee for Economic Research, and Committee on Economic Growth of the Social Science Research Council (eds). See also Daniel F Spulber, 'How Entrepreneurs Affect the Rate and Direction of Inventive Activity' in Josh Lerner and Scott Stern (eds), *The Rate and Direction of Inventive Activity Revisited, National Bureau of Economic Research (NBER)* (University of Chicago Press 2012) 277–315; Guillermo Marshall and Alvaro Parra, 'Innovation and Competition: The Role of the Product Market' (2019) 65 International Journal of Industrial Organization 221.

292 Spulber (n 31); Spulber (n 31).

293 ibid.

294 Daniel F Spulber, 'The Multiple-Winners Problem: Incentives to Invent when Producers Combine Inventions' (2022) Northwestern University, Working Paper.

295 For a survey and analysis of these models, see Baye and Hoppe (n 131).

296 Arrow (n 291).

knowledge and expertise within the firm. The incentive effects of mergers of inventors that supply inventions that are imperfect substitutes or complements depends on market conditions in downstream product markets.[297]

The relationship between competition and innovation also depends on the vertical structure of the industry. If R&D and production are vertically integrated, and the market for technology is limited, then firms innovate for their own use. Schumpeter considered how vertically integrated incumbents might bring routine managerial procedures and economies of scale to innovation.[298] With vertical integration, greater competition in the product market tends to decrease the size of each firm, which in turn can diminish incentives to invent and innovate. Xavier Vives shows that when there is imperfect competition with differentiated products in the product market, competitive pressures tend to decrease incentives to invent and innovate.[299] This suggests that in industries where R&D and production are vertically integrated, mergers may relieve competitive pressures and stimulate invention and innovation. With vertically integrated R&D and production, Vincenzo Denicolò and Michele Polo show that mergers can increase incentives for invention when returns to R&D do not diminish too repidly.[300] Giulio Federico et al. find that when there are rapidly diminishing returns to R&D, mergers can decrease incentives to invent.[301]

Innovation competition and acquisition of entrants

Innovation competition often involves both market entrants and incumbent firms. Innovative entrepreneurs play an important role when established firms encounter various types of economic and bureaucratic inertia and are slow to embrace new technologies.[302] Innovative entrepreneurs also establish firms when inventors and innovators encounter difficulties in transferring technologies to established firms.[303] This can occur when there are significant transaction costs in the market for technology that limit technology transfers.

Incumbent firms also are major contributors to innovation competition. Incumbent firms have knowledge and capabilities in invention and innovation. Incumbent firms that engage in 'open innovation' combine in-house innovation with transactions in markets for technology.[304] Many incumbent firms can succeed by developing or managing 'disruptive technologies', while others fail when encountering

297 Spulber (n 294).

298 Joseph Schumpeter, *Capitalism, Socialism and Democracy* (Harper & Row 1975 [1942]); Xavier Vives 'Innovation and Competitive Pressure' (2008) 56(3) Journal of Industrial Economics 419.

299 Vives (n 67).

300 See Denicolò and Polo (n 283). See also Vincenzo Denicolò and Michele Polo, 'Duplicative Research, Merger and Innovation' (2018) 166 Economics Letters 56.

301 Giulio Federico, Gregor Langus and Tommaso Valletti, 'A Simple Model of Mergers and Innovation' (2017) 157 Economics Letters 136; Giulio Federico, Gregor Langus and Tommaso Valletti, 'Horizontal Mergers and Product Innovation' (2018) 59 International Journal of Industrial Organization 1.

302 Spulber (n 34).

303 ibid.

304 Henry W Chesbrough, 'Open innovation: A New Paradigm for Understanding Industrial Innovation' in Henry W Chesbrough, Wim Vanhaverbecke and Joel West (eds) *Open Innovation: Researching a New Paradigm* (OUP 2006) 1. ('Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.') See also Henry W Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from*

these types of innovations.[305] The riskiness of innovation can have less impact on investment by diversified incumbent firms than on investment by entrepreneurial firms.[306]

This suggests that antitrust policy should avoid favoring either innovative entrants or innovative incumbents. The successful entry of innovative firms and the exit of incumbent firms need not indicate anticompetitive conduct. The rapid growth of new entrants need not indicate monopolization. The success of entrants simply may reflect technological change that increases economies of scale and returns to creating platforms. Entrants may benefit from disruptive technologies and low barriers to entry for digital platforms. New entrants may themselves face challenges from new technologies offered by future entrants.

