Appendix

Networks, Antitrust Economics, and the Case against Microsoft

Revolutions in science and technology, while bringing benefits to large numbers of people, also bring stresses of various sorts.\(^1\) New technologies can alter the scale of business activities, the geographic distribution of these activities, the types of firms that are involved in production and distribution, and the distribution of wealth. The benefits are many: consumers may enjoy cheaper goods and new products; firms that implement the new technology may make very substantial profits; and workers may enjoy higher wages, new types of careers, and generally expanded opportunities. At the same time, some businesses and workers will lose as new skills and methods of commerce supplant old ones.

In these circumstances, interested parties have often enlisted legislation or regulation to preserve old interests or defend new ones. The historical motivations for U.S. antitrust law have been at least in part an attempt by various parties to defend their stakes in the economy. The antitrust debates over new computer technologies in general, and Microsoft in particular, are consistent with this pattern. In particular, today, as in the past, there are calls for restrictions on the leading firms in new technology industries. Although the focus for scrutiny is Microsoft, the effects are likely to reach much further. As with past generations of antitrust law, the precedent and enforcement practice reached in the current debate are likely to have a wide and long-lasting influence.

\(^1\) A portion of this essay first appeared as “Dismal Science Fictions: Network Effects, Microsoft, and Antitrust Speculation,” *Policy Analysis* 324.
In the policy debates surrounding the antitrust campaign against Microsoft, both the Justice Department and various parties that have aligned against Microsoft have invoked some of the theories of networks and lock-in that we discussed in the body of the book. For example, as we noted in chapter 1, Franklin Fisher, the government’s economic expert in the Microsoft case, argues that network effects “protect” Microsoft against competition.

Widespread acceptance of the theories that we have presented and criticized in this volume would necessitate a radical rethinking of antitrust policy. It also appears that these theories are holding considerable sway in today’s antitrust debates. For example, Business Week reports:

Instead of basing his attack against Microsoft on outdated economic theories that demonize bigness, Assistant Attorney General Joel I. Klein is relying on a developing body of antitrust thinking that warns that the threat of anticompetitive behavior could be even greater in high technology than in traditional industries. This research on “network externalities” deserves to be taken seriously. . . . The Microsoft case is one of the first ever in which Justice has made use of network theory.²

A writer at the Wall Street Journal, a publication not known for embracing radical expansions of antitrust law, has fallen for lock-in theory. Alan Murray recently opined, on that paper’s front page, that:

[H]igh-tech industries might be more susceptible to antitrust problems than their low-tech brethren. That’s because consumers often feel a need to buy the product that everyone else is using, even if it isn’t the best, so their equipment is compatible. Economists call this “network externalities.”

It’s why most people use a keyboard that begins clumsily with the letters QWERTY; why most videos are now available only in VHS format; and why Windows has become the dominant operating system.³

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These new theories provide a convenient solution for those who would bring antitrust claims to bear against market leaders such as Microsoft. Those “outdated economic theories,” so cavalierly dismissed in *Business Week*, might fail to support antitrust enforcement against the current generation of high-tech market leaders. Standard theories of monopoly, which have long provided what economic foundation there was for antitrust, hold that monopoly restricts output in order to elevate prices. This, from the perspective of those “outdated theories” is the social harm of monopoly. What we seem to see in high technology markets, however, are falling prices and increased quantities, even as market shares of the market leaders become extremely large.4 Absent an allegation of high prices, antitrust authorities need to rely on these new lock-in theories in order to provide some economic support for their actions against such high-technology firms.

In the following, we first present some of the history of the conflict between Microsoft and the U.S. Department of Justice. Following that, we consider the economics of the allegations and doctrines that make up the case against Microsoft, with particular reference to the economics that we have discussed in the body of this book.

**Microsoft’s Dispute with the Justice Department**

Historically, new antitrust doctrines have developed in connection with the big cases of the times. These big cases most often involved the biggest and most successful companies. The pattern of attacking success is being repeated today.

Microsoft’s antitrust problems began with a government investigation of Microsoft’s pricing of software sold to original equipment manufacturers (OEMs). Microsoft agreed to end the disputed practices in a highly publicized 1994 consent decree with the Department of Justice.

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4. We are not, however, aware of any formal studies that examine market shares and prices in high-tech markets.
Whether these practices were anticompetitive or not, there can be little doubt that these practices had little to do with Microsoft’s successes in the market.\footnote{See “Declaration of Kenneth J. Arrow,” in Memorandum of the United States of America in Support of Motion to Enter Final Judgment and in Opposition to the Positions of IDE Corporation and Amici (January 17, 1995).}

The consent decree did little, however, to end Microsoft’s legal problems with the DoJ. When Microsoft attempted to purchase Intuit, a maker of financial software, the DoJ opposed the deal. In a highly publicized decision, the consent decree itself was temporarily overturned by Judge Stanley Sporkin’s decision, which was later overturned itself. Sporkin’s decision rejecting the consent decree appears to be the first time that path dependence theory had such an explicit influence on policy.

There were other skirmishes between Microsoft and the DoJ as well. The DoJ examined Microsoft’s inclusion of the Microsoft Network icon on the Windows 95 desktop, claiming that consumers would be unwittingly forced into acceptance of this product to the detriment of competition in the online service industry.

A later twist in the DoJ’s continuing investigation was its interest in Microsoft’s channel partners on its “active desktop.”\footnote{John R. Wilke and David Band, “Microsoft Allies in ‘Active Desktop’ Are Subpoenaed in Antitrust Probe,” Wall Street Journal (February 5, 1998), p. B6.} The antitrust theory behind this investigation is still unclear, but appears to be related to the exclusionary claims being made against Microsoft with regard to Internet Explorer.

