# The Economics of the Microsoft Case

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ABSTRACT

This paper explains the economics of Microsoft's anticompetitive actions, both the goal of suppressing Schumpeterian competition and the methods of denying widespread distribution to innovative new technologies. An understanding of the economics of the industry supports the logic of the government's antitrust case against Microsoft. Competition in the short run is limited by the network effects surrounding products like Microsoft Windows. Competition in the long run is far more feasible, but not automatic. The purpose of Microsoft's anticompetitive actions was to prevent widespread distribution of innovative technologies whose market success would have fostered long run competition. With that analysis in hand, this paper examines the effects of Microsoft's anticompetitive acts on the industry to determine whether and how the suppression was harmful to users of computers.

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# 1. Introduction

The economics of the Microsoft antitrust case follow from the underlying economics of the computer and Internet industries. Understanding how much competition is feasible in these industries, how much is desirable, and the form competition takes involves, more than in other industries, understanding the sources of dynamic long run competition. With that understanding, however, it is quite simple to understand the case. Microsoft's attempts to avoid competition by suppressing new technologies were based on the particular way in which competition works in the computer industry. The considerable harm to consumers and society that

The main locus of competition in these industries is Schumpeterian because of the tension between two very different underlying economic forces. Network effects and the desire for standards mean that particular market segments in these industries will typically be served by only a small number of applications development platforms. Users' and applications developers' sunk costs mean that established dominant suppliers of platform technologies will be unthreatened by competition for the length of technological and market eras.

Forces for change and competition counter these forces for inertia and concentration. Divided technical leadership in a platform, in which distinct, specialized firms advance key, complementary technologies used by the same applications, is a competitive force. Computing's high rate of technical progress brings technological and market eras to an end, creating epochal opportunities for competitive replacement of incumbents or for putting substantial competitive pressure on incumbents. Technologies that spend years isolated from competition with each other by serving different segments of demand can be brought into competition by technological or market change, a process called indirect entry. Schumpeterian competition typically combines elements of all three forces: divided technical leadership, epochal change and indirect entry.

With powerful forces for both competition/change and monopoly/persistence in place, it is no surprise that many observers are drawn to one of two false extreme positions. Some think that the industry is already perfectly competitive, that even Windows with all the network effects buttressing its position would be quickly replaced if a superior alternative came along.[2] Others think that the user and developer sunk costs and network effects surrounding Windows are so strong that it could not be displaced at all.[3] The truth lies somewhere in between. Network effects do indeed allow monopolies like Windows to have high entry barriers, but these barriers can fall under the right circumstances, namely divided technical leadership and disruptive technical and market change. This creates a powerful incentive for incumbent monopolists to block forces that might lower entry barriers.

The relationship between that positive economics and the antitrust case is direct. If either extreme position had been true, the basis for the antitrust case would have vanished. If Windows were not a monopoly, Microsoft's efforts would have already been disciplined by existing competition. If Windows were an impregnable monopoly, Microsoft's efforts to suppress innovation by other firms could not have harmed

[2] Schmalensee and Evans (2000).

[3] Economides (2000).

competition, since (operating systems) competition would not have existed either way. As in any monopolization case, the government needed to show both that there *was* a monopoly but that it *could have ended*, were it not for abuse of monopoly power via anticompetitive actions. The government met this burden in *U.S. v. Microsoft* by showing that widespread distribution of Internet-based technologies outside Microsoft's control, such as Netscape's browser or Sun's Java, would have established divided technical leadership at a time of disruptive change and thereby lowered entry barriers, were it not for Microsoft's anticompetitive behavior.

The methods by which Microsoft accomplished those anticompetitive ends follow from the same economics. Any piece of platform software, not only an operating system like Windows, needs widespread distribution and numerous complements (such as applications) to succeed. The network effects for an innovative new form of platform software, such as the browser or Java, depend on that distribution and those complements. With the widespread use of the Internet, these new forms of platform software gained an opportunity. They were complements to, not substitutes for, existing products (including Windows) so their initial adaptation did not need to overcome any barriers to entry. Their success would mean divided technical leadership, however, so Microsoft sought to prevent it.

The distinction between its own browser or Java and an externally controlled one was very important to Microsoft, for the latter meant divided technical leadership. Some of Microsoft's efforts to prevent that were legal but unavailing. They distributed their own browser and their own version of Java, both free, and improved them over time.[4] Those techniques were insufficient to stop the network effects growing up around the outside technologies, largely because the entrepreneurial Internet innovators had a head start.

With competition on the merits failing, Microsoft turned to contracts and marketing behavior that blocked third parties from widely distributing the entrepreneurial technologies or from supplying complements to them. Microsoft is a very effective marketer of software, and the antitrust case is overwhelmingly about marketing practices. Any new technology in the computer business needs the collaboration of dozens if not hundreds of third party complements. Microsoft sought, by bullying where they had the bargaining power and by bribes where they did not, to prevent third parties from collaborating with the independent browser and cross platform Java. This undercut effective distribution of those technologies and inhibited their use by developers and end users. Microsoft also sought, by its own product packaging decisions, to impose costs on its customers when they used the innovative technologies. The point of all this was to prevent success of the new technologies, divided technical leadership, and the resulting lowering of Windows entry barriers. The mechanism was to deny other industry actors the choice to develop and/or distribute software in the way that they felt would best serve their customers' interests or that directly blocked consumer choice

[4] Some observers mistakenly believe that the anticompetitive acts of which Microsoft was convicted had elements of "competing too hard" or "innovating too fast." They think that Microsoft was convicted of the free distribution of their software, the improvement of their browser, or the development of their own version of Java. In fact, none of these form part of the anticompetitive acts – all were treated by the courts as legitimate acts of competing.

Microsoft's pattern of anticompetitive acts, which went beyond the browser and Java to a number of other technologies, reveals a consistent and ongoing effort by the firm to block widespread distribution of or collaboration with technologies it finds competitively threatening.

This is a vertical foreclosure case in two senses. Microsoft sought to avoid divided technical leadership because it thought that widely distributed Internet-based technologies outside its own control, while complementary to Windows, would lower entry barriers into the Windows monopoly. Second, Microsoft sought to block third parties from acting as complementary collaborators with the innovative technologies. In many industries, either the anticompetitive goals would be infeasible or the anticompetitive acts would be ineffective. Vertical relationships between producers of complements are very important in the computer and Internet industries, both in collaboration to achieve technical advance and in ensuring future competition. The computer business, the mechanisms and the goals of Microsoft's anticompetitive behavior follow directly from the way the industry works.

The proceeding sections of this paper will identify how competition in the computer industry works, then explain how Microsoft sought to suppress that competition. The impact of these acts on competition and consumers in the computer and Internet industry are then examined. I limit attention to the outline of the story; thorough analysis of legal and economic evidence is left to other papers.

# 2. Competition

This section discusses the degree and form of competition that is feasible in the computer industry, and the conditions under which entry and dynamic competition are likely to be effective.

## *2.1. Network Effects*

The underlying economics of standards and compatibility that are at work in IT markets follow the logic of the economics literature on those topics.[5] In many IT markets, coordination on a particular standard achieves social increasing returns to scale through network effects. The network effects may be "direct," as when users of word processing software who want to share files are better off using programs that store files in the same, standard, way. The network effects may be realized only through a "proprietary" standard, as when each brand of word processing software stores files its own way, so users sharing files must buy the same brand. Or the standard may be "public." In either case, users may wish to choose products embodying the same standard as other users choose in order to gain from network effects, potentially ignoring their own preferences for the product.

