Antitrust in network industries: The Microsoft case

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Abstract

This paper analyzes the central antitrust and economic issues raised by network industries. Network effects, low marginal costs and other elements constitute special features of network industries to which antitrust enforcement should be adjusted. I discuss three specific forms of this adjustment, namely compatibility, restriction of abused intellectual property and joint standard setting. I also focus on the Microsoft antitrust case in which Microsoft was sued for taking anticompetitive action to eliminate the threat to its operating system monopoly, especially to two of its competitors, Netscape and Sun. After discussing the effects on consumers and competition, I indicate that the consent decree would be applicable and effective to Microsoft.

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Chapter 1

Introduction

In order to maintain competition, the U.S. government established the antitrust law against monopoly at the end of 19th century. For example, the monopoly companies such as U.S. Tobacco Company, Standard Oil, and AT&T, were dismantled and divided into several smaller companies. U.S. antitrust enforcements – through challenges to monopoly, and also cartels and practices that unfairly create or maintain monopoly power, facilitate cartels or otherwise restrain trade - has served the country well throughout the 20th century.

In the "new economy", network industries have gradually appeared along with rapid and significant technological research and development in the last decade of the 20th century, which has given rise to ubiquitous personal computers, the astonishing growth of the internet, and many new and more effective ways of communicating and receiving great amounts of information instantaneously. These rapid transformations have led many economists and policy makers to be concerned about the appropriate role of antitrust in network industries. Most of them would question whether antitrust policies developed in 19th century should apply to the new economy in the 21st century, particularly those industries where the products or services primarily contain intellectual property. The importance of network industries to the economy, and limited antitrust experience and precedent with some uses of intellectual property,

suggest that antitrust authorities need to establish clearly whether a dominant firm has grown by abusing its market power. And it is essential to acknowledge that network industries are quite different from the "old" industry. Antitrust enforcements must take those differences into account if they attempt to play a constructive role.

Generally, the goal of antitrust policy is the maximization of consumer welfare and enhancement of competition. And in network industries, in particular the policy should be to encourage compatibility and joint standard setting that compel access to open resource and information.

The rest of this paper has the following structure. In section 2, I analyze the different features and proposed solutions in network industries. In section 3, I examine the antitrust argument, recent economic theories and consent decree in an application of the Microsoft case. In section 4, I conclude that Microsoft has abused its market power and subsequently the remedial decree is a proper remedy that promotes compatibility and restricts Microsoft's anticompetitive conducts.

Chapter 2

Antitrust in network industries

2.1 Features of network industries

What are the different issues in network industries that require adjusting antitrust treatments? Among others, they include the following:

2.1.1 Network effects

Network industries are mainly characterized by network effects. Network effects are known as demand-side economies of scale[1] that exist in a market when the value to a buyer increases when more units of the products are sold. Traditionally, network effects arise because a subscriber can reach more subscribers in a large network. In a virtual network,[2] network effects arise because larger sales of a product A induce lager availability of complementary products, therefore increasing the value of product A.

Economides and Flyer (1998) indicate that markets with strong network effects where firms can chose their own technical standards are "winner-take-most" markets. Extreme market share and profits inequalities are common in these markets. The market share of the largest firm can easily be a

1 Natural monopolists, such as electrical and water enterprises, arise from supply-side economies of scale.
2 See Economides (2001), footnote 19. "A virtual network is a collection of compatible goods (that share a common technical platform). For example, all VHS video players make up a virtual network. Similarly, all computers running Windows98 can be thought of as a virtual network."

multiple of the market share of the second largest, the market share of the second largest firm can be a multiple of market share of the third, and so on. Moreover, consumers are willing to pay more for the brand with the largest market share and then profits gained with the brand can be a large multiple of profits of other brands. For example, in the operating system market of personal computer, Windows has a very large market share, Mac has a small market share, the third competitor, Linux, has a very small market share, and the fourth and other rivals have almost negligible shares.

There are other features of network effects as well which involve switching and learning costs. Different softwares have different user interfaces and in some ways, they are complex for new users to handle. Firms prefer using the same interface which is also widely used by other firms in their own computers rather than a new or different one because they are unwilling to reinvest in retraining workers and increasing technical support expenditures. And, it is necessary for their existing and new data to be interconnected and interoperated in the same software and their complementary programs. Therefore, users are being "locked in" those softwares. It has become a fact that the most popular software of different categories forms a standard gradually in its specialty.

2.1.2 Low marginal cost/High fixed cost

The typical example of a network product, software, is a special product that has different features from most commercial products in the market. All software

has the significant characteristic of low marginal cost in distribution and re-production. On the one hand, software is usually stored in a compact disc (CD) and delivered to consumers with a low marginal cost since a CD is so small and light to be carried and then its cost is negligible. On the other hand, software downloaded form the internet (for free) has a near-zero marginal cost. An application program, which is one type of software, could be created in conjunction with other bigger application programs by an experienced user. But, the top-level and most complex application programs, such as Windows operating system, have to have been created by huge investment and through cooperation of a large number of programmers. These fixed costs of development can constitute a barrier to entry for firms lacking financial resources and market experience.

2.1.3 Technical issues

Lawyers and judges who typically lack a technical background are often challenged by the questions arising in high-tech network industries. For example, in the antitrust case of Microsoft, such as defining the relevant market, and how to determine whether two application programs are complements or substitutes in the consideration of their functions and technical specifications, were contentious issues. Moreover, it can become far more difficult in high-tech industries such as biotechnology, where products that might curtail market power of a dominant incumbent firm are not in existence yet, and will not reach the market for several

years. Each of these issues raises questions in the realm of science and technology that often will be difficult to address. Theses difficulties are in addition to the standard difficulties of defining the relevant market in traditional industries.

2.1.4 Rapid change in the market

Due to rapid technology development and improvements in the production process, new generations of products, undermining existing market power, appear more frequently — replacing old products — than in mature industries. A firm without aggressive development efforts in technology will have difficultly surviving in network industries. Exceptional profits in such a market will also stimulate firms to enter and compete for the market. In this market, a dominant firm would be replaced by a new entrant endorsed with a sufficiently superior product which becomes the new network bandwagon. For example, a few months after its entry, Google became the dominant firm in the market of search engines of web pages because it owned superior technology allowing users to search information faster and more completely. An often-cited example involves IBM, which probably was a dominant firm if not a monopolist in certain markets when the government initiated its case in 1969, but which had lost monopoly power in many of these markets after 13 years when the case was abandoned (Pitofsky, 1999).