Many of the DoJ’s allegations against Microsoft concern the competition between Netscape and Microsoft that began in 1996. This investigation erupted into litigation in 1998 when the DoJ accused Microsoft of an antitrust violation, apparently because of Microsoft’s inclusion of its web browser in the operating system. We use the term \textit{apparently} in the last
sentence because it is not clear to us that the DoJ has a simple consistent theme in its case. Many other issues and claims have been raised in the trial, such as potential splitting of markets by ersatz competitors, predatory behavior, exclusionary agreements, and so forth.

Newspaper accounts and public statements by Department of Justice officials and other participants prior to the trial indicated that the economics behind these investigations were either partly or completely based on the theories of path dependence. The government’s expert economist, Franklin Fisher, considers network effects to be a very important element in his analysis and testimony. Perhaps deserving the credit or blame for promoting network effects into the antitrust arena is a series of briefs prepared by Gary Reback, a lawyer working for several of Microsoft’s competitors, along with two economists who have played prominent roles in this literature: Brian Arthur and Garth Saloner.

These briefs actually went much farther than the economics literature has gone. Reback does not stop with the traditional path-dependence claim that a market-based economy is likely to choose all sorts of wrong products. Nor does he stop with the claim that innovation might be eliminated in the computing industry. Instead, Reback portrays Microsoft as an evil empire intent on nothing less than world domination. To hear him tell it, the American Way of Life will be imperiled if the government does not rein in Microsoft. Lest you think we exaggerate, consider this from the amicus brief: “It is difficult to imagine that in an open society such as this one with multiple information sources, a single company could seize sufficient control of information transmission so as to constitute a threat to the underpinnings of a free society. But such a scenario is a realistic (and perhaps probable) outcome.”

These are fantastic claims indeed. They were repeated at the conference on Microsoft held by Ralph Nader before the start of the Microsoft trial. 8 Brian Arthur, Gary Reback, and Garth Saloner all made presentations. Although these claims do not appear in the government’s case, they seem to be just under the surface.

**Antitrust Doctrines and Network Technologies**

Both the Justice Department and some of Microsoft’s private competitors have used theories of lock-in to support a call for heightened antitrust scrutiny of Microsoft. By itself, lock-in would seem not to constitute an antitrust offense. There is nothing in the law that makes it a crime to have technologies that are less than the best available or less than the best imaginable. 9 Instead, lock-in theories offer an alternative way to claim harm in the absence of the usual monopoly problem of elevated prices and restricted outputs. Also lock-in stories offer new life and a contemporary spin on old antitrust doctrines.

The following two subsections consider some of the antitrust issues that have been raised in the software industry. The first subsection describes why monopoly leverage requires special conditions that make it nearly impossible to increase profits. The second describes why no smart monopolist would try predatory bundling.

**Monopoly Leverage, Tie-ins, and Bundling**

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9. This is not to say, however, that antitrust laws as written are ideal. If there really were serious problems with lock-ins to inferior technology we might want to rewrite the antitrust laws. For reasons set forth here, however, there is no evidence supporting that supposition.
In theory, monopoly leverage occurs when a firm uses its monopoly in one industry to win a monopoly in another industry. Tie-in sales and bundling are contractual practices that are sometimes alleged to facilitate monopoly leverage, but tie-ins and bundling do not have to create new monopoly to be profitable. Nor do tie-ins necessarily harm consumers. In fact, as this subsection explains, the theory of monopoly leverage requires so many special conditions that it seems certain to remain just that: a theoretical problem.

Economists have long been skeptical that monopoly leverage is either feasible or profitable. In most circumstances, forcing consumers to purchase some other product so as to create a second monopoly will not add to a firm’s profits. A monopolist can instead simply extract the value of its monopoly through the pricing of the good in the market where it has its first monopoly.

Suppose, for example, that a firm held a monopoly on oil furnaces. Such a monopoly might be quite profitable; oil furnaces are useful things that offer some advantages over other kinds of furnaces. The monopolist’s ability to maximize profits would face some limits, of course, such as the availability of substitutes like propane and electric heating. Still, the monopolist could devise a pricing system that captures the extra value of using an oil furnace rather than a competing source of heat. The lower the price of heating oil relative to the price of propane or electricity, the greater that value would be. If the furnace monopolist were to become

10. Tie-in sales may allow the monopolist to capture more of the surplus created by the monopolized good, may spread risk, may contribute to quality control or may provide a cheap means for monitoring intellectual property infringement. Such effects of tie-ins do not require monopolization of a second market. Further, where tie-ins are profitable for any of these reasons, they may contribute to economic efficiency. See Liebowitz (1983). Bundling is very common for all kinds of goods. People buy season tickets, cars with tires and transmissions, and houses with microwaves and furnaces. Bundling can be explained by efficiencies of either production or purchase and commonly occurs in highly competitive markets.

11. This analysis ignores natural gas, which in fact is usually cheaper than oil where it can be had.
the oil monopolist too, he might raise the price of heating oil, but that would only reduce what he could extract through the furnace price.

Consider this analogy: regardless of whether or not it worried you that someone had a key to the front door of your house, it would not worry you more if that person also had a key to your back door. Nevertheless, the idea that the second monopoly could be used for something has intuitive appeal. Even if the monopoly in furnaces could be used to extract everything that can be extracted from the furnace users, could not a monopoly in heating oil be used to extract something from people who use heating oil for another purpose? It turns out that, yes, there is a circumstance in which a second monopoly is worth something. That circumstance is a very limited one, however. If the furnace monopolist could also monopolize the heating oil industry, he could extract additional monopoly rents from heating-oil users who were not also his furnace customers.

