Florida State University Law Review

Volume 39 | Issue 3 Article 3

2012

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FLORIDA STATE UNIVERSITY
LAW REVIEW

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VOLUME 39 SPRING 2012 NUMBER 3

Recommended citation: John M. Newman, *Anticompetitive Product Design in the New Economy*, 39 FLA. ST. U. L. REV. 681 (2012).

ANTICOMPETITIVE PRODUCT DESIGN IN THE NEW ECONOMY

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ABSTRACT

Claims alleging anticompetitive product design and redesign lie at the very core of one of antitrust law's most challenging dilemmas: the intersection between innovation and regulation, invention and intervention. For over three decades, courts and scholars have struggled to determine the proper analytical framework within which to address such cases. Meanwhile, the very industries in which challenged conduct occurs have been undergoing fundamental changes.

As demonstrated by the ongoing and recent antitrust litigation involving high-technology firms Apple, Intel, and Microsoft, distinctive features characterize most product markets in what has been called the "New Economy"—and what increasingly has become simply "the economy." Many of these features not only uniquely incentivize anticompetitive, design-related conduct but also render such conduct uniquely susceptible to antitrust scrutiny. Accordingly, this Article both supplies a proper understanding of code-based product markets and, perhaps more importantly, provides a structured, efficient, and rational method for analyzing design-related conduct in those markets.

* Trial Attorney, U.S. Department of Justice, Antitrust Division. The views expressed herein are solely those of the author and do not necessarily reflect those of the Department of Justice. I owe an enormous debt of gratitude to Professor Herbert Hovenkamp for his invaluable expertise and insight. Finally, for participating in what must have seemed like innumerable discussions of this paper, I am grateful to Andrew Tran, Bryan Sullivan, and Rachel Howard.

I. INTRODUCTION

"Innovation" has come to be broadly regarded as one of the primary factors in achieving increased consumer and societal wealth.[1] As such, it has also become an increasingly prized goal of antitrust law.[2] And, consequently, antitrust courts have traditionally been hesitant to condemn unilateral conduct related to product design and redesign for fear that such decisions will place an undue chill on innovation in the marketplace.[3]

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1. *See* J. Gregory Sidak & David J. Teece, *Dynamic Competition in Antitrust Law*, 5 J. COMPETITION L. & ECON. 581, 603 (2009) ("Industry after industry can demonstrate gains from dynamic (innovation-driven) competition that overshadow the gains when competition is present but innovation is absent."); Gaia Bernstein, *In the Shadow of Innovation*, 31 CARDOZO L. REV. 2257, 2258 & n.3 (2010) ("We put brilliance, creativity, and innovation up on a pedestal, often tying these qualities to progress and overall improvement in human welfare.").

2. *See, e.g.*, U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES 23-24 (2010), *available at* http://www.ftc.gov/os/2010/08/100819hmg.pdf (devoting an entire subsection to "Innovation and Product Variety" and stating that enforcement agencies account for effects on innovation in conducting merger reviews).

3. *See, e.g.*, Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263 (2d Cir. 1979); *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 1003 (N.D. Cal. 1979), *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983).

The archetypical design-conduct challenge alleges that a firm, dominant in one product market, designed a new version of that product so as to maximize interoperability with its own complementary product(s), essentially requiring customers to buy the two together. Thus, the theory goes, the defendant either engaged in "foreclosure" (excluding rivals who make interoperable complementary goods from the market), "leveraging" (extracting overcharges from customers in the complementary-good market), or both. Such conduct is often referred to as "technological tying" because of its conceptual similarity to contractual tying.[4] And as with contractual tying, a healthy debate surrounds the viability of claims that it is anticompetitive.[5]

Yet, perhaps because the early cases consisted of similar fact patterns, too much emphasis has been placed on this resemblance to traditional tying, which tends to focus on the controversial "leveraging" theory of antitrust harm. The possibilities for firms to engage in anticompetitive product design and redesign are broader than technological tie-ins, particularly in markets for digital, or computer code-based, products. Take, for instance, a dominant manufacturer of central processing units (CPUs) for personal computers that also creates "compilers," software programs that expert computer programmers use in developing new software.[6] If the firm were to design or redesign its compilers such that the resulting software runs slower on personal computers that use rivals' CPUs, its conduct would have the effect of prolonging its CPU monopoly by foreclosing those rivals from the market. And if the dominant firm did so with no procompetitive justification, its behavior was anticompetitive.

Thus, this Article looks beyond conduct involving technologically tied products and more generally toward product design and redesign[7] in the product markets that characterize what has been called

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4. *See, e.g.*, Charles M. Gastle & Susan Boughs, Microsoft III *and the Metes and Bounds of Software Design and Technological Tying Doctrine*, 6 VA. J.L. & TECH. 7 (2001).

5. *Compare* Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123 HARV. L. REV. 397, 399 (2009) ("Even without a substantial foreclosure share, tying by a firm with market power generally increases monopoly profits and harms consumer and total welfare, absent offsetting efficiencies."), *with* Erik Hovenkamp & Herbert Hovenkamp, *Tying Arrangements and Antitrust Harm*, 52 ARIZ. L. REV. 925, 927 (2010) ("The great majority of ties are beneficial or at least benign, measured by either welfare standard, and this is true without even considering production efficiencies that many ties produce.").

6. This fact pattern is broadly drawn from *In re Intel Corp.*, No. 9341 (F.T.C.), but it is not intended to pass judgment on the defendant's behavior in that case.

7. Another term frequently used to describe anticompetitive, design-related conduct is "predatory innovation." *See, e.g.*, Joseph Gregory Sidak, *Debunking Predatory Innovation*, 83 COLUM. L. REV. 1121 (1983). As a label, however, it is (to at least some extent) conclusory, "[a]nd conclusory labels fall prey to hopeless circularity." Hon. Richard D. Cudahy & Alan Devlin, *Anticompetitive Effect*, 95 MINN. L. REV. 59, 59 (2010). More specifically, the term itself begs the question by assuming that behavior can be at once both "predatory" and truly "innovative." Yet, as argued *infra*, in the product markets under discussion herein, this is rarely—and indeed, likely never—the case.

the "New Economy"[8]—and what increasingly has become simply "the economy."[9] Here, the focus is on the destruction of interoperability between a dominant firm's products and those of its rivals—foreclosure, rather than leveraging.[10] The product markets that dominate the new economy are technology intensive and based on intangible computer code, unlike the physical-based product markets traditionally subject to antitrust scrutiny.[11] And, I argue, these new markets have distinctive features that not only uniquely incentivize anticompetitive, design-related conduct but also render such conduct uniquely susceptible to antitrust scrutiny.

Part II of this Article addresses the functioning of code-based product markets, focusing on their tendency to be characterized by positive network externalities. It contends that this tendency, combined with a number of other factors, serves to refute the argument that antitrust scrutiny is wholly inappropriate in these markets. Part II concludes with a discussion of some general principles of anticompetitive harm in new-economy product markets.

In Part III, I begin by first discussing the mechanics of designing and redesigning code-based software products. Next, I introduce the ongoing Apple FairPlay antitrust litigation as an example of how software updates, the principal method of redesigning software programs, can be used by a dominant firm to exclude rivals from a closed network market. Part III concludes by demonstrating that software updates are a uniquely attractive method of using product redesign to foreclose rivals and that code-based product redesign is uniquely susceptible to antitrust scrutiny.

Part IV of this Article begins by assessing the landmark antitrust product-design decisions, underlining the various approaches used by courts in addressing design claims, and foreshadowing the ineptitude of the various analytical frameworks used to date for addressing such

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8. *See, e.g.*, THE NEW ECONOMY AND BEYOND: PAST, PRESENT AND FUTURE (Dennis W. Jansen ed., 2006); James Crowe, *Regulation and Free Markets: How To Regulate the Telecommunications Industry in the New Economy*, 2 J. ON TELECOMM. & HIGH TECH. 429 (2003); Richard A. Posner, *Antitrust in the New Economy*, 68 ANTITRUST L.J. 925 (2001).

9. *See* Hon. Orrin G. Hatch, *Antitrust in the Digital Age*, *in* COMPETITION, INNOVATION AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKETPLACE 19, 22 (Jeffrey A. Eisenach & Thomas M. Lenard eds., 1999) ("High technology is the single largest industry in the United States, leading all other sectors in terms of sales, employment, exports, and research and development.").

10. For an excellent discussion of foreclosure strategies engaged in by intellectual property owners, as well as the harms to competition and innovation that may be caused thereby, see Christina Bohannan, *IP Misuse as Foreclosure*, 96 IOWA L. REV. 475 (2011).

11. *See* Dan Hunter, *Culture War*, 83 TEX. L. REV. 1105, 1107 (2005) ("As the modern era advanced, the importance of industrial production waned. No longer was heavy machinery and physical plant the predominant means of production; no longer was physical inventory the most important asset to industry.").

conduct. It also serves to reemphasize the burgeoning potential for anticompetitive product design and redesign in code-based product markets.

Finally, Part V examines and rejects the various standards employed by courts and advanced by scholars as inappropriate for assessing design-related claims involving code-based products. In their stead, it offers a structured, rational, and efficient analytical framework for assessing design-related claims. Crucially, this method of analysis allows the avoidance of both an overly defendant-friendly default rule and the inherent uncertainty of "balancing" anticompetitive effects against innovative justifications.

II. TECHNOLOGY-INTENSIVE AND CODE-BASED PRODUCT MARKETS

"Whatever faults this world has, it at least cannot be charged with being petrified; on the contrary it transforms itself unceasingly."

--Charles Gide[12]

Much has been said about the "New Economy," the paradigm shift[13] away from an economy based on physical goods and networks to digital ones.[14] What, exactly, is meant by this phrase tends to differ depending on who is using it. Generally speaking, it refers to a trend toward an information-based economy and away from the heavy focus on physical manufacturing and industrialization that characterized much of the early- to mid-twentieth century.[15] It encompasses primarily *digital* technological innovations that have allowed for sizable increases in productivity[16] and an accompanying

12. LAURENCE GRONLUND, THE NEW ECONOMY: A PEACEABLE SOLUTION OF THE SOCIAL PROBLEM 13 (1898).

13. The term "paradigm shift" originated in Thomas Kuhn's seminal *The Structure of Scientific Revolutions* and described a dramatic change in the paradigms underlying a prevailing theory of scientific study. *See* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 85 (3d ed. 1996). It has, however, subsequently entered the popular lexicon as a phrase more loosely describing any major change in political, social, artistic, or commercial structures, and it is in this latter sense that I employ the term.

14. *See generally* Turgut Ayhan Beydogan, *Interoperability-Centric Problems: New Challenges and Legal Solutions*, 18 INT'L J. L. & INFO. TECH. 301 (2010) (arguing that ensuring interoperability is necessary to encourage innovation in emerging information-technology markets); Geoffrey A. Manne & Joshua D. Wright, *Google and the Limits of Antitrust: The Case Against the Case Against Google*, 34 HARV. J.L. & PUB. POL'Y 171, 171 (2011) (discussing antitrust enforcers' "increased focus on innovative companies in high-tech industries"); Posner, *supra* note 8, at 925 (using the phrase to refer to computer-software manufacturing, Internet-based businesses, and information technology providers); Philip J. Weiser, *Innovation, Entrepreneurship, and the Information Age*, 9 J. ON TELECOMM. & HIGH TECH. L. 1 (2011) (addressing the role of antitrust enforcers in the "Information Age").

15. *See* Hunter, *supra* note 11, at 1107.

16. *See* JANSEN, *supra* note 8, at 2-3. The annual growth rate of average labor productivity declined precipitously from 1974 to 1995, averaging 1.44% per year during that period. Yet from 1995 to 2000, the growth rate averaged 2.36% per year, an increase attributable largely to advances in information technology. *Id.*

shift in the number and type of occupations available and sought after in the workplace.[17] And it identifies a change in the way everyday consumers purchase—or decline to purchase—products, a change spurred on by the speed and ease of the transmission of information allowed by these new digital technologies. Witness, for example, the rapid rise of online retailing, a means of commerce entirely unknown to firms and consumers only a few short decades ago.[18]

Yet the degree to which this economy is really "new," and the implications the answer to that question holds for antitrust law and policy, is unclear. Some argue that the concept of a "new" economy is merely, or at least largely, the product of semantics.[19] And it is true the phrase itself is hardly new, having appeared in literature at least as far back as the late 1800s.[20] "But it is safe to say that the economy has changed in the last decade or so, and that these changes are of sufficient importance to deserve the title 'New Economy.' "[21] And the changes that have occurred are due primarily to changes in the ways in which individuals in society access, process, store, and communicate information.[22] Those changes have been facilitated by two primary technological developments: (1) the advent of affordable, personal, digital computing devices and (2) the rise of inexpensive, high-speed, readily available access to the Internet[23] utilizing those devices.

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17. *See* Hatch, *supra* note 9, at 22.

18. In 2008, e-commerce in retail-trade industries totaled $141 billion. U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2011, at 662 tbl.1054 (2011), *available at* http:/www.census.gov/compendia/statab/2011/tables/11s1054.pdf. At only 3.6% of total sales, *id.*, online retailing has certainly not yet come to dominate these markets. Yet considering that, in recent memory, retail revenues from e-commerce totaled $0.00, the $141 billion figure is substantial.

19. *See* JEAN GADREY, NEW ECONOMY, NEW MYTH 1 (2003). As Professor Gadrey memorably stated:

> We have entered a new age, we are told. Its characteristics are ill-defined, the issues at stake uncertain, but we are told it is new and that we have to go along with it. The myths put about to stir people into action are flourishing, but little serious thought is being given to the general nature of this new age or to the social risks we might have to guard against. Trenchant turns of phrase and portmanteau words seem to be sufficient. However, these new words and the old ones have many points in common.

Id.

20. Attorney (and ardent socialist) Laurence Gronlund used the phrase in 1898 as the title of his major work, a cry that "[s]omething . . . must be done!" about the emergence of an unrivalled threat to workers: the Trust. GRONLUND, *supra* note 12, at 1, 15.

21. JANSEN, *supra* note 8, at 2.

22. *Cf.* Posner, *supra* note 8, at 925 ("I shall use the term 'new economy' to denote . . . the manufacture of computer software[,] . . . Internet-based businesses[,] . . . [and] communications services and equipment designed to support the first two markets.").

23. The increase in the number of Americans with ready Internet access has been unbelievably precipitous—take, for example, the second half of the year 2000 when "the number of American adults with Internet access grew from about 88 million to more than 104 million." LEE RAINIE & DAN PACKEL, PEW INTERNET PROJECT, MORE ONLINE, DOING

These two developments have given rise to a wealth of new industries that differ widely from the paradigmatic firms around which antitrust doctrine grew and developed. Traditional antitrust targets were industries that manufactured or were based upon physical products: oil, steel, railroads, tobacco, etc.[24] These industries tended to be relatively stable; entry and exit (and even substantial market share shifts) were rare.[25] Entry entailed relatively high sunk costs, and economies of scale offered existing market participants substantial advantages over potential entrants.[26] These firms also incurred both fixed and variable costs throughout their production cycle, with average variable cost rising even at relatively low levels of output. On the whole, these tended not to be characterized by positive network externalities (aside from the railroads and—of course—the telecommunications industry, the archetypical network industry). And the pace of innovation was modest.[27]

The nascent industries that have been built around digital computers and the Internet, on the other hand, use intangible—instead of physical—means as the dominant means of production.[28] The products and services they offer increasingly consist largely (or even solely) of computer code. As a result, intellectual property protections have become an increasingly crucial incentive to firms.[29] These markets frequently exhibit positive network externalities[30] and are characterized by high fixed costs and very low variable costs (often approaching zero). The barriers to creating entirely new products tend to be lower,[31] and innovations—perhaps as a result of this—appear to be more frequent.

MORE 2 (2001), *available at* http://www.pewinternet.org/~/media//Files/Reports/2001/PIP_Changing_Population.pdf.

24. *Cf.* Alan Devlin, *A Neo-Chicago Perspective on the Law of Product Tying*, 44 AM. BUS. L.J. 521, 560-61 (2007) ("[T]raditional antitrust jurisprudence has been aimed at those industries with eventual rising average costs in production.").

25. *See* Posner, *supra* note 8, at 926.

26. Chris Butts, Note, *The* Microsoft *Case 10 Years Later: Antitrust and New Leading "New Economy" Firms*, 8 NW. J. TECH. & INTELL. PROP. 275, 275 (2010).

27. Posner, *supra* note 8, at 926.

28. *See* Bernstein, *supra* note 1, at 2262.

29. *Id.* ("As the dominant means of production changed from the physical to the intangible, the determination of the appropriate scope of intellectual property rights became more crucial."). Of course, U.S. intellectual property regimes do not perfectly incentivize innovation in high-technology (or any other) industries. The disclosure requirement of patent law, for instance, can allow competitors to "design around" innovative firms' patented products. "Moreover, . . . competitors may actually gain an advantage by *not* being the first to introduce a product since they can then free-ride on the research-and-development investments of the original firm to produce a better product." Damon C. Andrews, *Why Patentees Litigate*, 12 COLUM. SCI. & TECH. L. REV. 219, 230 (2011).

