

This is a section of [doi:10.7551/mitpress/12686.001.0001](https://doi.org/10.7551/mitpress/12686.001.0001)

Innovation Matters

Competition Policy for the High-Technology Economy

By: Richard J. Gilbert

Citation:

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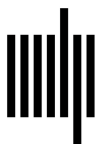
ISBN (electronic): 9780262358637

Publisher: The MIT Press

Published: 2022

OA Funding Provided By:

The open access edition of this book was made possible by generous funding from Arcadia—a charitable fund of Lisbet Rausing and Peter Baldwin.



The MIT Press

2 Should Competition Policy Differ for the High-Technology Economy?

An antitrust policy that reduced prices by 5 percent today at the expense of reducing by 1 percent the annual rate at which innovation lowers the cost of production would be a calamity. In the long run, a continuous rate of change, compounded, swamps static losses.
—Judge Frank Easterbrook, “Ignorance and Antitrust” (1992)

1 Innovation in the US Economy

Private businesses are the engines of technological progress in the US. About 70 percent of US research and development (R&D) spending occurs at private businesses, with the remainder split between higher education, nonprofit organizations, and federal entities. In the aggregate, US industries spent about 4 percent of their revenue on R&D in 2015. Some firms spend nothing on R&D. Many firms in high-tech industries such as computers and pharmaceuticals spend 10 percent or more of their revenue on R&D (figure 2.1).

Industries with high R&D intensities (defined by R&D expenditure as a percentage of total revenue) comprise the core of the high-technology economy. In addition to pharmaceuticals and electronic components, other R&D-intensive industries include communications equipment, software, information and internet services, data processing, aerospace products, scientific instruments, chemicals, and scientific services. For firms in the high-technology economy, it is critical that competition policy consider likely effects on innovation incentives, in addition to the traditional policy focus on conduct that may raise prices.

Invention and innovation have many determinants that are beyond the purview of competition policy. Inventions often spring from the spark of genius by a single entrepreneur driven by a desire to solve a

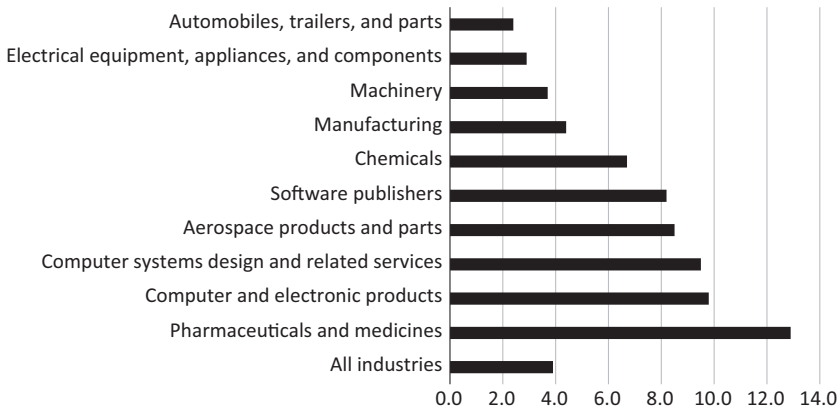


Figure 2.1

R&D expenditures as a percent of revenues for selected US industries (2015). Source: National Science Foundation (2018a) and (2018b).

problem or create a new product without paying particular attention to monetary rewards. Others, such as participants in the open-source software community, collaborate to share knowledge and create new business models that are not predicated on commercial success.¹ But most applied innovations in the modern economy result from industry teams driven in large part by expected profitability.² Competition policies can shape economic incentives to invest in innovative activities by preventing mergers or other conduct that would harm innovation incentives.

Antitrust scholars and practitioners debate whether characteristics of high-tech firms justify more or less antitrust enforcement, or perhaps an entirely different approach to competition policy for the high-technology economy.³ Section 2 of this chapter describes distinctive characteristics of high-tech industries. Section 3 asks whether traditional antitrust enforcement is up to the task of preventing conduct, such as acquisitions by dominant firms of potential competitors, that harms innovation. There is general agreement that the statutes that govern antitrust enforcement in the US and other developed economies are flexible enough to account for the complexities of high-tech markets. However, courts and enforcement agencies have applied antitrust laws with the objective of preventing harm to competition for existing products, while paying less attention to factors that may harm innovation or competition for new products. Section 4 demonstrates that moving from a price-centric to an innovation-centric focus for competition

policy will require significant changes in the way that courts evaluate competition. Some of these requirements appear again in the concluding chapter 11 of this book, but they are sufficiently important for innovation-centric competition policy to warrant repetition. It remains to be seen whether courts will rise to this challenge.

2 The High-Technology Economy Is Different

The high-technology economy has many characteristics that differentiate firms and industries in this sector. The distinctions are a matter of degree. These characteristics are not necessarily absent from firms and industries that do not have high R&D intensity, and not all industries with high R&D intensity possess all these characteristics. Furthermore, the list of high-tech firms and industries is ever-changing. Amazon began as a low-tech online bookseller before it distinguished its platform with advanced logistics and moved into other services such as cloud computing. For many years, motor vehicle manufacturers invested approximately the economywide average share of their revenues in R&D, but that may increase as motor vehicles incorporate more self-driving features.⁴

Innovation can disrupt industries and complicate predicted effects of antitrust enforcement

The high-technology economy is dynamic, with waves of innovation that can destroy incumbents. The dramatic growth of companies such as Microsoft, Amazon, Alphabet (the corporate parent of Google), and Facebook is testament to the power of “creative destruction,” a term coined by Joseph Schumpeter in 1942. He described a “perennial gale of creative destruction” powered by innovation from “the new consumers’ goods, the new methods of production or transportation, the new markets, [and] the new forms of industrial organization that capitalist enterprise creates.”⁵ Innovation has transformed the corporate landscape in only the past few decades by creating new industries such as internet search-driven advertising and social networking, and by adding value to more familiar industries such as personal computing and cellular communications.

Creative destruction poses a challenge to assess the implications of current market concentration for antitrust enforcement. Does a high market share justify concern about monopoly power, or does it reflect creative destruction from successful innovation? Will the gale of creative

destruction make monopoly only a temporary phenomenon? If markets are undergoing rapid change, will a merger or acquisition raise future prices or harm innovation?

Creative destruction complicates predictions of market outcomes, but it does not make antitrust enforcement irrelevant or unnecessary. Long periods of calm can persist between the waves of creative destruction. Indeed, the average duration of firms in the Standard & Poor's (S&P) 500 Index, which includes many high-tech firms, has been increasing since 2000.⁶ Although innovation can topple the corporate giants, there are also strong forces, such as high entry barriers and network effects, that can insulate firms in the high-technology economy from competition for decades.