The House Report expresses concerns about the effect of M&A on innovations: 'by pursuing additional deals in artificial intelligence and in other emerging markets, the dominant firms of today could position themselves to control the technology of tomorrow'.[307] The House Report suggests that Amazon, Apple, Facebook, and Google 'acquired hundreds of companies just in the last ten years. In some cases, a dominant firm evidently acquired nascent or potential competitors to neutralize a competitive threat or to maintain and expand the firm's dominance'.[308] The House Report observes that in some cases 'a dominant firm acquired smaller companies to shut them down or discontinue underlying products entirely—transactions aptly described as "killer acquisitions"'.[309]

According to the House Report, '[a]lthough the dominant platforms collectively engaged in several hundred mergers and acquisitions between 2000-2019, antitrust enforcers did not block a single one of these transactions'.[310] The House Report recommends that 'any acquisition by a dominant platform would be presumed anticompetitive unless the merging parties could show that the transaction was necessary for serving the public interest and that similar benefits could not be achieved through internal growth and expansion'.[311]

Innovation competition presents difficulties for antitrust merger policy toward acquisition of startups. Innovative entrepreneurs create startups and establish new firms based on multifaceted incentives. An innovative entrepreneur may obtain returns to own use of the technology by the new firm and licensing of inventions to other firms. Alternatively, an innovative entrepreneur may obtain returns from selling the new firm to an incumbent firm. Incumbent firms may have an advantage over new firms because the incumbent has access to financing, related technologies, innovative capabilities, human and organizational capital, brand names, and marketing channels.

Technology (Harvard Business Press 2003); Henry W Chesbrough and Melissa M Appleyard, 'Open Innovation and Strategy' (2007) 50(1) California Management Review 57.

305 Clayton M Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Harvard Business Review Press 2013); Henderson (n 168).

306 Andrea Caggese, 'Entrepreneurial Risk, Investment, and Innovation' (2012) 106(2) Journal of Financial Economics 287.

307 House Report (n 111) 387.

308 ibid.

309 ibid.

310 ibid 387.

311 ibid 388.

These advantages imply that that the entrepreneur may obtain greater returns from selling the new firm to an incumbent than from operating independently.

A challenge for antitrust policy is distinguishing acquisitions for monopolization from acquisitions that enhance innovation competition. These motivations may be intertwined if an acquisition confers multiple benefits on the incumbent. The potential returns from acquisition create incentives for entrepreneurial invention and innovation. Antitrust policy should recognize that extra scrutiny of acquisitions by dominant digital platforms may discourage some forms of innovative entrepreneurship. Antitrust agencies should develop general rules for determining whether acquisition of innovative entrants is on balance procompetitive or anticompetitive.

These issues arose in the proposed merger between Visa and Fintech startup Plaid. After a challenge from the DOJ, Visa and Plaid abandoned their $5.3 billion merger. According to the DOJ's complaint, in addition to increasing prices and raising entry barriers, 'Visa's proposed acquisition of Plaid also would eliminate a disruptive and innovative competitor'.[312] The DOJ argued that the incumbent did not plan competing innovations, 'Visa's CEO has acknowledged that Visa has no plans to launch Plaid's pay-by-bank debit services for consumer payments to merchants'.[313] AAG Delrahim emphasized innovation competition: '[n]ow that Visa has abandoned its anticompetitive merger, Plaid and other future fintech innovators are free to develop potential alternatives to Visa's online debit services'.[314]

Antitrust policy toward mergers also affects the market for technology. According to the IP Guidelines, '[t]he Agencies will apply a merger analysis to an outright sale by an intellectual property owner of all of its rights to that intellectual property and to a transaction in which a person obtains through grant, sale, or other transfer an exclusive license for intellectual property (i.e., a license that precludes all other persons, including the licensor, from using the licensed intellectual property)'.[315] The IP Guidelines state that '[s]uch transactions may be assessed under section 7 of the Clayton Act, sections 1 and 2 of the Sherman Act, and section 5 of the Federal Trade Commission Act'.[316] These types of limitations on the market for technology may diminish incentives for invention, innovation, and commercialization of IP.

VI. CONCLUSION

The accelerating pace of technological change has changed the nature of competition. Innovation competition generates new types of firms and entirely new industries. Firms engage in innovation competition by offering fundamental improvements in transaction methods, product features, and production processes. The major contributions of IP to business strategy, the evolution of

312 *Department of Justice Complaint, United States of America v Visa Inc and Plaid Inc*, 2020 <https://www.justice.gov/opa/press-release/file/1334726/download> accessed 14 May 2022.

313 DOJ ibid.

314 Department of Justice, Antitrust Division, Visa and Plaid Abandon Merger After Antitrust Division's Suit to Block, 12 January 2021<https://www.justice.gov/opa/pr/visa-and-plaid-abandon-merger-after-antitrust-division-s-suit-block> accessed 14 May 2022.

315 IP Guidelines 34.

316 ibid 34.

technology standards, and the widespread diffusion of general-purpose technologies have significant implications for antitrust policy.

Antitrust policy makers certainly recognize the far-reaching effects of innovation competition on consumer welfare and economic efficiency. Antitrust, however, should not approach innovation competition by exclusive reliance on traditional models of perfect and imperfect competition. Antitrust should not evaluate competitive conduct and industry performance based solely on price competition and static technology. Antitrust also cannot abandon economic analysis just to chase after big firms in high-tech industries.

Antitrust policy makers should consider advances in the Economics of Technology & Innovation to better address competition when there is substantial technological change. This requires applying theoretical and empirical frameworks that address R&D investment, markets for IP, technology standards, innovation strategies, and technology diffusion. Recognizing incentives for invention, innovation, and technology adoption can help inform antitrust policy.