2.1.5 The need for Collaborative Activities

In network industries, joint research and development is often essential to share the risks of innovation and to combine complementary technologies. Collaboration and later coordination between firms may be required to introduce a new standard for a new-coming product and to allow products to work on standards so as to guarantee they are interchangeable and compatible. For instance, in 1980, Sony and Philips established a standard for the production of CDs under their cooperation. The standard enabled the realization of potential network effects. Once a standard exists, manufactures will not be able to compete unless their products are compatible with that standard. A case in point is TCP/IP, a uniform protocol introduced by Microsoft for network transmission, which has been shared by network participants, and is necessary for interconnection with users and interoperability with complements. However, that raises an antitrust concern of whether this kind of cooperation, often seen as a horizontal agreement, would be considered anti-competitive.

2.2 Antitrust principles in network industries

Even if one acknowledges the differences between network industries and the traditional industries, the essential question remains: should the antitrust conventional role as enforcer of competitive principles be abandoned or should basic antitrust principles be modified, after taking into consideration the different characteristics of network industries?

Following the study of the literature, I believe antitrust should continue to apply regardless of the suggestion of a complete or even substantial exemption for the differences between network industries and traditional industries. Even if it is true that the technology of network industries is often complex, this should be a reason for antitrust officials and judges to understand the technology, not to abandon the field. Speed of change in the market structure is indeed impressive, where new entrants can leap-frog incumbent technology and quickly come to dominate a market. But that is not the whole story. Because network industries usually are based on intellectual property, patents and copyright laws can insulate a dominant firm (sometimes legitimately; sometimes not) behind the barricade of hundreds and even thousands of those forms of protection. Those firms can still obtain and maintain dominant positions, and extract monopoly benefits for extended periods of time not only by the protection of laws, but also through practices unrelated to the enhancement of consumer welfare. Collaborative efforts are often essential. I believe that traditional antitrust principles have taken a very lenient view of research and development cooperation across the "old" economy, and in almost all cases, production cooperation as well,[3] but compatibility and joint standard setting, which are new forms of collaboration in network industries, still require antitrust principles to be modified slightly.

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3 See Pitofsky (1999), footnote 11, "For example, federal enforcement has brought exactly one case against a research and development joint venture in the 109 years that the Sherman Act has been the law. *See United States v. Automobile Manufacturers Ass'n*, 1969 Trade Cas.(CCH), *modified sub nom. United States v. Motor Vehicle Manufacturers Ass'n*, 1982-83 Trade Cas. (CCH)."

The most perplexing question in this market is what to do about firms that achieve dominant and even monopoly market positions legally, but maintain those positions for extended periods as a result of network efficiencies. While such situations occur across the economy, network efficiencies exist only in network markets characterized by intense rivalry based on research and innovation.

As discussed above, when network effects exist across the economy and there are low marginal costs in delivery, it may be efficient and easier for a single firm to become the only supplier of related products or services. Once that happens, consumers are more likely to remain with the established standard because of their "lock-in". And suppliers of complementary products will tailor them to the established standard and resist preparing products for potential challengers. When that occurs, market power, which maybe transitory, can be retained by a dominant firm for an extended period of time.

Network monopolies or near monopolies are not unassailable. Sometimes, a new technology can completely leap-frog the market position of the incumbent network and quickly attract customers and suppliers. Sony's success of PlayStation 2 in a 32-bit video game, quickly surpassing Sega's old 16-bit format, demonstrates this point. An existing firm that invests heavily and strives to challenge a dominant firm can win at least a portion of the market. A firm that

obtains market power legally has an advantage in supplying its products or services over any existing or potential competitors.

There are substantial costs to a "hands-off" policy. Once a network monopoly is in place, it is frequent for the monopolist to exclude potential challengers. A network monopolist may have abilities to monopolize successive generations of a product, or complementary products and services, or its promoted standard. One of the possible strategies of the monopolist is to adopt a policy of allowing only those products manufactured by it to connect with the existing network. The other strategy is that it does not disclose complete technical specifications of its promoted standard so that products of other firms could not properly interoperate or interconnect with the monopolist's products. One result may be that over time, the best products or services may not win out. Therefore, potential competitors, recognizing the enormous difficulties of challenging an existing network monopolist, may have little incentives to compete.

In such a situation, what role does antitrust play? One possible approach, consistent with traditional but not recent antitrust principles, would be to adopt structural remedies, such as breaking up the dominant firm (such as AT&T). However, such an approach should be seriously justified in a network market. An existing dominant firm that achieves market power legally may be more efficient and aggressive in the production and technology research than other firms. A case in point is the original break up judgment in the Microsoft case, which was

imposed by a district court; it was abandoned at the end and replaced by other proposals based on conduct considerations.[4]

The other possible and more feasible approach should be used to break the monopolized control of the established standard and to create a platform of compatible access by new challengers. The proposed approach reaches the object of antitrust policy if imposed on three special types of business strategy in network industries that restrict dominant firms from leveraging their market power for extended periods. They involve compatibility, restrictions of abused intellectual property, and joint standard setting. Each of these is discussed in detail in what follows.

2.2.1 Compatibility

Compatibility determines the size and number of virtual or actual networks in network industries. Two products that are fully compatible belong to the same network. In order to reach the installed base[5] of an existing network, consumers expect that their purchases are compatible with this network. Therefore, the ability of a firm to make its product compatible with other products affects the value, sometimes even the commercial viability of the product. Compatibility can yield a tremendous source of competitive advantage when consumers who ensure their purchases to be compatible favor the product of a dominant firm.

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4 U.S. V.S. Microsoft, U.S. Court of Appeals for the District of Columbia Circuit, civil action No.00-5212, 5213

5 There are many compatible products and consumers existing in an established network. When a product enters into that network, it also has chances to serve for those products and consumers.

Therefore, compatibility is a key element of business strategy in network industries. Incumbent firms often find it profitable to deny access or compatibility to new entrants, and to seek to establish a standard excluding new products rather than participate in industry-wide standard setting efforts. Many of the battles in network industries involve efforts to join existing networks, to protect established networks, and to establish new networks. Since incumbent firms often wish to prevent rivals from hooking into their networks, entrants typically strive to do just that unless they can offer dramatic technical improvements on an incompatible basis (Farrell, Joseph and Katz, 1998).

Intellectual property rights, tempered by antitrust enforcement, often determine whether a network can be kept proprietary or not. Some of the most fundamental strategic questions revolve around firms' decisions to establish or participate in "open" networks or "close", proprietary networks. IBM has been criticized in business strategy circles for making its PC network too "open," and ultimately losing control of that network to Intel and Microsoft. Apple has been criticized for keeping its network too "closed," refusing to license hardware manufactories "clones" of the Macintosh, resulting in a small market share in the PC market.[6]

6 For the current quarter (Q1, 2002), IDC (www.idc.com) shows Apple as the number six computer maker with a 3.48 percent market share. This is an increase of 0.4 points over Q4 2001 and a 0.25 point increase year over year. Worldwide, Apple is in ninth place with a 2.4 percent market share.