Many high-tech industries have high entry barriers

High barriers protect many high-tech firms from new competition. Entry into these industries often requires large upfront R&D expenditures and production often has low marginal costs. Search engines have large fixed costs to develop algorithms, but the marginal cost of delivering another search result is close to zero. The combination of large up-front cost and low marginal cost (the cost of supplying another unit) makes new head-to-head competition a risky endeavor. Entrants into R&D-intensive industries face the risk that they will be unable to recover their R&D investments if established firms respond aggressively to their entry. Consequently, one or two firms often dominate the supply of many high-tech products and services. New entry, when it occurs, tends to be for products and services that do not replicate existing products and services.

Intellectual property protection is also a barrier to new competition in many high-tech markets. Many products and services in these industries are protected by patents, copyrights, or trade secrets. New competitors have to negotiate licenses to technologies controlled by incumbents or incur costs to invent workarounds that do not infringe the incumbents' technologies. Incumbents in some technological areas, such as computers, information technology, and biotech, control the rights to hundreds of patents that cover a product or technological application. These "patent thickets" create a formidable barrier to entry if new competitors have to negotiate with many different entities for licenses to these rights and do not have intellectual property of their own that they can trade. Furthermore, firms can allege trade secret theft to deter their employees from leaving to start potentially competitive new enterprises.

Traditional antitrust policy reflects the premise that society is better off when the price of a product or service is closer to its marginal production cost.⁷ Antitrust policies, such as cartel and merger enforcement, often strive to prevent conduct that would increase prices or prevent prices from moving closer to marginal costs. That is consistent with the goal of achieving static economic efficiency for the use of existing resources. However, prices that are close to marginal costs often are not sustainable in markets with large R&D costs and consequently do not promote dynamic economic efficiency in these markets.

Sustainable prices must cover a firm's average production costs, but a firm's average cost typically exceeds its marginal cost when the firm incurs large fixed costs, such as R&D expenditures. Competition policies that force prices closer to marginal costs can extinguish incentives for R&D and other investments that power the technological engines of the modern economy. Many high-tech industries must have high profit margins to survive. While this requirement does not justify anti-competitive conduct, it implies that profit margins can be misleading indicators of market performance in these industries.

Many high-tech industries have network effects that can entrench incumbents

Many firms that dominate sectors of the high-technology economy benefit from network effects that reinforce their market dominance.⁸ Network effects are present when the value of a product to each consumer increases with the number of other consumers of the product. This can occur either directly, because consumers want to interact with other consumers of the same product or service, or indirectly, because more consumers attract more developers of complementary products that enhance consumer experiences.⁹ Telephone and social networks exhibit direct network effects. Operating systems for computers and mobile devices exhibit indirect network effects because firms and consumers value the number of compatible applications, as well as their quality and diversity.

In markets with network effects, the success of a product or service depends on expectations about the number of firms and consumers that will adopt and support it in the future, in addition to its quality and price. Consequently, network effects can confer monopoly power on a firm that consumers expect will have large future sales. This phenomenon, in which a market tips to favor a monopoly supplier, can cause competition in markets with network effects to take the form of competition "for the market" rather than competition "in the market."

Firms can compete to win the market by aggressively cutting prices or by making exclusive deals with suppliers of complementary products that contribute to indirect network benefits.

Markets with network effects can exhibit excess inertia if firms and consumers fail to adopt a superior technology (i.e., a product or service) because the parties do not have confidence that others will do the same.¹⁰ Technology adoption can also exhibit the opposite condition: insufficient friction.¹¹ That is, firms and consumers that adopt a new technology may ignore the effects of their adoption decisions on the installed base of an existing technology, thereby stranding users of an incompatible technology.

The best technology does not necessarily win a market with network effects. Excess inertia and insufficient friction can prevent the adoption of an efficient technology or cause the adoption of an inefficient technology if technologies are not compatible with each other.¹² Compatibility allows different technologies to benefit from network effects. If new and old technologies are compatible, the adoption of the new technology would not strand users of the old technology and concerns about the number of future adopters would not prevent firms and consumers from adopting the new technology. However, compatibility can incur costs and decrease innovation incentives by preventing the innovator from becoming an exclusive supplier.

Although network effects shape the evolution of many high-tech markets, they do not operate without limits. Network effects can attain a maximum value before the entire potential market is covered. These effects can turn negative and become congestion costs if the network includes members (such as spam marketers in a telephone network) that impose costs on the participants rather than conferring benefits. Professionals may place a high value on participating in a network such as LinkedIn, which has many subscribers from their professions and related professions, but they may not care much about the ability to interact with other members of the workforce. Decreasing returns to scale on the supply side can be a disadvantage for large firms relative to smaller upstarts and prevent markets with strong network effects from tipping to a monopoly supplier. Firms can offer consumers differentiated products, which can cause some consumers to prefer a product even if it has a much smaller network.

Network effects do not guarantee that a dominant firm will persist or that rivals cannot compete. Most music listeners transitioned from records to audiotapes, tapes to CDs, and CDs to streaming services,

notwithstanding each previous technology's large installed base of consumers. Facebook replaced MySpace, Google leapfrogged Yahoo! and AltaVista, and Apple and Android smartphones supplanted the once-dominant Blackberry. Apple succeeded in the personal computing space despite the large installed base of applications that were compatible with Microsoft's operating system. Notably, these transitions embodied technological innovations or significant product differentiation; the successful entrants did not use lower prices or modest quality improvements to take market share from incumbents.

The distinctive features of markets with network effects motivate contrasting opinions about appropriate antitrust policies for markets with these characteristics.¹³ One opinion is that antitrust enforcement should be tougher in the presence of network effects because they create high barriers to entry and entrench incumbents with market power. Network effects amplify the harm from exclusion because exclusionary practices can cause a market with network effects to tip to a monopoly. There is a contrary view that antitrust enforcement can lower consumer welfare by enabling firms to fragment the market, which would lower the maximum available benefit from network effects,¹⁴ or that antitrust enforcement is unnecessary because the market will tip to a dominant supplier in any event.

Concerns about fragmentation in markets with network effects are not persuasive when the market has a dominant firm; it is conduct by a dominant firm that typically attracts antitrust scrutiny. Exclusionary conduct by a dominant firm is likely to harm consumers by preventing the entry of an efficient competitor or by suppressing its ability to compete. For this reason, antitrust enforcement should be more attentive to exclusionary conduct by dominant firms in markets with network effects and should apply a threshold level for anticompetitive exclusion that is less than substantial foreclosure.