30. *See* Posner, *supra* note 8, at 926 (referring to positive network externalities as "economies of scale in consumption").

31. *See* LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD 121 (2001) ("The barriers of cyberspace in its natural state are radically different from the barriers in real space.").

A. The Operation of the Markets: Stable Network Markets, Innovation-Based Rivalry, or Both?

As noted above, the product markets that have emerged in the new economy are both dynamic and different from the industries that dominated the economy in the past. Multiple explanations have emerged for this dynamism; perhaps the two foremost (and competing) theories advanced are the impact of network effects and innovation-based, or "Schumpeterian," rivalry. Both have a part to play in determining antitrust's role in evaluating product design and redesign in these markets.

1. Network Markets and Effects

Network markets are those markets in which one user of a good or service impacts, through her use, the value of that good or service to other users. As an initial matter, a network may be either "closed" or "open." A "closed" network is controlled by one firm, which limits full access to the network.[32] An "open" network, on the other hand, may be fully accessed by all who wish to do so. All networks, however, are characterized by "network effects," a term that is sometimes used in place of "positive network externalities" (described *infra*) but more properly includes all effects one user can have on the value of a product to other users in a network market.

Network effects can be direct or indirect. "Direct" network effects occur where an additional use or user causes a direct impact on the value of the product to other users. "Indirect" network effects, on the other hand, occur where an increase in usage incentivizes firms to produce additional complementary goods, increasing the value of the original product to all users.

(a) Positive Network Externalities

Network markets are frequently characterized by positive network effects, or "externalities"—"benefits to society that accrue as the size of a network grows."[33] In a network market, the value to each individual consumer increases with the number of other individuals who use the same network.[34] Take, for example, a telephone network. If very few telephones existed, I would not value a telephone very highly, or at least not nearly as highly as I do today. The more individuals who use the telephone network, the more individuals I am able to

32. It should be noted, however, that a closed network does not necessarily dominate or constitute a product market.

33. Howard A. Shelanski & J. Gregory Sidak, *Antitrust Divestiture in Network Industries*, 68 U. CHI. L. REV. 1, 7-8 (2001).

34. Another term sometimes used to describe this phenomenon is "economies of scale in consumption." *See, e.g.*, RICHARD A. POSNER, ANTITRUST LAW 246 (2d ed. 2001).

reach with my own telephone—and the more valuable my phone becomes to me. Thus, telephone networks allow for direct, positive network externalities.

Many of the industries that have arisen from the advent of digital computers and broadly available Internet access exhibit similar positive network externalities, both direct and indirect.[35] Online social networking sites like Facebook allow for direct, positive effects (much like the telephone industry). And a broad range of product markets allow for indirect, positive network externalities. Take, for example, Apple's iPod: as more individuals purchase iPods, Apple is increasingly incentivized to invest in adding songs to its iTunes Music Store, thereby increasing the value of the iPods. The current market for Blu-ray players operates similarly,[36] as does the market for Microsoft's Windows operating system (OS). These positive network externalities that tend to characterize new, digital industries can, however, have less benign implications.

(b) The "Side Effects" of Network Markets

If its product is not interoperable with rivals' products, a first-mover or firm with a relatively large market share at an early stage in a network market can gain a decisive advantage over other firms in the market simply by virtue of its early lead. This is so "because consumers are attracted to the good or service that offers the largest network benefit, and that benefit then only becomes larger and more attractive to later consumers."[37] Thus, a network owner is faced with a choice. First, it can choose to allow interoperability with competitors' products (that is, choose an open network), thereby increasing the number of users in the network and increasing the network's value to all users. On the other hand, it may refuse to interconnect (*i.e.*, choose a closed network), which "would lead to a race to become the dominant player."[38] Absent interoperability, consumers will desire to be a part of the largest network, which naturally offers the most value. Less risk-averse consumers will buy into the network early on, predicting that more consumers will follow (increasing the

35. *See id.* at 245-46; Arun Sundararajan, *Network Effects*, IOIT, http://oz.stern.nyu.edu/io/network.html (last visited Feb. 13, 2012) ("Today, [network effects] are widely recognized as a critical aspect of the industrial organization of IT industries, and are prevalent in a wide variety of sectors, including software, microprocessors, telecommunications, e-commerce and electronic marketplaces.").

36. It is perhaps worth venturing to predict that, as consumers move further and further into the "cloud," such physical-disk-based technology will eventually go the way of the dinosaur and the VCR, demonstrating the disruptive effect that innovation can sometimes play—even in network markets.

37. Shelanski & Sidak, *supra* note 33, at 8.

38. Daniel F. Spulber & Christopher S. Yoo, *Mandating Access to Telecom and the Internet: The Hidden Side of* Trinko, 107 COLUM. L. REV. 1822, 1890 (2007).

value of the early consumers' investment). At some point, consumers will perceive that a certain product will become dominant and accordingly flock to that product—a phenomenon known as the market's "tipping point."[39] And "[o]nce the market reaches its tipping point, the value of the network of the dominant player will so far outstrip that of its competitors that the market collapses into a natural monopoly."[40]

The possibility of charging higher-than-marginal-cost prices acts as a powerful incentive for firms to avoid interoperability and instead attempt to become the dominant firm in a closed network market.[41] Thus, in network markets, the good or service that constitutes the market[42] is frequently produced by only one firm and is frequently not interoperable with competing goods or services. Consumers who have bought the dominant firm's product (that is, joined its network) in order to obtain the larger value conferred by the larger network would have to incur switching costs in order to purchase or begin using a competitor's product.[43] And as a result, "consumers can become 'locked in' to a particular network,"[44] creating a barrier to potential

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39. *See, e.g.*, William J. Baer & David A. Balto, *New Myths and Old Realities: Recent Developments in Antitrust Enforcement*, 1999 COLUM. BUS. L. REV. 207, 221 n.47 ("Particularly in markets characterized by networks, an industry may reach a 'tipping' point where manufacturers of complementary products adopt the dominant technical standard of those products with which interface is necessary, or consumers adopt the product that is most favored by other consumers.").

40. Spulber & Yoo, *supra* note 38, at 1889. A relatively recent example of this phenomenon was the high-definition optical-disc format war that took place from around 2006 to 2008. The HD DVD and Blu-ray formats struggled for dominance until the market reached a tipping point early in 2008, with several major manufacturers announcing that they were exclusively adopting the Blu-ray format. Very shortly thereafter, Toshiba issued a press release indicating that it planned to discontinue the manufacture and sale of its HD DVD players, effectively ceding the market to Blu-ray. *See* Press Release, Toshiba, Toshiba Announces Discontinuation of HD DVD Businesses (Feb. 19, 2008), *available at* http://www.toshiba.co.jp/about/press/2008_02/pr1903.htm.

41. Daniel F. Spulber & Christopher S. Yoo, *Access to Networks: Economic and Constitutional Connections*, 88 CORNELL L. REV. 885, 922 (2003) ("[A] growing number of scholars have raised the concern that network owners may be able to use interconnection (or, more accurately, the refusal to interconnect) as an anticompetitive weapon.").

42. More precisely, the output of a network is "the use of the network's services." *Id.* at 894.

43. These costs would include any financial outlays, as well as time spent learning to operate the new technology.

44. Shelanski & Sidak, *supra* note 33, at 9. Take, for example, Facebook's social-networking website. The value of the code-based product is entirely dependent on the number of users in the network—and as of this writing, there are more than 900 million active users. *Fact Sheet*, FACEBOOK, http://newsroom.fb.com/content/default.aspx?NewsAreaId=22 (last visited Feb. 13, 2012). Given that many users, the network's value is very substantial, as reflected in a recent valuation (completed in preparation for Facebook's planned 2012 IPO) placing the Facebook corporation's value at an estimated $50 billion. Anupreeta Das, Geoffrey A. Fowler & Liz Rappaport, *Facebook Sets Stage for IPO Next Year*, WALL ST. J. (Jan. 6, 2011), http://online.wsj.com/article/SB10001424052748703730704576066162770600234.html. A potential rival, on the other hand, would naturally start with zero users and would offer relatively negligible value to potential users. Since Facebook is currently not interoperable with any other social-

entrants. Consequently, the dominant firm may become entrenched. Further, that firm's design choices will determine the market's technological standard—and later inventions will have to follow the "path" set by the market leader. This holds true even if that path is not the highest quality or most efficient possible.[45]

2. Innovation-Based Rivalry

As noted above, another characteristic of the new economy seems to be a more rapid pace of innovation than was seen in many of the industries that traditionally fell under antitrust scrutiny. This has given rise to scholars and commentators proclaiming that digital markets are driven primarily by innovation, rather than static price competition.[46] Their vision, which traces its roots directly to the writings of Joseph Schumpeter,[47] is of a marketplace periodically dominated by innovative firms, which are in turn displaced by firms that market the next wave of technology.[48] The core of the concept is that "the pursuit of market power is a creative and dynamic force that 'incessantly revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one.' "[49] Under this view, though a firm might temporarily gain monopoly power in a market, subsequent innovation by competitors will ensure that its ability to charge supracompetitive prices will be short-lived.[50] And

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networking websites, rivals would need some massive advantage to offer users in order to enter the market. One potential rival, "PeopleString," actually *pays* users; its market share remains dwarfed by Facebook's. *See* PEOPLESTRING, http://peoplestring.com (last visited Feb. 13, 2012).

45. *See* Shelanski & Sidak, *supra* note 33, at 9.

46. *See, e.g.*, Weiser, *supra* note 14, at 3 ("The dynamics of today's information age have pushed economists further away from the classic, static focus on prices—which remains an important part of economics, to be sure—to a greater appreciation for the impact of innovation.").

47. *See generally* JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY (1942).

48. *See, e.g.*, Robert W. Crandall & Clifford Winston, *Does Antitrust Policy Improve Consumer Welfare? Assessing the Evidence*, 17 J. ECON. PERSP. 3, 23 (2003) (arguing that there is no persuasive evidence that antitrust enforcement actually benefits consumers, in part because it has difficulty addressing the "new economy characterized by dynamic competition, rapid technological change and important intellectual property").

49. Shelanski & Sidak, *supra* note 33, at 11 (quoting JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM AND DEMOCRACY 83 (1942)).

50. Schumpeter also famously suggested "that large firms and monopolists may be more innovative than firms in competitive markets." Jonathan B. Baker, *Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation*, 74 ANTITRUST L.J. 575, 578 (2007). Perhaps the primary argument in favor of this proposition is that large firms and monopolists are more capable of funding research and development projects than are smaller firms. *See id.* On the other hand, as Judge Learned Hand memorably stated in the seminal *Alcoa* decision: "Many people believe that possession of unchallenged economic power deadens initiative, discourages thrift and depresses energy; that immunity from competition is a narcotic, and rivalry is a stimulant, to industrial progress; that the spur of constant stress is necessary to counteract an inevitable disposition to let well enough alone." United States v. Aluminum Co. of America, 148 F.2d 416, 427 (2d Cir. 1945). Indeed, some have argued

as a result, adherents call for a reduced role of antitrust enforcement in markets that seem to thrive on innovation-based rivalry.[51]

It is true that the advent and continuing improvement of the digital computer and the now widespread availability of high-speed, mobile Internet access has spawned many new advances—including "products that could not, or would not, have been built before the Net. Among these we could include the dynamically generated maps with driving directions[,] massive translation engines . . . , and online dictionaries covering hundreds of languages that otherwise would not be available . . . ."[52] Computing power has historically increased at such a rapid pace that a term, "Moore's Law," has been coined to refer to its rate of development.[53] And the Internet has exponentially increased, and continues to increase, the speed with which individuals can transfer large amounts of information.[54] Yet many of the goods and services that may seem "new" in fact are not—take, for example, e-mail, which is generally perceived as a product of the 1990s, when in fact it was developed over fifty years ago.[55] Many are merely digital versions of physical-based services, such as the online retailing offered by big-box department stores like Nordstrom and Macy's. Such "new" markets are generally not characterized by rapid rates of market-shifting innovation;[56] their business models are not much different from the mail order businesses that advertise through physical catalogs and have existed for over a century.

Further, it is dangerous to assume, based on past innovation in a market, that that market will continue to be characterized by rapid innovation. Take the telephone as an example: although it was rapidly improved and implemented immediately following its invention in 1876, the basic, underlying technology then remained static for decades. And it is, of course, never certain that even innovative rivals will unseat a dominant firm in a network market—giants like Facebook, for example, have yet to be dethroned.[57] That is particularly

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that, rather than market structure driving innovation, it is instead innovation that drives structure. Sidak & Teece, *supra* note 1, at 596–98.

51. *See, e.g.*, Crandall & Winston, *supra* note 48.

52. LESSIG, *supra* note 31, at 122 (citations omitted).

53. INTEL, MOORE'S LAW 1 (2005), *available at* ftp://download.intel.com/museum/Moores_Law/Printed_Materials/Moores_Law_2pg.pdf.

54. *See* Christopher S. Yoo, *The Changing Patterns of Internet Usage*, 63 FED. COMM. L.J. 67, 68 (2010) ("[The Internet] has revolutionized the way people communicate with one another and obtain information . . . .").

55. *See* Tom Van Vleck, *The History of Electronic Mail*, http://www.multicians.org/thvv/mail-history.html (last updated Dec. 20, 2010).

56. *But cf.* Alan J. Meese, *Price Theory, Competition, and the Rule of Reason*, 2003 U. ILL. L. REV. 77, 139-40 ("Innovation includes the discovery of new organizational forms and the application of old forms to new contexts.").

57. Indeed, some predict that, given the extremely strong positive network externalities that characterize social-networking websites and the fact that Facebook has hit a "critical mass" of users, "Facebook isn't going to go away anytime soon." Farhad Manjoo, *Is*

true where the market leader refuses to allow interoperability, for an innovation may not be enough to tempt users away from the largest existing network (and the firm that controls it). Finally, "the existing body of theoretical and empirical literature on the relationship between competition and innovation 'fails to provide general support for the Schumpeterian hypothesis that monopoly promotes either investment in research and development or the output of innovation.' "[58] Given all of this, it is not at all certain that the monopolies created in digital product markets will be fleeting or quickly destroyed by subsequent innovations. Thus, Schumpeterian tenets alone—which some contend would call for antitrust enforcement to play a limited role in markets characterized by relatively rapid innovation—cannot, and should not, dictate the degree of antitrust's involvement in assessing product design and redesign in new-economy markets.[59]

B. Antitrust Harm in Code-Based Product Markets

Though the new digital product markets on the whole appear to be characterized by a relatively rapid rate of innovation, they still allow the potential for—and sometimes even uniquely incentivize—anticompetitive behavior. As noted above, digital product markets tend to be characterized by substantial positive network externalities, whether direct or indirect.[60] The potential to capture monopoly profits by becoming the dominant firm in a network market may engender a "race to gain and to maintain dominance"—one that provides "motive[] to engage in anticompetitive conduct."[61] And those monopoly profits may be more substantial and enduring than would be possible in other industries, given the barrier to entry created by a large, locked-in network of users. Indeed, a "trend to monopoly occurs as a result of the 'network effects' present in most high technology markets."[62]

High-technology firms also tend to face different cost and profit structures that may encourage them to pursue monopolization

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Facebook a Fad? What Social Networks Will Look Like in Five Years, SLATE (Mar. 31, 2011), http://www.slate.com/id/2290039.

58. Joshua D. Wright, *Antitrust, Multidimensional Competition, and Innovation: Do We Have an Antitrust-Relevant Theory of Competition Now?*, *in* COMPETITION POLICY AND PATENT LAW UNDER UNCERTAINTY: REGULATING INNOVATION 228, 244 (Geoffrey A. Manne & Joshua D. Wright eds., 2011) (quoting Richard J. Gilbert, *Competition and Innovation*, *in* 1 ISSUES IN COMPETITION LAW AND POLICY 600 (W. Dale Collins ed., 2008)).

59. *Cf.* Thomas M. Lenard, *Introduction and Overview*, *in* COMPETITION, INNOVATION AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKETPLACE, *supra* note 9, at 3 ("The notion that rapid innovation, *per se*, makes the market for software immune from anticompetitive conduct and/or monopolization is simplistic and misleading.").

60. *See supra* notes 33-35 and accompanying text.

61. Shelanski & Sidak, *supra* note 33, at 9; *see also* 3B PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW ¶ 776c, at 297 (3d ed. 2006) ("[N]etwork status may increase both the incentive and the opportunities for certain kinds of anticompetitive behavior.").