The question then arises whether one monopoly could ever be extended to capture customers of solely another market. The answer again is yes, it is possible—but, again, only under very special circumstances. If there were economies of scale in the heating oil industry and if too few customers bought heating oil for non-furnace uses to support a separate supply of heating oil, then the furnace seller could lever his monopoly in furnaces into a monopoly in heating oil by preventing furnace customers from buying heating oil from other sources. By assumption, the non-furnace customers would not offer a large enough market to support any independent oil supplier and the furnace monopolist could then extract new monopoly rents in this other market. This explanation of leverage is sometimes referred to as market foreclosure.12

Ironically, the larger the furnace monopolist relative to the heating oil industry, the less likely it

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12. Although this explanation has been around in antitrust economics for some time, it is formalized in Whinston (1990).
will benefit from monopolizing heating oil because it will already have nearly all the potential customers.\textsuperscript{13}

This explanation shows that there is a theoretical possibility of harmful monopoly leverage, but that it requires very special conditions. The levered market must be big enough to matter, but not so big as to allow competitive independent suppliers to survive. There must be some economies of scale in the levered market, but not enough to have caused prior monopolization of the market. The levered market must have many of the same customers as the initial monopoly, so as to provide control of the new market, but not too many, or there will be no new rents to extract by establishing the second monopoly. In short, leveraging can be viewed as the Goldilocks theory of monopoly extension—everything has to be just the right size.

Do the facts of the Microsoft case fit within the leverage story at all? If Microsoft requires each customer to buy one copy of some other Microsoft product, this would, in and of itself, add nothing to its profits. That sort of tie-in sale with fixed proportions has long been understood to offer no advantage to the monopolist.\textsuperscript{14, 15} This is because the fixed proportions implies that the products can only be used together, as would be the case for left and right shoes.

\textsuperscript{13} Furthermore, the existence of economies of scale in heating oil make it likely that someone else has already monopolized the industry, in which case extending the monopoly from furnaces to oil would cause no economic harm; it would merely change the identity of the monopolist. The furnace monopolist is likely to benefit if it can avoid dealing with an oil monopolist who can share in the furnace monopolist’s profits, or lead to lower joint profits if the two monopolists each try to take larger shares of the profit.

\textsuperscript{14} Fisher, in his direct testimony (p. 20) claims that even with fixed proportions there is a potential gain because of the potential “metering” effect of tie-ins. We cannot go into the details here, but Fisher is incorrect, as demonstrated in Liebowitz (1983).

\textsuperscript{15} This does not hold true if a different firm monopolizes the tied market, as discussed in note 13. However, consumers suffer no harm if the other monopolist is merely replaced by Microsoft, and thus there is no reason that antitrust should care about that outcome.
In that case, where consumers really are buying *pairs* of shoes, it is fairly easy to show that a monopolistic seller of left-only or right-only shoes can capture all the profit that there is to be captured as long as the other shoe-type is sold competitively. So the issue must revolve around some variable proportion story, whether Microsoft could crowd out any rivals that sell to customers who do not use Microsoft’s own operating system.

Here the application to Microsoft of the market foreclosure theory runs into trouble. If the products that are allegedly crowded out by Microsoft’s bundling are products that run only under the Windows operating system, then monopoly leverage offers Microsoft no advantage.

To illustrate this point, consider a hypothetical example of successful tying-foreclosure using personal software products, such as Quicken and Microsoft Money. Both are sold in the Macintosh market and the Windows market. *If* Microsoft were to build Microsoft Money into the Windows operating system, *and if* this eliminated Quicken in the Windows market, *and if* the Macintosh market were too small to allow a product like Quicken to be produced at reasonable average cost in that market alone, *and if* Microsoft continued to sell the product separately in the Macintosh market (now at a monopoly price), *and if* there were few additional costs for Microsoft in creating a Macintosh version, then, and *only then*, would Microsoft benefit from leveraging monopoly.

Has this occurred? Does Microsoft sell in the Macintosh market disk compression, backup, fax software, or any other program that is included in the Windows operating system? The only product that comes to mind is a Macintosh version of Internet Explorer. But Microsoft *gives away* this product in the Macintosh market, and promises a permanent price of zero. If Microsoft sticks to its promise, it cannot profit from including the browser in the operating system. Even then, the other required conditions for market foreclosure (the Macintosh market
being too small to support Navigator and the costs of Microsoft creating a Macintosh version not being too large) may very well fail to obtain.

A simple rule that would prevent this type of foreclosure would be to prevent Microsoft from including in its operating system any program that it sells separately in another market. But although such a rule might remove the risk of this sort of market leverage, it also would penalize customers in other markets who would be excluded from the benefits of these programs in cases where no market leverage was contemplated. Given all the special conditions required for successful leveraging, it would be unwise to implement such a rule without further investigation of the potential harm of denying Microsoft products to consumers in tied markets.

Predatory Bundling

The current allegation against Microsoft concerns predatory use of its ownership of the Windows operating system. The specific allegation is that Microsoft’s integration of its browser into the operating system is largely predatory in intent, aimed at forcing other firms (Netscape) out of the browser market. The implications of this issue, however, extend well beyond the browser market, and extend to the very concept of what an operating system can be, and the nature of progress in the software industry.

Antitrust law defines as predatory those actions that are inconsistent with profit maximizing behavior except when they succeed in driving a competitor out of business. In predatory pricing, for example, a would-be monopolist allegedly charges a price that is so low that other firms cannot sell their outputs at prices that will cover even their variable costs. These other firms are then forced either into bankruptcy or to exit the industry because they have become unprofitable. Upon completing the predatory episode, the predator then gets to enjoy the benefits of monopoly pricing. It should be noted that during the predatory episode, consumers
benefit greatly from the low prices, so it is only the later monopoly pricing that causes harm to consumers.

Economists are generally skeptical of claims that price cuts or other actions have predatory intent because they have determined, both in theory and practice, that predatory campaigns are unlikely to have profitable endings. First, the predatory action is likely to be more expensive for the predator than for the prey. The predator cannot just cut price; it must also meet market demand at the lower price. Otherwise, customers will be forced to patronize the prey, even if at higher prices. If the predator is a large firm, it stands to lose money at a faster rate than the prey. Second, even if the predation succeeds in bankrupting the prey, there is no guarantee that a reestablished firm will not just reenter the industry once the predator has established monopoly pricing. If there are fixed investments in the industry, such as durable specialized equipment, the predator cannot establish monopoly prices as long as these durable assets can return to the market. If there are no durable assets, then the prey can cheaply exit the industry and re-enter when monopoly prices return. Either way, the predatory episode drains the predator while imposing uncertain burdens on the prey.