Network effects can also arise when individual products are not very valuable if used alone, but become valuable when combined with complements into systems. Users buy a computer and operating system in order to run complementary applications. If suppliers of complements (applications software authors) have increasing returns to scale, they will have an economic incentive to supply complements compatible with the system

[5] Surveyed in David and Greenstein (1990), Besen and Farrell (1994), and Katz and Shapiro (1994).

with the largest body of users. If the incremental costs of also supplying for a second system have a fixed component ("porting costs" for software) then there will be an incentive to supply first or only to the largest system. If users value the number or variety of complements, an "indirect" network effect among users arises and they choose the same system as other users to get the complements.

The first implication of network effects arises from (social) increasing returns to scale.[6] There are likely to be only a few actively competing alternatives for any particular product at any given time in many IT segments. This can lead to (at least transitory) market power for firms selling products embedding a key standard.

Some analysts exaggerate the importance of increasing returns, saying that competition must be either impossible or bad. This is an elementary error; in all industries with increasing returns, competition brings improved incentives at the cost of foregone scale economies. A more subtle error is to exaggerate the scope of the increasing returns, which are, in computing, often local to a particular market segments. IBM mainframes had huge network effects, but that didn't mean inventing the PC was a bad idea. Nor do Windows' network effects mean that its architecture should be used for all devices and purposes. Neither does the network effects logic compel a single firm to provide all of the general purpose (or platform) components.

The second important implication arises when there are sunk costs associated with using or developing applications for a particular standard or when there are coordination costs. Either can lead to first-mover advantages or barriers to entry. Historically, this has meant that many product categories with network effects have long eras of stable standards, with shifts to a new standard arising infrequently.

## *2.2. Divided Technical Leadership*

The limitations of using network effects theories as written to understand competition in the computer business arise from their partial equilibrium structure. While network effects imply that similarly situated computer users can gain from running applications that run on the same platform, they do not require that a single seller provide the platform technologies. A platform can have **divided technical leadership**. DTL is the supply of key platform components by multiple firms. A single firm participates in DTL if its technologies are widely enough distributed (either in its own products or others) to gain from the platform's network effects.[7]

For example, the PC platform has always had some divided technical leadership. At one stage, all of IBM and Compaq (computer), Microsoft (OS), Intel (CPU), Netware (networking OS), WordPerfect and Lotus (near-universal applications) participated in the technological leadership of the PC platform. Now, technical leadership has been reduced (by a process we shall discuss later) to Microsoft (OS, networking OS, near-universal applications) and Intel (CPU), with the sellers of computers themselves largely out of leadership. Currently, DTL is largely confined to one hardware and one software firm.

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[6] In the direct network effects case, this follows from the matching behavior of users. In the indirect network effects case, it arises because users are drawn to the system favored by developers, and vice versa. These are "installed base effects" in the language of some of the theory, "positive feedback" in a related language. This will lead to one standard if there is not much variety in tastes for standards, or to few standards if taste variety leads some users and developers to a distinct minority standard.

[7] This definition of divided technical leadership is from Bresnahan and Greenstein (1999).

Divided technical leadership is consistent with any of several market structures in each "layer" of the platform. There can be monopoly that persists for a very long time (OS), serial monopoly (word processors, so far), dominant firm plus pressure from a follower (CPU), and fragmentation (PC), though the fragmented layers tend not to participate in platform leadership when it is contentious.

The PC industry has had divided technical leadership and network effects played out in a number of different layers at once. There are indirect network effects in some layers, such as the microprocessor, the operating system, and the network operating system, and direct network effects in many applications products markets, such as word processing. As a result, there are powerful forces for having only a few products in each of these layers, but these forces do not imply that all these products should be sold by the same firm.

## *2.3. Competition under Divided Technical Leadership*

Divided technical leadership leads to improved competition in each layer of a platform even when there are substantial first mover advantages from network effects. Direct horizontal competition in the short run will be largely blocked, but there are a number of mechanisms by which firms in one layer can change the competitive situation of firms in another layer. All have been historically important in the PC business. I shall not review the history here at too great a length, instead pointing only to a few famous examples in footnotes.[8] The mechanisms come in two main classes: (1) firms in one layer encouraging entry and epochal change in another layer and (2) rivalry at layer boundaries.

A firm in one layer may *sponsor entrants* into another layer. If there is a technological or market opportunity for an epochal shift, entry with the technological expertise and distribution capability of the sponsor may succeed where standalone entry would fail. This is an important source of ending entrenched market power.[9] In some circumstances, the sponsor may *itself be the entrant*.[10] The positive competitive impact on the target market is the same in this instance, but the resulting loss of divided technical leadership can reduce competitive opportunities for in the long run. A firm in one layer may also *prevent exit* of the second-place firm in another layer in order to keep pressure on the market leader.[11]

Divided technical leadership also has positive competitive implications in between epochs. Some of the technical progress in computing is the invention of new technical capabilities, or "extensions". DTL leads to rivalry between existing firms that sell complements over which of them will include the new capabilities in its product. This rivalry is often valuable in competitively determining the features of the new

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[8] A more complete review of some important examples may be found in Bresnahan (2001a).

[9] Thus Intel sponsored Compaq's 1986 entry into the branded PC segment, substantially undercutting IBM's market power, with the opportunity given by the industry's transit from the 80286 to 80386 processor.

[10] This is Microsoft's preferred strategy for software markets, as when OS dominant firm Microsoft sponsored the early 1990s entry of Word against word processing dominant firm WordPerfect, with the shift from DOS to Windows offering the opportunity.

[11] Examples include AMD as a second to Intel for the CPU, supported by Microsoft. Another version of this is to offer the second-place product oneself, as Microsoft offers Money to counter market leader Quicken.

capability.[12] This rivalry is particularly strong when the new capabilities affect interface standards between layers, or when the new capabilities will be used by developers of applications running on the platform. The possibility that a strategically important capability may be controlled by a rival encourages firms, even ones that are secure in their central monopolies, to invent and improve versions of the capability. This provides incentives for much technical progress by dominant firms.

One outcome of extensions rivalry is that the new capabilities come to be part of the positive feedback loop centered on one layer and not the other. If several important extensions are in one layer rather than the other, both developers and users will tend to look to the first layer for services. This process can lead to "commodification" of the second layer.[13] The commodified layer lacks opportunities for product differentiation, whereas the network effects layers induce high levels of product differentiation.

## *2.4. Conditions for epochal and extensions competition*

Epochal and extensions competition are both contingent on divided technical leadership. Absent divided technical leadership, epochal competitive change arrives only very slowly[14]. Absent divided technical leadership, extensions competition simply cannot occur. Furthermore, divided technical leadership among firms that are more fundamentally similar in their capabilities (e.g., among software firms or among hardware firms as opposed to between software or hardware firms) offers more opportunities for either epochal or extensions competition.

Even when confronted by a new and superior alternative, dominant positions in any particular layer are hard to end by direct, horizontal, competition. However, such competition can and does end them at times. The opportunity for that epochal competition to emerge is contingent on disruptive change in other layers. This is the reason why DTL is important. Disruptive change can only lead to competition when the other layer is important, widely distributed, and under external control (i.e., not controlled by the dominant firm in the first layer). Unified technical leadership means no external control. Under it, disruptive technical change will be "managed" by the existing dominant firm to prevent competition and entry in any particular layer. Divided technical leadership means that firms in another layer may side with entrants over incumbents.

Disruptive change arises fundamentally from the underlying technical progress in the computer business. While the arrival of epochs which might end existing technological and market eras is not frequent, the forces behind it are amenable to economic analysis. The two key ideas are potential demand for, and potential supply of, a new product competing with an existing monopoly product in one layer. On the demand side, a substantial expansion of or change in the uses or the users of a platform facilitates platform shifts. (The famous historical example is the great expansion in the number of users, and the switch to business uses from hobbyist ones, in the PC industry

[12] The user interface rivalry between operating systems and various applications categories (word processor in one era, browser in another) is an example.