62. Thomas A. Piraino, Jr., *A Proposed Antitrust Approach to High Technology Competition*, 44 WM. & MARY L. REV. 65, 77 (2002).

through anticompetitive conduct. Digital products can be reproduced extremely cheaply, often with marginal costs approaching zero. Firms' fixed costs, on the other hand, tend to be relatively high.[63] Thus, firms that compete in digital product markets "have a substantial incentive to engage in conduct that will artificially extend the duration of their market power."[64]

As to the harm that can be inflicted by anticompetitive behavior in digital, code-based product markets, the governing principles are much the same as in other industries. A dominant firm might, for example, engage in tying practices, which can cause harm through either foreclosure of rivals[65] or "leveraging"—the extraction of overcharges from customers of complementary products.[66] Or it might engage in predatory pricing, again foreclosing rivals (and ultimately extracting overcharges, though in the short run consumers "benefit" from the artificially low prices). And (most relevantly for purposes of this Article) "[b]ecause the users of networks place a premium on compatibility, a dominant firm can exclude rivals anticompetitively by engineering incompatibilities between the dominant product and the product offered by rivals."[67] Thus, firms may be uniquely incentivized to create a closed network (and reap monopoly profits if that network dominates the market) by denying interoperability through design changes—as Microsoft attempted to do by steering users of its OS away from Netscape's Navigator browser.[68]

While the governing principles of harm are similar, the means that predatory firms have at their disposal have changed. The possibilities offered by digital product design open up a new range of anticompetitive strategies, as demonstrated by the allegations in the Federal Trade Commission's complaint against Intel.[69] As digital technology continues to evolve, new avenues for anticompetitive, design-related behavior will continue to develop.

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63. *See* Posner, *supra* note 8, at 926-27 ("Intellectual property is characterized by heavy fixed costs relative to marginal costs. It is often very expensive to create, but once it is created, the cost of making additional copies is low, dramatically so in the case of software . . . .").

64. Piraino, *supra* note 62, at 95-96.

65. *See* Hovenkamp & Hovenkamp, *supra* note 5, at 926. "Foreclosure occurs when a tie ousts or unreasonably limits the opportunities of rivals, typically in the tied product market." *Id.* at 927.

66. *Id.* ("The second type of antitrust harm is extraction, which involves overcharges that purchasers of tied packages are forced to pay.").

67. AREEDA & HOVENKAMP, *supra* note 61, ¶ 776c, at 297.

68. United States v. Microsoft Corp. (*Microsoft III*), 253 F.3d 34, 63-64 (D.C. Cir. 2001).

69. Complaint of Petitioner at 2-5, *In re* Intel Corp., No. 9341 (F.T.C. Dec. 16, 2009), *available at* http://www.ftc.gov/os/adjpro/d9341/091216intelcompt.pdf.

III. ANTICOMPETITIVE PRODUCT (RE)DESIGN IN CODE-BASED PRODUCT MARKETS

As noted above, the advent of the digital computer and the widespread availability of Internet access has given rise to new industries—what some have called the "New Economy."[70] Importantly, the primary product created by the participants in these industries is constructed from computer code, instead of the physical materials that characterized more traditional industries.[71] Even companies selling physical goods online, like the big-box department stores mentioned above, offer a product that consists at least in part of the ease of use and speed of transactions allowed by code-based programs.[72] The variety of code-based products offered today is mind-boggling. From personal-use entertainment (for example, digitized music, film, and literature, as well as video games) to educational software to productivity-enhancing programs like word processors and spreadsheet programs to social-networking websites—all are intangible, code-based products.[73] Thus, understanding the implications of code-based product design and redesign is crucial to understanding these new industries and markets—and the ways in which dominant market participants can engage in anticompetitive design changes.

A. Design and Redesign: Computer Programming and Software Updating

1. The Nature of Computer Code and the Products It Underlies

Computer code can be broadly divided into "source code" and "object code." "Source code" generally refers to the text produced by a human computer programmer, written in a programming language.[74] "Object code" (or "machine code") refers to the binary data that a computer actually executes; it is unreadable by humans.[75] Programming languages vary in their level of abstraction from machine

70. *See supra* notes 7-10, 13-31 and accompanying text.

71. *See* Posner, *supra* note 8, at 926 ("A key to understanding these industries is that, with the partial exception of communications equipment, their principal output is intellectual property, namely computer code, rather than physical goods.").

72. *Cf. id.* (stating that "Internet-based businesses, even those that sell physical products, such as groceries and books," are offering a service that "is a function to a large extent both of the sophistication of the business's computer software and of its trademarks and copyrights").

73. *See generally* J.B. DIXIT, COMPUTER PROGRAMMING 26-27 (2d ed. 2007) (describing some of the different types of software available).

74. *See Source Code*, TECHTERMS.COM, http://www.techterms.com/definition/sourcecode (last updated Oct. 11, 2007).

75. Thus, digital computers process "digital" data—that is, binary code. *See* DIXIT, *supra* note 73, at 2.

code.[76] Thus, at low levels of abstraction, code is much closer to machine code than to human language; conversely, high-level languages tend to be easier to understand and use.[77] As a result, the more abstract (that is, high-level) a language is, the fewer technical details the programmer must remember and input—but the less efficiently the resulting program tends to run. Low-level languages, on the other hand, tend to allow efficient programming, a necessity where computational ability and speed are of high importance.[78]

The source code that underlies computer programs is written line by line, not necessarily as a cohesive whole—what looks to the untrained eye like a paragraph-length section may actually contain multiple sections of code that do not relate to each other.[79] Frequently, programmers will begin by setting out definitions of variables and functions that will be used throughout the program. The remainder of the program will consist of sections of code that perform certain tasks,[80] referring back to the internally defined variables and functions (and sometimes to each other). Thus, a programmer may be able to look at a single section of code and explain its immediate function, though it may require a more holistic understanding of the program to explain that function fully if that section is highly interrelated to other sections. On the other end of the spectrum, however, the purpose and functionality of a single section of code that is relatively less interrelated to other sections may be much more readily apparent.

Source code by itself cannot be read by a computer.[81] Thus, once written by a programmer, high-level source code must be run through a compiler, a software program (itself consisting of code) that translates an entire program written in human-readable source code into a program written in machine-readable object code.[82] The result-

76. *See generally Programming Languages*, RZERO, http://alternatives.rzero.com/lang.html (last visited Feb. 13, 2012) (explaining and comparing various programming languages).

77. The lowest level programming language is known as "assembly language." *See id.*

78. *Id.* ("[I]f you need speed and/or compactness above all else, Assembly is the solution.").

79. In fact, though it is not common, a single program may be written in different programming languages.

80. While a smaller program may draw from a single source code file, most larger programs reference hundreds or thousands of separate source code files. *See Source Code*, *supra* note 74.

81. *See* GEORGES IFRAH, THE UNIVERSAL HISTORY OF COMPUTING: FROM THE ABACUS TO THE QUANTUM COMPUTER 309 (E.F. Harding trans., John Wiley & Sons, Inc. 2001) (1994) ("The written programme is then interpreted by a reader connected to the computer, its contents being translated into the machine's internal language . . . . The computer may then carry out the programme . . . .").

82. *Cf. id.* (using the term "reader" in place of "compiler").

ing product is a file executable by computers.[83] Consequently, code-based products are generally distributed to users solely in the form of object, rather than source, code. Although the primary method of distributing these code-based products to users was once physical disks, distribution via the Internet has become increasingly prevalent. Video games, for instance, were once sold primarily in brick-and-mortar stores like GameStop on physical disks. The same games, however, are now sold (by some of the same firms, including GameStop) via websites that allow users to download the files directly to their computers' hard drives.[84]

2. Redesigning Code-Based Products

Like any other product, a software program is frequently not perfect, particularly in its early iterations.[85] Software programs, however, can also be retroactively "redesigned" through software updates. These updates are typically distributed to users in the form of executable files written in object code that modify the software program itself.[86] Software can be, and is, redesigned via updates for myriad reasons—from adding new features, to fixing "bugs" in the software that cause it to run poorly or inefficiently, to ensuring security from malicious hackers and viruses, to external factors like an upgrade to a new OS.[87] As the *In re Intel Corp.*[88] and *United States v. Microsoft Corp.* (*Microsoft III*)[89] cases demonstrate, however, software design can also be anticompetitive[90]—and software redesign through updating is no exception.

3. The Apple iPod iTunes Antitrust Litigation

On January 3, 2005, a class action suit was filed against Apple Computer, Inc. alleging (among other things)[91] that Apple had violat-

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83. An "interpreter" is a program (somewhat similar to a compiler) that instead translates source code into object code one statement at a time, then immediately executes that statement. DIXIT, *supra* note 73, at 28.

84. *See, e.g.*, *Downloads*, GAMESTOP, http://www.gamestop.com/downloads (last visited Feb. 13, 2012). And the future may be in the "cloud"—already, the technology exists for (among other things) playing video games on remote servers, making the physical platform on which a game is played largely irrelevant to individual users' enjoyment of it.

85. *See The Irrepressible Reasons for Upgrading Software*, ITOMIC (Mar. 12, 2010), http://www.itomic.com.au/article/The-Irrepressible-Reasons-for-Upgrading-Software ("The need to update software is almost as inevitable as death and taxes.").

86. Updates do so in one of two ways: they either (1) completely replace part of the object code underlying the program or (2) simply insert additional object code into the program's object code.

87. *See id.*(discussing the primary reasons software updates are issued).

88. *See infra* Part IV.F.

89. *See infra* Part IV.D.

90. *See supra* notes 68-69, and accompanying text.

91. The plaintiffs also initially included a section 1 claim, which was subsequently dismissed. *See* The Apple iPod iTunes Antitrust Litigation, C 07-6507 JW, 2010 WL

ed section 2 of the Sherman Act.[92] The plaintiffs' theory—refined over the course of multiple amended complaints (and several years)—came to rest on product-design allegations. In 2001, Apple introduced a portable, digital music player, the soon ubiquitous "iPod." It allegedly subsequently obtained monopoly power in the portable digital audio player market.[93] Apple also introduced "iTunes," a software program (freely downloadable from Apple's website and compatible with the iPod) that allowed computer users to catalog and organize their digital music libraries.[94] The iPod initially could play only "unprotected" song files in .mp3 format.[95] "Unprotected" formats contain no restrictions on customers' use of the files; "protected" formats, on the other hand, contain digital rights management (DRM) software that restricts end uses. Subsequently, however, Apple launched the "iTunes Music Store," an online music store that allows customers to purchase and download a wide variety of songs and albums.[96] With the iTunes Music Store, Apple was entering a new market—the market for audio-file downloads.[97] At least according to the plaintiffs, Apple also obtained monopoly power in this market.[98]

(a) The Audio-File Market

The audio-file market is complex and, at least to some degree, a network market exhibiting both direct and indirect positive network externalities. Taking into account the seemingly inevitable copyright infringement that accompanies downloading audio files in unprotect-

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2629907, at *1 (N.D. Cal. June 29, 2010) ("In its October 30 Order, the Court found that Plaintiffs failed to state a tying claim pursuant to Section 1 of the Sherman Act . . . on the ground that Plaintiffs' allegations of a technological interrelationship between iTunes and iPods did not amount to a coercive tie.").

92. Class Action Complaint at 3, Slattery v. Apple Computer, Inc., No. C05-00037 JW (N.D. Cal. Jan. 3, 2005).

93. Amended Complaint at 23, The Apple iPod iTunes Antitrust Litigation, C 07-6507 JW (N.D. Cal. July 9, 2010) ("Apple has monopoly power in the Portable Digital Player Market.").

94. *Id.* at 10.

95. The ".mp3" format uses data compression to reduce the size of CD-quality audio files, facilitating their storage and transmission. The trade-off for the more convenient file size is a (generally imperceptible) loss in audio quality.

96. *See id*.

97. This product market might more properly include only non-copyright infringing audio-file-downloads—a robust market for pirated music (and films) existed then as it does now, though there may be relatively low cross-elasticity of demand for the two types of files, given the potential liability entailed by downloading pirated files. *See generally Who Music Theft Hurts*, RIAA, http://www.riaa.com/physicalpiracy.php (last visited Feb. 13, 2012) (discussing what the Recording Industry Association of America terms "music theft"). At least according to the RIAA (far from an unbiased source), during a five-year span from 2004 to 2009, "approximately 30 billion songs were illegally downloaded on file-sharing networks." *For Students Doing Reports*, RIAA, http://www.riaa.com/faq.php (last visited Feb. 13, 2012).

98. *See* Amended Complaint, *supra* note 93, at 11-12 (stating that Apple obtained a 92% market share in the "Audio Download Market" as defined by the plaintiffs).

ed file formats, the audio-file-download market is characterized by direct positive network externalities. This is so because when song files are sold to users in unprotected file formats, those users can then share audio files with other users, whether as a gift or in exchange for song files or other remuneration from such users—albeit in violation of the Copyright Act.[99] Thus, increased usage by others directly increases the value of the original product to the user. The indirect positive network effects, on the other hand, arise because increased usage incentivizes sellers to increase the number of titles offered through their online stores, which in turn increases the value of audio-file players to users.

Further, the network may be open or closed depending in part on whether unprotected or protected file formats are used. If audio files are distributed in an unprotected format, all firms that wish to offer files for download are generally free to do so using that format. The files themselves can be played on a variety of software programs and portable digital audio players, and users can even download song files from each other via person-to-person file-sharing networks (again, frequently in violation of U.S. copyright laws). If, however, a firm encodes its audio files with its proprietary DRM software, it can effectively restrict consumers from playing the files on other firms' audio players or uploading files to or downloading them from other users' music libraries. Thus, a firm that produces both DRM-protected song files and digital audio playback programs (whether installed on personal computers, portable digital audio players, or both) can effectively create a closed market with which other firms' products are not interoperable.

(b) Apple Closes the Network

Initially, Apple intended to compete in an open network—in fact, it "touted the iPod's interoperability as a selling point, and made no efforts to restrict the music that could be played on the device. Similarly, iTunes users could sync their [digital music] libraries with non-Apple devices."[100] According to the complaint, however, at the same time Apple launched the iTunes Music Store, it "secretly 'updated' the iTunes software so that iTunes and its iPod were compatible with FairPlay, Apple's proprietary DRM."[101] Apple at all times refused to

99. *See generally* 17 U.S.C. § 106(1) (2006) (granting to copyright owners the exclusive right "to reproduce the copyrighted work in copies or phonorecords"). There is (almost) universal agreement among courts and scholars that naked copying of media files constitutes copyright infringement. *See* John M. Newman, *Raising the Bar and the Public Interest: On Prior Restraints, "Traditional Contours," and Constitutionalizing Preliminary Injunctions in Copyright Law*, 10 VA. SPORTS & ENT. L.J. 323, 363 & n.247 (2011).

100. Amended Complaint, *supra* note 93, at 4.

101. *Id.* at 11.

license FairPlay to other firms that offered digital audio downloads. And, with all of that, the pieces were then in place for Apple to close its network and strive for continued dominance in the audio download market.

Concurrently with the introduction of the iTunes Music Store, Apple allegedly updated the iTunes software and issued a new generation of its iPod music players so that (1) the iTunes music library program could export audio files only to iPods (not competing portable media players) and (2) iPods would accept files only from iTunes (not competing software).[102] It also began selling song files encoded with FairPlay; such files could be played only via iTunes (on computers) and on iPod portable music players. Thus, Apple had effectively created a closed network—it offered song files for purchase and download through the iTunes Music Store that could be played only via its iTunes and iPod products. Meanwhile, iTunes and iPods could play only Apple's proprietary, DRM-encoded files (not those offered by other firms).[103]

Though further factual development would be needed for a more definite explanation, it seems likely that Apple made the choice to switch to a closed network, purposely prompting the race for dominance that such decisions tend to cause.[104] Such a move is a gamble—on the one hand, Apple might have chosen to instead maximize interoperability with rival music players in order to maximize sales of digital audio files from the iTunes Music Store. But as noted above, if a closed market "tips" in favor of one firm, the resulting monopoly will be protected by the natural barrier to entry constituted by the size of the network itself, allowing the dominant firm to charge monopoly prices.[105]

With a closed network in place, one that (at least according to the plaintiffs) dominated the market, Apple could rationally begin setting prices above marginal cost. In such a setting, it would be natural for the resulting profits to attract new entrants. And, indeed, RealNet-

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102. *Id.* at 4 ("Unbeknownst to consumers, Apple released a new generation of iPods and altered the iTunes software so that iTunes and iPods were only interoperable with each other.").

103. This network, it should be noted, was closed more specifically only as to DRM-encoded song files—iTunes and iPods remained capable of playing unprotected .mp3-format audio files.

104. *See supra* notes 38-40 and accompanying text. Alternatively, it could be argued that Apple's using FairPlay was an attempt to comply with the wishes of record companies, who have a strong interest in preventing music piracy. *See* Defendant Apple Inc.'s Answer and Defenses to Plaintiffs' Consolidated Complaint at 7-8, The Apple iPod iTunes Antitrust Litig., No. C 05-00037 JW (N.D. Cal. June 6, 2007). Yet, as the plaintiffs' amended complaint points out, "[t]hese companies . . . did not require Apple to limit Audio Downloads to use with Apple products. It was Apple's choice to encode the Audio Downloads sold through iTS with its own proprietary DRM, FairPlay." Amended Complaint, *supra* note 93, at 11.