Another problem with predation is that almost any action that a firm takes to become more attractive to consumers can be alleged to be predatory. If customers like something a firm is doing, its competitors will not. In the most elementary case, a price cut or product improvement will damage the prospects for some competitor. It bears noting that most of the alleged cases of predation have been demonstrated to be false.\(^{16}\)

Predatory bundling, like predatory pricing, is a simple idea that ultimately has the same failings as pure predation. If a firm with a controlling share of one product bundles in some other

\(^{16}\) The most famous of these cases is John D. Rockefeller’s Standard Oil. See John McGee (1958).
product, competitors who sell the bundled-in product will have to compete with a product that, to the consumer, has a zero cost. If Microsoft includes in its operating system a piece of software that competes with other vendors in what had been a separate market, Microsoft ensures that virtually all purchasers of computers then have a copy of the new software.

Suppose Microsoft bundles a fax program into Windows 98. If Microsoft’s fax program, relative to its cost, is better than other fax products, then the bundling can not really be predatory. The Microsoft product would win in the marketplace anyway and adding it to the operating system costs less than its value to consumers. If the product is worth more to consumers than the costs of creating it, then bundling will also be profitable without any exclusionary consequences. In contrast, if Microsoft’s fax program, again considering its cost, is inferior to alternatives or provides less value than its cost, then Microsoft would profit only if bundling caused other firms to exit the market and Microsoft were able to raise the price of the operating system by the now higher implicit monopoly price for its fax product.

As a strategy, however, predatory bundling has the same liabilities as predatory pricing. As in predatory pricing, Microsoft stands to lose money (relative to not including the fax software) faster than its rivals do if its fax program costs more to produce than its value to consumers. Moreover, a rival with a superior fax program could keep the product on the market for a price that reflects the advantages that it offers over the bundled product. The rival could not charge more than that because the Windows consumer would already have the inferior fax program. The rival could still capture the extra value that its own intellectual property contributes, however, especially since it would enjoy low marginal costs of “producing” (that is, copying) its software and the marketing edge of an installed customer base. Although it may lose profits or market share, the rival will retire its fax program only if it is inferior to Microsoft’s.
From a social or consumer welfare perspective, then, Microsoft’s bundling action would do no harm. The rival software is a fixed asset in the industry; it does not wear out. In the extreme case, a bankrupt producer might put its fax program on the web, making it freely available to all. This would limit what consumers would be willing to pay for the program bundled into Windows 98 to its extra value, which is zero. Thus Microsoft would be unable to charge a higher price for the bundled software despite having incurred the costs of creating the fax program. Microsoft would lose money and fail to monopolize the market. Furthermore, the creative talents used to make the rival fax program still exist, ready for some other firm to hire should Microsoft ever achieve a monopoly price on the fax program.

Of course, an antitrust enforcer might reply that the OS producer has distribution or coordination advantages that an independent rival lacks. But if these are real advantages that outweigh any quality advantages of the rival, then it is efficient for the OS producer to bundle its fax program.

All this suggests that bundling, as a predatory action, is unlikely to succeed. Furthermore, the software industry has very important nonpredatory reasons to bundle functions into operating systems and other software products. As we explain below, new sales of software will require continual additions to functionality.

In the Netscape case, antitrust enforcers might allege that Microsoft is not interested in defeating the Netscape browser so much as destroying Netscape as a company. Industry pundits have often theorized that web browsers might constitute a means of establishing a new operating system. Netscape, they allege, constitutes a threat to Microsoft’s position in the operating system market. Regardless of the technical reasonableness of this claim, however, it runs into the same problems as other allegations of predation.
Here, as elsewhere, predation would not destroy the durable assets of the prey.

Netscape’s software will hardly disappear if Microsoft bundles a browser into Windows. Indeed, Netscape has already made the source code for its Navigator program publicly available. Even if Microsoft still tried to destroy Netscape in order to protect Windows’ market share, it would ultimately fail. Any of Microsoft’s several large and vigorous competitors, such as IBM or Sun, would happily purchase Netscape, or hire its engineers, if they thought that by so doing they could share some of Microsoft’s enviable profits.

The Rate of Innovation

Putative Dangers

One concern that has been raised by the Justice Department, in the Judiciary committee hearings, by some journalists, and by several path-dependence theorists, is that Microsoft’s dominant position in the market will somehow inhibit innovation. The suggestion is that Microsoft will be able to so dominate the software market that no small firms will dare compete with it. Firms will be unwilling to create new products in any market that is likely to attract Microsoft’s attention, especially in products that are possible additions to the operating system. It is not clear that current antitrust law addresses such concerns. If valid, however, and if not addressed by antitrust law, they might encourage new legislation. Of course, the impact of such legislation would probably reach beyond the computer industry.

Concerns about lock-in drive the accusations against Microsoft. Consumers are viewed as being so locked-in to Microsoft’s products that even if the Wintel platform fell far behind the cutting edge of computer technology, no other combination of an operating system, applications, and support could displace it. Obviously, no one can empirically disprove the claim that products that might have been created would have been better than currently existing products. Instead,
the analysis here focuses on whether lock-in theory correctly concludes that Microsoft will stifle innovation in the computer industry.

Certainly there are instances where Microsoft has incorporated programs into the operating system where the former providers of such programs have gone on to other things. Disk compression and memory management programs are two examples. Fax programs, backup programs, and disk-defragmenting programs are counterexamples where the inclusion of such programs in the operating system has not eliminated the separate market. The difference appears to be in whether the programs Microsoft includes in its operating system are as good as the separate programs or not. When Microsoft produces a product as good or better than the competition, the separate market usually does disappear. It is difficult, however to conceive of consumer harm in this case.