What is the solution of antitrust to the fact that incumbents often wish to deny access or compatibility to potential rivals? The best response is to require incumbents that control proprietary standards to open their technology by offering compulsory licenses to late-comers. New entrants can be charged a royalty fee, including a premium that takes into account the risks the network incumbent took in achieving its dominant position. Complying with the opening of an established standard, consumers will benefit from various choices by the emergence of more compatible products.

However, there is always the risk of undermining the purpose of the intellectual property laws. It is stated in the Antitrust Guidelines for the licensing of Intellectual Property Guidelines that:

> "Intellectual property law bestows on the owners of intellectual property certain rights to exclude others. These rights help the owners to profit from the use of their property." (p. 5)

2.2.2 Restriction of abused intellectual property

When recognizing the importance of intellectual property rights, the Guidelines immediately go on to make clear that these rights are circumscribed by antitrust law:

> "An intellectual property owner's rights to exclude are similar to the rights enjoyed by owners of other forms of private property. As with other forms of private property, certain types of conduct with respect to intellectual property may have anticompetitive effects against which the antitrust laws can and do protect. Intellectual property is thus neither particularly free from scrutiny under the antitrust laws, nor particularly suspect under them." (p. 5)

However, while there is no presumption that intellectual property induces significant market power, it is worth noting that a firm owning intellectual property that gives it control over a proprietary network standard may well have such power.

Anthony (2000) indicates that intellectual property rights are weakened when a firm that controls intellectual property, such as patents or copyrights, relevant to a standard has committed itself to an "open" standard in order to obtain industry support for the standard in the first place. In that situation, subsequent efforts to gain control of that standard by asserting these same intellectual property rights can implicate competition and raise antitrust concerns.

Firms may manipulate or abuse the standard-setting process by asserting that complying with an agreed-open standard violates their intellectual property rights. If indeed the standard lacks reasonable substitutes, monopoly power may be in jeopardy that would raise antitrust concerns on intellectual property. If a firm attempts to capture and control an open standard, it may be guilty of actual or potential monopolization in a relevant antitrust market, depending on its specific conduct and the ability of other firms to use substitute technology.

The Antitrust authorities are also concerned about situations in which a dominant firm alters its product in a way that offers few or no consumer benefits but reduces the attractiveness of rival products by introducing incompatibilities with its products.

A possible defensive strategy by which an incumbent monopolist can undermine the viability of an entrant's product is to assert that the entrant's product infringes the incumbent's intellectual property. If the incumbent's assertion is valid, or based on facts, it is hard to see how the assertion can constitute an antitrust violation. However, it was noted in the Intellectual Property Guidelines:

> "Objectively baseless litigation to enforce invalid intellectual property rights may also constitute an element of a violation of the Sherman Act." (p. 34)

Such litigation can be especially destructive in network industries if it is part of a fear, uncertainty, and doubt strategy, convincing consumers that the entrant's product will not succeed. An investigation would be indicated to determine whether a party with monopoly power has engaged in such conduct. If the facts indicate that competition has been harmed, antitrust liability might well be found.

2.2.3 Joint standard setting

Frequently, a single firm is incapable of launching a new technology, especially if that technology is not compatible with existing products. As noted above, the collaborative example was that Sony and Philips jointly promoted the compact disc technology. Cooperation of this sort has the advantage of avoiding a potentially unproductive standards war, in part by assuring consumers that they will not be stranded if they invest in the new technology. Much like research joint ventures, cooperative standard setting also can permit the teaming firms to combine the best features of their technologies

We have to make sure that rival firms do not use joint standard setting as an excuse to avoid competition against each other. On the other hand, we believe that two or more of rival firms agreeing to a joint standard setting could independently promote comparable technologies. Absent network effects or strong economies of scale, consumers are gaining if the two rivals compete with their distinct products, rather than agree to offer only a single product. However, with strong network effects, consumers may be better off with a single network. For example, with a de facto product standard, especially, two or more firms are able to offer products conforming to the standard that would not incur any royalty liabilities. Even in this case, however, Shapiro (1996) claimed that:

> "Antitrust enforcers must ask whether competition to become the standard has been cut off prematurely, before technological avenues were adequately explored or before consumers realized the benefits of rivalry between firms jockeying to set the standard." (p. 14)

Such concerns are lessened when the firms engage in developing complementary technology, so their joint standard is superior to others that either could introduce on its own.

A somewhat different set of concerns arises when firms with a vested interest in current technology engage in the setting of standards for a new and superior technology. In this situation, an incumbent firm may have an incentive to slow down the arrival of the new technology in order to preserve its proprietary advantage. Under such a business strategy, the champions of the newer technology may have to break off from the incumbent firm when the firms intend to establish a

new standard on their own, either in the market or through a standard-setting process. Under the objection of antitrust policy, the incumbent firm is not compelled to support the newer technology, but it might generate antitrust liability if it engages in conducts that block the new technology from being adopted. An investigation and fact finding is typically necessary to determine conducts in which an incumbent is alerting industry participants to the genuine drawbacks of the new technology, reducing consumer benefits associated with compatibility by resisting spreading of an established standard, or preserving its market power by blocking new, beneficial products or standards from emerging (Balto and Pitofsky, 1998).

2.3 Prospects

Considering compatibilities, intellectual properties and network standards, three special business principles in network industries, the most attractive approach from an antitrust perspective is offering long-term licenses by charging a low royalty fee for a network standard or a new technology containing intellectual property, to later firms entering a compatible network or not jointly setting standards. This approach allows consumers to enjoy network benefits associated with compatibility, enables many firms to compete to supply compatible technology, and greatly smooth the standard-setting process while it permits the incumbents to recover their research and development investments through the modest royalty payments. But, there exists a problem to

administrators and judges: how to supervise on a continuing and competitive basis that terms and conditions in the license arrangement are not unfair or discriminatory? In addition, Shapiro (1996) emphasized that:

> "Market participants and antitrust authorities must be ever vigilant in markets with these features to prevent one firm from converting an initially open standard into a proprietary standard, unless such control is gained by genuine improvements and innovation that extend the open standard."(p. 14)

These also exists another problem of how to determine that the qualified firms which may be potential challengers to the advance of incumbents would not be excluded form the standard (Sheremata, 1998).

Existing problems in network industries are rich and complex. With any adjustment to new principles in economics and antitrust, the proposed approach is cautiously called for. In the following part, we review and analyze the Microsoft antitrust case, involving many principles and questions discussed above.