105. *See supra* notes 39-45 and accompanying text.

works, a competitor in the audio file download market, announced in January 2003 that its software-based music player had become capable of playing songs bought from the iTunes Music Store.[106] Subsequently, in July 2004, RealNetworks announced the release of its "Harmony" software, which allowed songs purchased from RealNetworks' online store to play on iPods.[107] Likely of greatest concern to Apple, however, was the fact that RealNetworks was offering legal music downloads—in a file format that was fully compatible with Apple products—at prices as low as $0.49 per song, substantially undercutting Apple's traditional price of $0.99 per song.[108]

Apple responded quickly. In a press release, it stated: "We are stunned that RealNetworks has adopted the tactics and ethics of a hacker to break into the iPod, and we are investigating the implications of their actions under the DMCA and other laws."[109] Beyond merely investigating the copyright law implications of RealNetworks' actions, however, Apple also issued a veiled threat: "We strongly caution Real and their customers that when we update our [iPod] software from time to time it is highly likely that Real's Harmony technology will cease to work with current and future [iPods]."[110] And Apple allegedly made good on this threat, issuing software updates to its iTunes music library program that blocked RealNetworks and its Harmony software from any interoperability with Apple products.[111]

According to the plaintiffs, this pattern repeated itself multiple times. "For example, in or about the beginning of 2005, a software program known as JHymn . . . was developed . . . so that Audio Downloads purchased from [the iTunes Store] could be played on . . . Apple's iPod or any non-Apple device."[112] Apple, however, "immediately began issuing software updates to thwart JHymn."[113] It

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106. John Borland, *RealNetworks Breaks Apple's Hold on iPod*, CNET (July 26, 2004), http://news.cnet.com/RealNetworks-breaks-Apple's-hold-on-iPod/2100-1027_3-5282063.html.

107. *Id.*

108. At least according to RealNetworks, its prices were incredibly successful in attracting customers away from Apple's iTunes Store, even over a short period of time. "In its first three weeks of selling iPod-compatible music files, RealNetworks sold approximately three million music files," which equated to about 10% of the market shifting from Apple to RealNetworks. Amended Complaint, *supra* note 93, at 14, 15.

109. JAMES BOYLE, THE PUBLIC DOMAIN: ENCLOSING THE COMMONS OF THE MIND 110 (2008) (quoting Apple's press release).

110. Jim Dalrymple, *Apple Accuses RealNetworks of Hacking*, PCWORLD (July 30, 2004), http://www.pcworld.com/article/117183/apple_accuses_realnetworks_of_hacking.html (quoting the same press statement).

111. *See* Amended Complaint, *supra* note 93, at 15 ("True to its threat, beginning in October 2004, Apple 'updated' its iPod and iTunes software to prevent songs downloaded from RealNetworks' music store from being played on iPods."). All iTunes users were allegedly required to install the new software updates if they wished to continue to use Apple's iTunes Store. *Id.* Further, Apple allegedly failed to disclose to consumers that the updates would block interoperability with RealNetworks' products. *See id.*

112. *Id.* at 16.

113. *Id.* at 17.

also used software updates to block similar programs from achieving interoperability with Apple products.[114] By 2009, Apple found itself in a game of cat-and-mouse with Palm, which had programmed one of its smartphones to accept digital music files uploaded from Apple's iTunes music library program. For months, the two companies issued warring software updates to their respective devices—Palm would issue an update reopening connectivity and Apple would respond with an update re-blocking it.[115]

Importantly, the plaintiffs alleged that Apple's software updates served no procompetitive, innovative purpose.[116] On the strength of those allegations, the district court denied Apple's motion to dismiss the product-design section 2 claims.[117] In a subsequent amended answer, on the other hand, Apple admitted only "that it released updates to its FairPlay technology to, among other things, stop JHymn and other hacks that circumvented the content protection required by the [major record] labels on music purchased from the iTunes Store . . . ."[118] The inclusion of "among other things" raises—or at least does not eliminate—the possibility that Apple will allege some procompetitive justification other than merely foreclosing rivals. Thus, at least at the pleading stage, no clear answer has emerged as to whether the updates were pro- or anticompetitive (unlike, for example, *Microsoft III*, where the defendant failed to identify any procompetitive justification for certain of its design-related actions).[119] Yet if the plaintiffs'

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114. *See id.* (identifying QTFairUse and PlayFair as additional programs targeted by Apple's software updates).

115. *See id.* (referring to three separate Apple updates and two Palm updates over a three-month period, each of which either reestablished or blocked interoperability between Apple and Palm products).

116. *Id.* ("Apple continually redesigned its software even though it admitted that doing so served no genuine antipiracy purpose.").

117. The Apple iPod iTunes Antitrust Litigation, Nos. C 05-0037 JW, C 07-06507 JW, 2010 WL 2629907, at *4 (N.D. Cal. June 29, 2010) ("The Court finds that Plaintiffs has [sic] alleged facts, which if proven true, would suffice to hold Defendant liable under Section 2 of the Sherman Act.").

118. Defendant Apple Inc.'s First Amended Answer and Defenses to Plaintiffs' Amended Consolidated Complaint ¶ 65, at 10, The Apple iPod iTunes Antitrust Litigation, No. C 05-00037 JW (N.D. Cal. Sept. 24, 2010), 2010 WL 6323163.

119. *Microsoft III*, 253 F.3d 34, 67 (D.C. Cir. 2001). Recently, the district court denied Apple's motion for a protective order and allowed the plaintiffs to depose Apple's CEO, Steve Jobs. The order, however, included the requirement that the deposition be limited to the subject of Apple's anticompetitive actions toward RealNetworks. *See* The Apple iPod iTunes Antitrust Litigation, No. C 05-0037 JW, 2011 WL 976942, at *3 (N.D. Cal. Mar. 21, 2011) ("[T]he deposition shall be limited to the topics of (a) the July 26, 2004 RealNetworks announcement [regarding Harmony], (b) the July 29, 2004 Apple Announcement in response thereto, and (c) Apple's software updates in October 2004 that rendered the RealNetworks's digital music files once again inoperable with iPods."); *see also* Philip Elmer-DeWitt, *Judge Orders Steve Jobs to Appear*, FORTUNE (Mar. 22, 2011), http://tech.fortune.cnn.com/2011/03/22/judge-orders-steve-jobs-to-appear/ (detailing the events leading up to the court order, including a continuance granted so that Jobs could "focus on his health").

allegations are correct—and if they are susceptible of proof at trial[120]—Apple may very well be (eventually) found guilty of monopolization through product redesign.[121]

B. Software Updates as a Uniquely Attractive Method of Using Product Redesign to Foreclose Rivals

The facts of the *Apple iPod iTunes Antitrust Litigation* present issues unique to antitrust product design jurisprudence. In particular, the use of software updates to quickly, cheaply, and easily—yet effectively—redesign code-based products with an eye toward closing a network, destroying interoperability to preserve a closed-network monopoly, or otherwise excluding rivals from the market poses a distinctive threat to competition and innovation. And it is a threat that does not implicate, or implicates less heavily, the traditional concerns with condemning product redesigns under the antitrust laws.

One of the primary concerns with condemning product redesigns as anticompetitive is that "in most cases if the conduct is excessively exclusionary it is also self-deterring."[122] More specifically, it is thought that "a product innovation is extremely costly and time consuming to develop, design, manufacture, and place on the market."[123] Further, redesigning goods merely to make them incompatible with competitors' products will likely cause customers to react negatively.[124] And there are "sunk" costs associated with innovation, costs that cannot be recovered once invested.[125] If negative customer response forces the firm to pull the new product, the firm will forfeit these sunk costs; it will also incur reversal losses by switching back to its former product.

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120. The plaintiffs may also face difficulty in showing that Apple has monopoly power in the relevant markets given the somewhat unfamiliar product markets the plaintiffs will need to define for their monopolization claims to succeed. *See generally* Philip Elmer-DeWitt, *Does Apple Have a Monopoly?*, FORTUNE (Feb. 16, 2011), http://tech.fortune.cnn.com/2011/02/16/does-apple-have-a-monopoly/ ("The answer to . . . whether Apple has sufficient control over a particular market for regulators to even ask whether its behavior has been abusive or coercive depends on how you define the market.").

121. Certainly, the Apple litigation bears some resemblance to the landmark Microsoft antitrust litigation. *See id.* ("[I]n the months ahead . . . you will hear Apple using many of the same legal arguments Microsoft made . . . ."). Both are high-technology firms that appear dominant in their core competencies—code-based product markets characterized by positive network effects—and both are unquestionably innovative.

122. HERBERT HOVENKAMP, THE ANTITRUST ENTERPRISE: PRINCIPLE AND EXECUTION 275 (2005).

123. AREEDA & HOVENKAMP, *supra* note 61, ¶ 775c, at 284.

124. *See* HOVENKAMP, *supra* note 122, at 274-76.

125. *See* Spulber & Yoo, *supra* note 41, at 919-21 (discussing sunk costs generally and in relation to the telecommunications industry).

Thus, if $C_i > P_m - LR$,[126] a rational firm will not engage in the anticompetitive, design-related behavior. Redesigning physical (as opposed to intangible) products is generally fairly expensive, so C_i in such markets is relatively high, making true anticompetitive product redesigns less common. Since innovations in such markets are thought to be "extremely costly" and most of those costs are unrecoverable in the face of a failed product launch, L is also considered to be high. Additionally, firms can expect to incur substantial reversal losses, making L still higher. Finally, expected customer resistance to product changes that do not represent true innovations also makes R relatively high in these traditional markets, further dissuading such behavior. Therefore, the argument goes, the market itself tends to discipline potential, anticompetitive product-design decisions. The left side of the formula tends to outweigh the right.

As an initial matter, the potential rewards of anticompetitive, code-based product redesign through software updates may frequently be greater than those of physical product design, increasing the value of P_m in the formula above. This is so because, as noted *supra*, the relevant markets tend to be characterized by positive network externalities that form a natural barrier to entry.[127] Given that, a firm that dominates a closed network market may enjoy a more stable monopoly than would be possible in a non-network market.[128]

But more importantly, and more certainly, other factors in the formula are different in the realm of digital product markets and software updates. Specifically, I contend first that C_i tends to be lower, reducing the value that the right side of the formula must overcome in order to make an anticompetitive product redesign rational.[129] Next, I argue that R also tends to be lower, reducing the amount that usually offsets the potential of monopoly profits.[130] Finally, I also contend that L tends to be lower. Each of these features tend to make anticompetitive product redesign through software updates uniquely attractive to firms.[131]

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126. In this formula, *Ci* is the costs a firm incurs by redesigning the product and bringing the replacement to market; *Pm* is the potential monopoly profits; *L* represents the potential losses from unrecoverable sunk costs, reversal costs, or damages awards in antitrust suits; and *R* represents the risk—the probability that the design will fail due to customers rejecting the new product or the design being condemned under antitrust laws.

127. *See supra* notes 33-45 and accompanying text.

128. This is subject, of course, to the possibility that it will be "leapfrogged" by firms innovating around its network. *See supra* notes 13-31 and accompanying text (discussing the argument that the New Economy tends to be characterized by higher rates of innovation).

129. *See infra* Part III.B.1.

130. *See infra* Part III.B.2.

131. It should be noted that, if $Ci < Pm - LR$, a rational, profit-maximizing firm still would not necessarily engage in the anticompetitive design-related behavior. Instead, at the point that $Pm - LR$ exceeds *Ci*, the firm would be faced with deciding whether $Pm - LR$

1. Relatively Low Design-Related Costs to Firms: Lower C_i *Incentivizes Anticompetitive Product Redesigns*

As the costs to firms of developing and distributing a product redesign decrease, the attractiveness of an anticompetitive product redesign increases. The following two subparts discuss two reasons redesigning code-based products through software updates is inexpensive relative to redesigning physical products. Part III.B.1.a explains that developing a software update tends to entail lower sunk costs than developing a new physical good, while Part III.B.1.b explores the low distribution costs associated with issuing software updates via the Internet. Importantly, both factors tend to lower C_i and, as a result, make anticompetitive product redesign more attractive to firms.

(a) Low Development Costs Relative to Physical Product Redesign

Redesigning code-based products through software updates generally entails low development costs relative to redesigning physical products, making it an inviting avenue for anticompetitive design-related conduct. Software can be effectively redesigned through an update—which may affect only a small part of the software program—relatively cheaply. Take, for example, the product designs at issue in some of the seminal product-design antitrust cases discussed in the following Part: a new computer system (the IBM plug-compatible cases);[132] an instant camera and redesigned, complementary film (*Berkey Photo, Inc. v. Eastman Kodak Co.*);[133] or a skin-graft gun and redesigned replacement needles (*C.R. Bard., Inc. v. M3 Systems, Inc.*).[134] Each required a team of engineers, changes to production facilities, and substantial marketing costs. A software update, on the other hand, can be designed and produced by a single computer programmer working at a single computer; at most, it requires only a team of programmers.[135] Thus, the development costs of software updates tend to be lower than those entailed by redesigning physical products, lowering the value of C_i in the formula above. Yet software updates can be used just as effectively to exclude rivals from a market as a physical redesign—as Apple allegedly did by issuing soft-

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is also greater than *Pc*, where *Pc* represents the profits that could be obtained through either making a procompetitive design change or declining to make any change. Since the analysis that follows is unaffected by its omission, the remainder of the Article declines to mention this consideration for purposes of simplicity and readability.

132. *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 972-73 (N.D. Cal. 1979), *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983).

133. Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 268-71 (2d Cir. 1979).

134. C.R. Bard., Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1346-48 (Fed. Cir. 1998).

135. *Cf.* PETER SEIBEL, CODERS AT WORK: REFLECTIONS ON THE CRAFT OF PROGRAMMING 154-56 (2009) (discussing writing and rewriting computer code).

ware updates to block interoperability with RealNetworks' digital audio files.[136]

So, while the potential rewards of code-based product design through software updates are generally greater than or similar to those of physical product design, the sunk costs of development are relatively lower. Thus, the overall risk usually associated with a purely exclusionary physical product design is relatively higher than the risk of issuing an anticompetitive product update. And as a result, it is more likely that $C_i < P_m - LR$, making anticompetitive design decisions more likely rational—and the market less able to act as a check on exclusionary design conduct in this area.

(b) Speed, Ease, and Low Costs to Firms of Online Software-Update Distribution

Like the initial distribution of software,[137] updating software was once a costly, time-intensive project. It generally required design and subsequent distribution of code-based program files on physical disks to consumers. Given that files typically needed to be stored on such disks to allow for transportation to end users, distribution channels were necessarily physical, and, as a result, distribution was relatively slow and costly. Immediate updates for the purpose of repairing unforeseen problems with software—or for any other reason—were impossible.

Installing the updated files, at least in the early days of digital computing, also required expertise on the part of consumers or, alternatively, required consumers to hire expert installers. In these ways, updating code-based software was fairly similar to updating the design of other physical products—take, for example, a car. Frequently, automobile manufacturers design, develop, and ultimately sell a particular make and model to consumers and then discover a defect in the design months (or even years) down the road—perhaps a flaw in the vehicle's airbag system. In order to "update" the design, the manufacturer must issue a recall announcement asking consumers to bring their vehicles to a dealer for replacement or repair of the faulty system. The manufacturer must also physically distribute the relevant replacement parts to its dealers. Consumers would then have to bring their vehicles to the dealer in order to complete the installation of the update, making the entire process quite lengthy—months or even years—and costly to manufacturers.[138]

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136. *See supra* notes 106-11 and accompanying text (noting that Apple admitted to doing so).

137. *See* LESSIG, *supra* note 31, at 7 (noting the "high costs of production" and "the extraordinarily high costs of distribution" present in real-space markets).

138. The scale of such recalls can be massive—currently, the largest auto recall in history included 14.1 million Ford vehicles that had been built with faulty cruise-control switches. The model years included were 1993-2004; Ford announced the recall in two

With the advent of nearly universal access to the Internet, however, firms marketing products based on computer code were given an unprecedented, even revolutionary, distribution tool. Programmers can now write update files that a firm can distribute to users almost instantaneously, eliminating the lion's share of the time lag inherent in physical distribution systems. Likewise, the Internet has made costs of update distribution to software firms relatively negligible—unlike, for example, the costs an auto manufacturer would incur by shipping fourteen million cruise-control switches via physical distribution systems.[139] As a direct result, updating software through files distributed via the Internet has become an industry norm.[140]

The speed and ease of distribution of software updates can also allow a firm to be more nimble in anticompetitively redesigning its products. Consider again the rapid series of updates issued by Apple to repeatedly block interoperability with Palm's products.[141] Firms wishing to foreclose competition by redesigning physical products were hampered by the length of time required for the new product to reach consumers—in the meantime, competitors could enjoy interoperability and access to the market. Redesigning software through updates, however, allows firms to respond much more rapidly to threats by rivals.