[13] The famous example is the conversion of the PC itself into a commodity as network effects shifted from IBM to Microsoft and Intel.

[14] For example, IBM mainframes enjoyed at least a decade of dominance after many customers came to the view they would be better served by newer technologies.

in the early 1980s which gave the IBM PC an opportunity to enter.) Disgruntled locked in users of current technology are another demand condition facilitating shifts.

On the supply side, the existence of a technological base for new, competitive, products can arise from the broad, ongoing technical progress in computing. An important form of this arises when technologies serving other segments of demand move to the segment at hand. Such "indirect entry" is a familiar pattern in the computer business.[15]

## 2.5. Feasible Competition

This account leads to a more competitive industry than one might have thought.

Network effects might lead one to the conclusion that the degree of competition in these industries must be small. This is generally correct for direct horizontal price and quality competition in the short run. However, the tremendous technical dynamism of the computer industry means that long run competition can be very important and that the long run can arrive quickly. Opportunities to replace existing standards, or to improve the incentives of the proprietor of a dominant standard, are important sources of long run consumer benefit through competition. Those opportunities arise far more frequently under divided technical leadership.

Although DTL is not as effective as direct horizontal competition at affecting price setting and service quality, it does provide better opportunities to replace incumbent monopolists in particular layers or to put competitive pressure on them for improvements. In many industry contexts, this would be a very negative assessment of the degree of feasible competition. In the historical period of the PC industry, this limited form of competition led to a considerable shakeout of companies that were once successful and the replacement of many technologies (sometimes without competitive turnover among sellers) according to consumer choice, not incumbent seller desires.

Since one important mechanism of epochal competition under divided technical leadership is entry by firms in other layers themselves, DTL tends to decline over time. The lack of DTL raises substantial entry barriers. Thus, on a fixed technical base, the industry will tend toward unified technical leadership simply by playing out the mechanism. However, the rapid rate of technical innovation in the computer industry reverses the tendency of DTL to decline over time, because it creates new layers for entry and the re-creation of DTL.

I have couched this section as analytical and deductive, drawing on standard economic tools for thinking about competition. Yet my positive analysis differs only in its language, not in its ideas, from the way computer industry people analyze competition in their own industry. In particular, it is close to the theory that Microsoft managers constructed to guide their own strategic behavior – in their case, based on an inductive method that looked at the history of their industry. Their core strategic goal was to prevent competition that would follow from the restoration of divided technical leadership enabled by widespread use of the Internet.

[15] See Bresnahan and Greenstein (1999).

# 3. Efficiency and Competition

Divided technical leadership as an organizational scheme has clear theoretical advantages and disadvantages relative to technical leadership unified in a single firm. Unified technical leadership allows within-the-firm coordination across a number of distinct technologies, yielding a better coordination mechanism than one cutting across selling firms and implemented by buyers who "mix and match." Divided technical leadership permits technical and market specialization at the level of the firm, not just the division, creating a superior organizational form for rapid technical progress in individual areas. Finally, as we have just seen, the competitive implications of divided technical leadership mean that there is a large difference in seller incentives between the two organizational schemes.

The question of which of these two systems is more efficient cannot be resolved on theoretical grounds, for each has strengths and weaknesses that depend on the economic, technological, and market environment.[16] The computer industry offers the opportunity to compare their efficiency as well as their competitiveness. Both systems have been deployed (unified technical leadership by IBM and other large-systems companies, and by Apple, divided technical leadership by the PC industry). Evidence strongly attests to the superiority of the divided technical leadership model when the rate of technical progress is high or its direction uncertain.

## *3.1. Innovation*

Unified technical leadership is better at learning what incremental technical change will serve a fixed body of users undertaking a slowly evolving body of uses. Divided technical leadership is better at offering buyers a number of distinct alternatives, whether they are extensions or epochal departures possibly replacing existing dominant products. Unified technical leadership tends to advance more slowly while ensuring that new components in different layers work together. Divided technical leadership is able to progress rapidly in some layers without regard to others. Unified technical leadership will offer limited opportunities for customer choice, while divided technical leadership lets customers choose components. This last distinction is related to the differences in seller incentives under the two systems. Which system will be superior in given circumstances depends on the economic environment and on that system's successes in avoiding its own inherent weaknesses.

The level of uncertainty and innovation in the computer industry plays to the advantages of the DTL model. The PC business, and now the PC+Internet business, has had ongoing technical progress marked by periods where new bodies of demand and new types of use emerge. Roughly divided, these periods of stable (if growing) demand include a hobbyist period, a power user period, a general business person period, a home user period, and now, perhaps, a mobile user period. Transitions between these periods have often been uncertain. At many junctures, there has been considerable difference of opinion as to the appropriate direction of technical change, leading different specialized sellers to offer very distinct choices to customers. Technologists have had some difficulty forecasting with precision what customers want, so the market value of distinct

[16] See Perry (1989) or Katz (1989) for reviews and Aoki (2001) for a theory of the "Silicon Valley" form of organization in contrast to unified technical leadership.

initiatives among which customers may choose is high. Invention that has moved the industry forward overall has come from a remarkably diverse number of specialized companies.

The disadvantages of divided technical leadership in effecting coordination are mitigated by strong network effects that push towards unification. Uncoordinated technical progress occurs in order to permit experiments, but once consumer demand is revealed, progress is quickly coordinated through interfirm communication and coordination mechanisms (themselves invented specifically to take advantage of network effects). Market forces, rather than directed management, achieve much of the task of coordination.

## 3.2. Industry View of DTL

PC industry leaders view divided technical leadership and specialization as the key industry structure variables explaining the competitive and innovative success of their industry. They point to advantages of technical specialization and to the incentive advantages that arise when customers may choose to replace only a single component rather than needing to replace an entire platform to get the benefits of competition. When they are writing about their industry, industry leaders conclude that the economic and technical performance of DTL is highly superior to unified technical leadership.[20] The executives' assessment of superior performance of divided technical leadership comes, in large part, from their view of the industry history they have lived. The mechanism by which important innovations have been introduced has been competitive, and the mechanism by which new substantial technological possibilities have been exploited has involved widely dispersed innovation by many companies with different capabilities, incentives, and expectations.

In an earlier paper, I quote a number of industry people at some length on this point.[21] Let me reproduce here just two of those quotations. The first one comes from Dr. Grove of Intel; I quote him to show that the industry conclusion about the net benefits of divided technical leadership comes from industry people performing the analysis I have just sketched out, looking at both advantages and disadvantages. At the end of a long discussion of why divided technical leadership offers more customer choice, more efficient supply, and less lock in, Dr. Grove concludes that the "new" way of organizing (divided technical leadership) is far better than the "old" (unified):

> A consumer . . . might have trouble making them work [together] but he put up with that trouble and worked a bit harder because for $2,000 he had just bought a computer system that the old way couldn't deliver for less than ten times the cost. This was such a compelling proposition that he put up with the weaknesses in order to avail himself of the power of this new way of doing business.

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[20] Of course, marketing materials from firms that are dominant in one layer sometimes take the other line, telling customers it is a good idea to give up choice for "integration."

[21] Cf. Bresnahan (2001a).

Mr. Gates agrees with Dr. Grove's analysis: unified technical leadership leads to lock-in and lack of consumer choice, and the resulting lack of competition and variety is bad for innovation. Here is Mr. Gates advising public policy about the industrial organization of supply for the "information superhighway," the ancestor of the commercial Internet:

> A wide range of skills, from a wide range of companies, will be necessary to put the information highway together sufficiently for a mass market to begin. It will be tempting for a company strong in one or more of the necessary disciplines to try to find a way to do every piece and ignite the market all by itself, but I think this would be a mistake.

