

CHAPTER I

INTRODUCTION TO THE LAW AND ECONOMICS OF TECHNOLOGY INDUSTRIES

This handbook considers issues of antitrust law and economics in technology industries—those industries centered around information technology, including software and hardware for computers, mobile and embedded devices, networking, and rapidly growing cloud-based industries such as social media. Competition in these industries occurs at several levels: final products (“downstream” products such as smartphones and personal computers); intermediate goods used in their production (e.g., semiconductors and display panels); and the technologies and intellectual property that make the development and production of such products possible.

Technology industries frequently exhibit intense price and non-price competition. These two forms of competition are often interrelated. Non-price competition among technology firms may take the form of *process* innovation, when suppliers seek to reduce their marginal costs by implementing more efficient manufacturing methods (thereby permitting them to charge lower prices), or by engaging in *product* innovation (which can lower their costs of production or create a competitive advantage for the supplier by offering new product capabilities, in each case allowing them to charge less, creating pressures for competitors to offer lower prices or to innovate in response). These forms of competition generate what most consider to be the hallmark of technology industries—products of ever-increasing complexity, capability, or ease of use, often at prices that drop over time.

The resulting technological and product improvements, and falling prices, have contributed significantly to improving consumer welfare. Government enforcers and private parties seek to stop or deter anticompetitive conduct that threatens such benefits. Of course, an important policy question emerges—what is the appropriate amount of enforcement? Many argue that the antitrust laws work too slowly to stop harms before new technologies brush aside both the threatened products and the bad actors; others claim that dynamic industries are immune to anticompetitive conduct.

The rapid innovation that fosters the frequent emergence of new technology products can also result in inventors or “rapid followers” swiftly achieving market power, at least in the short run. Such firms might try to protect their market positions through anticompetitive means. However, credible threats of costly antitrust enforcement litigation can deter firms from engaging in such anticompetitive conduct, even in the technology context.

Another challenge is avoiding misapplication of the antitrust laws that would punish what in fact is competitive behavior. Even when such actions fail, the time and expense of defending against such challenges may deter future innovators.

The purpose of this chapter is not to opine on the utility or appropriateness of the antitrust oversight of technology markets, but instead to explain how it is done. U.S. antitrust agencies—the Department of Justice (DOJ) and Federal Trade Commission (FTC)—“can and do[] enforce the antitrust laws in fast-moving high-tech markets,”¹ because “[v]igilant protection of competition is particularly important in technology industries,” given their “potential to grow our economy and raise consumer welfare through the introduction of new technologies, products and methods of doing business.”²

The following sections explore the characteristics of technology industries and how antitrust agencies and courts have considered the impact of these issues in antitrust analyses and in crafting enforcement remedies.

A. Selected Characteristics of Technology Industries and Markets

Competition in technology industries is frequently characterized by rapid innovation and intense price competition. Such innovation has the potential to undermine the market power incumbents might have. These

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1. Julie Brill, Comm’r, Fed. Trade Comm’n, Merger Enforcement in High-Tech Markets, Skadden Arps/Compass Lexecon Symposium (Jan. 28, 2013), *available at* http://www.ftc.gov/sites/default/files/documents/public_statements/merger-enforcement-high-techmarkets/130128-skaddenhightechmarkets.pdf.
 2. Fiona Scott-Morton, Deputy Ass’t Att’y Gen., Antitrust Div., U.S. Dep’t of Justice, Antitrust Enforcement in High-Technology Industries: Protecting Innovation and Competition, Remarks as Prepared for the 2012 NYSBA Annual Antitrust Forum 1 (Dec. 7, 2012), *available at* <https://www.justice.gov/atr/file/518956/download>.

rapid innovations have been estimated to account for a sizable majority of American economic growth.³

A firm's ability and incentive to innovate depends, among other things, on the characteristics of the markets in which it operates. These factors could include the existence and magnitude of network effects or switching costs; the essentiality of intellectual property that firms use to develop or supply their products; the tactics and business strategies of the owners of such intellectual property, and, closely related, the nature of industry standard-setting processes; and, the extent to which interoperability among products is desirable or costly.