And the relatively low distribution costs associated with issuing software updates contributes to the rebalancing of the risk–reward analysis discussed above, further incentivizing anticompetitive behavior. Given low development *and* distribution costs, and holding constant—or, in a network market, even increasing—the potential reward of monopoly overcharges, exclusionary product redesign becomes yet more attractive to firms. Or, put another way, it is even more likely that $C_i < P_m - LR$. Again, the market acts as much less of a check in such a scenario, mitigating one primary concern with regulating anticompetitive, design-related behavior.

2. Relatively Low Risk That Consumers Will Reject Redesigns: How Lower R *Further Incentivizes Anticompetitive Product Redesigns*

As the risk that customers will reject product redesigns decreases, the likelihood that a firm can offset development and distribution costs by reaping monopoly profits increases. As a direct result, lower

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separate announcements, one in 2008 and the other in 2009, years after the defective vehicles were sold. *See* Vincent Aubé, *Ten Biggest Auto Recalls*, MSN AUTOS, http://autos.ca.msn.com/photos/gallery.aspx?cp-documentid=22338216 (last visited Feb. 13, 2012).

139. *See generally id.* (describing such a recall).

140. *UpdateShield 1.0: Product Overview*, SCIENSOFT, http://www.sciensoft.com/products/updateshield (last visited Feb. 13, 2012) ("Automatic software update is becoming a standard feature in many software products today.").

141. Amended Complaint, *supra* note 93, at 17.

R further incentivizes anticompetitive product redesigns. The next two subparts demonstrate that redesigning code-based products through software updates does, in fact, involve relatively low risk that customers will react negatively to product redesigns.

(a) Relatively Low Cost to Consumers Lowers R

As shown above, redesigning code-based products through software updates entails relatively low costs to firms. Firms can and do take advantage of these low costs by offering low-cost or free updates to software users, yet ultimately make a profit. This can be done for legitimate purposes—for example, Facebook's constantly updated, yet free, online social-networking service. Facebook's profit mechanism is selling advertising space to other firms; it can afford to update its software at no extra charge to users because software updates are relatively inexpensive and it is profiting from selling advertising space. But such design changes can also be done for exclusionary purposes. Take, for example, Apple issuing free updates to its iTunes music library program and iPod portable digital audio players in order to exclude RealNetworks from the market for music downloads. Assuming Apple's iTunes Store dominated the market for legal music downloads, Apple could have issued updates for free yet made a profit because software updates are relatively inexpensive and it would prolong its monopoly by excluding RealNetworks from the market. Where C_i is high, firms must either absorb the costs or pass them on to consumers; where it is relatively low, firms can charge consumers less for the product redesign. And that, in turn, lowers *R*—an element of which is the risk that consumers will reject the redesign.

Another element of cost consumers take into account in deciding whether to accept a redesigned product is the time required to do so. As noted above, the time required of customers to receive and install software updates has been reduced considerably by the advent of widespread Internet access and the corresponding elimination of reliance on physical distribution processes.[142] As compared to physical goods, consumers are required to expend minimal time accepting software redesigned through updates delivered via the Internet. This further lowers their costs, further lowering *R* and further increasing the probability that an anticompetitive product redesign will be profitable.

(b) The Trend Toward Automatic Software Updates

Even further mitigating this concern is one final aspect of software updating in the context of ubiquitous, high-speed Internet access: the trend toward automatic software updates. As noted *supra*,

142. *See supra* Part III.B.1.b.

one of the arguments against antitrust oversight of product redesigns is that customers will reject new products that are not really improvements over the old.[143] This can hold true where customers are given a meaningful choice whether to keep the old product or switch to the new. Where, for example, a firm begins selling a new instant camera (and new complementary film), customers can make a relatively informed choice whether to keep their old cameras and buy interoperable film from rivals or switch to the new camera and film. If the design changes represent true innovation that offers substantially more value to consumers, then customers will switch over; if the changes were merely exclusionary, customers will (so the theory goes) rationally reject the new products.

In the new era of code-based product markets and widespread, high-speed Internet access, however, "automatic" software updates are becoming increasingly prevalent.[144] Automatic software updates are triggered by code written into software programs themselves. This code directs the users' computers to check a certain server via the Internet for any available updates, then download and install any and all updates that are available. So long as the users' computers connect to the Internet at some point, no further action is needed on the part of users to install the updates. There are plausible procompetitive advantages to automatic, versus manual, software updates: users need not oversee the updating process, they allow for more effective and rapid virus protection, problems with software can be fixed or "patched" more rapidly (perhaps even before the user ever notices a problem), etc.[145]

But automatic software updates also eliminate customers' ability to make an informed *ex ante* choice as to whether they should accept the redesigned product. Customers may not have any information available to them regarding what, exactly, the software update does. In fact, they may not even be aware that an automatic software update has occurred.[146] By allowing firms to count on the virtual certainty that a product redesign will be accepted by customers, automatic software updates slash *R* dramatically, further increasing the attractiveness of an anticompetitive product redesign. Thus, one of the primary concerns with condemning product-design

143. *See supra* notes 124-27 and accompanying text.

144. *UpdateShield 1.0: Product Overview*, *supra* note 140; Tamara Wilhite, *Automatic Software Updates: The Good, the Bad, and the Ugly*, IIE BLOGS (Jan. 14, 2008, 12:00 AM), http://www.iienet2.org/Blogger_comment.aspx?id=11216&blogid=612 ("Automatic software updates have a number of advantages, which is why they are so frequently used in the IT world.").

145. *See* Wilhite, *supra* note 144 (noting four distinct advantages of automatic software updates).

146. And even when software updates are not entirely automatic, frequently all a customer sees is a small pop-up window asking whether to or not to "install new updates."

decisions—that excessively exclusionary design conduct is generally deterred by potential customer resistance—does not apply with much force (if at all) to code-based product redesigned through software updates.

3. Relatively Low Losses Incurred if Product Redesigns Fail: How Lower L *Further Incentivizes Anticompetitive Redesigns*

As discussed above, C_i tends to be lower for code-based product redesign through software updates, especially for updates distributed via the Internet. Since C_i takes into account sunk costs, L (the total costs incurred by a firm that undertakes a failed product redesign), which similarly accounts for sunk costs, also tends to be lower in these markets. Yet redesign of software programs also carries another unique feature that lowers L even further—relatively low reversal costs.

If a firm redesigns and brings to market a new physical product, it has likely altered its assembly and packaging lines, marketing, etc., in ways that would entail significant reversal costs in the face of a failed product launch. Take, for example, the new Instamatic cameras at issue in *Berkey Photo*.[147] To launch the Instamatic, Kodak presumably needed to alter its manufacturing facilities, place orders for component parts and materials, develop and begin assembling new packaging, mount a marketing campaign, and actually ship thousands of the physical cameras to brick-and-mortar stores. If the Instamatic had been a failure, Kodak would have needed to revert its production facilities to the status quo, dump its new packaging, pull promotional materials and mount a new advertising campaign touting the old product, and (depending on contractual arrangements) perhaps account for the mass of unwanted product in the hands of retailers. All of this would have added up to significant reversal costs, making L high.

Conversely, imagine that Apple's exclusionary software updates had been installed by customers who, upon realizing the updates foreclosed interoperability with RealNetworks, began to substitute away from Apple products. Apple could quickly, easily, and above all *cheaply* reverse the design by simply issuing another update that contained commands undoing the exclusionary code functions. It would not need to revert production facilities, change packaging, alter its advertising campaign, or account for unwanted inventory at its retail stores. This scenario would hold true for almost all code-based product redesigns through online software updates. Thus, in addition to the reductive effect of relatively low sunk costs, the lower reversal costs further reduce L. This, in turn, increases the value of

147. A more detailed discussion of *Berkey Photo*'s facts—and especially the Second Circuit's reasoning behind its decision in that case—follows. *See infra* Part IV.B.

the right side of the formula, again making anticompetitive product redesigns more attractive.

C. Code-Based Product Redesign as Uniquely Susceptible to Antitrust Scrutiny

The other primary concern regarding antitrust scrutiny of product design decisions is that, "[a]s a general matter, antitrust courts are not competent to second-guess decisions about product design."[148] Multiple unique features of modern code-based product redesign, however, render it uniquely susceptible to antitrust scrutiny. First, redesign through software updates allows firms to make targeted design changes to products; thus, these redesigns are much less comprehensive than typical physical product redesigns—making anticompetitive elements more conceptually separable from procompetitive innovations. Second, and similarly, sections of code perform specific functions and are separable from surrounding sections, again facilitating the ability of courts to discern between exclusionary and innovative design elements. Finally, since computer code can be configured multiple ways to perform the same function, a design change to a code-based product that limits interoperability is more likely motivated by the desire to foreclose rivals from the market than physical product changes.

1. Software Updates Are Conceptually Separable from the Base Product

The stereotypical, allegedly anticompetitive product design (like the design decisions challenged in, for example, the IBM plug-compatible cases or *Berkey Photo*) consists of introducing to the market a significantly redesigned product that renders competitors' complementary products noninteroperable. In such situations, courts are wisely reluctant to condemn the design change—given the conceptual difficulty of separating potentially exclusionary design elements from procompetitive innovations, courts recognize the potential that using antitrust law to condemn such changes will frequently chill innovation.[149] Yet Apple was (allegedly) able to use software updates to redesign small segments of products already in the hands of consumers and was able to do so with an ease and frequency that was previously unheard of (witness the cat-and-mouse interoperability battle with Palm).[150] By delivering targeted product redesigns almost instanta-

148. HOVENKAMP, *supra* note 122, at 275.

149. *See, e.g.*, *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 1003 (N.D. Cal. 1979), *aff'd sub nom*. Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983).

150. *See supra* notes 106-15 and accompanying text (detailing a series of redesigns made possible by online software updates that occurred over a short period of time).

neously via the Internet, Apple's behavior highlighted the possibilities for anticompetitive product design available to firms competing in the new, code-based product markets. Yet it also highlighted one reason such redesigns are uniquely susceptible to antitrust scrutiny.

As noted above, software updates—the dominant method of redesigning software programs—do not constitute a total redesign; instead, they contain a relatively small amount of object code that alters certain functions of the base software program's underlying code. The update code interacts with, but exists separately from, the previous code underlying the program. Not so with the redesigned Instamatic camera and accompanying film in *Berkey Photo*—there, the court was faced with trying to separate the design elements that led to an improved product[151] from those that made Berkey Photo's film incompatible. Yet the very same elements performed both functions, making conceptual separation of the two a Sisyphean task that the court quite rightly declined to attempt.[152] Since the elements and functionality of a software update are relatively easily conceived of as separate from the elements of the base software program affected by the update, courts are more competent to address their effects on competition than the same courts would be in the stereotypical product-design case.[153]

2. Lines of Code Are Separable from a Software Redesign as a Whole

The objection might be raised that a software update itself may contain both innovative and anticompetitive aspects. Thus, while an update may be conceptually separable from the base software program, it does not necessarily follow that anticompetitive elements are likewise capable of being isolated. Yet, recall that a software program consists of a series of functions expressed in object code.[154] Each line or section of code performs a specific, finite function. Thus, within the code that composes a software update, specific functions are separable. If a software update serves to foreclose interoperability with a rival's products, that noninteroperability can be traced to those certain functions. And as a result, even if a software update contains multiple design changes, the lines of code that dictate functions with-

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151. And the Instamatic (along with Kodacolor II film) was indeed perceived as such by consumers—they "went on to become two of the great successes of amateur photography." HOVENKAMP, *supra* note 122, at 275.

152. *See* Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 286-87 (2d Cir. 1979).

153. It should be emphasized at this point that I do not take issue with the usual contention that "courts and juries are *generally* incapable of addressing the technical merits or anticompetitive effects of innovation." AREEDA & HOVENKAMP, *supra* note 61, ¶ 775c, at 284 (emphasis added); *see also* Sidak, *supra* note 7, at 1143-48 (arguing that a rule of per se legality should apply to product innovations).

154. *See supra* Part III.A.1.

in the update are separable, allowing direct analysis of what those respective functions are.

3. Code Can Be Written Different Ways to Perform the Same Function

In writing the source code for a software program, a programmer first decides what functions are needed for the program to perform its intended role. She next organizes these functions into an organizational flow chart, rearranging as necessary to achieve secondary goals, like allowing for efficient computing. Finally, the programmer writes the source code itself.[155] "This stage in the process is comparable to the novelist fleshing out the broad outline of [her] plot by crafting from words and sentences the paragraphs that convey the idea."[156] Thus, programmers constantly make choices that are frequently arbitrary—even in crafting simple calculations and formulas.[157] Indeed, "in the computer field '[t]here exists a virtually unlimited number of instruction sequences that would enable a programmer to construct a program which performs even the more basic algorithmic or mathematical procedures.' "[158]

Given that computer code can be written multiple ways to perform the same function, it is more likely that a function that destroys interoperability was programmed and distributed in order to foreclose rivals. Alleged innovative justifications traditionally raise the possibility that a redesign was procompetitive, implicating the concern that "courts are not competent to second-guess decisions about product design"[159] without unduly chilling innovation. With physical products, a plausible claim can usually be made that design choices were dictated by either functional, cost-related, or aesthetic concerns, all of which may be valued by customers.[160] But with the actual writ-

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155. *See* Marc T. Kretschmer, Note, *Copyright Protection for Software Architecture: Just Say No!*, 1988 COLUM. BUS. L. REV. 823, 825-27 (describing the general process of software development).

156. *Id.* at 826.

157. SAS Inst., Inc. v. S & H Computer Sys., Inc., 605 F. Supp. 816, 825 (M.D. Tenn. 1985) ("At every level, the process is characterized by choice, often made arbitrarily, and only occasionally dictated by necessity. Even in the case of simple statistical calculations, there is room for variation . . . .").

158. M. Kramer Mfg. Co. v. Andrews, 783 F.2d 421, 436 (4th Cir. 1986) (alteration in original) (quoting Anderson L. Baldy III, Note, *Computer Copyright Law: An Emerging Form of Protection for Object Code Software After* Apple v. Franklin, 5 COMPUTER L.J. 233, 251 (1984)).

159. HOVENKAMP, *supra* note 122, at 275.

160. Though courts tend to be somewhat more suspicious of claims that a redesign was a purely aesthetic improvement, it is not clear that aesthetic improvements should thus be disfavored (or at least discounted) by antitrust law. "[C]onsumer preferences are driven by aesthetic concerns as much as by concerns for lower cost, increased speed, decreased size, lightness, flexibility, and other factors." AREEDA & HOVENKAMP, *supra* note 61, ¶ 776a, at 287.

ing of lines of source code, functional concerns less frequently dictate the particular expression chosen by the programmer.[161] And aesthetic concerns drive decisions only to the extent that the programmer herself prefers a certain design for its aesthetic value,[162] for consumers almost never see the object (let alone the source) code underlying the programs they use.[163] Thus, alleged innovative justifications are much more capable of judicial scrutiny in code-based product markets than in traditional, physical product markets.

Take, for example, the *Microsoft III* court's careful dissection of the files containing the commingled Internet Explorer and Windows OS code (discussed in greater detail below).[164] In *Microsoft III*, "the defendant took advantage of the fact that computer code can readily be configured in practically any fashion that programmers wish."[165] Microsoft could offer no innovative or procompetitive justification for its choices.[166] The fact that computer code can easily, quickly, and cheaply be configured—or reconfigured—in multiple ways further alleviates the traditional concern that courts should not second-guess product-design decisions.

IV. PRODUCT DESIGN AND TECHNOLOGICAL TIES: EARLY ANALYTICAL APPROACHES THROUGH THE DIGITAL AGE

Forging a cohesive, efficient analytical framework for addressing anticompetitive product design in code-based product markets requires first examining the somewhat tangled skein of past design-related antitrust cases. For over three decades, district and appellate courts have wrestled with how to approach claims that firms have engaged in anticompetitive, design-related behavior. A wide-ranging variety of analyses have been used, though due to the fear of stifling innovation noted above, courts have on the whole tended to be quite deferential to defendants.[167] The prevailing school of thought runs

161. *See SAS Inst. Inc.*, 605 F. Supp. at 825. Certainly, at a certain level of abstraction, generally the organizational flow-charting stage, programmers make choices based primarily on efficiency. But at the very lowest level of abstraction, the writing of lines of source code itself, multiple ways of expressing the same idea exist.

162. *Cf.* Anthony L. Clapes et al., *Silicon Epics and Binary Bards: Determining the Proper Scope of Copyright Protection for Computer Programs*, 34 UCLA L. REV. 1493, 1535 (1987) ("Not surprisingly, each programmer develops her own style of expression.").

163. *See supra* note 84 and accompanying text.

164. *See Microsoft III*, 253 F.3d 34, 66 (D.C. Cir. 2001) ("Another Government expert likewise testified that one library file, SHDOCVW.DLL, 'is really a bundle of separate functions. It contains some functions that have to do specifically with Web browsing, and it contains some general user interface functions as well.' " (quoting the trial testimony of Edward Felten)).