Chapter 3

An application to the Microsoft case

3.1 Introduction to the Microsoft case

Recently, public attention has focused on the U.S. government antitrust investigation against Microsoft. Microsoft, the top software manufacturer in the world, produces Windows series of operating system and MS-office application software for personal computers and servers. The Microsoft antitrust case is a well recognized typical case in the 21st century's competition policy of network industries. This is because the analysis of its whole process and consent decree involves many recent developments in economics and builds up a new framework for antitrust enforcement in the new economy.

In 1994, the United States department of justice (DOJ) sued Microsoft for violating the Sherman Act and alleged that Microsoft had entered into licensing agreements with original equipment manufacturers (OEM) that prevented other operating system vendors from widely distributing their products. Microsoft and the DOJ entered into a consent decree in which Microsoft agreed to abide by certain restrictions on its licensing arrangements.[7] After a year of legal wrangling, an appeal court approved the consent decree on June 16, 1995.

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7 U.S. V.S. Microsoft, final judgment, Civil Action No. 94-1564

On December 11, 1997, Microsoft was prosecuted again for violation of the 1995 consent by bundling Internet Explorer (IE) into the Windows 95 operating system and was required to offer Windows 95 and IE as separate products under the order of Judge Thomas Penfield Jackson. After half of year, the Appeal Court reversed Judge Jackson's order and judged that the 1995 consent decree did not apply to Windows 98 which was shipped with an integrated IE as part of the operating system and an IE icon on the PC desktop.[8]

On May 18, 1998, DOJ joined with the Attorneys General of 20 States and the District of Columbia, and brought a major antitrust suit against Microsoft.[9] The District court issued "Finding of Fact" on November 5, 1999[10] and "Conclusions of Law" on April 3, 2000[11], finding for the plaintiffs (DOJ and 20 states) on almost all the points against Microsoft. In those documents, Judge Jackson found that

(i) Microsoft has a monopoly in the operating system market of Intel-compatible personal computer;

(ii) Microsoft's monopoly is protected by the "applications barrier to entry"[12] that results in no prominent substitute choice for consumers;

(iii) Microsoft used its monopoly power to exclude rivals and harm consumers;

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8 U.S. V.S. Microsoft, U.S Court of Appeals for the District of Columbia Circuit, No. 97-5343

9 U.S. V.S. Microsoft, DOJ complaint for the District of Columbia circuit, No.98-1232

10 U.S. V.S. Microsoft, court's findings of fact, Civil Action No.98-1232,1233

11 U.S. V.S. Microsoft, conclusions of law and final order, Civil Action No.98-1232,1233

12 See Findings of Fact, p. 17, "applications barrier would prevent an aspiring entrant into the relevant market from drawing a significant number of customers away from a dominant incumbent even if the incumbent priced its products substantially above competitive levels for a significant period of time".

(iv) Microsoft engaged in anti-competitive conducts which were designed to maintain its monopoly position in the PC operating system.

On June 7, 2000, the District Court issued its remedies in which Microsoft was to be separated into two companies and which imposed severe business conduct restrictions. Microsoft appealed and on June 28, 2001, the Court of Appeals overturned most of the District Court's remedies including the separation decision.

After twenty-nine months of investigation and hearings, on November 12, 2002, the District Court judge Kollar-Kotelly made the final judgment and accepted the reconciled remedies between Microsoft and the U.S. government.[13] In the consent decree, Microsoft was prohibited from imposing certain restrictions on its business practices to PC manufactories, software and hardware vendors, and internet access providers. It was also required to disclose application programming interfaces (APIs) and communications protocols of Windows operating systems to set up a compatible platform for applications of rivals.

Two States and two computer unions[14] appealed again since they were not satisfied with the result and believed that the punishment to Microsoft was not enough.

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13 U.S. V.S. Microsoft, final judgment, memorandum & order, Civil Action No.98-1232,1233

14 The states are Massachusetts and West Virginia. The computer unions are Computer & Communication

In the next section, I analyze some economic issues raised by the Microsoft case: the influence of network effects, the strength of market power, the reasons behind the low price of Windows, the economic analysis of Microsoft's conduct, the effects on consumers and competition, and the value of the remedial decree.

3.2 Monopolization of the operating system market

3.2.1 Market definition

Generally, the first step in an economic antitrust analysis is to determine whether the firm has market power in the relevant market. Usually, antitrust authorities assess market power by defining the relevant market affected by a firm's conduct. A relevant market is defined in merger guidelines such that a single, profit-maximizing firm controlling a candidate market could raise the price from the prevailing level by a small but significant and non-transitory amount (for example, 5 percent) for a non-negligible time period.[15] The result of applying this paradigm is to identify a group of products and a geographic area with respect to which sellers could exercise market power if they were able to coordinate their actions perfectly so as to act like a monopolist. Therefore, market power is the important issue to understand and verify the market definition.

In economics, market power is defined as the ability to profitably raise price above marginal cost. The market power of a firm is based on its elasticity of

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Industry Association ("CCIA") and the Software & Information Industry Association ("SIIA")

15 U.S. DOJ, merger guidelines , §1 ,1982

demand which measures the responsiveness of demand to variations in price, and which is defined as the percentage change in quantity demanded divided by the percentage change in price. From the print of view of market definition, market power takes into account demand substitutability, supply substitutability, and new entry capacity (Fisher and Rubinfeld, 2000). On the demand side, substitution depends on whether consumers can and will switch to other products in response to a price change. So, the determination of market definition is based on the substitution considerations. On the supply side, we must include sellers who produce or could easily switch production to the relevant product or close substitutes. Marker power and market definition also generally include actual and potential sellers, that is, firms that can rapidly alter their production processes to supply substitute products if the price so warrants.

DOJ alleged that in the Microsoft antitrust case, the relevant market was the market for operating systems in inter-compatible personal computers. There exist potential alternative products for a sufficient number of consumers to substitute for Windows operating system in the market: other operating systems that run on inter-compatible personal computers and non-inter-compatible computers. Consumers could easily find these substitute products and switch to them in replacement of the Windows operating system, but, in fact most consumers did not.

The most important consumers of the PC operating system, the original equipment manufacturers (OEM) of personal computers, testified in the trial that they don't have any alternative products to the acquisition and installation of the Windows operating system. They would continue to install Windows on their machines even if Microsoft increased the price and/or imposed some restrictions on them.[16]

Market share is used as a proxy for market power. DOJ estimated that Microsoft's market share of inter-compatible PC operating system has been over 90 percent in recent years and alleged that consumers have no substitutes for those systems. Consumers wouldn't be willing to change Windows or the inter-compatible personal computer to other systems because other systems couldn't run as many useful applications as Windows has. The Windows operating system is much more valuable to consumers than other systems that have only a few applications. According to DOJ, there are only poor substitutes to Windows and Microsoft definitely has considerable market power and is a monopolist.