1. Rapid Innovation

Rapid product and/or process innovation is a hallmark of technology industries. Both effects have given rise to Moore's Law: the observed tendency (and resulting prediction) that microprocessors double in power every two years.⁴ This increase in processing power means computers are increasingly more powerful, which in turn encourages the development and use of more complex and capable software and peripheral devices. This innovation contributes to the dynamism of the computer industry and to the fact that the majority of U.S. patents are awarded to computer and electronic products.⁵

The rapid emergence of new or improved products in turn leads to short product lifecycles, as consumers constantly shift to the latest and greatest products. In contrast to more stable "smokestack" industries,

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3. See generally Robert M. Solow, *A Contribution to the Theory of Economic Growth*, 70 Q.J. ECON. 65 (1956).
 4. Intel co-founder Gordon Moore observed that the number of transistors per unit of area on a chip had doubled each year since the invention of the microchip, and he conjectured that this trend would continue. See <http://www.mooreslaw.org>. Commentators have recently noted, however, that the rate at which computing power is advancing is slowing. See, e.g., Tom Simonite, *Moore's Law Is Dead. Now What?*, MIT TECH. REV. (May 13, 2016), available at <https://www.technologyreview.com/s/601441/moores-law-is-dead-now-what>.
 5. Patenting by Geographic Region (State and Country), Breakout by NAICS Industry Classification, available at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/naics/stc_naics_fg5/usa_stc_naics_fg.htm; see also WIPO IP Facts and Figures fig. B.4 at 16 (2013) (listing patent applications by field of technology), available at http://www.wipo.int/edocs/pubdocs/en/statistics/943/wipo_pub_943_2013.pdf.

where products or firms may maintain long-term leadership positions (e.g., automotive, food, agriculture, steel, etc.), short product life cycles in technology industries can facilitate the displacement or marginalization of dominant technology firms. Rivals' research and development (R&D) efforts can lead to breakthroughs, enabling them to establish leadership positions secured through first-mover advantages including, but not limited to, ownership of patent rights that are essential to compete in the same business area going forward. Of course, notwithstanding first-mover advantages, the same rapid innovations and short product life cycles that led to a firm's rapid rise can in turn also lead to its rapid demise, wave after wave.

Certain technology industries feature low marginal costs. For example, software products can be reproduced and distributed at little or no cost, especially if they are distributed electronically through the Internet. Innovations can reduce market participants' marginal costs of production. For example, more efficient semiconductors can provide more processing power at a lower price. Technological innovation can reduce "up-front" costs of entry. For example, the emergence of "cloud-based" platforms has reduced the up-front and recurring costs of operating social media, online shopping, and other web-based businesses. Companies can add or remove capital assets by leasing server space, processing power, and database storage on-demand in the cloud—paying only for what they need, when they need it. These platforms thus limit sunk costs by giving new or expanding competitors access to the resources necessary to start up and grow without having to first purchase expensive hardware and software, or real estate upon which to place it.

2. Network Effects and Switching Costs

Certain behavioral and structural factors can threaten the consumer benefits bestowed by unbridled innovation in technology industries. Network effects, for example, have the potential to insulate market leaders from competition. Direct network effects exist where the utility of any one user of a product or service increases with the number of other users of the same service. Indirect network effects also arise in technology industries. Indirect network effects exist when increased use

of Product *A* leads to increased utility to users of a second product, *B*, which in turn increases the utility to users of Product *A*.⁶

Such “demand-side economies of scale,” which are common in technology industries, can create entry barriers. For industries in which incumbents enjoy strong direct network effects, for example, new entrants may need to achieve a threshold level of users before becoming viable. This catch-22 can make entry difficult, as firms struggle to draw away users from the incumbent supplier in order to reach critical mass. In this context, tactics that increase switching costs or the cost of “multi-homing”—where users employ multiple networks simultaneously—may have an exclusionary effect.⁷