165. HOVENKAMP, *supra* note 122, at 276.

166. *See Microsoft III*, 253 F.3d at 67.

167. Naturally, this defendant-friendly standard employed by most antitrust courts lowers one component of *R* in the formula explored above—the potential costs entailed by defending or losing an antitrust lawsuit or both.

that because (1) the market itself generally disciplines anticompetitive, design-related conduct and (2) antitrust courts are generally not competent to second-guess design decisions, condemning such conduct runs a high risk of producing false positives. Yet, antitrust courts have generally been called upon to consider design conduct involving more traditional, physical products, as in the first three cases discussed below.

The seminal *Microsoft III* marked the first major antitrust decision involving design of a computer code-based product; it also marked a departure from the general mode of analysis used by previous antitrust courts in design-related cases.[168] Yet default rules favoring defendants are still very much en vogue, as demonstrated by *Allied Orthopedic v. Tyco*,[169] a 2010 Ninth Circuit Court of Appeals decision also discussed here.[170] This Part concludes with a brief discussion of the *In re Intel* consent decree,[171] also issued in 2010, as an example of the ever-expanding avenues of anticompetitive product design available to high-technology firms.

A. The IBM Plug-Compatible Peripherals Litigation

In 1964, IBM introduced its extremely successful third-generation computer systems to the nascent computer system market.[172] IBM's resulting profits naturally attracted competitors, and in the late 1960s, "several companies began marketing copies of IBM's tapes, disks and printers, which were 'plug-compatible' with IBM CPUs."[173] These plug-compatible devices were not only perfect substitutes for IBM peripherals, they were much cheaper.[174] In response, IBM introduced the "370" system, which used a "new and improved peripheral[]" design that was incompatible with the plug-compatible manufacturers' existing designs.[175]

Several of the plug-compatible manufacturers (PCMs) sued IBM under sections 1 and 2 of the Sherman Act, alleging (among other

168. 253 F.3d 34.

169. Allied Orthopedic Appliances, Inc. v. Tyco Health Care Grp., LP, 592 F.3d 991, 994-95 (9th Cir. 2010).

170. *See infra* Part IV.E.

171. Agreement Containing Consent Order, *In re* Intel Corp., No. 9341 (F.T.C. July 28, 2010) (non-public), *available at* http://download.intel.com/pressroom/legal/ftc/FTC_Final_Executed_Agreement.pdf.

172. *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 972 (N.D. Cal. 1979), *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983).

173. *Id.* at 973.

174. *Id.* ("A user could simply unplug the IBM peripheral, substitute the cheaper copy, and plug it into the IBM CPU.").

175. *Id.* at 972.

theories) that IBM's new product design was anticompetitive.[176] The theory was fairly straightforward: "[A] monopolist could utilize the design of its own product to maintain market control or to gain a competitive advantage."[177] More specifically, it was essentially a "technological tie-in" theory—IBM was forcing customers of its computer systems to also buy its peripherals.

The courts addressing these cases set forth some of the foundational principles that have generally been reflected in subsequent antitrust jurisprudence considering the legality of product design. Primary among these was the concern for preserving incentives to innovate. As the district court deciding the suit brought by Transamerica put it, "[E]quipment design can have pro-competitive as well as anticompetitive aspects. Truly new and innovative products are to be encouraged, and are an important part of the competitive process."[178] Taken to the extreme, this concern can result in a standard like the one employed by the *ILC Peripherals Leasing Corp.* court, which reasoned that if expert testimony so much as differs on a design's legitimacy, the design is irrebuttably presumed legal.[179] Yet deciding on a more appropriate standard proved difficult.[180] The opposite extreme, *per se* illegality for product bundling or redesigns that have the effect of foreclosing rivals' interoperability, holds the obvious likelihood of unduly chilling competition through innovation.

The courts addressing these cases generally disposed of the section 1 "tying" claims by holding either that the separate-products requirement was not met or that the design yielded "facially plausible benefits."[181] As to the section 2 monopolization claims, the courts generally found that the redesigned product was technologically su-

176. *Id.* at 971; Telex Corp. v. IBM Corp., 367 F. Supp. 258, 267 (N.D. Okla. 1973), *rev'd*, 510 F.2d 894 (10th Cir. 1975).

177. *In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. at 1002.

178. *Id.* at 1003. Similarly, the district court in *Telex Corp. v. IBM Corp.* stated, "Nor should the court unnecessarily involve itself in the task of the administration of . . . product designs and technological applications or other functions . . . ." 367 F. Supp. 258, 356 (N.D. Okla. 1973), *rev'd*, 510 F.2d 894 (10th Cir. 1975). Notably, that court issued a decree enjoining IBM to release upon request "at the time of first customer shipment of an IBM CPU or its channel, information describing the design of the electronic interface for such product." *Id.*

179. ILC Peripherals Leasing Corp. v. IBM Corp., 458 F. Supp. 423, 439 (N.D. Cal. 1978) ("Where there is a difference of opinion as to the advantages of two alternatives which can both be defended from an engineering standpoint, the court will not allow itself to be enmeshed 'in a technical inquiry into the justifiability of product innovations.' ") (quoting Response of Carolina, Inc. v. Leasco Response, Inc., 537 F.2d 1307, 1330 (5th Cir. 1976)).

180. *In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. at 1003 ("It is more difficult to formulate a legal standard for design conduct than it is to imagine clearly illegal situations.").

181. David A. Heiner, *Assessing Tying Claims in the Context of Software Integration: A Suggested Framework for Applying the Rule of Reason Analysis*, 72 U. CHI. L. REV. 123, 125 (2005).

perior, and thus it was not "unreasonably restrictive of competition."[182] Some imprecisely formulated the standard as "reasonableness"—as the Ninth Circuit put it, the "reasonableness" of IBM's behavior precluded finding an antitrust violation.[183]

B. Berkey Photo, Inc. v. Eastman Kodak Co.

Around the same time the protracted IBM antitrust litigation was wending its way through the court system, Berkey Photo brought a somewhat similar claim against Eastman Kodak under section 2 of the Sherman Act.[184] Both companies manufactured still cameras targeted at amateur photographers, although Kodak's market share far outstripped Berkey Photo's.[185] A giant in the field at the time, Kodak had gained its position through aggressive innovations that were exceedingly well received by consumers.[186] Berkey Photo manufactured cameras and film that were interoperable with Kodak's products.[187] Kodak, however, unveiled a new system, the 110 Instamatic camera and Kodacolor II film. The camera was smaller and more convenient than its predecessors and was, by all measures, a "dramatic success."[188] It was also incompatible with Berkey Photo's products.

Berkey's antitrust claims included a product-design theory—that Kodak hastily launched the new products together in order to exclude Berkey Photo from the camera market.[189] At the trial court level, Ko-

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182. *In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. at 1003; *see also* Cal. Computer Prods., Inc. v. IBM Corp., 613 F.2d 727, 744 (9th Cir. 1979) ("The reasonableness of IBM's conduct in this regard did not present a jury issue."). *But see ILC Peripherals Leasing Corp.*, 458 F. Supp. at 430-31 (granting IBM's motion for a directed verdict as to the monopolization charges on the grounds that the plaintiff, Memorex, had failed to show that IBM had monopoly power in the relevant product markets).

183. *Cal. Computer Prods., Inc.*, 613 F.2d at 744; *accord* Transamerica Computer. Co. v. IBM, 698 F.2d 1377, 1383 (9th Cir. 1983) ("[W]e affirm the district court's ruling that the interface changes were not unreasonable.").

184. *See* Berkey Photo, Inc. v. Eastman Kodak Co., 457 F. Supp. 404, 419 (S.D.N.Y. 1978), *rev'd*, 603 F.2d 263 (2d Cir. 1979).

185. *Berkey Photo, Inc.*, 603 F.2d at 269-70.

186. *See generally* Vrinda Kadiyali, *Eastman Kodak in the Photographic Film Industry: Picture Imperfect?*, *in* MARKET DOMINANCE: HOW FIRMS GAIN, HOLD, OR LOSE IT AND THE IMPACT ON ECONOMIC PERFORMANCE 89, 91-99 (David I. Rosenbaum ed., 1998) (describing the competitive strategies that contributed to the rise and prolonged dominance of Eastman Kodak).

187. *Berkey Photo, Inc.*, 603 F.2d at 269 ("Other camera manufacturers, including Berkey, copied both these inventions but for several months after each introduction anyone desiring to purchase a camera in the new format was perforce remitted to Kodak.").

188. *Id.* at 278.

189. *See id.* at 285. Berkey Photo also premised its claim to some degree on Kodak's failure to give advance notice of the new film's altered technical specifications—a claim that has been properly identified as having anti-innovative implications. *See* Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J. COMPETITION L. & ECON. 153, 173-74 (2010). If firms were required to disclose novel innovations to competitors before introducing them to the market, antitrust law would essentially be "turning a novel innovation into an old hat." *Id.* at 174. The first-mover advantage that accrues to

dak contended that introducing new products must " 'as a matter of law' be immune from attack under the antitrust laws."[190] The trial court rightly rejected this argument, reasoning that product introductions, like other ordinarily legal business decisions, may in the right circumstances be anticompetitive.[191] Yet it declined to enumerate the proper analysis. On appeal, the Second Circuit held that even though there was evidence that Kodacolor II was inferior to Kodacolor X in several ways, there was also evidence that it was an improvement in at least one regard.[192] The court thus held that, as a matter of law, the design and introduction were not anticompetitive, recognizing that "[p]reference is a matter of individual taste."[193]

The analysis employed by the Second Circuit was more focused than the "reasonableness" standard identified by the Ninth Circuit.[194] It was also very deferential to the possibility of harming innovation. Whereas the IBM decisions generally rested on a finding that the new product was on the whole superior to the old, the Second Circuit required only evidence of *some* innovation or improvement—even in the face of proven disadvantages—for the product design to be held lawful.[195] Notably, the *Berkey Photo* court also identified customer acceptance of the redesign as relevant to its inquiry; while such evidence may be relevant in traditional product markets,[196] for reasons discussed subsequently, it should bear much less heavily in design cases involving code-based products.[197]

C. C.R. Bard, Inc. v. M3 Systems, Inc.

A less defendant-friendly analysis was used by the Federal Circuit in deciding *C.R. Bard, Inc. v. M3 Systems, Inc.*[198] Like *Berkey Photo* and the IBM plug-compatible peripherals litigation, *C.R. Bard* involved an antitrust challenge to a dominant firm's redesign of physical products. In *C.R. Bard*, the eponymous firm manufactured an automated, reusable biopsy gun, as well as replacement needles for the

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successful innovators is a crucial element in incentivizing innovative (and thus procompetitive) behavior.

190. Berkey Photo, Inc. v. Eastman Kodak Co., 457 F. Supp. 404, 411 (S.D.N.Y. 1978), *rev'd*, 603 F.2d 263 (2d Cir. 1979).

191. *Id. But cf.* Sidak, *supra* note 7, at 1143-48 (arguing that a rule of per se legality should apply to product innovations).

192. *Berkey Photo, Inc.*, 603 F.2d at 286.

193. *Id.* at 287.

194. *See* Cal. Computer Prods., Inc. v. IBM Corp., 613 F.2d 727 (9th Cir. 1979).

195. *Berkey Photo, Inc.*, 603 F.2d at 286-87.

196. *See* AREEDA & HOVENKAMP, *supra* note 61, ¶ 777b, at 306 ("Clearly, antitrust should not intervene when the invention pleases consumers . . . .").

197. *See supra* Part III.B.2. (demonstrating that, in such markets, there is a relatively low risk that consumers will reject even anticompetitive redesigns).

198. 157 F.3d 1340 (Fed. Cir. 1998).

gun.[199] M3 Systems, a competitor, manufactured identical replacement needles that were substitutes for C.R. Bard's needles.[200] Bard responded by redesigning its biopsy-sampling gun so that M3 Systems' needles were no longer interchangeable (and thus, no longer usable as substitutes for Bard's needles).[201] M3 Systems then sued Bard under section 2, basing its claims on a technological tie-in theory—that Bard had "leveraged its monopoly power in the guns to obtain a competitive advantage in replacement needles by modifying its gun to accept only Bard needles."[202]

On appeal, the Federal Circuit opened its analysis of the jury's antitrust verdicts by identifying a standard that seemed to hinge on intent. As Judge Bryson put it, "M3 was required to prove that Bard made a change in its Biopty gun for predatory reasons, *i.e.*, for the purpose of injuring competitors in the replacement needle market, rather than for improving the operation of the gun."[203] To support this, the Federal Circuit decision cited one of the IBM plug-compatible decisions discussed above.[204] Yet, there, the district court had merely identified two hypothetical situations in which a monopolist redesigned a product with the sole "purpose and effect" of foreclosing rivals,[205] emphasizing the point that it was not thereby attempting to announce an analytical framework.[206] The heavy focus on intent, then, represented a novel approach to product-design analysis.

En route to ultimately affirming the jury's finding of a section 2 violation, the appellate decision admitted that at least some evidence had been adduced at trial to the effect that Bard had modified its gun to facilitate loading and unloading of needles—a procompetitive innovation.[207] Yet the Federal Circuit pointed out that "there was substantial evidence that Bard's real reasons for modifying the gun were to raise the cost of entry to potential makers of replacement needles, to make doctors apprehensive about using non-Bard needles, and to pre-

199. *Id.* at 1346.
200. *See id.* at 1382.
201. *Id.*
202. *Id.* at 1367.
203. *Id.* at 1382 (citing *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 1002 (N.D. Cal. 1979), *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983)).
204. *Id.*
205. *In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. at 1002-03.
206. *Id.* at 1003 ("It is more difficult to formulate a legal standard for design conduct than it is to imagine clearly illegal situations.").
207. *C.R. Bard, Inc.*, 157 F.3d at 1382 ("Bard contended at trial that it modified its Biopty gun to make it easier to load and unload . . . .").

clude the use of 'copycat' needles."[208] Thus, the court held that a jury could reasonably have found that the redesign was anticompetitive.[209]

Like the record before the Second Circuit in *Berkey Photo*, the record in *C.R. Bard* contained conflicting evidence as to whether the product design constituted an overall innovation. Yet the Second Circuit in *Berkey Photo* held that in such cases the design is not anticompetitive as a matter of law. The Federal Circuit in *C.R. Bard*, on the other hand, held that such cases may, at the very least, go to the jury.

D. United States v. Microsoft Corp.

In the D.C. Circuit's 2001 decision in the Microsoft antitrust litigation (often referred to as "*Microsoft III*"), one area of Microsoft's challenged conduct involved the integration of Internet Explorer and the Windows OS.[210] Microsoft primarily achieved this integration via three means: (1) excluding the Internet Explorer programs from the Windows OS's "Add/Remove Programs" function; (2) programming Windows such that, when users chose to set Internet browsers other than Internet Explorer as their default browsers, Windows sometimes overrode that choice; and (3) commingling Internet Explorer's code with Windows code "so that any attempt to delete the files containing IE would, at the same time, cripple the operating system."[211] These tactics, it was alleged, were designed to deter Original Equipment Manufacturers (OEMs) and consumers from using different Internet browsers, particularly Netscape Navigator,[212] which could perform basic OS functions (thus threatening Microsoft's OS monopoly). Thus, while it bore some resemblance to more traditional technological-tying claims, the United States' allegations were more complex

208. *Id.*

209. It has been urged that this was an example of the court using (if implicitly) a "balancing test" to determine whether a product redesign was, on the whole, anticompetitive. *See* Jonathan Jacobson, Scott Sher & Edward Holman, *Predatory Innovation: An Analysis of* Allied Orthopedic v. Tyco *in the Context of Section 2 Jurisprudence*, 23 LOY. CONSUMER L. REV. 1, 13 (2010) ("Although the [*C.R.*] *Bard* court did not articulate a 'balancing test' for determining whether such conduct violated the antitrust laws, the decision squarely focused on whether, on balance, Bard's conduct would harm customers, even though it was undisputed that the 'innovation' did marginally improve the Bard product."). It must be remembered, however, that the *C.R. Bard* court was merely deciding whether there was sufficient evidence to support the jury's finding that the antitrust defendant had engaged in exclusionary conduct—a decision that falls under the "clearly erroneous" standard of review. Rather than balancing, then, the Federal Circuit was concerned merely with whether the jury's decision was clearly incorrect. Further, recall that the Federal Circuit's analysis began with the premise that product-design liability turns on a firm's purpose. *See supra* note 203-206 and accompanying text. As a result, if the court was engaged in any balancing, it was not looking to the redesign's anticompetitive or procompetitive effects; rather, it was considering Bard's purpose in redesigning the gun and replacement needles.

210. *Microsoft III*, 253 F.3d 34, 45 (D.C. Cir. 2001).

211. *Id.* at 64-65.