The economic logic that underlies antitrust law for predatory conduct does not naturally extend to markets with network effects. Appropriate tests for predatory conduct are uniquely challenging for network industries because outcomes depend on consumer and firm expectations about future adoption decisions, and because firms often use low prices or other means to reward adoption and benefit from network effects. Consequently, network effects put antitrust authorities in the uncomfortable position of having to make guesstimates about expectations to justify enforcement decisions about predation allegations. Further research is needed to craft enforcement tools to address predatory

conduct in network industries. For now, the best that can be said is that antitrust enforcers should address such allegations with caution.¹⁵

For the most part, antitrust enforcers have not employed a different rulebook for industries with strong network effects. As discussed in chapter 8, the court of appeals in *US v. Microsoft* introduced its opinion with the statement, “We decide this case against a backdrop of significant debate amongst academics and practitioners over the extent to which ‘old economy’ §2 monopolization doctrines should apply to firms competing in dynamic technological markets characterized by network effects.”¹⁶ However, with a few exceptions discussed in chapter 8, the court applied traditional antitrust policy regarding exclusionary practices by a firm with monopoly power and did not craft new policies to account for the fact that Microsoft operated in a dynamic technological market characterized by network effects.

Many firms in the high-technology economy are platforms that serve populations with different price-cost margins

Unlike a traditional firm that provides a product or service to consumers, a platform provides products or services to two or more sides populated by different agents. Platforms are not new. Newspapers, over-the-air television networks, auction houses, videogame consoles, and real estate brokers are all examples of platforms. Platforms have gained prominence recently as a business model for the high-technology economy. Four of the five publicly traded US firms that had the highest market values on December 31, 2018 are technology platforms: Alphabet (Google), Amazon, Apple, and Microsoft, in that order.¹⁷

A platform is a more general case of a “two-sided market,” a term that Jean-Charles Rochet and Jean Tirole introduced in 2002.¹⁸ The term is a misnomer in some respects. Every market has at least two sides: It takes a seller and a buyer to consummate a transaction. Furthermore, “two-sided” markets often have more than two sides: Google’s internet search engine provides services to consumers looking for information, advertisers that want to connect with consumers, and website publishers that want to showcase their products and possibly benefit from advertising revenues; Apple and Microsoft connect computer or smartphone users to application developers and device manufacturers.

Platforms differ from conventional markets in a number of respects, although the differences are often a matter of degree rather than a clear demarcation. In a platform, agents on at least one side of the platform have benefits that depend on the number of agents on the other side

of the platform: these are “cross-platform” network effects. Facebook’s advertisers value the number of participants on its social network. Restaurants that participate on OpenTable, a website that allows diners to make reservations, value the number of subscribers to OpenTable, and subscribers value the number of restaurants that use the service.

Another distinguishing characteristic is that a platform manager actively intervenes to determine prices and terms of service to incentivize participation on the various sides of the platform.¹⁹ That may imply prices that are far above marginal cost for one side and zero or even negative prices (rewards or other inducements) for another side. In a conventional market, firms on one side of the market benefit from consumers on the other side, and vice-versa, but they make their pricing and participation decisions without active intervention from a separate party.²⁰

Although several of the most prominent firms in the high-technology economy are notable examples of platforms with strong cross-platform network effects and active management, many conventional firms also display platform characteristics. For example, we don’t typically characterize brick-and-mortar retail stores as platforms. Nonetheless, a shopping mall is a candidate for designation as a platform because there are cross-platform network effects (i.e., shoppers care about the number, quality, and variety of stores in the mall, and stores care about the number of shoppers and their shopping lists), and the mall manager may subsidize one or more anchor tenants in order to attract other stores.

Entry barriers can be very high for platform markets. Cross-platform network effects imply that a successful entrant must attract participants from at least one side of the platform, and often from multiple sides. A new operating system will not interest computer users if it does not have an attractive suite of applications, as IBM discovered when it attempted to compete head-to-head against Microsoft in the market for personal computer (PC) operating systems. Microsoft suffered a similar fate with its unsuccessful entry into the smartphone market.

Platforms that serve at least one side with zero or very low prices present an additional challenge for new competitors. A new search engine cannot compete by offering a lower price for search (short of paying consumers to join its platform), although it might offer a lower quality-adjusted price, such as by taking better care of user data. Differential markups of prices on different sides of a platform upend the usual signals to identify anticompetitive conduct. Search engines do not engage in predatory pricing merely because they allow consumers

to search without charge and do not abuse market power merely because they charge advertisers a price that greatly exceeds the marginal cost of placing ads on the search engine results page.

Platforms can amplify the effects of exclusionary conduct. For example, suppose that a platform serves two sides, "A" and "B," and there is a single incumbent and a potential entrant. Suppose that the incumbent negotiates exclusive contracts with agents that participate on the A side. The contracts eliminate participation on the A side of the potential entrant's platform and therefore make it much more difficult for the entrant to compete on that side. Moreover, given cross-platform network effects, the contracts make the potential entrant's platform less attractive to participants on the B side and therefore make it more difficult for the entrant to compete on that side of the platform.

As discussed in the context of network effects, the consumer harm from exclusionary contracts depends on whether they are imposed by a dominant firm or a smaller rival. Exclusive dealing on either side of a platform can allow a dominant firm to prevent competition, but exclusive dealing can allow a rival to gain a foothold to challenge a dominant incumbent. DIRECTV's exclusive contracts with certain content providers (e.g., the NFL ticket) likely enhanced competition by making the satellite TV service an attractive alternative to cable.

In a similar fashion, a broad prohibition on exclusive arrangements can promote platform dominance. A requirement that products must interoperate with each other is similar in some respects to a prohibition on arrangements in which products are exclusive to a subset of customers. Robin Lee finds that compatibility across video games would allow the dominant video game platform to benefit from games developed for other video platforms and would reinforce its dominance. In his analysis, consumers who had previously multihomed by purchasing multiple game consoles, each of which had games that operate exclusively with a single console, would instead have purchased the dominant platform if all games and consoles were compatible.²¹

Exclusive arrangements can have contrasting competitive effects, which depend on the market power of the platform that imposes an exclusive arrangement and on the technical features of the affected markets. Broadly speaking, exclusionary practices by a dominant firm in a platform market have the potential to cause significant harm to competition and consumer welfare, but some forms of exclusionary contracts can promote competition from a smaller rival. Furthermore,

a ban on exclusionary contracting does not necessarily promote competition or consumer welfare in platform markets.

Platform markets have characteristics that warrant careful attention for antitrust analysis, but do not generally require a different approach. The complaints filed in *US v. Microsoft* and in the European investigations did not identify PC operating systems as platforms, perhaps because the term was not yet established in the antitrust vernacular. Nonetheless, the complaints recognized that applications were a barrier to entry that protected Microsoft's monopoly. It is unlikely that more specific attention to platform economics in these cases would have supported different enforcement outcomes.