Network effects can also be procompetitive. One example is online user ratings and reviews, which signal the value of a product or service to other users. The more users who contribute ratings and reviews, potentially the more diverse, independent, and decentralized the aggregate opinion will be, improving the quality of the ultimate assessment.⁸

In certain situations, network effects may virtually be unbounded, in the sense that consumer demand for the product at issue always increases as the number of users increases, to the point where everyone prefers to use that product to the exclusion of others. In such a situation, the dynamics of the marketplace—in which, because of network effects, increased use of a product drives increased demand for the product by new users, further increasing demand by others—may cause the quantity demanded of the product to reach a “tipping point,” beyond which its producer sells most or even all of the units sold in that market.⁹ In such circumstances, the supplier may obtain market or even monopoly power

6. See *United States v. Microsoft Corp.*, 253 F.3d 34, 55 (D.C. Cir. 2001) (finding the large number of applications developed for the Microsoft operating system created an “applications barrier to entry”).

7. See *id.*

8. See generally JAMES SUROWIECKI, *THE WISDOM OF CROWDS* (2004) (arguing these characteristics make for “wise crowds”).

9. Renata B. Hesse, Deputy Ass’t Att’y Gen., Antitrust Div., U.S. Dep’t of Justice, *At the Intersection of Antitrust & High-Tech: Opportunities for Constructive Engagement*, Remarks as Prepared for the Conference on Competition and IP Policy in High-Technology Industries 7 (Jan. 22, 2014), available at <https://www.justice.gov/atr/file/517776/download>.

that is durable (as others would find it very difficult to achieve even “toehold” entry due to the tipping nature of the network effects).¹⁰

Such “tipping” is more likely in markets where multi-homing is costly or impractical. This phenomenon is illustrated by social networks. Social networks have large network effects: the more users a social network site has, the more useful it is to each user, as it offers greater prospects of making new connections. But there are opportunities for multi-homing because the same user may participate in multiple social networking sites simultaneously.

Even when the use of social networks has no monetary price to consumers, there are costs to multi-homing. For example, users are unable to readily share or “like” content between sites, and users incur administrative costs of maintaining multiple profiles—noting interests, keeping up with messages, uploading pictures, and updating relationship-statuses.

Because social networks have large network effects and multi-homing costs, the history of social networks might have been expected to provide empirical evidence that “tipping” actually occurs in high-technology markets. The dynamism of this segment appears to have prevented this from happening (although some might contend that the jury is still out). Friendster was one of the first “circle of friends” social media sites, allowing users to connect and share content with a network of other users based on the user’s set of contacts—users could browse profiles of friends and friends-of-friends.¹¹ Friendster was launched in 2002, and quickly grew to three million users—it was reported that Friendster, unable to keep up with its own rapid growth, was plagued with stability and technical problems.¹² A year later came MySpace, with fresh innovation and a focus on music and bands, quickly overtaking Friendster, and growing to more than 100 million users, with users

10. *See id.*

11. Friendster.com—Social Network for Connecting with Friends Online, available at <http://www.aboutus.com/Friendster.com>.

12. Jonathan Abrams, *Wallflower at the Web Party*, N.Y. TIMES (Oct. 15, 2006), available at http://www.nytimes.com/2006/10/15/business/yourmoney/15friend.html?_r=1; Richard Nieva, *Remember Friendster? Thought so*, CNET (Feb. 4, 2014), available at <http://www.cnet.com/news/remember-friendster-thought-so>.

abandoning Friendster for MySpace.¹³ A year after MySpace launched, Facebook entered the market, initially focusing on students from elite universities, but eventually opening up to all comers.¹⁴ Facebook eventually did to MySpace what MySpace had done to Friendster—offering more innovative features, like the ability to tag people in photos and providing a third-party development platform—overtaking MySpace in 2008, and in 2017 boasting more than two billion active users.¹⁵

The ability to multi-home likely was crucial to these shifting patterns of allegiance to social networking sites. Consumers are unlikely to simply “pull the plug” on their existing social network and move to another. Rather, they may try out an alternative while remaining active on their existing social network, and switch when and if they determine that the new one is more to their liking. This intermediate step is, of course, an instance of multi-homing.