The "mistake" of choosing unified technical leadership arises precisely because of the problems identified in this section – unified technical leadership is inefficient in times of general rapid technical change drawing on many distinct disciplines.

There are two main conclusions about the benefits of divided technical leadership. One is about competition, the other about innovation and dynamic efficiency. Industry participants firmly believe that divided technical leadership brings both benefits, and that it is very beneficial to their customers net of its costs. They are right.

## 4. The Antitrust Case

I now turn from a general discussion of competition in computing to the specifics of the antitrust case. The logic of the government's main claim was that Microsoft, an existing monopolist, maintained that monopoly by preserving entry barriers that would otherwise have fallen. The first part of that, the monopoly part, is very simple in its economics. Microsoft sells the dominant PC operating system, and substantial entry barriers defend its position.

The government in *U.S. v. Microsoft* described the indirect network effect entry barriers protecting the Windows monopoly as the "applications barrier to entry."[22] An entrant operating system would need to attract a substantial body of applications in order to compete with the network effects created by existing applications that already ran on Windows. An entrant product would need to be far superior in price/performance to attract users and developers away; entry by an equally efficient or moderately superior competitor would fail.

This entry barriers theory prevailed at trial largely because it forms such a basic part of Microsoft's internal thinking. Many memoranda talked about how Windows was not vulnerable to a "frontal assault" from an operating system competitor, how Windows would retain its market position even if it were to lose "feature parity" with other operating systems, how Windows pricing was based on network effects logic, etc.[23]

I note two differences between this use of the network effects logic in the antitrust case and some modeling conventions of formal theory. First, the theory is sometimes written so that there is permanent lock-in -- entry never overcomes the very high barriers of the installed base effects. This is simply theory's habit of rounding "difficult" up to "impossible" for expositional clarity. In the antitrust case's logic, it was important that a

[22] See, e.g., Fisher (1998) or Fisher and Rubinfeld (2000) for an articulation of this theory.

[23] See Bresnahan (2001b) for a more detailed review of those documents and their relationship to the theory. Microsoft uses very sophisticated theories of network effects and lock in for business decisionmaking, not surprising given their role in the industry.

mechanism existed to lower the entry barriers and make entry possible. That mechanism was divided technical leadership.

Second, even though the theory emphasizes the possibility that network effects markets might be locked-in to the "wrong" standard, the antitrust case makes no assumption about whether Windows was the "wrong" operating system. The Windows monopoly circa 1995 was not challenged; it was *monopolization* (i.e., preserving that monopoly against entry threats made real by the Internet) that was challenged. What is important in the case is not that the PC market might have been locked into a bad standard (Windows), but rather that, when things changed and Windows might have been augmented or replaced by forces outside Microsoft, Microsoft was in a position to block that new competition.[24]

## 5. The Internet Tidal Wave

The conversion of Internet technologies into commercial computing technologies and their prospect for widespread distribution were the events that triggered Microsoft's anticompetitive campaign. These events played the role both of disruptive change that might affect existing network effect systems and the potential redrawing of the technical leadership map with new layers. Microsoft immediately saw the implications for potential entry into and competition in the operating system business.

Microsoft was surprised by the consumer popularity of the Internet, and especially surprised by the popularity of the browser as an application. Netscape had introduced Navigator in 1994, and it was the "killer application" of 1995. In the memorandum which gives this section its name, Mr. Gates laid out the main logic of why an independent browser would restore divided technical leadership and competition to the benefit of Microsoft's customers but to the detriment of its monopoly profits.[25] The firm sought to prevent divided technical leadership by pushing its own browser, Internet Explorer ("IE"). The very considerable lead enjoyed by Netscape, fruits of its entrepreneurship, left Microsoft with an uphill battle, which it ultimately won by anticompetitive means.

A related development was the invention and dissemination of Java by Sun Microsystems. Successful Java represented even more divided technical leadership, as applications might be developed within the Java architecture. Applications developers were very excited about Java, for at least two reasons. It promised effective mechanisms for developing network-oriented applications, e.g., ones that run partly on an E-commerce seller's server and partly on the buyer's PC. It promised "cross-platform" development, i.e., applications that would run whether the server was HP, Sun, IBM, or Microsoft, and whether the PC was Windows, some Unix, or a Macintosh.[26] To counter this threat, Microsoft designed its own version of Java, far more limited in its ambition and – of course – monoplatform in its goals. While Microsoft might have argued that a monoplatform Java was better, as cross platform features limit performance and there was, in any case, at the time only one important platform Windows, it was unprepared to

[24] Liebowitz and Margolis (1999, 2001) have been consistent in ignoring this basic point about the case.

[25] That 8-page memo, which is GX 20, has much of the logic of this paper in it.

[26] The language used in the industry can lead to some confusion here. Java was pushed by Sun as a platform for applications development – here platform means anything that offers services to other software. Java was also "cross platform" in the sense of working with different kinds of computers.

risk developer choice between Java versions with only that argument. Microsoft's version was ultimately dominant on the PC, without a market test, and has now been dropped from widespread distribution.

## 5.1. Epochal Change?

The commercialization of the Internet brought with it the conditions for epochal change in existing layers of the PC market, even those where existing dominant firms had high entry barriers, as in operating systems. Microsoft analyzed this by using the economic model I sketched above in sections 2.3 and 2.4. They asked whether the new technical and market conditions were ones in which there would be new end-user oriented applications, whether there would be new bodies of end users, and whether their existing customers were grousing about Windows' limitations. When all three questions were answered "yes," they reached the sensible conclusion that there was a real opportunity for radical worsening of their monopoly position. Mr. Gates, acting as CEO and explaining a gigantic reallocation of resources within Microsoft, summarized all these arguments by saying that the widespread use of the Internet was the most important change in the industry since the introduction of the IBM PC.

Microsoft managers and technologists were alarmed by the widespread success of the browser not only because of web browsing. This heralded an era of new very widely distributed applications, which might be the drivers of user demand for platform software and of developer attention. As a class, these might be called network applications or network-centric applications. The class includes email, browsing (of course), chat, authoring and posting web pages, e-commerce buying, and viewing multimedia. While some of these applications, like email, seem older and more familiar to those of us in academic life, they were not all that important in the commercial PC world.

The Internet brought personal computing to a substantial new body of users, home users largely interested in the computer as a communications tool. This triggered great alarm on Microsoft's part. Such users might be served by something "far cheaper" than a Windows PC, in Mr. Gates' view, but powerful enough for Web browsing – and later, for email, for instant messaging, and other home-centric or network-centric applications. Windows' virtues would be lost on such users, especially if they did not want to use existing applications, and they would then focus on Windows' faults, especially the very expensive hardware to run it and the limited focus of either hardware or software on communications applications support.

One threat to Microsoft would flow through a limited horizontal scope of network effects. If a new, cheaper platform could have gotten its own cycle of positive feedback going around home users, it would have existed in parallel to Windows, which would have continued dominant for a while in the at-work and work-at-home segments. This raised the prospect of indirect entry when such a new platform might have been brought into competition with Windows even for work users. Microsoft's anticompetitive campaign had as its first goal the prevention of a market test of Windows vs. new platforms for this body of new users. They achieved this goal.