212. *Id.* at 63.

than a simple tie-in theory. The district court found them convincing and held that Windows had thereby violated section 2 of the Sherman Act.[213]

Like the Federal Circuit in *C.R. Bard*, the D.C. Circuit's *Microsoft III* decision was relatively less deferential to the possibility of deterring innovation.[214] Rather, it applied a more traditional section 2 analysis that used burden-shifting and (somewhat controversially) a "balancing" inquiry. In analyzing the three instances of conduct set forth above, the D.C. Circuit stated that the initial burden rests on the plaintiff to show that the defendant's conduct caused anticompetitive effects.[215] The court found that, in this case, the United States had "plainly" made a prima facie case of anticompetitive effect.[216] The court's analysis then shifted the burden to Microsoft to show some procompetitive justification for its behavior.[217] As to (1) and (3), it held that Microsoft failed to show that the conduct served any purpose other than maintaining its monopoly on the OS market.[218] As to (2), the court held that Microsoft alleged "valid technical reasons" for its actions.[219] As a result, the burden shifted back to the United States to rebut the justification and show "that the anticompetitive effect of the challenged action outweighs it."[220] And since no rebuttal was offered, the D.C. Circuit found this aspect of Microsoft's design-related conduct to be legal.[221]

Notably, the *Microsoft III* product-design claims dealt with software products, making the D.C. Circuit's holding the first major decision on potentially anticompetitive software design.[222] *Microsoft III*, then, presented the first example of an antitrust court examining expert testimony on computer-code-based products, and the D.C. Cir-

213. United States v. Microsoft Corp., 87 F. Supp. 2d 30, 44 (D.D.C. 2000) ("[T]he predatory nature of [Microsoft's] conduct compels the Court to hold Microsoft liable under § 2 of the Sherman Act.").

214. The D.C. Circuit began by recognizing the concern for avoiding undue deterrence to innovation that animates much of the product-design jurisprudence. 253 F.3d at 65 ("In a competitive market, firms routinely innovate in the hope of appealing to consumers, sometimes in the process making their products incompatible with those of rivals; the imposition of liability when a monopolist does the same thing will inevitably deter a certain amount of innovation."). It quickly went on to state, however, that "[j]udicial deference to product innovation . . . does not mean that a monopolist's product design decisions are per se lawful." *Id.* at 65.

215. *Id.* at 59.

216. *Id.* at 67.

217. *Id.* at 59.

218. *Id.* at 67.

219. *Id.* (internal quotation marks omitted). The accepted justification was that some of Windows' Internet-based functions depended on controls and formats not supported by competitors' Internet browsers.

220. *Id.*

221. *Id.*

222. Conversely, "[t]he IBM cases of the 1970s all concerned computer hardware." Heiner, *supra* note 181, at 126.

cuit's seminal opinion reflects some of the unique aspects of such products.[223] Unlike, for example, the Kodacolor II film under discussion in *Berkey Photo*, the code underlying Internet Explorer was capable of dissection into and analysis of separate functions,[224] allowing the court more freedom to analyze anticompetitive aspects of its design.

E. Allied Orthopedic Appliances, Inc. v. Tyco Health Care Group LP

In *Allied Orthopedic*, the defendant, Tyco Healthcare Group LP, was a dominant manufacturer of its patented pulse-oximetry systems.[225] Anticipating that the expiration of its patent would allow for a flood of generic entries, Tyco drew up a new design for its monitor-and-sensor system that moved the system's digital memory chip from the monitor to the sensor, making generic sensors incompatible.[226] A group of competitors, including four rivals that had planned to begin manufacturing compatible generic sensors, sued Tyco on a theory resembling a technology-tying claim.[227] The design decision, however, also "allowed Tyco to add new features" to the sensors[228] and reduced the switching costs incurred when customers decided to adopt a new type of sensor—which, the Ninth Circuit reasoned, in turn facilitated innovation in the sensor product market.[229]

In weighing the merits of the plaintiff's claim, the court emphasized that, "[a]s a general rule, courts are properly very skeptical about claims that competition has been harmed by a dominant firm's product design changes."[230] It then rightly noted that product-design changes are not categorically immune from scrutiny under antitrust laws.[231] Strongly departing from the D.C. Circuit's *Microsoft III* decision, the *Allied Orthopedic* court eliminated the third step of the D.C. Circuit's analysis, the "balancing" of procompetitive benefits and anticompetitive harm. As the Ninth Circuit put it:

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223. The *Microsoft III* decision has been called "the seminal decision with regard to claims of anticompetitive product redesign." *See* Jacobson et al., *supra* note 209, at 21. While this perhaps overstates the case's significance, the decision has been heavily discussed by other courts, antitrust enforcers, and legal scholars—it has been cited over 3000 times.

224. *See Microsoft III*, 253 F.3d at 66 ("Another Government expert likewise testified that one library file, SHDOCVW.DLL, 'is really a bundle of separate functions. It contains some functions that have to do specifically with Web browsing, and it contains some general user interface functions as well.' ") (quoting the trial testimony of Edward Felten).

225. Allied Orthopedic Appliances Inc. v. Tyco Health Care Group LP, 592 F.3d 991, 994 (9th Cir. 2010).

226. *Id.*

227. Allied Orthopedic Appliances, Inc. v. Tyco Health Care Group L.P., No. CV 05-06419 MRP (AJWx), 2008 WL 7346921, at *1-2 (C.D. Cal. July 9, 2008).

228. *Allied Orthopedic Appliances Inc.*, 592 F.3d at 994.

229. *Id.* at 994-95.

230. *Id.* at 998 (alteration in original) (quoting *Microsoft III*, 253 F.3d 34, 65 (D.C. Cir. 2001)) (internal quotation marks omitted).

231. *Id.*

> There is no room in this analysis for balancing the benefits or worth of a product improvement against its anticompetitive effects. If a monopolist's design change is an improvement, it is "necessarily tolerated by the antitrust laws" . . . .
>
> . . .
>
> To weigh the benefits of an improved product design against the resulting injuries to competitors is not just unwise, it is unadministrable. There are no criteria that courts can use to calculate the "right" amount of innovation, which would maximize social gains and minimize competitive injury.[232]

Given that it was "undisputed" that Tyco's redesigned sensor allowed for some improvements, the court's rubric naturally dictated that the product redesign did not violate the Sherman Act.[233] This forceful holding led some scholars to characterize it as having established a per se rule shielding product redesign from antitrust scrutiny.[234] While this is likely overstating the Ninth Circuit's position to some degree, it is not too far off the mark. The *Allied Orthopedic* analysis would presumably still allow a court to find an antitrust violation in a situation like, for example, *Microsoft III*, where the defendant could offer no procompetitive justification whatsoever for its behavior. The analysis would, however, likely immunize the behavior condemned in *C.R. Bard*, where the defendant produced evidence at trial that its redesign created at least some product improvements.[235]

F. In re Intel

On December 16, 2009, the Federal Trade Commission (FTC) filed a complaint against Intel Corporation, alleging that it had violated section 5 of the Federal Trade Commission Act,[236] which bans "[u]nfair methods of competition in or affecting commerce."[237] In the *Intel* complaint, the FTC charged Intel with anticompetitively rede-

232. *Id.* at 1000 (citation omitted).

233. *Id.* at 1001-02.

234. *See* Jacobson et al., *supra* note 209, at 4 ("[T]he Ninth Circuit's decision in *Allied Orthopedic v. Tyco*—which established a *per se* rule protecting redesign—was a significant departure from the normal standards employed to determine whether a product redesign is predatory . . . .").

235. C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1382 (Fed. Cir. 1998).

236. *See* Complaint of Petitioner, *supra* note 69, at 1.

237. 15 U.S.C. § 45(a)(1) (2006). This language has been interpreted as granting the FTC jurisdiction over anticompetitive practices. *See generally Appendix 1—Laws Enforced by the FTC*, FED. TRADE COMM'N (last modified June 25, 2007), http://www.ftc.gov/opp/gpra/append1.shtm (referring to the FTC's "antitrust law enforcement responsibilities"). There is some debate over whether, and to what extent, the scope of section 5 of the FTC Act extends beyond that of the Sherman Act. Herbert Hovenkamp, *The Federal Trade Commission and the Sherman Act*, 62 FLA. L. REV. 871, 873 (2010) ("[T]he power to condemn undefined practices that have been held not to violate the Sherman Act is hardly uncontroversial.").

signing and selling its "compiler" software.[238] "Compilers" consist of code-based software that serves a sort of translating function—they convert source code (written by human programmers) into object code (binary that can be run through a "linker" utility that combines it into an executable program).[239] The FTC alleged that Intel deliberately programmed its compilers so that they output software programs that ran more slowly on computers with non-Intel CPUs than on those with Intel CPUs.[240] This, in turn, would cause consumers to perceive non-Intel CPUs (such as those produced by AMD, Intel's main rival) as inferior to Intel CPUs. According to the FTC, this conduct had no procompetitive justification.[241] The complaint also alleged that Intel initially encouraged manufacturers of graphics processing units (GPUs) to innovate based on Intel's CPU platform.[242] This interoperability was made possible by Intel's use of open interfaces between its CPUs and chipsets. Yet after perceiving increasingly sophisticated GPUs as a threat to its dominant position in the CPU market, Intel "selectively cut off or hindered" interoperability.[243]

Intel agreed to a consent decree on July 28, 2010;[244] and the FTC issued its decree on October 29, 2010.[245] As to the GPU-interoperability issue specifically, the decree required that Intel refrain from designing any of its interfaces so as to intentionally make any competitors' GPUs noninteroperable with Intel's CPUs.[246] And, as to the product-design claims generally, the consent decree required that Intel "not make any engineering or design change" to its products if the change "(1) degrades the performance of a . . . [p]roduct sold by a competitor of [Intel] and (2) does not provide an actual benefit" to the Intel product.[247] The decree further put the burden of showing such a benefit on Intel.[248] Interestingly, the FTC explained in a Notice accompanying the proposed consent agreement

238. Complaint of Petitioner, *supra* note 69, at 10.

239. *Definition of: Compiler*, PCMAG.COM, http://www.pcmag.com/encyclopedia_term/0,2542,t=compiler&i=40105,00.asp (last visited Feb. 13, 2012).

240. Complaint of Petitioner, *supra* note 69, at 10. The FTC further alleged that "Intel represented to [users] that programs inherently performed better on Intel CPUs than on competing CPUs." *Id.*

241. *Id.* at 15.

242. *Id.* at 14.

243. *Id.* at 14-15.

244. Agreement Containing Consent Order, *In re* Intel Corp., No. 9341 (F.T.C. July 28, 2010) (non-public), *available at* http://download.intel.com/pressroom/legal/ftc/FTC_Final_Executed_Agreement.pdf.

245. Decision and Order at 21, *In re* Intel Corp., No. 9341 (F.T.C. Oct. 29, 2010), *available at* http://www.ftc.gov/os/adjpro/d0341/101102inteldo.pdf.

246. *Id.* at 6.

247. *Id.* at 13.

248. *Id.*

that merely showing "actual benefits" would be sufficient.[249] Thus, the decree did not contemplate any sort of "balancing" of anticompetitive harms and procompetitive benefits.[250] Yet the Notice went on to state that "[a] balancing test would be appropriate in a legal challenge to an Intel design change under Section 5 of the FTC Act or Section 2 of the Sherman Act."[251]

Like *Microsoft III* (and unlike the other product-design cases discussed *supra*), *In re Intel* dealt with software design. And software is essentially a code-based, intangible product rather than physical hardware like camera film, biopsy-gun replacement needles, or even the peripherals in the IBM plug-compatible cases. While it would be overreaching to infer too much from Intel's entering into a consent decree rather than having been found guilty of an antitrust violation, *In re Intel* at the very least demonstrates the potential that code-based products offer for anticompetitive product redesign, a potential that presents unique problems for antitrust law and its enforcers.

V. LOOKING FORWARD: A SUGGESTED ANALYTICAL FRAMEWORK

The Supreme Court has never decided a section 2 claim based on a theory of anticompetitive product redesign, leaving lower courts to employ the broad spectrum of analytical approaches in cases like those discussed above. As a baseline principle, all courts have recognized that "product improvement without more is protected and beyond antitrust challenge."[252] Beyond that, however, antitrust courts and scholars have differed on the proper approach to product-redesign liability. This Part seeks both to demonstrate the flaws of past analyses as applied to design-related conduct in code-based product markets and to set forth a structured, efficient, and usable method for analyzing such conduct in the future.

A. Defendant-Friendly Approaches Are Inappropriate

On one end of the spectrum, some have argued that a rule of per se legality should apply to all product innovations.[253] No court has yet gone so far, though some have come close. The *Allied Orthopedic v. Tyco* opinion, for one, has been characterized as creating such a

249. Analysis of Proposed Consent Order to Aid Public Comment, 75 Fed. Reg. 48338, 48345 (F.T.C. Aug. 10, 2010), *available at* http://www.ftc.gov/os/fedreg/2010/august/100810intelconsent.pdf.

250. *Id.*

251. *Id.*

252. AREEDA & HOVENKAMP, *supra* note 61, ¶ 776a, at 286 (citing Transamerica Computer Co. v. IBM, 481 F. Supp. 965 (N.D. Cal. 1979), *aff'd*, 698 F.2d 1377 (9th Cir. 1983)).

253. *See* Sidak, *supra* note 7, at 1148 ("Courts should advance from their strong presumptions of legality for technological tie-ins and acknowledge that marketing strategies for product innovations should be per se legal.").

rule.[254] Even *Allied Orthopedic*, however, required that the defendant demonstrate at least some procompetitive justification for the redesign; if any justification is shown, the Ninth Circuit reasoned, the conduct would be legal.[255] The court in *ILC Peripherals Leasing Corp.* used a similar analysis, holding that if expert testimony so much as differs on a design's legitimacy, the design is irrebuttably presumed legal.[256] And the Second Circuit in *Berkey Photo* used a somewhat similar approach, holding that in the face of conflicting evidence as to whether the new product is an improvement, the conduct is legal (at least given demonstrated consumer preference for the new product).[257]

What all these approaches have in common is that they place a thumb on the scale in favor of defendants, at least as compared to the generally used section 2 exclusionary-conduct inquiry,[258] essentially a rule-of-reason analysis. The D.C. Circuit in *Microsoft III* set forth the general method of analysis, complete with allocations of the burden of proof. First, the burden is on the plaintiff to make a prima facie case that the defendant has engaged in monopolistic conduct (properly defined).[259] If the plaintiff does so, the burden then shifts to the defendant to show a procompetitive justification for the redesign.[260] If the defendant fails to do so, the conduct is exclusionary.[261] If, however, the defendant shows some plausible justification, the burden shifts back to the plaintiff to rebut that justification.[262] If the plaintiff fails to do so, then the plaintiff must show that the anticompetitive harm outweighs the procompetitive justification.[263] The leading trea-

254. *See* Jacobson et al., *supra* note 209, at 4 (arguing that "the Ninth Circuit's decision in *Allied Orthopedic v. Tyco* . . . established a *per se* rule protecting redesign").

255. Allied Orthopedic Appliances Inc. v. Tyco Health Care Grp, 592 F.3d 991, 1000-02 (9th Cir. 2010).

256. ILC Peripherals Leasing Corp. v. IBM Corp., 458 F. Supp. 423, 439 (N.D. Cal. 1978) ("Where there is a difference of opinion as to the advantages of two alternatives which can both be defended from an engineering standpoint, the court will not allow itself to be enmeshed 'in a technical inquiry into the justifiability of product innovations.' ") (quoting Response of Carolina, Inc. v. Leasco Response, Inc., 537 F.2d 1307, 1330 (5th Cir. 1976)).

257. Berkey Photo, Inc. v. Eastman Kodak Co., 603 F.2d 263, 286-87 (2d Cir. 1979).

258. Broadly speaking, in the realm of section 2 jurisprudence, "a structured approach to the issue of exclusionary conduct has emerged." 2 JOSEPH P. BAUER & WILLIAM H. PAGE, KINTER FEDERAL ANTITRUST LAW ¶ 14.15, at 353 (2002) (describing a burden-shifting analysis).

259. *Microsoft III*, 253 F.3d 34, 58-59 (D.C. Cir. 2001). There are, of course, myriad definitions of what constitutes "monopolistic conduct"; which (if any) is "correct" may vary depending on the particular facts of a case and is, at any rate, far beyond the scope of the present discussion. *See generally* 3 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION ¶ 651, at 96-109 (3d ed. 2006) (describing alternative definitions, their various advantages and disadvantages, and the degree to which they have been used by courts).

260. *Microsoft III*, 253 F.3d at 59.