In contrast, the Supreme Court opinion in *Ohio v. American Express* faulted plaintiffs for failing to take full account of the two-sided nature of the market for credit card transactions.²² Payment networks are clearly two-sided markets because transactions require a consumer that belongs to the network and a merchant that accepts payment from the network. The Supreme Court's opinion raised concerns that it heralded a fundamental shift in antitrust policy for platform markets, with onerous implications for antitrust plaintiffs.²³ Many firms can fit the description of a two-sided platform, and the complexity of a two-sided analysis of conduct can be a practical obstacle for antitrust enforcement. Does this opinion mean that every antitrust case that plausibly involves a platform will require a two-sided analysis?

The American Express case addressed the competitive effects of rules that prohibit merchants from steering customers to use a different credit card if the customer presents an American Express card for payment. The rules suppress competition at the point of sale by discouraging rival credit card networks from offering merchants better terms, such as lower transaction fees, to increase transactions on their networks and by preventing them from offering other inducements in return for promoting the use of their cards. The rules also encourage the issuers of credit cards to compete by offering their cardholders attractive awards to motivate the use of their cards. Issuers have incentives to reward cardholders for the use of their cards if they generate large merchant fees.²⁴

The relevant question for antitrust analysis is not whether a market must be defined as one-sided or two-sided, but rather how best to measure the effects of conduct on competition and output. In some situations, a two-sided analysis is useful to address the trade-offs

between competition that can occur on the different sides of a platform, but it is not necessary to address these tradeoffs.²⁵ Attention to competitive effects on one side of the platform can be appropriate, provided that the analysis fully accounts for relevant interactions with the other side, including cross-platform network effects to the extent that these interactions are significant. In the American Express case, the central issue is not whether the analysis must be two-sided, but instead whether a two-sided or one-sided analysis is more informative about the interactions between merchant rules and incentives for consumers to transact over payment networks.

Another example of an antitrust case involving a two-sided market is the Google Shopping case discussed in chapter 9. The Federal Trade Commission (FTC) in the US and the European Commission (EC) investigated Google's practices regarding its search results for comparison shopping services. The agencies were aware that Google operated a two-sided platform, but neither agency defined a two-sided price. The FTC declined to challenge allegations that Google was biasing its search results to disadvantage competition. The EC held that Google's search practices were anticompetitive. The EC considered the interaction between search results and the market for search-related advertising, although that interaction did not play a decisive role in its conclusions.

Information is critical for the high-technology economy

The high-technology economy is both a consumer and a producer of information. Society benefits when information is shared, but sharing reduces information's private value and the incentive to create knowledge. Unlike most conventional goods, where use by one entity denies use by others, information is a "nonrival" good that can be consumed by many. If someone eats an orange, that orange is not available to anyone else. But if someone develops an idea to create a better mousetrap, others can use that idea too. The nonrival characteristic of information creates a policy dilemma. Information is most valuable when it is freely available, but restrictions on copying are often necessary to allow firms to profit from creating the information in the first place.

Antitrust laws interact with intellectual property laws to provide incentives for innovation in the economy. Both are imperfect, and they are in tension with each other. Antitrust policies foster competition and oppose exclusionary conduct, while intellectual property laws confer rights that allow owners to exclude competition. It is often said that the two legal regimes are complementary because intellectual property

provides incentives for innovation, which benefits consumers. While this notion is correct in some respects, intellectual property rights can also allow their owners to elevate prices and impose costs on innovators that build on existing knowledge to create new and improved products or services.

The design of optimal intellectual property protection is outside the scope of this book, but antitrust enforcement can affect the exercise of intellectual property rights. Intellectual property protection does not confer an exemption from antitrust enforcement for conduct that excludes competition. Antitrust agencies sometimes condition mergers in high-tech industries on agreements to license intellectual property rights. The agencies also can pursue remedies for monopolization that require a dominant firm to offer licenses to its intellectual property, including licenses required for firms to supply interoperable products.

High-tech firms such as Google and Facebook benefit from very large data troves that allow them to better target potential consumers for paying advertisers. Data, which some call the raw material of the digital economy,²⁶ is a nonrival good. If not shared, data can be a barrier to entry because it is costly to duplicate. Competition policy can address data as a barrier to entry, such as by requiring incumbents to make their data available to rivals or by giving individuals ownership rights to their data, notwithstanding protection of data as intellectual property.

Data has yet to raise unique antitrust issues. Although some very large data sets are important sources of value and potential barriers to competition,²⁷ relatively small data sets also can raise antitrust concerns, and large data sets need not foreclose competition.²⁸ The US Department of Justice (DOJ) required Thomson to sell copies of three financial data sets, license related intellectual property, and provide access to personnel and product support as preconditions to allow the company to merge with Reuters.²⁹ The DOJ concluded that the companies were two of only a few firms that supplied financial fundamentals data, earnings estimates data, and aftermarket research reports and alleged that without the divestiture the merger likely would have led to higher prices and reduced innovation for these products.³⁰

The FTC raised competition concerns related to media audience data in its analysis of the merger of Nielsen Holdings and Arbitron. The EC alleged that the two companies were uniquely positioned to develop national syndicated cross-platform audience measurement services (i.e., aggregated measures of audience sizes for different media platforms) and required Arbitron to divest its cross-platform audience

measurement business, including data from its representative panel, as a condition to approve the merger.³¹

The Thomson-Reuter and Nielson-Arbitron cases did not raise novel antitrust issues because the data sets were tightly connected to relevant products for which the agencies applied conventional analytical tools to analyze anticompetitive effects. The EC explored more general “big data” issues in its investigation of the acquisition of the professional social networking website LinkedIn by Microsoft. The EC considered whether the combination of large data sets controlled by Microsoft and LinkedIn would allow the merged company to increase its market power in a relevant market or increase barriers to entry. The EC found no cause for these more general concerns; nonetheless, the EC accepted commitments from Microsoft to facilitate interoperability of LinkedIn with other professional networks.³²

Complements, interoperability, and standards require different approaches to evaluate competition

Many high-tech industries support an ecosystem of firms that supply complementary products.³³ Applications run on computer and smart-phone operating systems. Specialized integrated circuits provide functionality to support microprocessors. Competition among suppliers of products or services that are complements differs from competition among suppliers of products or services that are substitutes for consumers or businesses.

When products A and B are substitutes, a lower price for A increases the demand for A and reduces the demand for B. If a firm only sells product A (or B) and lowers its price, it does not account for the reduction in the demand for a substitute product B (or A, conversely) and it is often delighted to benefit at the expense of its rival. A firm that sells both products would internalize this demand substitution and choose higher prices for A and B than firms would choose if they are sold separately. This is why mergers and cooperative price-setting raise flags for antitrust enforcers when the firms sell substitute products.