The general claim that innovation will suffer if Microsoft is allowed to grow and add programs to the operating system has several shortcomings. For one thing, it wrongly assumes that programmers hired by Microsoft lack or lose creativity. It proves nothing to observe that small startup companies generate creative ideas more frequently than Microsoft does. There are fifteen times as many outside programmers developing programs for Windows as there are programmers working for Microsoft. Instead, it assumes that Microsoft could not, or would not, use these programmers to produce as much creative activity as they would produce if they continued to work for smaller companies.

Firms benefit from good new ideas. Profits will increase when these new products are brought to market. Monopolists benefit just as much from an extra dollar of profit as do competitive firms. The argument that large firms might innovate less than small firms do usually relies on some variation of the view that large firms are fat and lazy. That is, that they do not
innovate because they do not have to. Still, a dollar is a dollar. Most investors are just as eager for their large-firm stocks to perform well as they are for their small firm stocks to perform well. For the fat-and-lazy condition to hold, it must be that large firms with dispersed ownership of their stock do not have the same incentives to maximize shareholder value and profits as do small firms which are usually closely held. This real possibility is known as the problem of separation of ownership and control.

Although it is conceivable that large firms produce less innovation than small firms do (adjusting for size) this has been investigated at length in the economics literature with no clear consensus. If there were a reason to believe that the software industry would be different from most other industries in this regard, it would tend to support a view that large software firms will continue to innovate, in large part because of the entrepreneurial character of these firms and the hands on activity of the largest stockholders who usually still work within the firm. The ownership of Microsoft and most other high tech firms is not widely disbursed. For example, Bill Gates owns almost 25 percent of Microsoft and several other early Microsoft investors own very substantial stakes. This may in fact explain why Microsoft is still considered such an intense competitor.

Alternatively, it is vaguely suggested that Microsoft stifles innovation because it copies software ideas from others, leaving these other firms no reward for their efforts. If there were any

18. It is also the case that Microsoft now boasts one of the corporate world’s biggest annual research and development budgets at $2.6 billion, almost a quarter of its 1996–97 sales revenue. Bill Gates nonetheless recently announced plans to double Microsoft’s R&D budget. See “Gates expects Microsoft’s research budget to double,” Minneapolis Star Tribune (March 18, 1998), p. 5D.
truth to this claim, the problem would appear to lie in intellectual property law, not in any potential monopoly power on the part of Microsoft. After all, if Microsoft could copy the ideas of its rivals, so could a host of other large (or small) firms in the industry, in each instance lowering the profits of the innovator, large or small.19

It would be a serious problem if innovators in software were not being properly rewarded for their efforts. The purpose of intellectual property laws is to allow innovators to collect economic rewards for their efforts. Without such laws, imitators could take a free ride off the efforts of innovators and produce similar products at lower cost, driving true innovators out of business. So, while deserving of investigation, these problems do not seem fundamental in any way to Microsoft, or its ownership of the operating system. Perhaps a reevaluation of intellectual property laws would be in order. But this claim seems to have little to do with antitrust.

There are some factual matters that do not seem consistent with the claim that Microsoft reduces innovation. Microsoft’s behavior toward its developers, for example, does not seem to square with the claim that it is intent on driving out independent software producers:

Microsoft doesn’t court only the powers from other industries. It’s also spending $85 million this year ministering to the needs of 300,000 computer software developers. It subsidizes trade-show space for hundreds of partners. And it’s not above lavishing attention on small companies when it needs their support. . . . “The platforms that succeed are the ones that appeal to developers,” admits Alan Baratz, president of Sun Microsystems Inc.’s JavaSoft division. He calls Microsoft’s hold on the developer community its “crown jewel.”20

19. Note that many small startups have in fact gained access to enormous amounts of capital in the equities market when they were able to convince investors of the potential value of their ideas. These would include Netscape, Yahoo, and many other Internet companies.

More broadly, there seems to be a paucity of evidence to support the concern that the pace of innovation is insufficiently rapid. The pace of innovation in the computer industry is generally regarded with some awe. Certainly, the Windows market does not appear to have suffered from stifled development of applications.21

Finally, there seem to be tremendous rewards to those who do innovate in this industry. Even in the instance of Netscape, a supposed victim of Microsoft’s power, the founders walked away with hundreds of millions of dollars. Does this discourage others from taking the same path? Unless and until careful research answers these sorts of questions, any antitrust action would be premature and potentially dangerous to the software industry and the economy as a whole.

A Real Danger to Innovation
The nature of software markets requires that software producers continually add functionality to their products. Unlike most other products, software never wears out. If Big Macs never change, McDonald’s can keep selling them because consumers still want to purchase Big Macs that are just like the ones that they ate the day before. This is true for most goods, which eventually need replacement. But because software lasts forever, with no diminution in quality, there is no reason for consumers to purchase more than once a word processor or operating system unless new improved versions come to market. Undoubtedly, improvement will mean additional functionality.

To aid in understanding this, consider what it means to improve software. Software could be made to run faster and perhaps more intuitively, with no additional functionality. But this is not likely to win over many new customers. First, consumers will discover that greater speed

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21. Surely it is difficult to argue that the software market has been insufficiently innovative in recent years. Nonetheless, it
improvements are likely to come from the inevitable speed increases that occur when they replace their old computers with faster ones. Further, although intuitive interfaces are useful, practice overcome inherent design imperfections. So the natural inclination of consumers would be to stick with any familiar version of a program (or operating system) unless the newer version could perform some useful tasks not available in the old version. This requires adding functionality not found in previous versions.

Added functionality can be seen in every category of software. Word-processors have far more functionality than they used to—spelling and grammar checkers, mail-merge programs, and thesauruses represent only a small portion of the additional functions that were not included with the original generation of word processors. Spreadsheets, database programs, and nearly every other category of program also have far more functionality than before. That is one reason why new software seems to fill our ever-expanding hard drives, which have hundreds or thousands of times the storage capacity of earlier machines.