Richard Schmalensee, Microsoft's chief economics expert, argued at the trial that the concept of relevant market raised by the government was quite narrow. He claimed that the relevant market in the personal computer software was "platform", not operating system. A platform is a set of software interfaces to

16 U.S. V.S Microsoft, testimony of Franklin Fisher, Civil Action No.98-1233(TRJ)

which programmers can write applications. Platforms include various forms of middleware products, such as Netscape's Navigator web browser and Sun's Java, and operating systems including Mac, Unix, Linux and Palm. However, the market definition evaluated by Microsoft was much broader than the original setting of personal computer in the computer market. Personal computers are mostly designed to be conveniently used by home or small business users in desktop computers and notebooks. According to Microsoft's idea, Windows would face competition form complex operating systems designed for big enterprises and even from simple interfaces for portable electronics.[17]

But, from the same perspective, the government's definition of the relevant market was definitely quite narrow. The relevant market should be the market of operating system in personal computers, not only in Intel-compatible personal computer. The government's theory excluded two reasonable substitutes; one was Mac's operating system, another recognizable operating system in personal computers, the other was Linux, a new rapidly developing operating system in Intel-compatible personal computers. But, even adopting this broader definition, Windows still has over a 90% market share[18] in the operating system market and hence substantial market power.

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17 Indeed, Microsoft developed Windows series operating system with different functions and similar interfaces for different purposes. Windows series include Window98, Me & XP, which were designed for home and small business users; and Window NT, 2000 & 2003, which were designed for big enterprise and date centers and compete with Unix; and Window CE, which was designed for portable handheld and compete with Palm.

18 According to IDC (www.idc.com), Microsoft's share of server operating systems (SOE) new license shipments jumped from just under 42% in 2000 to nearly 49% in 2001 as the company's client operating

3.2.2 A market with network effects

If there exists an operating system that offers many applications as Windows does and has attractive prices, at least part of consumers would attempt to use it, and then Microsoft wouldn't have such a high market share in the Intel-compatible personal computer market. However, there is no such system. Why? Due to network effects, application programmers like to write applications on the operating system with a larger number of users. And also, it is impossible for applications written for a specific operating system to run on a different operating system without modification to the program or with some set of plug-ins.[19]

This is a "chicken-and-egg" problem: the more users an operating system has, the more applications will be written for it; and the more applications written for an operating system, the more users it will obtain. This is the significant feature of network effects that creates great difficulty for new entrants to enter the operating system market.

It is obvious that the operating system market is characterized by network effects and Microsoft's monopoly power is protected by an "applications barrier

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systems (COE) new license shipments inched up from 92% to 93%, leaving little room for competitors.

19 See Findings of Fact, p 2-4. An operating system controls the allocation of system resources and supports the functions of compatible applications by exposing "application programming interfaces" (APIs). Application programmers must write programs to interact with Windows APIs so that they don't have to be concerned about handling basic functions, such as accessing files, executing instructions in computer memory, or utilizing links to hardware. An application that relies on APIs of a special operating system will not function on another operating system unless it is "ported" to the APIs of that operating system.

to entry". Because of the existence of network effects, and because the operating system and application programs that run on that operating system are complements, the existence of a large number of application programs available for Windows increases the value of Windows. In addition, the increasing value of Windows stimulates independent application programmers to write applications for Windows and furthermore increases sales and market share for Windows.

Richard Schmalensee asserted that traditional measures of market share subject to market definition were not appropriate to reflect the degree of competition in the computer software market. The market may be characterized by the succession of temporary monopolies because of the rapid speed of market transition. Schmalensee suggested a new behavioral approach to market definition, based on observation of whether a firm is behaving competitively or not. He claimed that:

> "Every software category leader is threatened form many directions – from new entrants into the category, from absorption into other software categories, and from niche players who may overtake the leader. Entry possibilities are numerous and multifaceted."[20]

3.2.3 Monopoly pricing

Based on his new approach, Richard Schmalensee argued that Microsoft was so competitive that it did not behave like a monopolist. His reason is that the

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20 Schmalensee, Richard L. (1999), "Schmalensee Testimony," available at www.microsoft.com/presspass/trial/schmal/schmal.asp

monopoly price of Windows should have been at least ten times the actual price which is around \$50-\$60[21] for OEM charged by Microsoft.

Bernard Reddy (1999), another Microsoft's economics expert, used a standard static model to support his conclusion that Microsoft lacks market power and faces competition in the platform market. He assumed that Windows is installed in all computers, that the marginal cost of Windows is negligible and that Microsoft receives the net revenue from the sale of other complementary products for each copy of Windows sold. Since hardware and software are typically sold together, the demand of a PC with Windows is the demand combination of PC hardware and Windows $D(P_c + P_w)$. In the model, profits of Microsoft from Windows are:

$$\prod w = (P_w + R_c) * D(P_c + P_w) - F_w$$

where P_w is the price of Windows, P_c is the price of PC hardware, F_w is the fixed cost of developing Windows and R_c is the net revenue form complementary products. Maximizing the profits $\prod w$:

$$D(P_c + P_w) + (P_w + R_c) * dD/dP_w = 0$$

$$1 + [(P_w + R_c)/(P_c + P_w)] * [(P_c + P_w)/D] [\, dD/dP_w] = 0$$

$$(P_w + R_c)/ (P_c + P_w) = 1/ |\varepsilon|$$

21 Here and what I use below refer to U.S. dollar.

$$P_w = (P_c - R_c*|\varepsilon|) / (|\varepsilon| - 1)$$

Where $|\varepsilon| = -[(P_c + P_w)/D] [dD/dP_w]$ is the market elasticity of demand for a PC with Windows. Microsoft experts calculated that the monopoly price of Windows is P_w=\$1,600 when the average price of PC hardware is \$1,800, the net revenue form complementary products is \$100 and the elasticity is 2. Even if government economic experts assumed a much higher elasticity of 4, a higher complementary net revenue of \$150 and a much lower price of PC hardware of \$1,000, the monopoly price is \$133, which is still higher but much closer to the actual price of Windows.

Franklin Fisher and Daniel Rubinfeld (2000), two U.S. government experts, disagree with the above ideas and argued that Microsoft did not maximize its short-run profits and its pricing of Windows operating system was consistent with long-run profit maximization by a firm with monopoly power. They believed that every dominant firm in the network industry should take into account factors to adjust its price strategy for long-run profit, such as the value of growing its installed base, the source of significant network effects, increasing demand for complementary products, discouraging software pirates, and the imposition of restrictions to OEM.