Suppose instead that products A and B are complements, such as operating systems and applications. Firms or consumers tend to use both products if they are complements. A lower price for product A increases the demand for product B by making the combination of A and B less expensive. A firm that sells only product A (or B) would not account for the positive effect of a lower price on the demand for B (or A, conversely). A firm that sells both products would internalize this

effect and may choose lower prices for A and B than the sum of the prices for A and B that firms would choose if they are sold separately.

Competition lowers prices for products that are substitutes but independent price-setting can raise prices for products that are complements. The latter is the "Cournot complements effect," named after the brilliant nineteenth-century French economist Augustine Cournot.³⁴ The Cournot complements effect also applies to innovation incentives. A firm that supplies only product A would not account for the positive effect of an improvement on the demand for complementary product B, while an integrated supplier of A and B would internalize this cross-product effect.³⁵

In many high-tech industries, the benefits from competition among firms that sell complementary products require that the products be capable of interoperating with each other. Interoperability in turn requires technical standards, which can come from coordination by formal standard-setting committees or from market forces. Committees created the different generations of cellular communication standards. Market forces supported the x86 architecture standard for PC microprocessors developed by the Intel Corporation.

Interoperability and the need for standards raise numerous potential antitrust concerns. Dominant firms may purposely obstruct interoperability to deter competitors. IBM was accused of strategically manipulating interoperability standards for connecting peripheral devices to its mainframes. Microsoft was accused of altering the Java programming language to prevent it from being able to support platform-independent applications. Interoperability concerns are not limited to the computer, internet, and information technology industries. Drug companies have been accused of patenting minor changes to drugs that are close to losing patent protection in order to prevent generic competition. The equivalence between generic drugs and their branded counterparts is a form of interoperability.

Formal standard-setting often can raise antitrust concerns, if only because it involves cooperation by actual or potential competitors. Established firms may agree to support standards that prevent competition from new technologies, and dominant firms may attempt to stack votes in standard-setting committees to adopt a favored standard. Other concerns relate to interactions between standards and intellectual property, because the adoption of a standard can cause patents that cover standardized technologies to have considerable market power. Formal standard-setting organizations and their participants can contribute to

monopolization by failing to take actions to limit the power of these so-called standard-essential patents. The opposite is also a concern. Formal standard-setting organizations and their participants can be criticized for exercising buyer market power (“monopsony”) by suppressing the ability of patent owners to achieve a financial return on their intellectual property.

Interoperability allows competing suppliers to benefit from industry-wide network effects, and antitrust agencies have used their leverage to promote desired industry compatibility. Chapter 8 discusses interoperability conditions that were included in commitments that settled antitrust allegations against Microsoft. The Antitrust Division of the DOJ and the EC conditioned their decision not to challenge Cisco’s acquisition of Tandberg on the parties’ commitment to support an open industry standard.³⁶ The Cisco-Tandberg merger combined the two leading suppliers of “telepresence,” a high-definition type of videoconferencing. Cisco agreed to divest ownership of its TelePresence Interoperability Protocol (TIP) to an independent industry body and authorized the industry body to license the rights necessary to implement TIP to any interested party, royalty-free.³⁷

The FTC filed a complaint against Intel alleging that, among other conduct, the company stifled competition by impeding interoperability between Intel’s newest microprocessors and competitors’ graphics processing units (GPUs).³⁸ The FTC settled the case by issuing an order that, among other conditions, prevented Intel from making any engineering or design changes that would degrade the performance of a competing GPU without providing an actual technical benefit for Intel.³⁹

A requirement to support an open standard or otherwise support interoperability often has economic justification. Firms with a large installed base of consumers can be biased against interoperability because they enjoy disproportionately large benefits from network effects, which bestow on them a strategic advantage vis-à-vis their rivals. However, an obligation to support compatibility with an open standard is not the best course for every circumstance. The chosen standard may not be the best technology, and compatibility can diminish competition that would have occurred when firms with incompatible products struggle to win market acceptance. Furthermore, compatibility can lower firms’ innovation incentives because a share of the benefits from innovating would accrue to rivals that supply compatible products.

Many high-tech firms have a low cost to integrate into new markets and exclude competition

Many firms in the high-technology economy face a relatively low bar to expand their portfolio of products and services because they have capabilities that apply to numerous products and services (called “economies of scope”) and that allow them to produce and distribute new products and services at low incremental costs.⁴⁰

Suppose that General Motors (GM) wants to get into the business of selling tractors. GM would have to invest in facilities to manufacture the tractors and would need a distribution network to sell them. Tractors that fail to sell would be a costly write-off on GM’s balance sheet. Contrast GM’s entry calculation with Microsoft’s decision to supply web browsing functionality along with its Windows 95 operating system and subsequently integrate web browser code in Windows 98, discussed in chapter 8. Although Microsoft invested heavily to develop its Internet Explorer (IE) web browser, it was relatively easy for the company to deliver IE to consumers even before downloading became a popular distribution method. The cost of including IE on a compact disk was negligible, and Microsoft did not incur additional costs if consumers chose not to use the browser. Another example is Google’s development of a comparison shopping service. A shopping service can utilize many of the same algorithms and hardware as a general internet search engine. The service incurs negligible incremental costs once developed and is distributed along with other Google search results.

Consumers may benefit when a dominant firm expands into new or related markets, while rivals may condemn the expansion as anticompetitive leveraging of monopoly power. Distinguishing procompetitive expansion from anticompetitive leveraging is a critical challenge for antitrust enforcers. Chapter 9 describes the different responses by the US FTC and the EC to Google’s expansion into the display of comparison shopping services in its search results. The comparison shopping example shows that enforcers have not reached agreement on how to deal with this complex issue.

The high-technology economy raises other concerns, such as the protection of privacy, that this book does not address because they do not fall within the conventional scope of competition policy. Nonetheless, it would be wrong to conclude that these concerns have no relevance for antitrust enforcement. Firms compete in dimensions other than price, and the protection of privacy is a non-price dimension that

is similar to product quality. For example, Facebook can increase its dominance of social networking by promising to keep consumer data private while subsequently breaking that promise to generate additional advertising revenue.⁴¹ Such a promise could have antitrust implications by allowing Facebook to increase or maintain its dominance of social networking for reasons unrelated to competition on the merits.

Furthermore, there is scope for regulations, such as rights to personal data, that could facilitate competition by making it easier for consumers to switch to alternative suppliers, much like number portability facilitates switching between cellular networks. A more controversial requirement would compel companies to share their data with others at regulated terms. The European Union's recent General Data Protection Regulation obligates companies that operate in Europe to protect personal data and gives consumers greater control over the use of their data. These regulations should be designed with care because they can have unintended adverse competitive consequences by imposing compliance costs that are difficult for smaller rivals to bear and by creating additional barriers for new entrants into data-intensive activities if consumers do not choose to share their data.