Defenders of Microsoft make two incorrect arguments about this. They falsely charge that arguments like this ignore network effects, thus asserting that the competition would be unlikely to succeed and (repeating a frequent error about the scope of network effects) in any case would not be in consumers' interests. The former argument is a

positive error; the latter a normative one. Microsoft's executives did not make either error, believing both (positively) that the possibility of a new platform was real and (normatively) that it was in their customers' interest. Like any other increasing returns to scale, network effects alone are not sufficient for the efficiency of using a single platform to serve two bodies of demand. That depends on the costs of a common platform (notably enough hardware to support both home and work applications and lack of specialization of features and components to the distinct demands' needs) vs. benefits (wider span of realized positive network externalities.) The market can best decide the value of that kind of tradeoff to consumers. When new bodies of computer demand have emerged in the past, especially when there has been technological opportunity to make a cheaper platform, markets have sometimes chosen to establish new platforms with their own network effects.[27] Mr. Gates' analysis of that prospect in the late 1990s was that it was likely to happen, to his customers' benefit but at a loss in Microsoft's profits, for the usual reasons why monopolists don't much like competition.[28]

The Microsoft executives' worry that there would be divided technical leadership and possible growth of alternatives to the Windows PC outside their core markets was heightened by a sense that many longstanding customers were ready to migrate away from Windows. We have already seen that Windows embodies an expensive hardware-hungry architecture, which would be an issue for price-sensitive customers. Other technical features of Windows were also leading to calls for augmentation and replacement. These included the difficulty of maintaining Windows PCs ("total cost of ownership" issues) and Windows' limited mechanisms for dividing applications in a network. Mr. Maritz, then head of systems, summarized the need to deal with these problems for corporate customers as "end world hunger". It was not lost on Microsoft that, as Mr. Chase put it, Java and Netscape Navigator made "viable" forms of horizontal competition that might "obsolete Windows" and "commoditize the OS."

I do not bring these points forward to say that it is clear the world was locked into a bad Windows standard, but rather to say that the prospect of competition by creation of an alternative to Windows, whose entry would be sponsored by (or perhaps undertaken by) Netscape or Sun, was one that hard headed managers and technologists inside Microsoft took very seriously. At the time, they focused on a potential entrant that was identifiable in the marketplace, the "network computer." More generally, however, they thought that an alternative operating system to Windows might gain end user acceptance; Linux, for example, has gained considerable use in technical environments or as a server operating system without overcoming the applications barriers to entry. Microsoft feared that, with an independent browser or Java, it might.

Even if neither a new home consumer based platform or a new work platform would succeed in replacing Windows outright, Microsoft executives worried about the limitations on their technology strategy that would result if one were to be a real threat. Their ability to dictate the direction of end user oriented computing to applications developers, OEMs, and consumers, would be reduced if there were more consumer choice.

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[27] Again cf. Bresnahan-Greenstein (1999).

[28] This allusion, like the other one in the subsection, is to GX 20. Cf. Bresnahan (2001b) for a more systematic review of Microsoft's thinking on these issues.

### *5.2. Re-Creation of DTL*

The Microsoft executives thought past the immediate crisis to the possibility of a future with more divided technical leadership. This would arise if there were an independent browser that was established, and/or if the Java architecture would be widely used by developers. Even after the particularly opportunity for epochal change of the late 1990s passed, there would be (from the perspective of an operating systems monopolist) the ongoing annoying competitive initiatives that divided technical leadership brings.

Microsoft was highly concerned because the foreseeable future of extension competition centered on Internet and other related network extensions. This meant that the more Internet-oriented layers of the PC+Internet industry might dominate the definition of standards around those extensions, i.e., the extensions of the future might be Netscape or Java extensions, not Windows extensions, with the resulting trend toward commodification and increased competition in their operating systems business. Microsoft felt the sharp need to prevent that.

The same outcome, prevention of DTL's re-emergence and continuation of UTL, would also serve to protect Microsoft from future entry threats into the OS business. Many executives talked about how much easier it was going to be to prevent the establishment of a market position for an independent browser or Java than to reverse it once established.

The obvious solution, from Microsoft's perspective, was to slow down the rate of distribution of valuable new technologies at the boundary between the Internet and the PC until (a) the prospect of divided technical leadership could be dealt with by killing off the independent browser and Java (b) versions of the Internet extensions which were connected to the Windows architecture could be prepared and distributed to users and developers. That is what they set out to do, communicating to the rest of the industry that a go slow technology policy was optimal.

## 6. The Anticompetitive Campaign

This section first looks at the goals of Microsoft's anticompetitive campaign against Internet technologies. While the ultimate goal was to maintain the Windows monopoly past the shift of individual end user computing from PC to PC plus Internet, the implementation plan had four main subgoals. First, prevent widespread distribution of technologies that might, if successful outside Microsoft's control, form the foundation for divided technical leadership – call them "platform technologies." These were, during 1995-1998, primarily the browser and Java. Second, prevent widespread distribution of generally useful outside technologies that might cooperate with outside providers of platform technologies. These were, in that era, often multimedia technologies. Third, where either kind of technologies are clearly important, enter with a Microsoft variant and ensure its SR market success while changing its character to make it consistent with the persistent windows monopoly. Fourth, slow down the rate of transition to new technological opportunity so that a "migration path" consistent with Windows can be found for developers.

I then look at the mechanisms used to achieve these goals, the "bad acts" of the antitrust case. What is important about the mechanisms is their universality in scope in two senses. First, the campaign attacked the widespread distribution not only of clear platform software that might be the basis of DTL, such as the browser or Java, but any

software that competed with Microsoft's core products and any software that might have general purpose characteristics. Second, the anticompetitive campaign swept in a very wide range of third parties who might distribute, use, or cooperate with new technologies. Finally, the activities consist of anticonsumer and antideveloper activities, destroying not creating choice.

## 6.1. Blocking Collaboration/Distribution via PC

Microsoft sought to interfere with contracts and collaborations between the suppliers of new, competitively threatening Internet technologies and a wide range of third parties in the computer business. They followed the simple marketing logic of identifying those potential collaborators who would be particularly important in assuring widespread *distribution* of the new technologies and those collaborators who would be particularly important in assuring the *utility* of the new technologies, and then attacking entrants' opportunities to contract with those collaborators. Firms in the existing PC business were under Microsoft's strategic control, and Microsoft employed threats to compel them not to cooperate with new technologies.

Manufacturers of PCs (called "OEMs") were one of the two low-cost channels to distribute browsers to users. The idea was, users who bought a new computer could buy one with the browser they wanted on it, set up and configured for them to use that browser. Since much browser usage was going to be made by new segments of users, like home users, this distribution vehicle was important. Older categories of users, notably users at work, tended to replace computers reasonably frequently, contributing to the value of this distribution outlet. As a condition to keep their Windows licenses, OEMs were required to undertake a long series of anticonsumer activities whose goal was reduction of the distribution of Netscape Navigator. First, OEMs were contractually required to carry Internet Explorer and display it prominently, even when consumers overwhelmingly preferred Netscape and when OEMs protested that there were substantial costs (confusion, support calls, etc.) of distributing the product consumers didn't want next to the product they did. This formal contractual requirement was backed up by less formal threats to seriously disadvantage the OEMs who did carry Netscape.[29] Similarly, when valuable technical progress by OEMs tended to make it easier for consumers to choose Netscape over IE, Microsoft banned it.[30] OEMs could not afford *not* to distribute Microsoft Windows and survive commercially, so this was clear use of existing monopoly power to prevent a competitive threat.

Firms that made PC applications software ("ISVs") were contractually required to make IE the default browser used by their software and to make Microsoft Java the default Java (if their software used a browser or Java). They would then have to cooperate technically with Microsoft's efforts in these areas, even if their best judgment of the underlying technology and benefits to their customers was that the independent

[29] Compaq executives, for example, had compiled an impressive list of ways Microsoft would carry out its threats to punish cooperating with an entrant under "How Retaliatory Would They Get?" IBM OEM managers reported on those threats as well.