Furthermore, Werden (2001) developed the analysis of monopoly price by contributing two important factors in the PC market. First, PCs are homogeneous products, combined with low-priced PCs in the range of \$400-\$600 and

high-priced PCs in the range of $1500-$2500. The price of Windows is the same for all PCs and when it changes, the price of all PCs are changed by the same amount. However, an increase in the price of Windows causes a greater proportion at increase in the price of low-priced PCs than it does for high-priced PCs. Second, the elasticity of demand for low-priced PCs is certainly higher than the elasticity of demand for high-priced PCs. Therefore, the elasticity of Microsoft's derived demand is doubtlessly higher than the simple share-weighted average of low-priced and high priced elasticity.

Werden used a slightly different model than Reddys':

$$W + R = P / |\varepsilon|$$

where W is the price of Windows, R is the gross profit form complementary products for each copy of Windows sold, P is the price of PCs, and ε is the elasticity of demand for PCs. Let

p=the price of a PC of type I (with Windows installed)

$q_i (p_i)$ = the demand for PCs of type i

$q_i' = dq_i / dp_i$, X= the total quantity of PCs

$s_i = q_i / Q$ $\quad s_1 + s_2 = 1$ $\quad P=s_1p_1 + s_2p_2$;

$\varepsilon_i = p_i * dq_i / q_i * dp_i$; the elasticity of demand of a PC of type i.

Since the price of all PCs is changed by the same amount when the price of Windows changes, Warden assumes $dp_1 = dp_2$, which implies $dP/P = dp_i/P$.

$$dQ/Q = [(q_1'/Q)*dp_1 + (q_2'/Q)*dp_2]$$

$$dQ/Q = [s_1*\varepsilon_1/p_1 + s_2*\varepsilon_2/p_2]dp_i$$

$$\varepsilon = P*dQ / Q*dP = s_1*\varepsilon_1*P/p_1 + s_2*\varepsilon_2*P/p_2$$

$$W = (s_1p_1 + s_2p_2) / (s_1*\varepsilon_1*P/p_1 + s_2*\varepsilon_2*P/p_2) - R$$

Supposing that p_1 = \$500, p_2 = \$2000, R = \$150, ε_2 = 1, the predicted monopoly price of Windows is based on the three remaining variables, s_1, s_2, and ε_1. Warden proved that the monopoly price of Windows is exactly \$50 for a wide range of plausible combinations of these variables. He concluded that homogeneous products and the higher low-priced elasticity may explain why Microsoft charges the lower price of Windows even though it is a monopolist in the PC operating system market.

3.2.4 Threats to monopoly

The government's and judge Jackson's theory was that Microsoft abused its monopoly power by attempting to marginalize Netscape and "pollute" Java. The government claimed that Netscape's navigator browser and Java posed a potential threat to Microsoft's monopoly in Intel-compatible PC operating system from the mid 1990s.

According to the government's theory, Microsoft had the incentive to protect the barrier to entry that other operating systems could not share the common set of applications as Windows. Middleware products, such as Web browsers or Java, can overcome the problem of applications barrier to entry. Microsoft believed that Netscape and Java could potentially threaten its market position since these products provided the capability to include APIs that are portable to other operating systems. In other words, middleware products provided significant opportunities for competitive operating systems by reducing the applications barrier to entry. The threat was real to Microsoft because Netscape Navigator and Java run on different systems and incorporate a set of APIs. Then, consumers could adopt the middleware products and still use the large number of programs that runs on Windows. And developers could save their work in the development of applications that are required to run on several operating systems when applications are written on APIs exposed by middleware products. When it happens, new applications would not be associated with a particular operating system. In order to avoid this catastrophic situation and protect its market power, Microsoft believed that it had to respond to these serious threats and then designed to eliminate them by engaging in two types of conducts, predatory and exclusionary.

3.3 Economic analysis of Microsoft's conduct

3.3.1 Exclusionary contracts

Exclusionary contracts are contracts between a buyer and a particular seller where the buyer agrees to purchase certain goods or services only from the seller in a given period. The Chicago critique of exclusionary contracts focuses on whether they enhance efficiency because a buyer in these transactions wouldn't agree to sign contracts that make him worse. Bork (1978) identified that exclusionary contracts could result in a reduction of the wholesale price since consumers need the compensation for the loss of their variety choice. Recent developments of the Chicago critique show that exclusionary contracts can be a profitable strategy. Some economists proved that some form of externality arises form exclusionary contracts on consumers who have not joined the contract and that this externality makes signing exclusionary contracts jointly optimal.

The first theory from Aghion and Bolton (1978) showed that a buyer and seller could use exclusionary contracts with penalty clauses to extract profit out of a potential entrant because the entrant has to compensate the buyer for breaking the contract. The second theory is that if many buyers ignored each other's purchase decisions and were induced to sign exclusionary contracts with a single seller, the overall effect can raise externalities to the other rivals in the market (Rasmusen, Ramseyer, and Wiley, 1991).

Exclusionary contracts not only deter the entry of potential entrants but also raise the cost of existing rivals. In many cases, raising rivals' costs can reduce social welfare. However, there are some situations in which such conduct can

increase efficiency and economic welfare. For example, raising an inefficient seller's cost can increase total surplus by shifting market share to more efficient producers. Moreover, Gilbert and Kata (2001) believed that exclusionary contracts that raise distribution costs for other manufacturers may also support efficient relationship specific investments by the parties entering into exclusive contracts. Since the welfare effect of exclusionary contracts can be positive or negative, Gilbert and Kata (2001) suggested that antitrust analysis should focus on the institutional details of the specific conduct in a given case to determine their effects.

In the middle of the 1990s, DOJ alleged that Microsoft used anticompetitive licensing practices, "Per-processor" contracts with OEMs, to monopolize the market of PC operating systems.[22] "Per-processor" contracts are unfair contracts where Microsoft would charge license fees for every Intel-compatible personal computer assembled from OEMs, even including those computers that did not have Windows. Consumers were being charged additional fees for Windows whether they received it or not. It was obvious that consumers would not benefit form such conduct. If Microsoft did not have considerable market power, it could not force OEMs to pay extra fees from which they extract no benefit. These contracts increased the relative cost of installing a rival's operating system in non-Windows computers.

22 U.S. V.S. Microsoft, complaint, 1995

This price strategy discouraged OEMs from using operating systems other than Windows because it has already been paid for. This is definitely a strategy of raising rival's costs since rivals had to offer more valuable contracts or attractive prices for their operating system to attract OEMs. Gilbert (1999) shows that "per-processor" contracts would seem efficiencies in the short run when they force the rival to compete by offering OEMs its operating system at marginal cost, but he admitted that such contracts would distort economic efficiency by reducing the rival's incentive to invest in its products. In a 1995 consent decree, Microsoft was forbidden from using "Per-processor" contracts with OEMs.