3 Does the High-Technology Economy Need More Aggressive Antitrust Enforcement?

Innovations over the past few decades have delivered astounding improvements in computing power, communications, and connectivity. Yet a number of indicators suggest that entrepreneurial vigor is lacking in the high-technology economy and the benefits from technological progress have not been shared broadly with the American workforce. Several firms in the high-technology economy have earned high returns on invested capital with relatively modest increases in investment.⁴² Increases in profitability have coincided with a decrease in the share of output claimed by workers, which aggravates inequality.⁴³

Should antitrust enforcement take more active measures to address the increase in market power in the US economy? There is a flood of opinion statements calling for more aggressive antitrust enforcement, including breakups of tech titans, and for changes in antitrust standards to support these actions.⁴⁴ Aspiring politicians call for antitrust enforcement with a passion that we have not seen for over a century.⁴⁵ A focus on innovation could energize antitrust enforcement, but it should not abandon the fundamental tenet that big is not necessar-

ily bad. Consumers benefit when firms develop new products or disrupt markets by employing more efficient methods of production and distribution.

Nonetheless, consumers can benefit from a change in the direction of antitrust enforcement to focus on innovation. Such changes include a lower standard for anticompetitive exclusion than substantial foreclosure in markets such as computer operating systems where network effects reinforce dominance. Antitrust policy also should be more vigilant to prevent acquisitions by dominant firms that may challenge their dominance.

Merger enforcement is the policy lever that antitrust authorities use the most to influence industry evolution, and there is evidence the authorities have tolerated too many mergers in recent years.⁴⁶ A theme in this book is that antitrust enforcement should focus on conduct that eliminates potential competition, particularly acquisitions that silence potential innovators. There is a decline in new business formation. Since 2000, initial public offerings (IPOs) have recently declined by more than one-half compared to the period 1980–2000.⁴⁷ The number of publicly traded firms has declined along with the decline in the number of IPOs. The Wilshire 5000 stock market index—a list of the 5,000 largest publicly traded firms—contained only 3,816 stocks in 2017.⁴⁸ As with other economic indicators, there are many explanations for this trend, among which are increasing financial regulation of public companies and the availability of private capital. But one explanation is merger policy that has allowed dominant firms to acquire hundreds of start-ups that might have floated public offerings as new companies.

Venture capitalists describe a “kill-zone” that surrounds the major tech companies. They allege that the tech giants acquire start-ups before they can become a competitive threat or they copy and trample firms that attempt to compete, and consequently they are reluctant to fund start-ups that intend to compete in applications that overlap with the core competencies of the major tech companies. After Snap Inc. rebuffed Facebook’s attempt to acquire its multimedia messaging app, Snapchat, Facebook cloned many of Snapchat’s features.⁴⁹ Amazon introduced its own home intercom system and video-conferencing tool after it invested in the start-up Nucleus, which sells a similar product.⁵⁰

The tech companies can spot potential rivals in their infancy and have sophisticated tools to identify promising technologies.⁵¹ Google and its parent company, Alphabet, made more than 200 acquisitions between 2001 and 2017.⁵² They include the Android operating system;

YouTube; Motorola Mobility for smartphones and related intellectual property;⁵³ Zagat for restaurant reviews; the Quickoffice productivity suite; Waze for navigation; the mobile payment company Zetawire; the Picasa image organizer; Nest for home internet-connected devices; ITA Software, which provided the flight information used by many airlines and travel sites; and several artificial intelligence (AI) firms, including Deep Mind, Dark Blue Labs, Halli Labs, and Kaggle.

Google is the dominant supplier of search-based advertising. Acquisitions have helped Google to acquire a leading position in technologies that service advertising for internet and mobile networks. They include: the ad serving intermediary DoubleClick, which Google acquired in 2007; AdMob, the leading ad network for advertising on mobile platforms, acquired in 2010; Invite Media, which manages the purchasing of advertising inventory, also acquired in 2010; and the ad inventory manager AdMeld, acquired in 2011.⁵⁴

Facebook made more than sixty acquisitions between 2005 and 2017. They include the social networking site ConnectU; the social network aggregator FriendFeed; Beluga for group messaging; Oculus VR for virtual reality; the ad server LiveRail; the photo-sharing site Instagram; the mobile instant messaging service WhatsApp; and the social polling app tbh, which allows users to create surveys and send them anonymously to their friends. WhatsApp had more than 400 million active users when Facebook bought the company for \$19 billion in 2014. When Facebook acquired tbh (as in “to be honest”) in 2017, the app had surpassed 5 million downloads and had more than 2.5 million active users, even though it had been available for only a few months. Despite its initial popularity, Facebook shut down tbh soon after the purchase, which Facebook explained was due to low usage of the app.⁵⁵

Other tech titans strengthened control of their markets and ventured into new markets with numerous acquisitions. Apple made more than ninety acquisitions between the date the company went public and 2017. Recent acquisitions include a cloud service firm; Shazam for music and image recognition; and a number of start-ups that specialize in AI, including RealFace for face recognition and Lattice for data mining. For its part, Microsoft has made hundreds of acquisitions, including the videoconferencing service Skype; the telecommunications and consumer products company Nokia; and the open-source software development platform GitHub.

Amazon is also an active player in the acquisition game. The long list of Amazon acquisitions includes online bookstores in Germany and the UK; the internet movie database IMDb; the online music retailer

CDNow; the online software retailer Egghead Software; the online shoe and apparel retailer Zappos; Quidsi, which operates websites for consumables such as *diapers.com* and *soap.com*;⁵⁶ and the grocery chain Whole Foods.

The semiconductor chip giant Intel made fewer acquisitions compared to the newer tech titans for most of its history, but it recently jumped on the acquisition bandwagon. The growth of AI spawned a new generation of chip-makers with designs that emphasize application-focused performance. Intel acquired Nervana Systems, a new entrant into AI-specific chips, in 2016. Intel also acquired Mobileye, a developer of advanced driver-assistance systems, presumably as a complement to a move into AI.⁵⁷

Several of these acquisitions cemented the dominance of these giants and should have been reviewed with greater attention to their likely future effects. Google's acquisition of ITA Software allowed the company to improve its Google Flights service, but the acquisition also may have hobbled competition from other travel sites such as Expedia or Kayak. Furthermore, by making ITA Software captive to Google and its Alphabet parent, the acquisition may have lessened incentives to improve the product that ITA would have had as an independent company that served the entire online travel industry.

The US and European authorities reviewed, but did not challenge, Facebook's acquisition of WhatsApp and Instagram. The EC noted that WhatsApp and Facebook were but two of many messaging services and that WhatsApp did not compete with Facebook for online advertising.⁵⁸ Both agencies should have paid greater attention to the possibility that WhatsApp could have become a rival social network, much as the multipurpose messaging service WeChat has done in China (albeit censored by the authorities). Indeed, the \$19 billion that Facebook paid for the app, despite little usage at the time in the US, should have been an indicator of its potential as an industry disruptor.