[30] OEMs had designed programs to make it easier for consumers to set up their computer for a good "OOB (out-of-box) Experience." When Microsoft banned these, a Hewlett-Packard executive wrote, "From a consumer perspective, . . . [you] are hurting our industry and our customers." The bans were only possible because Microsoft had a monopoly: "if we had another supplier, I guarantee [that] you would not be our supplier of choice." GX 309.

browser or cross-platform java was the way to go. Why did ISVs accept? The requirement was a condition of the "First Wave" contracts that permitted ISVs to learn about new versions of Windows in the lengthy testing and coordinating period before the versions were commercially released. Timely access to that information was a commercial necessity to anyone writing end-user oriented software, so they agreed. Through these ISV requirements, Microsoft successfully denied Netscape and Sun the opportunity to make valuable contractual and collaborative relationships with software developers that would have led to improved Internet software applications.

Even Apple computer found itself in a position where it had to agree to a contract to distribute IE and make it the default browser on Macintosh computers.[31] Observers were baffled at the time: Steve Jobs was roundly booed and pelted with debris at MacWorld, because this seemed like such a departure from Apple's and its customers' interests. Yet Microsoft had threatened to withdraw support for MacOffice, and without new versions of MacOffice (one was all but complete at the time), Apple likely would have been unable to earn a profit from its Macintosh line of computers.

One of the most notable examples of Microsoft's exertion of monopoly power was its compelling Intel to abandon a line of innovative software. One might have thought that Microsoft and Intel were symmetric in the divided technical leadership of the late 1990s in the PC industry, but this was not the case. Microsoft pressured Intel to halt development of valuable multimedia technologies because of their potential to become part of a non-Microsoft technology initiative, particularly in connection with Java. Microsoft further pressured Intel not to cooperate with Sun in making Java run particularly well on PCs. The existence of AMD, a horizontal competitor to Intel, provided Microsoft with a back-up supplier if negotiations broke down. In addition, they would be able to "chill," according to Mr. Gates, OEMs' willingness to adopt Intel innovations.

The point of all this was to use the existing Windows monopoly, and the dependence of a number of different collaborators on Microsoft, to block widespread distribution of valuable new technologies. If the new technologies remained only a technical threat, without widespread distribution, there would be no new divided technical leadership and thus no opportunity for entry into Microsoft's core monopoly, Windows.

## *6.2. Blocking Collaboration/Distribution via Internet*

Microsoft did not limit its efforts to deny collaborators and distribution partners to the innovative software firms to those PC industry firms. Internet-based firms, part of the new emerging industry, would form valuable collaborators as well, and Microsoft sought to prevent that. With these firms, threats tended not to work, and Microsoft ended up resorting to bribes to prevent the widespread distribution of competitively threatening technologies and the resulting DTL. Some bribes were ones that no entrant could match, as they were conditional on Microsoft's unique capability to distribute software to end users.

The first, and perhaps most surprising, effort was a direct one to induce Netscape not to change the competitive situation of Windows. Microsoft met with Netscape in

[31] For those who like the "IE is just an improvement to Windows" defense, explaining why Microsoft compelled its distribution on Macs is a challenge.

June, 1995, before the first version of Internet Explorer shipped, in an effort to bribe and threaten Netscape to change its distribution and technology policies for Navigator. Microsoft proposed having Microsoft browsers running on all new versions of Windows (starting with the one due to be released in two months, Windows 95) and Netscape browsers on everything else (including older versions of Windows, Macintoshes, Unix computers, and so on). Alternatively, the Netscape *brand* of browsers could be ubiquitous, but it would simply be a shell over Microsoft browser technologies on the new Windows 95. Either of these arrangements would have prevented DTL, which was the anticompetitive point of Microsoft's offer.

Microsoft employed both carrot and stick elements to get Netscape to agree. As a stick, Mr. Andreessen's (of Netscape) notes of the meeting quote Microsoft as asking, " 'Would you [Netscape] be interested in having a partnership where NS gets all the non-Win95 stuff and MS gets all the Win95 stuff . . . If NS does want to, then we can have our special relationship.' THREAT THAT MS WILL OWN THE WIN95 CLIENT MARKET AND THAT NETSCAPE SHOULD STAY AWAY." (Emphasis in original, GX 33.) As a carrot, Mr. Gates suggested giving Netscape a great deal of support and money to move away from software on the PC and to support its investment in server technologies.[32] Netscape, making a good guess about the relative profitability of a successful browser vs. Microsoft's offer and/or a bad guess about Microsoft's ability to follow up on the threat, turned the deal down.

Along with OEMs, Internet service providers and online services (e.g., AOL) are the other important distribution channel for browsers – collectively these are called Internet access providers (IAPs.) Microsoft paid IAPs for exclusive contracts to distribute IE, not Navigator.[33] The most important of them, AOL, negotiated toughly with Microsoft, correctly sensing that Microsoft was in danger of losing the browser war. Microsoft ultimately bartered something uniquely valuable to AOL, the right to put an AOL icon on the Windows desktop. Other IAPs were rewarded with cross-promotional deals (making it easy to subscribe to their service after buying a new Windows PC). These contracts could not possibly have been matched by Netscape, since Microsoft offered distribution opportunities to IAPs that only a monopolist could provide. Ultimately, Microsoft had exclusive deals with fourteen of the top fifteen access providers and with many smaller ones. Many of these contracts had strong exclusivity provisions, guaranteeing distribution of the MS browser over the Netscape one. The purpose of these restrictions was, as a Microsoft marketing manager put it in his courtroom testimony to "avoid losing all those side by side product comparisons."

In a related move, Microsoft paid Internet content providers to use Microsoft technologies instead of Netscape ones. Internet content did not, however, become all that big a business very quickly, and content provider distribution of browsers was not all that important.

For Internet-based firms, Microsoft offered both cash and distribution advantages that an entrant could not possibly match. The purposes of the payments were to prevent

[32] For those who like the "Microsoft was convicted of competing too hard" defense, their attempt to pay off Netscape is another challenge.

[33] They were in some instances permitted to distribute Navigator if customers specifically requested it, but the volume of such distribution would be capped in the contract. Restricting the affirmative distribution of Navigator and forcing "opt-in" by consumers impacts distribution, of course.

competition between Internet Explorer and Netscape Navigator in order to ultimately prevent divided technical leadership and thus maintain Windows' position.

### *6.3. The Mass Market Acts*

Microsoft also orchestrated mass-market anticompetitive acts to steer individual users and developers away from threatening technologies.

Individual end users liked the Netscape browser, and Microsoft was concerned that they would continue to work to overcome the distribution difficulties it had imposed and thus choose the Netscape browser. Microsoft feared that the large installed base of Netscape, plus either switching costs or network effects (or both) in browsers, would make it impossible for them to catch up. While Microsoft could force the distribution system to deliver IE to the user, and induce much of the distribution system not to deliver Netscape, consumer choice kept rearing its ugly head. Consumers were using the Netscape browser and deleting IE. So Microsoft worked to make it difficult for the individual end user to remove IE, for example, by taking IE out of the Add/Remove utility and mixmastering the files so that IE files could not be deleted to save disk space.

The point of this was clearly made in the decision documents. Microsoft feared losing the browser war and thus suffering DTL, and could not rely on only the distribution restrictions to achieve that. It was therefore necessary to make it a "jolting experience" to use any browser other than the Microsoft one. End users, who would have freely chosen a Netscape path, were compelled to take a Microsoft one. In the final decisionmaking email exchange, the argument in favor of "tighter integration" between Windows and the Microsoft browser was to avoid losing the browser war. A senior Microsoft manager okayed the plan to do this, a plan which he approved "even if the OEMs suffer."