The consumer benefits in many ways from this added functionality in spite of the gripes often heard by some reluctant upgraders. The prices of these large programs almost always cost far less than the sum of the prices that the individual component products used to command. The various components also tend to work together far better then separate components because they remain very difficult to prove that the industry has been optimally innovative.

22. For example, word processors now contain draw packages, paint packages, graphing packages, dictionaries, thesauruses, grammar checkers, equation editors, outliners, and so forth. Spreadsheets now routinely include spell checkers, graphics packages, statistics programs, financial programs, programming languages, linear and nonlinear programming routines, and so forth. Even fax programs now contain optical character recognition software (to convert faxes to text), draw packages to create cover pages, and so forth.
are made for each other. If it were not the case, consumers would not purchase new generations of software products.

As this process of adding functionality to programs continues, it is possible that the number of small companies specializing in add-ons will shrink. But is this any reason to prevent creators of word processors from including grammar checkers and thesauruses? Should the producers of dominant programs be forbidden to add functionality while producers of less successful programs are allowed to add new functions? That hardly seems a recipe for success. Do we really believe that innovation was retarded because add-on companies feared that they might have been put out of business? Do we even know if they have been put out of business? That those programmers are no longer working on new ideas? Again, questionable logic and a dearth of evidence make these claims suspect.

Yet it appears that some Microsoft’s critics, including those within the government, have proposed freezing the operating system, putting in jeopardy any additional added functionality. If this proposal were accepted for the operating system, it would also seem to apply to other categories of software. The results would be disastrous for software producers, who would have no new sales except to new computer users, for computer manufacturers, who would find little demand for more capable hardware, and most importantly for users, who would be forced to use seriously crippled software. The proposal to freeze Windows reflects a view that all the useful things have already been invented. Few proposed antitrust policies are as dangerous as this one.

The Irrelevance of the “Browser Wars”
At the Senate hearings, and in the media, considerable attention has been given to the claim that Microsoft’s desire to prevent OEMs from removing the Internet Explorer icon from the desktop was somehow inimical to competition. This section explains why Microsoft and OEMs might
each want to control the placement of desktop icons and provides an economic framework for
deciding who should be allowed to control the desktop icons. Ultimately, though, it turns out that
icon placement should probably not matter even to the computer and software industry, much
less to antitrust enforcers.

Control of the desktop might be valuable because, as a practical matter, all computer
users see the desktop. In principle, desktop placements of “advertisements,” whether a program
or a message, could be sold to companies interested in such exposure. For example, assume that
an icon for America Online appears on the desktop. Consumers interested in an online service
might just click on the icon and begin the process of becoming an America Online customer.
Knowing this, a company such as America Online might be willing to pay the controller of the
desktop for a good placement of its icon.23

Assume for the moment, then, that these icon placements are indeed valuable. The next
subsection explains why, nonetheless, regulators should not care whether Microsoft or OEMs
control icon placement. Following that, the discussion critically reexamines the assumption that
control of icons should matter even to the computer industry.

A Simple Theory of “Desktop Rights”
If placing icons on the desktop can generate revenues, it should not be surprising that both OEMs
and the owner of the operating system (Microsoft) each will claim the right to place the icons.
Economic analysis allows us to examine whether it makes any difference who has this right. It
also may provide some guidance as to who should get this right.

23. This was supposedly the main ingredient in a well-publicized deal whereby America Online agreed to include Internet
Explorer on its installation disks (although users could use Netscape’s browser if they so desired). See John R. Wilke And David
The Coase theorem can help to explain the tradeoffs involved.\textsuperscript{24} If the rights to place desktop icons were well defined, and if there were no transactions costs or wealth effects,\textsuperscript{25} the Coase theorem tells us that regardless of who initially has these rights, they would end up where they have the greatest value.

Consider the following example. If the rights to sell desktop placement were worth $5 to Microsoft and $10 to OEMs, then OEMs would wind up controlling the desktop icons regardless of who initially had the rights. If Microsoft initially controlled the desktop, OEMs would be willing to pay up to $10 to Microsoft for these rights, and Microsoft would be better off selling the rights to OEMs. It would do this by raising the price of the operating system by more than $5 (but no more than the $10 that OEMs would pay) and granting OEMs the right to place the icons. If, on the other hand, OEMs initially control desktop placements, Microsoft would be willing to lower the price of the operating system by up to $5 in exchange for the right to control icon placements. OEMs would prefer to keep the rights themselves, however, because they can generate more than $5 in revenues by maintaining this control. In either case, OEMs wind up with the rights, and both parties share the $10 in extra revenue brought about by icon placement sales. Although the two parties might be expected to fight over the rights, it makes no difference to the rest of us who gets the rights. By analogy, as almost all microeconomics textbooks explain, if the government subsidizes gasoline purchases it makes no difference whether

\textsuperscript{24} This refers to a paper by Ronald Coase that is the most highly cited paper in the field of economics, and for which he received the Nobel prize. See Coase (1960).

\textsuperscript{25} “Transaction costs” include such things as the costs of finding parties willing to conduct business, the costs of negotiating deals, and the costs of arranging for payment and delivery. The term \textit{wealth effects} refers to the fact that parties enriched or impoverished by an initial entitlement to a good might skew final outcomes in a market because the initial entitlement will alter their consumption patterns. Whoever has the initial entitlement to a glass of water in a desert will, for example, probably end up drinking it.
automobile drivers or service stations receive the subsidy, because in either case the subsidy would be shared in exactly the same way.

Sometimes the assumptions of the Coase theorem are not met. For example, if negotiations between OEMs and Microsoft were not feasible, efficiency considerations would require that the property rights be assigned to the party who can generate the highest value for desktop placements.\textsuperscript{26} Because Microsoft and OEMs are already negotiating over other aspects of the desktop (e.g., price), however, there is little reason to believe that the market will not work efficiently. Because this is a matter of contract, property rights can be defined and transacted within the contract.