In 1998, the U.S. government charged that Microsoft signed several contractual agreements with parties that tented to exclude rivals in the browser market. One set of agreements was signed with internet service providers, such as AOL and CompuServe, in which Microsoft offered a function in Windows that makes internet service providers easier to be accessed by users if they agreed to deny most or all of its subscribers a choice of internet browser. A second set of agreements was signed with OEMs, such as Compaq and Dell, in which OEMs could neither remove the Internet Explorer icon nor feature a rival browser more prominently than Internet Explorer. A third set of agreements was made with internet content providers, in which Microsoft offered no-cost placement on the channel bar in Internet Explorer to them if internet content providers promoted Internet Explorer as their browser of choice.

The government argued that Microsoft leveraged its monopoly market power in the PC operating system to the related browser market. Microsoft defended that Internet Explorer was a new entrant product which owned a small share of browser usage and its contracts were intended to build Internet Explorer to become a more popular browser. However, in this special case, it is hard to judge whether these conducts are illegal or not. Since Netscape browser was not completely excluded by Microsoft's conducts, OEMs were still allowed to continue installing Navigator and users could get them by other means, such as downloading them form the Netscape web site. Definitely, those agreements would disadvantage the usage of Netscape and other rivals' browsers. However, there is no evidence of harm to consumers. If harm exists, it would be that consumers who preferred Navigator now have to spend more time in searching or getting Navigator form OEMs and the Netscape site. Furthermore, the contract between Microsoft and internet content providers is a complementary agreement on them in which links to internet content providers in Internet Explorer channel bar was a useful advertisement that could catch more attention from internet users. Possibly due to such a reason, Judge Jackson concluded the contracts with internet content providers were not anticompetitive.

3.3.2 Predatory conduct

Microsoft decided to set a zero price for Internet Explorer because it recognized that those exclusionary contracts were not sufficient to increase the

usage of Internet Explorer. Even though this conduct was not an element in the government's complaint, it was emphasized at the trial as a predatory pricing practice for eliminating a major source of revenues for Netscape.

Predatory pricing typically refers to a dominant firm's design to drive out rival firms by offering a product at an unprofitably low price. Obviously if the victim has limited financial resources to fight a predatory price war, as often occurs with new entrants, the predator may successfully be able to force it to exit. Once the predator has successfully driven out existing competitors and deterred entry of new firms, it can raise prices and earn higher profits.

However, it is hard to distinguish predatory pricing form a vigorously competitive price. Areeda and Turner (1975) introduced a legal standard for the evaluation of predatory pricing. The standard was that prices below average variable costs would be considered as predatory. However, the fact that software has very low average variable costs of production, increases difficulties in identifying predatory pricing. Farrell and Kata (1999) asserted that the Areeda and Turner test can't correspond to the influence of network effects in which firms use low price or even zero price as advertising investments and recoup from complementary products.

So, in a typical case, the traditional way to judge predatory pricing was that the defendant firm sacrificed its short run profit to eliminate competitors and subsequently raised the price in the long run. In the Microsoft case, the government claimed that Microsoft sacrificed the profit of its browser in the short run so as to

maintain its monopoly profit of Windows in long run. Microsoft argued that the zero-price setting was a valid business strategy, necessary to overcome a very large installed base of Netscape's browser. Microsoft also said that this strategy had the ability to generate advertising revenues and increase the sales of the Windows operating system (Schmalensee, 1999).

Even though Microsoft and lately Netscape set the price of their internet browsers to zero, they both could recoup the lost profit form selling other relevant applications such as building up a web site or writing web pages. Consumers still get distinct browsers for free in the same convenient ways, such as downloading from a web site, or software packages in a CD from internet service providers. In such a situation, Microsoft decided to bundle Internet Explorer into Window 95 and lately integrated it into Window 98 as a system component that cannot be separated and removed. Such a business behavior, regarded as another type of predatory – tying conduct, was announced anti-competitive by the government's economists.

Tying refers to a restriction in which consumers buying a product A from a firm are required to buy another product B form that same firm. A traditional argument was that a dominant firm could leverage its market power from market A to market B and then gain its profit from increased consumers. Chicago economists believed that this leverage theory was wrong in logic. They said that monopolists cannot use tying as a profitable way to extend its monopoly power to other markets (Church and Ware, 2000, chapter 22.3). For example, in the Microsoft case, where

Windows monopolized products and the browser was its complementary product, it would not be profitable for Microsoft to tie Internet Explorer into Windows because it would lose consumers who prefer the Windows/Netscape bundle.

However, the tying argument under the Chicago theory may break down in certain circumstances. First, a monopolist has an incentive to exclude the rival's substitute product because it will extract profits form monopolist's products. In particular, the relationship between Windows and the browser is not only complementary but also substitutive (O'Brien, 2001). The browser is a complement to Windows when consumers only want to surf the internet. The browser is a substitute to Windows when consumers may get and run the application directly on the internet in the future, thus effectively bypassing the applications barrier of entry created by the Windows operating system. To the extent that this is a technical issue, it is hard for judges and economists to evaluate the competitive effect of Microsoft strategies. If the browser is more strongly a substitute than a complement, the competitive effect of tying, even including exclusionary contracts, is strengthened. Otherwise, if the browser is more strongly a complement than a substitute, then the competitive effect of Microsoft's strategies is weaker. Currently, the browser is regarded as a complement rather than a substitute, but in the future, it has a great opportunity to become an alternative platform to Windows. Lots of evidence presented at the trial suggests that Microsoft was afraid of Netscape to be a threat to the Windows monopoly position.

Second, Carlton and Waldman (2000) provide a model that explains a similar phenomenon. They developed a two-period model incorporating network effects in which the monopolist's product A is essential to complementary product B in period 1, but it will not be essential in period 2 if the rival has the ability to develop a version of A in period 2. Complementary product B has network effects in which the rival cannot make sale of B in period 2 if it does not make sales in period 2. So, the monopolist can deprive the sale of rival's product B by physically tying its product B (or setting a negative price of product B), which may drive the rival out of the market. The profit of the monopolist in period 1 will be reduced, but its profit may increase by more in period 2. So, Microsoft sacrifices its browser profit now in order to maintain potential profits that will not be lost in the future.

Furthermore, Clements (2002) used a model to evaluate Microsoft's tying conduct in which tying a complemental software as one of components into the system reduces the cost to consumers of using the whole system, but

> "This cost reduction is not necessarily welfare-enhancing, and bundling can also reduce welfare by decreasing innovation incentives". (p. 1)

In this case, the incremental value to consumers of using Navigator in the operating system integrated with Internet Explorer was zero since most of them cannot distinguish the difference in functions and determine which is better between the two browsers.