There were many small developers of end-user oriented applications that were not large enough for individualized Microsoft contracts. These can be found in smaller ISVs and in the computer departments of corporations. Once Microsoft had decided to violate its contractual requirement to make its Java comply with open, cross platform standards, it faced a marketing problem with this constituency. Many developers liked the promise of cross platform Java, and would choose Sun's version for that reason, even with a performance penalty. So Microsoft misled this constituency through false technical statements about the openness of Microsoft Java and by hiding tools and techniques that would permit developers to develop open Java applications. Once again, the point of Microsoft's actions was to reduce developer choice by contract for large developers and by manipulating information for smaller developers. The end goal was to make sure, as with the restrictions on collaboration they imposed on larger developers, that new valuable network effects did not spring up around Internet-based technologies outside Microsoft's control, as that would have, after a period of time, led to potential competition for Windows.

In these mass market actions, as in the earlier contractual ones, Microsoft's illegal actions were ones which blocked the choice of its customers, either directly or through impeding distribution.

### 6.4. A pattern

While the most immediate threat to Microsoft in the late 1990s came from a new, widely distributed application, the browser, and a new, popular architecture for network-centric applications, Java, there were other technologies they found competitively inconvenient. As a group, these were controlled outside Microsoft, generally useful, new, and widely distributed. They included multimedia technologies from RealNetworks, Intel, and Apple, for example. Microsoft sought to impede their widespread distribution by similar anticompetitive means. The point was to leave no gaps into which future divided technical leadership might flow by leaving no technologies outside their own control.

What the pattern shows is that Microsoft is prepared to block the widespread distribution of a class of innovative technologies. These technologies have "platform attributes," i.e., are potential widely useful, could offer services that would be used by applications, and might run with Windows or with other kinds of operating systems. Innovations within that class will be subject to interference with distribution, for Microsoft fears that successful complements to Windows might someday be sponsors of, or be part of a coalition that sponsors, a competitive entry threat to Windows.

## 7. Microsoft's Defenses and Other Confusions

While Microsoft's legal strategy involved a wide ranging effort, entirely failed, to disprove almost everything I have said here, a few issues have particular resonance with some economists and should be addressed specifically.

One is the issue of market power. Microsoft claimed they had none, despite owning the most valuable intellectual property in the history of the world, and despite the large number of internal documents attesting to the importance of the lack of competition because of network effects in ordinary business decisionmaking. A particular form of the "no market power" argument is that the government "should have' had a "platform market definition" instead of focusing on the operating system monopoly, at which point it would have seen that there was plenty of competition. This represents two silly errors. First, at the time of the violations, the innovative technologies were complements to, not substitutes for, Windows, so customers who wanted to escape one of Microsoft's attacks on competition could not substitute to them. Second, the threats to Microsoft's position represented by these innovative entrants required more than their introduction, they required success and the establishment of DTL. An existing monopolist crushing a nascent threat is the central problem addressed by monopolization law, not a technical error in its application.

Another is the issue of causation. Microsoft's defense team has attempted to minimize the impact of the violations by saying that they were technical, ineffectual, and so on. But Microsoft's managers made no such mistake. They were convinced, up to the time of the final acts judged to be illegal, that they would lose the browser war if they were forced to compete on the merits. Indeed, that repeated finding inside Microsoft was linked to many of the anticompetitive acts I have chronicled here. The documents make clear that the anticompetitive acts caused the loss of DTL, as absent them Microsoft would have lost the browser war. That DTL would have led to entry and effective competition against Windows requires more steps away from the historical path, so it is harder to be certain that it would have. It is not mere speculation, however, as it is the

path of causation the managers followed, and it is the path of causation seen repeatedly in the history of the industry.

Much has been made in recent writings about the possible inefficiencies of vertical disintegration, particularly since the government proposed to restore divided technical leadership by dividing Microsoft into operating systems and applications lines of business.[34] As the previous section has shown, the long-run advantages of DTL overwhelm short-run disadvantages, and there is no obtaining DTL without with vertical disintegration.

If vertical disintegration is inefficient, we have a very broad problem in this industry, for the PC business remains extremely vertically disintegrated to this day. [35] Most PC applications software is not supplied by Microsoft. Indeed, many applications categories are dominated or near dominated by a firm other than Microsoft. Microsoft has not been on a program of acquiring or getting rid of complementary software monopolies. Instead, Microsoft has been on a program of acquiring or getting rid of complements which might participate in DTL. Microsoft tends to supply near-universal categories of applications (word processor, spreadsheet, presentation, browser, email client, etc.). Their anticompetitive actions focused on the narrow subset of complementary technologies that were very widely distributed, had clear general purposes, and which might run both on the Windows PC and on other devices. These were the outside technologies that might lead to DTL.[36] Consequently, the advantages or disadvantages of vertical disintegration are largely irrelevant to assessing the issues in the antitrust case or its remedy.[37]

Finally, Microsoft offered long, tedious explanations of all of the anticompetitive acts, suggesting efficiency theories of each of them. As a practical matter, the impact of this on the world was to lead to very unhappy cross examination experiences for the Microsoft executives, for the efficiency theories were invented for litigation while the anticompetitive stories were borne out in the documents that underlay the decisions.

It was, of course, in principle possible that exclusive contracts, banning of technical progress by OEMs, among the other actions undertaken by Microsoft, might be

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[34] See, e.g., Economides (2001) or the new edition of Liebowitz and Margolis (2001).

[35] Here is Mr. Ballmer extolling the benefits of vertical disintegration in 2000: ". . . a whole different industry structure. A structure which still is maintained today. A structure of specialization. You have chip companies, you have communication companies, you have systems software companies, you have applications companies. People tend to specialize. Now, we've been called out because we participate in two sectors of those, but, heck, it's still a very specialized business."

[36] What should we make of this selectivity? At a theoretical level, one could imagine that Microsoft's desire to avoid some vertical disintegration was driven either by a strategic desire to attain or maintain market power, or by efficiency concerns. The selective focus of their actual attempts on those technologies that might be competitively threatening (through DTL) combined with their cheery encouragement of complementary monopolies when there is no DTL issue speaks to their thinking. So, too, do many, many Microsoft internal documents brought to light by the antitrust case, which are too bulky to review here. The documents go on at considerable length about the strategic (as opposed to efficiency) benefits of unified technical leadership. See Bresnahan (2001b) for sources.

[37] There is a related question of how the industry has overcome the disadvantages of vertical disintegration for pricing and service quality. Part of the answer is DTL, which puts considerable competitive pressure on existing monopolists. Another part of the answer is dynamic monopoly pricing rules, which invest in the future growth of the overall PC platform rather than harvest available current period monopoly profits. The invention of those rules by Mr. Gates and by Dr. Noyce of Intel changed industry performance.

efficient. One of the most important ideas to be imported from Economics to antitrust analysis is the Coasian one that complex private contracts can be efficient. Forty years ago, antitrust tended to condemn far too many contracts as reducing competition whereas their economic logic was driven by increasing returns, imperfect information, and the need to provide efficient incentives that could not easily arise in spot markets. Competition in the market for contracts in the long run, not SR spot market competition, is the key to economic efficiency in these theories. Microsoft's efforts to prove these theories as a matter of fact have been rejected by the courts as nonsense. More importantly, however, is the point that Microsoft sought, affirmatively and repeatedly, to break up opportunities for pro-consumer contract between entrants and third parties. For the Coasian argument to be right, there has to be an opportunity for new firms as well as established ones to pursue efficient pro-consumer contracts. Microsoft also showed that it does not view itself as bound by contracts when obeying them is strategically inconvenient, but instead views raw power as the key question at such points. This, too, undercuts the Coasian argument.

One final point about the wide logic of the case, which concerns Schumpeterian competition. Many critics believe that the antitrust case was an error because any problems in the computer and Internet industry will be solved by technology competition based on creative destruction. This misses the entire point. Microsoft sought to block the mechanisms by which Schumpeterian competition plays out. It saw the coming together of the PC and the Internet as a potential occasion – one of a series of occasions – for competition against its monopoly, and engaged in the pattern of anticompetitive acts to prevent that potential from being realized.