The current anxiety regarding desktop placements is misplaced. So long as the parties freely enter into new contracts, neither party will benefit from a legal stipulation of who initially controls the desktop. It should not matter at all to the government who has the rights.

The reader may naturally ask, “if it makes no difference, why is there fighting over who places the icons?” There are two answers. First, there is little evidence that Microsoft and OEMs disagree. It is Microsoft’s competitors who are complaining. Second, it is not unusual in such circumstances for there to be contract disputes or strategic behavior. Two parties can negotiate a

\textsuperscript{26} Who is most likely to maximize the value of desktop placement? The ability to generate value in desktop placement depends largely on the costs of searching, marketing, and negotiating desktop placement with both users and placement purchasers. In this case, it might appear that that Microsoft would be able to transact at lower costs with placement purchasers than could OEMs, arguing for giving Microsoft the property rights. First, OEMs are not included in the upgrade market, and thus Microsoft already would be negotiating for these desktop placements. The additional costs for Microsoft’s controlling OEM placements would seem trivial. Second, each OEM would likely duplicate the marketing, search, and negotiation costs of other OEMs. On the other hand, OEMs often sell other software to customers of which Microsoft has no knowledge. Although the placement of these icons could be preordered in a particular way, this might impose its own inefficiencies. It is conceivable that this would tilt the result toward giving OEMs property rights. The bottom line is that at this time it remains unclear who can maximize desktop value.
contract, then subsequently dispute their understanding of the terms of that contract. If, for example, OEMs are receiving a lower price from Microsoft because Microsoft thought it controlled desktop placement, but now OEMs have a chance to sell icon placement while remaining under a fixed contractual price for Windows, it would not be surprising that a dispute would arise.

Is Icon Placement Valuable?
In order for icon placement to be valuable, it must generate future revenues. America Online benefits in the previous example because consumers could not use its services without paying a monthly fee. Having its icon on the desktop increased the chances that consumers would sign up for the service.

For a typical software product to be on the desktop, however, it is usually the case that the software is already installed on the computer, and thus already purchased. The icon placement only increases its likelihood of use. The only additional benefits to the software producer from having the consumer use the software after purchasing it is that the consumer might purchase upgrades or ancillary products.

For the Netscape and Microsoft browsers there are several reasons why the icon placement might be important. (This analysis ignores any future revenues from upgrades, inasmuch as both companies have agreed not to charge for browsers or upgrades.) It is possible that Netscape and Microsoft might be able to trade off the success of their browsers to sell software specializing in serving up web pages (known as servers) because of their large presence among the base of users and the (presumably) assured compatibility with these browsers.
There is another possible reason for the web browser icon to have value. When a browser is first put into use, it goes to a default starting location on the Internet. If large numbers of web users (surfers) view a particular location, advertising revenues can be generated as some popular locations on the Internet, such as Yahoo, have discovered. Yahoo in fact paid Netscape many millions of dollars to provide Netscape users an easy way to reach the Yahoo page. Netscape and Microsoft, although somewhat late to this game, both are working on new start pages (to which the browsers will be preprogrammed to go) in the hopes of enticing users to stay at their web sites. It is thought that browsers might become a potent revenue generating force by leading consumers to particular pages.

There are serious reservations to the claim that the browser icons are valuable for the control they provide of the start page, however. First, it is possible, and quite easy, for users to alter the start page. Would it make sense for radio stations to pay automobile dealers to have car radios set at certain stations when the cars leave the new car lot? This is virtually a perfect analogy to the browser icon story. Yet it seems hard to believe that radio stations would benefit, mainly because it is so easy to change stations. Is it really that much more difficult for consumers to change the icons on the desktop? This is an empirical question whose answer may change as consumers become more accustomed to operating their browsers.

There is, however, a more fundamental impediment to the claim that desktop placement is important for browsers. Just having the icon on the desktop is insufficient to gain access to the Internet. Clicking on that icon will not connect users to the Internet. For that they will have to use one of many Internet service providers. The Internet service provider will almost certainly

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27. Early in the history of the Internet, it was possible to have a browser and not know what to do to get started. Start pages cropped up to help consumers learn to maneuver their way around the web.
provide its own browser, independent of what icon is on the desktop. Therefore, it is hard to see how the icon on the desktop at the time of sale provides much value at all.

Finally, the concept of detailed governmental control over desktop placement leads to other seemingly endless and seemingly absurd questions. What about the Start button in Windows? The order of programs tends to be alphabetical. Should the government be concerned about the ordering of these programs, and who gets the rights to order these programs? Has anyone investigated whether the various color schemes found in Windows work to benefit Microsoft’s icons over the alternatives? Is the screen saver in Windows that shows the Microsoft Windows icon moving around anticompetitive in its subliminal effects? In conclusion, and in all seriousness, we should ask this: Should the government really be involved in these types of decisions?

The Trial so Far
The trial is playing out as this book is going through its copyediting stage, with the government’s case just wrapping up. So far, the level of evidence put forward appears to be, from an economic vantage, disappointing, largely based on anecdotes and e-mails by various employees of companies that do business with Microsoft. The economic case consists of theories proposed by the government purporting to demonstrate how Microsoft is trying to protect its monopoly in operating systems through illegal tactics. Lacking from the government’s case is almost any empirical examination of the economic conditions in software markets. There was, as far as we

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28. For example, both America Online and AT&T’s Worldcom Internet services use a version of Internet Explorer that is specially set up to go to America Online’s and AT&T’s home pages, respectively. Note that control of the start page is a Coasian problem analogous to the icon placement problem.
can tell, no methodical examination of prices, quantities, or just about any other economic magnitudes.

Franklin Fisher, an eminent economist and the government’s final witness, attributes to network effects an enhancement of monopoly power and a barrier to entry. He seems to accept the theoretical view that network effects slow down changes in market shares. He seems, like many other economists, to believe in “tipping” and “lock-in.” The empirical support for these views? As far as we can tell, none. As is often the case, theory is itself is supposed to be persuasive, even if it is theory that has never been demonstrated to have any predictive or descriptive power, nor any empirical support.