Using recent tying theories, the U.S. government alleged that Microsoft tied the operating system and Internet Explorer as a way to protect its monopoly position in the market of operating systems by excluding Netscape's Navigator

form growing to a platform competitor. Microsoft argued that its tying conduct reduced the cost to consumers and also was a product improvement no different form its previous integration of file management tools into the operating system. And Microsoft emphasized that other operating systems, such as Linux and Sun, were integrated with their own internet browsers.

Another action by Microsoft which the government believed it was a predatory conduct also was that Microsoft developed its proprietary version of Java embraced into Windows. Microsoft alleged that its version of Java was optimal for Windows that runs faster and more efficiently than does Sun's Java. The government responded that Microsoft tried to "pollute" Java so that it could not become a standardized language because applications written on Microsoft version of Java would not run on other platforms other than Windows.[23] Gilbert and Kata (2001) stated that

> "Microsoft Java strategy was predatory because Microsoft was incurring unnecessary costs in the short run to undermine the middleware threat posed by a widely deployed, operating – system programming language". (p. 20)

Judge Jackson agreed with the government in the Finding of Fact that Microsoft intended to undermine the portability of Java and encouraged developers to write applications on its version of Java that could only run properly on Windows.

There also existed some evidence that Microsoft tried to make Windows operating system technologically incompatible with middleware software.[24] Sun

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23 Java was originally designed to be a cross-platform software layer with its own APIs that resides on top of a platform. Java is the most popular middleware on the internet and also a standardized language on platforms in different hardwares, such as handheld computer, cell phone, for writing small applications or applet.

24 The Find of Fact outlined a number of examples of technologically incompatible foreclosure, such as Netscape's complaint (pp. 90-92), and Sun's complaint (pp. 386-407)

complained that its Java could not run more effectively than did Microsoft's Java because Microsoft did not completely disclose Windows' APIs that are required to connect with most software. Moreover, Netscape blamed Microsoft for the fact that its new generation of Navigator was postponed because Microsoft delayed the publications of Windows APIs relating to internet protocols. There has always been a rumor that Microsoft can develop software that is better than other challengers' running on Windows by using Windows latent APIs.

3.4 Effects on consumers

It is known that Microsoft's use of exclusionary contracts and predatory conduct undermined the competitive ability of Netscape and Sun, but what was the impact on consumers' welfare?

Usually, we solve this question by considering its short run and long run effects. In the short run, consumers seem to have benefited directly form Microsoft's alleged predatory conduct in which Microsoft developed a Windows-optimized version of Java, offered Internet Explorer for free and bundled Internet Explorer into Windows. Under the pressure of Microsoft's predatory conduct, Netscape was forced to give Navigator for free. Moreover, consumers have benefited form improvement in browsers' quality as a result of this competition. However, Microsoft's exclusionary contracts and tying imposed costs (for example, the time of searching and downloading, and the harddrive's space for installing the product) on consumers who preferred Netscape's browser.

In the long run, there are many ways in which consumers may be hurt by Microsoft's conduct. First, they may be hurt because this conduct limits their choices of available products in variety and quality. Second, according to economic theory, the price of operating systems would be higher in the long run without substantial substitutes and competitors. Third, consumers could not get a superior product running effectively on Windows due to technologically incompatible foreclosure where Microsoft selectively opens Windows' APIs. Forth, insufficient competition may limit innovative activity, thereby hurting consumers. But, this is a controversial issue in which the relationship between the degree of competition and the degree of innovation is complex. Economists often debate on whether monopoly or competition would create more innovation (Economides, 2001), and there is no unambiguous answer to this question.

3.5 Remedies

On November 12, 2002, the District Court judge Kollar-Kotelly made the final judgment and accepted the reconciled decree between Microsoft and the U.S. government. The consent decree describes three categories of behaviors which the Court of Appeals found illegal. First, Microsoft was prohibited from imposing certain restrictions on how OEMs, software and hardware vendors, internet access providers, and business partners install or develop software form other software developers. For example, Microsoft must allow OEMs to install middleware products (for example, Java) from its competitors and to configure Windows'

desktop under the demand of consumers. The decree also prohibits Microsoft from entering into agreements with software and hardware vendors that limits their ability to the development and promotion of Java, Navigator, and other middleware software.

The second category of conducts is that Microsoft is required to disclose sufficient software interfaces and related technical information so as to guarantee software to be interoperated properly in Windows. For example, Microsoft is required to disclose certain APIs and communications protocols of Windows operating systems, thereby significantly increasing the ability of middleware software and non-Windows operating system to interact with computers running Windows. This requirement prevents Microsoft from keeping secret information that is normally considered proprietary, which may give internally developed software a competitive edge (Hahn, 2002).

Finally, the decree contains strict enforcement provisions. It creates an independent three-person technical committee with broad review for Microsoft's future conducts complying with the decree. And it also gives the government authorities to seek financial and conduct sanctions when Microsoft violates certain provisions. For example, it requires Microsoft to offer five-year uniform license terms to the 20 largest OEMs, thereby preventing the company from passing other provisions of the decree by discounts and promotion.

However, there arises another important issue: how to determine which APIs and protocols are necessary to interoperate and interact between different operating

systems? Because the Court is afraid that the more detailed and extensive information disclosure would help competitors to "clone" Microsoft's technology, it does not require Microsoft from disclosing all APIs and protocols. It is definitely a difficult technical specification issue to antitrust authorities even with a three-person technical committee.[25]

25 This is not a problem yet. In 2003, Microsoft opened its original source codes (including all APIs protocols) of Windows operating systems to all governments of the world and to international associations.

Chapter 4

Conclusion

The main conclusion of this study is that Microsoft has definitely abused its market power even though consumers benefited form the relatively low price of Windows and the zero price of Internet Explorer. The objection of antitrust policy is not the possession of market power. Rather, a central issue in any antitrust case of monopolization is whether the dominant firm abuses its market power to hinder competition or consumer benefits. So, even if we are to accept the tenet of Microsoft's argument that it faces tough competition and its monopoly position is transitory, it cannot be denied that Microsoft has strong incentives to build up barriers to entry, raise rivals' costs, and engage in other anti-competitive conducts that prolong its temporary monopoly.

From the proposed Microsoft remedy, we believe that antitrust authorities have known the special features and new challenges in network industries and thereby imposed different remedies form those applicable in traditional industries (such as a separation order). To the extent that the remedy maintains most of intellectual property rights of the sued firm, it also creates a compatible environment for existing and potential competitors, even providing the best protection of benefits to consumers. Moreover, it is clearly that the Microsoft case will become a representative case on network industries in antitrust history, sufficiently determining anticompetitive conduct in subsequent case. And most applications of antitrust theories, such as tying and compatibility, have been

improved during the process of this case.

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