This is not some effete academic theory but a story of an attack on competition that was real and immediate to managers. The story told here is culled from a logical application of the economics underlying this industry and the history of the industry found in documents which changed the strategic direction of the world's most successful company, directed the expenditure of hundreds of millions of dollars and the deployment of thousands of marketers and developers, focused the vast structure by which Microsoft deals with outside agents on the task of preventing widespread distribution of new technologies, and show the sustained and time-consuming participation of senior management in anticompetitive strategies.

## 8. What has been lost

Based on hardheaded business judgment, Microsoft itself internally concluded that they had no way of winning the browser war despite their best efforts to improve their own browser and their very considerable talents as distributors and marketers of software. This conclusion was largely driven by their slow start in the browser market and was based on a large volume of market research about browser usage and browser users. Their thinking did not change throughout the period covered by the case documents, 1995-1998. After that, the cumulative impact of the anticompetitive acts shifted browser standards to Microsoft control. Internet Explorer is now the dominant browser instead of Navigator, which would have been the dominant browser if not for Microsoft's anticompetitive acts. As a result, there is far less divided technical leadership in the PC+Internet industry today than there would have been if Microsoft had not violated the antitrust laws.

The absence of an independent browser removed a key distribution vehicle for client-side Windows-independent Java. Combined with Microsoft's efforts to directly inhibit technical collaboration with Sun and developer use of Sun's Java, control of choices about Java was also removed from the marketplace. Java succeeded on the server side, where there was no effort to suppress it, and a series of remarkably Java-like technologies are now, slowly, slowly, coming out of Microsoft, so it is difficult to argue that the market outcome on the client side reflects efficiency. Instead, it reflects the strong desire of an incumbent monopolist to avoid divided technical leadership.

The resulting lack of divided technical leadership has prevented and is preventing market consideration of alternatives to Windows in two important eras. The first is the late 1990s. I explained above (section 5.1) how that time period was particularly suitable for entry by an alternative to Windows in serving new uses. Had a serious alternative to Windows been given a crack at consumer demand, either of two very positive outcomes could have occurred. First, a new platform might have arisen to serve the new demand. Microsoft feared indirect entry from such a new platform. Second, the competition between Windows and an innovative home-computing platform would have provided ideas and incentives for improving Windows that were not present in the actual history of the late 1990s.[38] Microsoft, while a fabulous implementer, is not always the inventor of new features in Windows.

A second opportunity is being foregone in the present. Many technologists believe that there will be a new kind of end user oriented computing use in the early part of this century, one that serves sometimes mobile, sometimes stationary end users. Developments in this area are moving forward, but they are moving forward in a world in which Microsoft has not only the Windows monopoly, but also control of PC to Internet communications. There is no divided technical leadership for end user oriented applications if communication between the web and end-user devices occurs using only Microsoft technologies. That will ensure that devices less capable than PCs – personal digital assistants, smart cell phones, set top boxes, game boxes and the like – do not grow into a potential threat to Windows.

Many technologists think that as bandwidth gets cheaper, end user oriented computing will move from running largely on the PCs that sit right in front of us to central servers. Applications-dividing technologies will permit running applications on the web and accessing them from a number of devices. Microsoft's attacks on divided technical leadership now ensure that technologies do not become a threat to Windows; instead, they will be the continuation of the Windows monopoly into a new technical era. Under divided technical leadership, sponsored entry into competition with Windows, especially as Windows shifts out into these new areas (new hardware, such as PDAs, and new locations, such as on web servers) would have been far easier. Consumers are losing the opportunity to consider whether they want multiple alternatives in those areas.

Those who think that nothing has been lost and nothing is being lost often point to the large network effects associated with Windows. This argument fails to explain why consumers should not be empowered to influence developments related to the technical scope of that platform or the length of time it is a monoply. No one knows whether the

[38] As Mr. Ballmer said "Microsoft is our best when we have competition." The firm is far weaker at inventing valuable new features for its products than it is at imitating them and implementing the imitations.

network effects will efficiently extend from the PC down to the PDA or up to the server. No one knows whether the shift to a more Internet-centric form of personal computing should involve radical change in the main platform used for end-user computing, continuity, or a mixture of continuity on the desktop and radical change elsewhere. In the current environment, all those decisions have been relegated to central planning by the incumbent monopolist, Microsoft. Markets would do a better job. In the first instance, forecasting what buyers want is difficult when there is tremendous new technological opportunity, and offering buyers a choice is a better way to find out what they want. Markets would do a better job in the second instance because the relevant incumbent monopolist can't think of everything – these are the guys who were late to the Internet, remember?

Finally, we should not forget the importance of giving entrepreneurs a chance to introduce and distribute widely potential substitutes for Windows or potential platform-level complements for it. In the current industry regime, the lack of DTL makes either kind of entrepreneurship find it far more difficult to obtain widespread distribution than it would otherwise. Even if you think that there is no serious chance of a threat to the Windows monopoly, there is a real opportunity to introduce valuable technical ideas into the industry. This is economically quite important, given the strengths and weaknesses of incumbent monopolist Microsoft. They are certainly the best incremental technical change and implementation software design firm ever assembled, and their marketing skills are fabulous. Yet they have been, despite a huge R&D budget, very often a follower in terms of important new technical ideas. We would be better off if they were more often forced to be a good follower, and forced to attempt to compete as a follower on the merits. Then Windows itself would get better faster.

The loss of divided technical leadership has cost us the opportunity to run a number of market tests about end-user oriented computing. Consumer choice has influenced, and is influencing, the nature of the computers we use far less than it should be. The costs arise in a lower rate of technical progress in the industry,

# 9. Conclusion

The portion of the computer industry that supports individual end users could be far more competitive than it is. The commercialization of the Internet was epochal enough to give entrants the opportunity to challenge incumbent monopolists. Entrant operating systems did not get that opportunity to challenge Windows, nor did inventive new devices get the opportunity to challenge the Windows PC. The same disruptive event clearly would have re-established divided technical leadership in the PC+Internet industry; it did not. Competitive pressure in the transition should have offered buyers and developers a choice between evolutionary and revolutionary change, but did not. Consumers lost the opportunity make choices not only during the late 1990s, but later. Entry and competition against incumbent products would be being sponsored under divided technical leadership. Consumers lost the right to have their wishes accommodated by incumbent monopolists, as only under DTL would reasonably promising threats be putting real pressure on Microsoft. As a result, industrywide technical progress has been slowed.

Microsoft, the longstanding monopolist in the personal computer operating systems market, saw the commercialization of the Internet in the mid-1990s as a potential

threat to its position and its market power. Microsoft feared divided technical leadership. It thought that external control of such Internet-centric technologies as the browser and Java would lower barriers to entry into PC operating systems. It therefore acted to prevent widespread distribution of those innovative technologies under the control of other firms. Caught off guard by the sudden success of the Internet, and far behind in standards-setting races, Microsoft found itself unable to win by advancing its own versions of browser and Java technologies and giving them away for free, despite its considerable "strong second" skills in incremental technical progress and technology marketing. Having failed at competition, Microsoft turned to a wide-ranging arsenal of anticompetitive tactics, exploiting the innovation-preventing clout of its existing monopoly position. Its ultimate success in establishing dominance for its own browser and client-side Java were the fruits of those anticompetitive acts. That dominance, in turn, means that technical leadership in the industry is more unified than it would have been had the market been permitted to choose. The entry barriers into the PC OS business have remained high as a result of unified technical leadership and the anticompetitive acts to prevent the widespread distribution of whichever valuable new technologies Microsoft finds competitively inconvenient.

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