As we have seen in chapters 7 and 8, the evidence from the software markets is not one of slow changes in market shares. Instead, market changes occur at breakneck speed. There was no support for the concepts of tipping. And throughout the book we have failed to find any evidence of lock-in. To our knowledge, no one has presented any evidence contrary to our findings in the software industry.

Professor Fisher also accepts the idea that predation makes sense in this case. Microsoft, in his view, tried to destroy Netscape in order to protect Windows from potential competition with Java. The problem, of course, is that even if Java were a threat to Windows, and it is not clear that it ever was, predation is not going to get rid of that threat, as explained above. And there are other logical explanations for giving away the browser, or including it in the operating system. Because Professor Fisher conducts no empirical economic analysis, he cannot distinguish between these hypotheses, and instead used e-mails and memos to try to make his case.
As something of an aside, he also claims that a tie-in sale would increase profits for Microsoft even if the two tied products were used in fixed proportions. This is a factual error on Professor Fisher’s part, inasmuch as it is impossible for a tie-in with fixed proportions to increase profits for a monopolist if there are no other monopolists in related industries.29

The government’s other economics witness, Frederick Warren-Boulton, did make a claim about pricing in the industry. The claim had to do with the fact that prices of hardware seem to have fallen more than prices of software, or more specifically, the prices of the operating system. The problem with this statement, even if true, is that it is totally irrelevant to the issue at hand. Hardware prices and software prices would not be expected to bear any particular relationship to one another. Do we expect the prices of corn flakes and milk to move together, or automobiles and gasoline, or socks and shoes? Theory and common-sense empirics both are in agreement that the answer to this last question is “no.” Perhaps Dr. Warren-Boulton was just tired from a hard day’s testimony. Unfortunately, from our reading of the trail, this was about the only market-based empirical statement made by the two economists.

Implications
The theories of path dependence and lock-in are relatively new to the economic literature. These theories have not won over the economics profession after years of debate, and have they have not made their way into many economics textbooks. Nor do these theories draw on first principles in obvious and secure ways. That does not make theories of path dependence and lock-in bad economics, or wrong economics, or inappropriate topics for academic research. On the contrary, it makes the academic debate that much more important. It makes these theories,

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29. See Liebowitz (1983) for a proof of this point.
however, a poor foundation for public policies that could effect the progressive nature of the American economy.

If we were treating a dying industry, even speculative economic medicine might be worth a try. But the computer and software industries continue to astound most people with the rates both at which products improve and at which prices decline. It makes no sense to submit such a robust patient to the risks of economic quackery.

In the main text of the book we have shown that there is a poor connection between theories of path dependence and the real-world behaviors of entrepreneurs and consumers. We also discussed the disconnect between the alleged empirical support for these theories and real events. Contrary to the lock-in claim, and contrary to some popular stories of markets gone awry, good products do seem to displace bad ones. Because there is no real support for the supposition that markets fail in increasing returns environments, there is no more basis for antitrust in increasing-returns markets than in any others.

There might even be less reason to apply antitrust to such markets. Our most basic theory of increasing returns implies that monopoly or near-monopoly equilibria are likely. Where people do value compatibility, or where increases in firm scale really do lower costs, dominant formats or single producers will probably result at any particular moment. This certainly was a prominent finding in our examination of software markets. There is no point in the government attacking serial monopolists competing to continue their dominance into the next period.

Furthermore, consumers benefit from serial monopoly. Anything else will frustrate the urge for compatibility, unnecessarily raise costs, or both. So monopoly outcomes need not imply that anything has gone wrong or been done wrong. Monopolies that are undone by the government may lead only to monopolies that are redone in the market. The faces may change,
but market structure may not. If we insist that natural monopolies be populated by several firms kept at inefficiently small shares, we are likely to find these markets taken over by foreign companies without such restrictions.

In such markets, firms will compete to be the monopolist. It is in this competition that products that create more value for consumers prevail against those that create less value. Notice what that means. The very acts of competition that bring about the market tests of these products—the strategies that save us from inferior keyboards—will look like monopolizing acts. That is because they are. They determine which monopoly prevails until better products prompt new campaigns to capture an increasing returns market.

Many of the other claims that surround the new antitrust debate are disconnected, not only from real-world observations, but also from any real theoretical support. One such claim is that Microsoft would like to crush any would-be direct competitor. It probably would. Theory and history, however, do not tell us how predation could ever work in a world in which assets are perfectly durable. Further, as we have seen, Microsoft has been visibly unsuccessful in crushing anything except where their products are better than the opposition. They had to resort to an attempted to buy the uncrushed Intuit; they have barely dented America On Line with the much ballyhooed Microsoft Network; and they only began to erode Netscape’s near-monopoly when their own browser came up to snuff. Microsoft’s products, which dominate in the Windows environment, also are the better products, and have often dominated first in the Macintosh market.

There is, finally, the vaguely posed claim that Microsoft stifles innovation—another disconnect. The claim fails to conform to several prominent features of the PC landscape. First, Microsoft courts and supports its many software developers, who now number in the hundreds of
thousands. Second, the personal computing industry, by any practical standard of comparison, seems to be astonishingly innovative.

Finally, and most importantly, antitrust doctrines brought to bear against Microsoft cannot be constructed so that they will apply to Microsoft alone. If doctrines emerge that the biggest operating system must be kept on a short leash, then why not also restrain a big producer of database software that sets the standards for that activity, or the biggest producer of printers, or scanners, or modems, of microprocessors, and so on? If these new technologies do exhibit increasing returns, or important reliance on standards, or network effects, or instant scalability, then we are likely to see high concentration in all of these areas. Unless we are to embark on a relentless attack on whatever it is that succeeds, we need to acknowledge that the constructive competitive actions that firms take in this environment—new products, new capabilities, new deals—will often hurt competitors by the very fact that they make consumers better off.