Instagram had thirteen employees and no advertising revenue when Facebook acquired the company in 2012 for approximately \$1 billion in cash and stock. The UK Office of Fair Trading reviewed the acquisition and concluded that Instagram was one of many competitors in the photo app space and was not uniquely placed to compete against Facebook, either as a potential social network or as a provider of advertising space.⁵⁹ That prediction failed to appreciate Instagram's potential both as a type of social network and as a platform for advertising. By 2018, Instagram was generating approximately \$7 billion in advertising revenue and had become a major source of revenue growth for

Facebook.⁶⁰ As in Facebook's acquisition of WhatsApp, antitrust enforcers again overlooked the potential of an emerging service to disrupt the acquiring firm's market.

Google's acquisition of the mobile advertising firm AdMob in 2010 is another illustrative case study of the failure of antitrust enforcers to prevent acquisitions that ultimately reinforced dominance in the digital economy. Mobile application developers and publishers rely on mobile ad networks to sell advertising space that they cannot sell effectively on their own. AdMob and Google were the leading mobile advertising networks when the FTC opened its investigation of the proposed acquisition in late 2009. The FTC was poised to block the transaction until it learned that Apple was about to enter the market with its own mobile advertising network, iAd. The FTC concluded that as the owner of the dominant mobile platform, Apple was uniquely positioned to compete with Google and AdMob. As a result, the FTC reversed course and allowed Google to acquire AdMob.⁶¹

Perhaps the FTC should have followed its prior instincts. According to eMarketer, in 2014, Google's share of US mobile ad revenue was about 37 percent and Apple's share was less than 3 percent.⁶² In 2019, the consulting service Mobbo reported that Google's AdMob serves about 83 percent of ads on Android phones and 78 percent on Apple iOS phones.⁶³ These numbers are not sufficient to conclude that Google's acquisition of AdMob harmed competition that otherwise would have occurred for mobile advertising. That would require an in-depth analysis of the state of competition in the industry, not just a snapshot of market shares. Instead, they show that predicting future competition is a risky business, and antitrust enforcers should be aware of the risk of making errors of allowing harmful acquisitions to occur, as well as the risk of overenforcement.

The US antitrust agencies blocked a few acquisitions in high-tech sectors of the economy and approved others with conditions, but most acquisitions of small companies went unchallenged. It is likely that the agencies missed some important acquisitions, which are hard to unwind once integrated into a corporate structure. The Hart-Scott-Rodino (HSR) Act requires parties to notify the antitrust agencies about proposed mergers if revenues exceed set thresholds. That has no bite for acquisitions of start-ups with little or no revenues. Furthermore, many acquisitions by major tech platforms are not companies, but rather are people (called "acquihires") with skills that can be critical to new applications.

Acquisitions, even small ones, can eliminate a significant source of competition and innovation. An empirical study of the effects of phar-

maceutical acquisitions (aptly titled “Killer Acquisitions”) found that companies were more likely to terminate drug research projects that they acquired from other companies than projects that they originated themselves when the acquired projects were similar to projects in the acquiring firm’s R&D pipeline.⁶⁴

Nonetheless, it would be unwise to categorically prohibit dominant firms from acquiring start-ups that operate in the same or related businesses. Preventing the acquisition of a potential competitor runs the risk that the acquired firm may never have evolved as a significant competitor or may not have made as significant a contribution to the economy without the acquisition partner. Dominant firms have assets and capabilities that can energize new technologies, and the promise of a lucrative buyout is a major stimulus for start-up innovation. Although some entrepreneurs have the ability to create independent public companies, many others were formed with a narrow goal to develop a specific capability that would attract the interest of an incumbent firm. For these start-ups, becoming stand-alone companies is not necessarily the best way to ensure commercialization of their innovative technologies.

Whether consumers benefit from these acquisitions or whether they merely buttress the market power of existing dominant firms is a critical question for antitrust enforcement. Instagram and YouTube benefited from the market power of the platforms that acquired them, but they could have offered advertisers and internet users additional alternatives if they had remained independent companies or become affiliated with other internet entities. Chapters 5 and 7 explore innovation concerns related to mergers and acquisitions of potential competitors in more detail.

4 Issues for Applying Antitrust Law to Innovation

The antitrust laws do not need to be changed to address innovation.⁶⁵ The Antitrust Modernization Commission, established by Congress to consider whether the antitrust laws are adequate to address consumer welfare in the global high-technology economy,⁶⁶ concluded, “There is no need to revise the antitrust laws to apply different rules to industries in which innovation, intellectual property, and technological change are central features.”⁶⁷

Although the antitrust statutes are broadly flexible, courts have applied them in ways that raise barriers to the enforcement of dynamic competition. The tools that courts have developed to evaluate antitrust

allegations, such as market definition, focus on price effects in existing markets. This policy evolution brought commendable analytical rigor to antitrust enforcement. Yet the price-centric analytical focus of modern antitrust enforcement also erects hurdles to evaluate allegations of harm to innovation. No court in the US or Europe has litigated to a final verdict an antitrust case that deals solely with innovation. This section addresses some of the obstacles to litigation of innovation effects. The focus here is on mergers, although there are similar obstacles for enforcement of single-firm conduct that affects innovation.

Antitrust market definition

Section 7 of the Clayton Act prohibits mergers if “in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.”⁶⁸ In 1956, the US Supreme Court affirmed that the phrase “in any line of commerce or in any activity affecting commerce in any section of the country” means that competitive effects must occur in a “relevant market.” In *United States v. E. I. DuPont de Nemours*, the Court said:⁶⁹

Determination of the relevant market is a necessary predicate to a finding of a violation of the Clayton Act because the threatened monopoly must be one which will substantially lessen competition “within the area of effective competition.” Substantiality can be determined only in terms of the market affected.

A rigid interpretation of the relevant market requirement for the Clayton Act is fatal for the evaluation of mergers that may affect innovation or future competition in markets that do not presently exist. R&D is not bought and sold in a market, apart from contracted R&D, but that does not mean that mergers cannot harm innovation by reducing incentives to invest in R&D for new or improved products. A merger of firms that are working to develop similar new products could have adverse effects on future price competition if both companies would have been successful innovators. Courts may not consider such future price effects because they occur in markets whose boundaries are inherently uncertain. Yet, a refusal to consider the possibility of these future price effects is tantamount to ignoring them entirely.