High switching costs can allow a dominant firm to maintain its market position even without network effects. “Lock in” occurs when platform-dependent products that are costly to replace tether a user to the platform. This concern is consistent with the key allegation brought against Apple in the iPod iTunes antitrust litigation. The plaintiffs unsuccessfully argued that, by using digital rights management to protect music sold on Apple’s iTunes store, Apple unreasonably prevented users

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13. Emma Barnett, *MySpace By Numbers*, TELEGRAPH (Jan. 6, 2011), available at <http://www.telegraph.co.uk/technology/myspace/8243403/MySpace-by-numbers-how-it-compares-to-its-rivals.html>.
 14. *Facebook: 10 milestones on the way to social success*, TELEGRAPH (Oct. 7, 2010), available at <http://www.telegraph.co.uk/technology/facebook/8048220/Facebook-10-milestones-on-the-way-to-social-success.html>.
 15. Josh Constine, *Facebook Now has 2 Billion Monthly Users . . . and Responsibility*, TECHCRUNCH (June 27, 2017), available at <https://techcrunch.com/2017/06/27/facebook-2-billion-users>; Chunka Mui, *Why Facebook Beat MySpace, and Why MySpace’s Revised Strategy will Probably Fail*, FORBES (Jan. 12, 2011), available at <http://www.forbes.com/sites/chunkamui/2011/01/12/why-facebook-beat-myspace-and-why-myspaces-revised-strategy-will-probably-fail>. While other social media platforms have entered the market, none thus far have managed to displace Facebook’s dominance. See Dave Chaffey, *Global Social Media Research Summary 2017*, SMART INSIGHTS (Apr. 27, 2017), available at <http://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research> (showing Facebook at the market leader, followed by WhatsApp and Facebook Messenger).

from playing music on devices other than iPods, locking users into its devices because moving to a different platform would require users to re-purchase their music.¹⁶

3. Multi-Sided Platforms

Some technology industries include multi-sided platforms. Unlike standard vertical business models, where upstream suppliers deal with downstream customers, multi-sided platforms act as intermediaries that link the interests of disparate groups of individuals or businesses. Each “side” of the platform benefits from the actions of the other.

General search engine providers such as Google or Microsoft Bing are commonly cited examples of multi-sided platforms. While many consumers think of Google or Bing as sources of free search results, these search engines make most of their revenues by selling advertisements. Users are attracted by the opportunity to search the Web for free. Search engines analyze users’ behaviors to learn what their searches indicate about their consumption proclivities. The search engines then attract advertisers (and increase advertisers’ demand for ads on their search engines) by credibly offering to expose their ads to many users who are well disposed towards their products or services. The prospect of profits from advertising encourages the search engine providers to improve their free “organic” search capabilities for users, in order to increase the numbers of individuals that would be reached by the advertisements. For this reason, search engines like Google and Bing

16. *In re Apple iPod iTunes Antitrust Litig.*, 796 F. Supp. 2d 1137, 1143 (N.D. Cal. 2011); *see also Foremost Pro Color, Inc. v. Eastman Kodak Co.*, 703 F.2d 534 (9th Cir. 1983) (rejecting challenge to Kodak introducing a new film that was incompatible with existing film processing procedures and chemical solutions, except those offered by Kodak itself: “We do not believe that, standing alone, such technological interrelationship among complementary products is sufficient to establish the coercion essential to a per se unlawful tying arrangement. Indeed, such a rule could become a roadblock to the competition vital for an ever expanding and improving economy.”). *But see Image Technical Servs., Inc. v. Eastman Kodak Co.*, 125 F.3d 1195, 1202 (9th Cir. 1997) (affirming antitrust liability against Kodak for refusing to sell its photocopier parts to competing aftermarket service providers).