261. *Id.*

262. *Id.*

263. *Id.*

tise takes issue with the last step, at least insofar as it seems to call for courts to engage in "balancing" of close cases—advocating instead a burden-shifting analysis that, while perhaps somewhat less defendant-friendly than the above approaches, calls for "resolv[ing] close cases in favor of the defendant."[264] The various approaches described above, however, end the analysis and dismiss the claim as soon as the defendant shows any plausible justification for its behavior. This favorable treatment traditionally accorded to defendants in this area is due largely to the concerns noted above—the fear that, because (1) the markets themselves act as a check on exclusionary product redesigns (making them quite rare) and (2) antitrust courts are generally not competent to second-guess design changes, condemning product redesigns will tend to unduly stifle innovation.

Yet, as shown above, these concerns largely dissipate in the types of markets under discussion. As to the first, the nature of code-based products and the widespread availability of high-speed Internet access have combined to make the now standard method of redesigning these products—software updates—a uniquely attractive method of foreclosing rivals. This is so for three primary reasons: (1) low development and distribution costs,[265] (2) low risk that consumers will reject redesigns,[266] and (3) low losses incurred if these product redesigns fail.[267] Additionally, new-economy markets tend to be characterized by strong positive network externalities, which may further incentivize monopolistic behavior.[268] Given the confluence of these factors, it is much more likely that $C_i > P_m - LR$ in these markets.

And with regard to the second concern, as shown above, the inherent and unique nature of code-based product redesign makes it uniquely susceptible to antitrust scrutiny.[269] Given that such redesigns are more easily analyzed than traditional, physical product redesigns, it should come as no surprise that firms may be able to offer no justification for their conduct (as occurred in *Microsoft III*). Alternatively, they may simply settle out of court or enter into consent decrees (as may have occurred in *In re Intel*). At any rate, the point is that antitrust courts no longer need to simply throw up their hands and find for defendants in design-related cases.

Since these concerns largely dissipate in these markets, the need to place a thumb on the scale in favor of defendants—that is, the need for the inquiry to end as soon as the defendant makes any plau-

264. AREEDA & HOVENKAMP, *supra* note 259, ¶ 651e2, at 122.
265. *See supra* Part III.B.1.
266. *See supra* Part III.B.2.
267. *See supra* Part III.B.3. Further, if the relevant market is a network market, as these markets tend to be, the incentive to engage in anticompetitive behavior even higher.
268. *See supra* notes 60-69 and accompanying text.
269. *See supra* Part III.C.

sible claim of a procompetitive benefit—dissipates as well. And in the formula expressed above, a defendant-friendly approach lowers *R* by reducing the risk of antitrust liability for engaging in exclusionary, design-related conduct. Absent the usual check of market forces, such an approach even further incentivizes such conduct. Firms can and almost certainly do engage in anticompetitive design in these markets; witness Microsoft's commingling of code,[270] the FTC's theory in *In re Intel*,[271] or Apple's allegedly exclusionary software updates.[272] While courts are rightly reluctant to review antitrust challenges to physical product design changes, code-based product markets exhibit unique features that obviate the need for an overly defendant-friendly analysis.

B. "Actual Improvement" and "Reasonableness"

Alternative approaches used by courts in evaluating challenged product redesigns include whether the redesign constituted an "actual improvement"[273] or whether the defendant's conduct was "reasonable."[274] Both are inappropriate for somewhat similar reasons—primarily that they provide little helpful guidance to courts considering code-based product-redesign claims. Further, the first would tend to misdirect focus in such cases; the second is simply too vague to be of much use.

1. "Actual Improvement": Unfocused

Inquiring whether a product redesign constitutes an "actual improvement" in the realm of code-based products involves too high a level of abstraction in analyzing defendants' conduct. As an initial matter, it is geared toward scrutinizing redesigned physical products, which (as noted above) may contain inextricably interwoven design elements that serve to both improve the product and destroy interoperability with rivals' complementary products. Thus, if the redesigned product as a whole was an improvement, it was deemed legal because courts were cautious (and likely incapable) of attempting to dissect these elements.[275] Yet the coded functions that underlie soft-

270. *Microsoft III*, 253 F.3d 34, 64-65 (D.C. Cir. 2001).

271. Complaint of Petitioner, *supra* note 69, at 5.

272. The Apple iPod iTunes Antitrust Litigation, Nos. C 05-00037 JW, C 07-06507 JW, 2010 WL 2629907, at *3 (N.D. Cal. June 29, 2010).

273. *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 1003 (N.D. Cal. 1979) *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983).

274. *See* Cal. Computer Prods., Inc. v. IBM Corp., 613 F.2d 727, 744 (9th Cir. 1979) ("The reasonableness of IBM's conduct in this regard did not present a jury issue."); *accord* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377, 1383 (9th Cir. 1983) ("[W]e affirm the district court's ruling that the interface changes were not unreasonable.").

275. *See In re IBM Peripheral EDP Devices Antitrust Litig.*, 481 F. Supp. at 1003.

ware products are uniquely separable from the whole product,[276] and a particular line of code is much less likely to constitute both an "actual improvement" and an exclusionary element, especially given the fact that code can be configured multiple ways to perform the same function.[277] Thus, courts are less bound to analyze products as a whole and are more free to directly scrutinize particularized instances of design-related conduct. Additionally, code-based products are today almost exclusively redesigned through software updates delivered via the Internet; as noted above, these updates are thus capable of isolation and separate analysis from the base product.[278]

2. Reasonableness: Overly Vague

Insofar as the "reasonableness" standard is simply shorthand for antitrust's rule-of-reason analysis, it does little harm, for "[t]he law of exclusionary practices lies at the center of antitrust's rule of reason."[279] But given the complex issues at stake, the substantial harm that can be caused by exclusionary design practices (particularly in network markets),[280] and the potential for chilling innovation that is present in all product-design and product-redesign cases, reasonableness is too broad a standard to serve as a standalone approach. Whether a change is "reasonable" is an inquiry that offers little value to antitrust courts[281] and, perhaps worse, provides little to no real predictability for firms considering innovation.

C. Intent: Relevant, but Not Dispositive

While "intent" should be relevant to some degree in addressing product-design and -redesign claims in code-based product markets, it should not alone be dispositive. Recall that in *C.R. Bard*, the court characterized the inquiry as whether the plaintiff had shown that the defendant had engaged in conduct "for predatory reasons, *i.e.*, for the purpose of injuring competitors in the replacement needle market, rather than for improving the operation of the gun."[282] Thus, its ap-

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276. *See supra* Part III.C.2.

277. *See supra* Part III.C.3.

278. *See supra* Part III.C.1.

279. AREEDA & HOVENKAMP, *supra* note 259, ¶ 651e3, at 121.

280. *See* HOVENKAMP, *supra* note 122, at 281-82 (highlighting the increased threat of anticompetitive practices in network markets). *But cf.* POSNER, *supra* note 34, at 249 ("The gale of creative destruction that Schumpeter described, in which a sequence of temporary monopolies operates to maximize innovation that confers social benefits far in excess of the social costs of the short-lived monopoly prices that the process also gives rise to, may be the reality of the new economy.").

281. *Cf.* Cudahy & Devlin, *supra* note 7, at 59 ("Inherently nebulous terms such as 'reasonable,' 'sufficient,' 'foreseeable,' and 'justified' pervade the law.").

282. C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1382 (Fed. Cir. 1998) (citing *In re* IBM Peripheral EDP Devices Antitrust Litig., 481 F. Supp. 965, 1002 (N.D. Cal. 1979), *aff'd sub nom.* Transamerica Computer Co. v. IBM Corp., 698 F.2d 1377 (9th Cir. 1983)).

proach seemed to hinge on subjective intent, rather than actual or likely anticompetitive effects. Other courts, including the Supreme Court, have been less than clear on the import of "intent" in monopolization cases.[283] Yet the core concern of antitrust law is with preventing anticompetitive *effects*. Consequently, "[a]ntitrust appraisal of conduct depends on an understanding of its likely anticompetitive consequences as well as its possible social benefits."[284] The focus should be primarily directed toward effects, not intent.

And this is doubly true in the realm of product-redesign jurisprudence. A firm that redesigns its product generally has the goal of harming rivals by causing customers to substitute away from their products and to the firm's. Yet this goal is not in itself an antitrust concern[285]—a firm that is wildly innovative may be motivated solely by the desire to drive its rivals out of the market, yet directly and greatly increase both consumer and societal wealth through its innovations. As a result, it is frequently difficult to distinguish competitive intent from monopolistic intent.[286] Allowing intent inquiries to inform antitrust review of design-related conduct poses a high risk of confusing the pertinent issues. Again, antitrust's focus must be on effects; thus, subjective intent should be deemed relevant only in ambiguous cases where it can potentially shed light on such consequences or benefits.[287] *C.R. Bard* may have been such a case—as noted above, in addressing the comprehensive redesign of a physical product, it is difficult (if not impossible) to conceptually separate anticompetitive from beneficial design elements. If so, the court properly used intent as a means of discerning likely anticompetitive effects. But, as demonstrated *supra*, code-based product redesigns will rarely present a truly "ambiguous" case. Thus, in such markets, intent should rarely be necessary, and intent alone should never be dispositive.

D. Consumer Acceptance, Not Preference: A Constrained and Uninformed "Choice"

The court in *Berkey Photo* relied at least to some degree on evidence of consumer preference to find that the new camera-and-film

283. *Compare* United States v. Aluminum Co. of Am., 148 F.2d 416, 431 (2d Cir. 1945) ("We disregard any question of 'intent.' "), *with* United States v. Grinnell Corp., 384 U.S. 563, 570-71 (1966) (stating that "willful acquisition or maintenance" of monopoly power is an element of the monopolization offense).

284. AREEDA & HOVENKAMP, *supra* note 259, ¶ 651c, at 112.

285. *See* BAUER & PAGE, *supra* note 258, ¶ 14.16, at 354 ("Nor is it unlawful, by itself, for a firm to harm its rivals . . . .").

286. *See id.* ¶ 14.17, at 357 ("In competitive markets, managers often use warlike language in referring to their rivals, even if they only plan to compete vigorously.").

287. *See* Aspen Skiing Co. v. Aspen Highlands Skiing Corp., 472 U.S. 585, 602 (1985) ("In [monopolization offenses] evidence of intent is merely relevant to the question whether the challenged conduct is fairly characterized as 'exclusionary' or 'anticompetitive' . . . .").

combination was technically superior to preceding products. This logic holds true, however, only where consumer choice was unconstrained and at least somewhat informed. As noted *supra*, those conditions are rarely present in instances of software redesign. Instead of expressing that they "prefer" such redesigns, users generally "accept" them.

Consumer choice in this area is often constrained by software companies requiring users to accept and install software updates in order to continue using the program or all of its features. Witness, for example, Apple's requirement that iTunes users download its allegedly exclusionary software updates in order to access the iTunes Music Store.[288] Unlike in *Berkey Photo*, the choice here was not between buying a competitor's product and buying the dominant firm's product. Rather, the choice that modern consumers must increasingly face is between being able to continue to use a familiar, already owned product and either losing that ability or being forced to continue using a less functional version of the same product. Given switching costs, particularly in closed network markets, consumer acceptance can hardly be said to be "unconstrained" in such scenarios.

Further, as noted above, the dominant trend toward automatic software updating means that consumers are not allowed to make a meaningful, informed choice as to whether to accept an update.[289] And even before automatic software updating became the dominant method of code-based product redesign, little information was generally available to users. Since customer "choice" is neither unconstrained nor informed, antitrust courts must be extremely cautious in considering it as evidence of a technical improvement to a code-based product.

E. Shifting Burdens, Yet Avoiding Both "Balancing" and a Defendant-Friendly Default Rule

A burden-shifting analysis offers a rational, useful, and efficient way for courts to approach claims of anticompetitive conduct, particularly design-related claims in the product markets under discussion here. As the party that bears the ultimate burden of proving its case, the plaintiff must first make a prima facie showing that the defendant has engaged in exclusionary conduct. The burden then shifts to the defendant to show a procompetitive justification for its actions. If the defendant fails to do so, the inquiry ends. And under the analyses employed in many product-design cases, if the defendant succeeds in doing so, the inquiry also ends. But, as shown above, the rationale for

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288. The Apple iPod iTunes Antitrust Litigation, No. C 05-00037 JW, C 07-06507 JW, 2010 WL 2629907, at *3-4 (N.D. Cal. June 29, 2010).

289. *See supra* Part III.B.2.b (discussing the trend toward automatic software updates and its implications for consumers).

such defendant-friendly analyses does not hold in code-based product markets (and especially markets characterized by positive network externalities). Thus, the burden should shift back to the plaintiff, allowing the opportunity to rebut that justification. If the plaintiff can do so, the conduct is rightly deemed unlawful.

But where the plaintiff fails to rebut the justification, courts would seem to be forced into an unpleasant choice between (1) attempting to "balance" the anticompetitive effects against the procompetitive justification[290] or (2) adopting a "tie-goes-to-the-runner" default rule favoring the defendant.[291] The problems that inhere in a balancing test have been extensively documented[292] and may even be exacerbated in the realm of product-design conduct, where such a test would require courts to "balance" anticompetitive effects against the benefits of innovation—a task that may well be workable in clear cases[293] but could be so fraught with uncertainty as to preclude any meaningful analysis of close cases. Yet a default rule favoring defendants is, as noted above, generally inappropriate in addressing code-based product redesign claims (particularly in network markets).[294]

In the realm of code-based product redesign, however, this dilemma is largely illusory. Given the unique separability of coded functions from a code file as a whole and the fact that code can be configured multiple ways to perform the same function, design-related conduct that truly causes both anticompetitive effects and constitutes procompetitive innovation will be at most extremely rare, and likely nonexistent. Thus, as in *Microsoft III* (and quite possibly *In re Intel*), many defendants that have engaged in anticompetitive conduct will likely not be able to even show a plausible procompetitive justification. In the cases in which a plausible justification is shown, close examination at a low level of abstraction will generally reveal the effect of each coded function.[295] Finally, antitrust courts should keep in mind the fact that code can be configured multiple ways to perform

290. *See Microsoft III*, 253 F.3d 34, 59 (D.C. Cir. 2001); Decision and Order, *supra* note 245.

291. AREEDA & HOVENKAMP, *supra* note 259, ¶ 651e3, at 121-23. At least in the realm of unilateral conduct, such a rule favoring plaintiffs has neither been adopted nor urged, given the difficulties that inhere in achieving and maintaining monopoly power.

292. *See, e.g.*, Allied Orthopedic Appliances, Inc. v. Tyco Health Care Grp. LP, 592 F.3d 991, 1000 (9th Cir. 2010) ("To weigh the benefits of an improved product design against the resulting injuries to competitors is not just unwise, it is unadministrable. There are no criteria that courts can use to calculate the 'right' amount of innovation, which would maximize social gains and minimize competitive injury. A seemingly minor technological improvement today can lead to much greater advances in the future.").

293. One need not use a very precise scale to determine that an elephant weighs more than a chicken.

294. *See supra* notes 252-74 and accompanying text.

295. This is particularly true of programs written in relatively higher-level programming languages. *See supra* notes 74-78 and accompanying text.

the same function, making truly ambiguous cases very rare. If a court finds itself seemingly unable to determine whether a defendant's conduct was anticompetitive or innovative, it should go back and take a hard look at the alternative methods of designing the code that were, ex ante, available to the defendant. To the extent that intent can be ascertained, it could also be considered at this point. Thus, courts employing a burden-shifting analysis should be enabled to identify anticompetitive conduct with an acceptably low rate of false positives, all while avoiding both the uncertainty of balancing close cases and an inapposite default rule favoring defendants.

VI. CONCLUSION

The new economy has brought with it a host of innovations that have vastly benefited consumers and society. Yet it has also opened novel avenues for firms to engage in exclusionary conduct, creating the potential for untold harm to both consumer and total wealth. As shown above, the distinctive aspects of these markets and the products they comprise uniquely incentivize firms to engage in anticompetitive, design-related behavior—here, perhaps more frequently than in any other markets, $C_i > P_m - LR$. Fortunately, these aspects also render code-based product redesign uniquely susceptible to antitrust scrutiny. They also allow courts to apply a burden-shifting analysis that avoids balancing. Perhaps more importantly, they allow courts to properly avoid employing an overly defendant-friendly default rule that would reduce R, further tipping the balance toward incentivizing harmful exclusionary conduct.

After decades of debate over the principles and ideology of antitrust law, some consensus has emerged regarding core antitrust values. The resulting "antitrust doctrine is supple enough, and its commitment to economic rationality strong enough, to take in stride the competitive issues presented by the new economy."[296] Despite this measure of doctrinal accord, however, some continue to criticize antitrust's *institutions* as unwieldy or its rules as unfocused.[297] This Article seeks to allay those concerns. Given a proper understanding of code-based product markets and a structured, efficient, and rational method of analyzing design-related conduct in those markets, antitrust's institutions will also be well-equipped to protect competition in such markets—and can do so without stifling true innovation.

296. Posner, *supra* note 8, at 925.

297. *See, e.g.*, *id.* ("The real problem lies on the institutional side: the enforcement agencies and the courts do not have adequate technical resources, and do not move fast enough, to cope effectively with a very complex business sector that changes very rapidly.").