Jurisprudence on mergers and future competition is limited, but the available precedent is unhelpful for the analysis of innovation competition. In *SCM Corp. v. Xerox Corp.*, a district court heard a complaint that Xerox engaged in various practices that excluded SCM from markets for plain- and coated-paper copiers, including acquisitions of patents.⁷⁰

While noting that patent acquisitions are not exempt from § 7 of the Clayton Act, the judge concluded that “liability for retrospective money damages cannot be predicated under § 7 upon a patent acquisition made prior to the existence of a relevant product market.... Indeed, there is considerable doubt whether liability can be grounded under § 7 for the mere acquisition of any asset prior to the existence of a relevant product market.”⁷¹

The court of appeals affirmed the ruling and held that, “*The existing market* provides the framework in which the probability and extent of an adverse impact upon competition may be measured.”⁷² More recently, a district court rejected a market for R&D because the complaint did not identify one or more product markets consisting of reasonably interchangeable goods.⁷³ The court of appeals affirmed that ruling.⁷⁴

Fortunately, the antitrust enforcement agencies have not followed the opinions expressed in *SCM v. Xerox* and its progeny. Chapter 7 describes several proposed mergers for which the agencies have alleged anticompetitive effects in markets that do not presently exist, or for which the contours are not sufficiently established to clearly define a relevant market. But it remains to be seen whether these challenges would survive if litigated in the courts.

A related issue is whether the pace of innovation in high-tech markets renders market boundaries so fluid that conventional antitrust analysis, which focuses on competitive effects in relevant markets, becomes too speculative for sound enforcement decisions. Although the potential for disruptive change may ease concerns about anticompetitive conduct under some circumstances, the possibility that markets may differ in the future does not prevent anticompetitive harm in the present or prevent those harms from having lasting effects.

Section 7 of the Clayton Act is intended to curtail the anticompetitive consequences of mergers in their incipiency. It addresses anticompetitive effects that are likely to occur in the future but cannot be predicted with certainty. Limiting application of the act to competitive effects that occur in existing markets is unnecessarily restrictive and contrary to the purposes of the act.

Potential competition

Suppose that a drug manufacturer acquires a company that has a drug in development, which, if successful, would compete with a drug supplied by the acquiring firm. The acquisition would potentially eliminate an independent competitor in a market presently occupied by the acquirer. Courts have imposed high hurdles to establish antitrust harm

from potential competition when the competition is uncertain,⁷⁵ but this policy is not appropriate for mergers in which the potential competitor is a potential innovator. If the acquisition was not an important motivator for the innovation in the first place and has no efficiency benefits, it should be blocked if it would eliminate an important competitor in the event of successful innovation by the acquired entity, even if the probability of success is small.

I discuss these issues in more detail in chapter 5. In some cases, acquisition by an established firm is the most powerful incentive for innovation and the best way to commercialize a new product. Prohibiting acquisition by an established firm could curtail innovation by preventing the commercialization of the product. In other cases, acquisition of a potential innovator by an established firm should be blocked because it risks eliminating an important independent competitor with no offsetting benefits. A competition policy that balances the potential for acquisitions to motivate innovation against the harm from suppressing independent competition would allow antitrust enforcers and the courts to prevent acquisitions if there are other likely acquirers that are not actual or potential competitors.

Efficiencies and appropriability

Mergers and other arrangements can have benefits for innovation that differ from the types of benefits that antitrust authorities may recognize (albeit grudgingly⁷⁶) and credit against possible anticompetitive effects. For example, antitrust authorities are more likely to value savings in variable production costs rather than savings in fixed costs because the former are more likely to be passed on to consumers in the form of lower prices. Antitrust authorities may dismiss R&D cost-savings because they are savings in fixed costs, and they may regard them as unacceptably speculative because any consumer benefits from the savings occur in the distant future—and maybe never. However, just as antitrust authorities should not dismiss innovation concerns merely because they cannot be proven with a high degree of certainty, they also should not apply an unreasonable standard of proof to acknowledge R&D cost-savings and related efficiencies, including benefits from conduct or transactions that allow an innovator to appropriate greater value from its R&D efforts.

It is possible, if not likely, that a merger or other arrangement can promote innovation while also raising prices. If courts follow their historical practices, they are unlikely to trade off R&D efficiency and

innovation benefits against higher prices, even if the benefits could conceivably compensate for the consumer costs from higher prices.⁷⁷ Courts should reconsider this historical approach to provide a level playing field to evaluate innovation benefits from mergers and other conduct.

Evidentiary requirements

Antitrust enforcement has moved beyond structural presumptions based on market shares and increasingly relies on quantitative analysis of competitive effects, particularly for mergers. The demand for empirical precision is commendable, but it is also an obstacle for plaintiffs that allege harm to innovation or for defendants that allege innovation benefits, because it is difficult to construct empirical tests that isolate the effects of a transaction on innovation.

Lack of precision should not prevent courts and antitrust authorities from considering innovation effects when there is a reasonable basis for an enforcement decision. Plaintiffs bear the burden to prove their allegations, and it is socially costly to hold parties liable for conduct that is unlikely to create harm. But it would be unwise to abandon merger enforcement for innovation merely because effects cannot be predicted with a high degree of certainty. Decisions not to challenge mergers that may harm innovation are also subject to error and can have high resulting social costs.

Absent analytical tools, corporate documents and industry testimony can sway enforcement decisions. In a merger of companies X and Y, that can include statements such as, "We [company X] need to keep innovating to keep up with Y." However, companies can control what their executives put in print, and industry testimony can be self-serving. A better alternative is a body of theory and empirical validation that courts can rely on to make predictions of alleged innovation effects.

Structural presumptions for innovation and future price effects should be justified by empirical research in related industries, which measures the effects of historical merger activity in an industry on innovation outcomes. The empirical studies in turn should be supported by sound theoretical analysis. This book is an effort to assemble a reliable reference for the theory and empirical research to justify antitrust policies that balance the risks of overenforcement and underenforcement for innovation and competition for new products and services.

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The open access edition of this book was made possible by generous funding from Arcadia—a charitable fund of Lisbet Rausing and Peter Baldwin.



This book was set in Palatino by Westchester Publishing Services.

Library of Congress Cataloging-in-Publication Data

Names: Gilbert, Richard J., 1945- author.

Title: Innovation matters : competition policy for the high-technology economy / Richard J. Gilbert.

Description: Cambridge, Massachusetts : MIT Press, [2020] | Includes bibliographical references and index.

Identifiers: LCCN 2019039525 | ISBN 9780262044042 (hardcover)

Subjects: LCSH: High technology industries. | Competition. | Antitrust law--Economic aspects. | Consolidation and merger of corporations--Law and legislation--Economic aspects.

Classification: LCC HC79.H53 G56 2020 | DDC 338.8/2--dc23

LC record available at <https://lcn.loc.gov/2019039525>