BEFORE THE UNITED STATES DEPARTMENT OF JUSTICE

UNITED STATES OF AMERICA., Plaintiff, v. MICROSOFT CORPORATION, Defendant.	Civil Action No. 98-1232 (CKK)
STATE OF NEW YORK ex. rel. Attorney General ELIOT SPITZER, et al., Plaintiffs, v. MICROSOFT CORPORATION, Defendant.	Civil Action No. 98-1233 (CKK)

Comment of Nicholas S. Economides on the Revised Proposed Final Judgment

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1. Introduction

I am filing these brief comments on the Revised Proposed Final Judgment ("RPFJ")[(1)] and Competitive Impact Statement ("CIS")[(2)] to provide the Justice Department and the court with a useful economic analysis to assist the court in judging the appropriateness of the remedy in the RPFJ. I believe that the RPFJ is in the "public interest," as that test is applied under the Tunney Act. Accordingly, the RPFJ should be approved.

2. Interest Of The Commenter

I am professor of economics at the Stern School of Business of New York University specializing in industrial organization and antitrust with particular emphasis on network

industries. I am filing this submission in my own personal capacity and not on behalf of the New York University or the Stern School of Business. I am not employed or retained as a consultant on matters before this court by Microsoft, the United States Department of Justice, the Attorneys General of various States that sued Microsoft or any other interested party. Furthermore, I am not receiving any compensation from anyone for submitting these comments.

I have followed this case closely and extensively for the past several years, in my academic capacity. Since 1995, I have created and maintain the "Economics of Networks" web site on the Internet at http://www.stern.nyu.edu/networks/ that has acted as a focal point for academic research in the economics of network industries. Since the beginning of the present Microsoft case, I have added a number of pages on this web site that contain information and my analysis of this case. I have published three articles in refereed journals(3) on the specific issues raised by the present matter and I attach the article "United States v. Microsoft: A Failure of Antitrust in the New Economy," Symposium: Cyber Rights, Protection, and Markets, *UWLA Law Review*, (April 2001) as Attachment B. I also have published over 70 articles in industrial organization, competition policy, antitrust, networks, and telecommunications issues. My Curriculum Vitae is attached as Attachment A. I believe that my academic expertise, as well as my experience in competition policy in a number of matters, including the merger of MCI with WorldCom and the proposed merger of WorldCom with Sprint, as well as in a number of regulatory telecommunications proceedings is relevant to the issues raised in this case.

On November 6, 2001, the United States and the States of New York, Illinois, North Carolina, Kentucky, Michigan, Louisiana, Wisconsin, Maryland and Ohio reached a proposed final judgment (RPFJ) that will terminate litigation in the above cases. My comments below are supportive of the proposed final judgment, argue against other remedial proposals, and discuss various issues that are relevant to the case. *In my opinion, the RPFJ is a good and fair settlement that achieves the objectives of remedial relief without damaging the software industry.*

3. Criteria For Remedies

In the Appeals Court decision, Microsoft was found liable of monopolization of the market for operating systems for personal computers. The objective of the remedial relief is to impose prohibitions and requirements that will eliminate Microsoft's practices that were found to be illegal, prevent the recurrence of such practices, and restore the threat posed by middleware to Microsoft's operating systems monopoly. The remedial relief should also make sure that it does no damage the software industry, and should take into account two important special factors that are relevant to the case: (i) the very fast technological growth in these two markets; and (ii) the existence of network effects in the

market for operating systems and the market for software applications.

a. **Remedies' Limitations Imposed By Rapid Technological Change**

Any intervention by antitrust authorities creates a disruption in the workings of markets. The objective of the remedial relief is to accomplish the objectives mentioned in the previous paragraph without damaging efficient production and competition in the market. The potential damage that antitrust intervention can produce is larger when it is applied to an industry such as software with fast technological change, where leaps to new and more efficient technologies are expected, while the specific nature of the future winning technology is unknown. Firms in the software business confess that they are uncertain of the future winning technology in their field of business. Antitrust authorities know even less than the firms in the field. It is plainly difficult to predict future winning technologies and therefore it is very hard to fashion an antitrust remedy with an accurate prediction of its effect on industry structure and competition a few years down the road. Of course, this uncertainty is multiplied when the remedy creates a significant intervention in the industry. Therefore, lacking the knowledge of the effects of their actions, it is in the public interest that antitrust authorities and courts avoid very extensive intervention in industries with fast technological change. It is best to intervene only to the extent that (i) intervention reverses the effects of actions for which liability was established; and (ii) the effects of the intervention are predictable.

Another implication of very fast technical change in software is that the boundaries among the software products are fungible. Over time, these boundaries can be redrawn. New functions may be incorporated in larger programs, and sometimes it is more efficient to do so. An intervention that fits well in the present market may be counterproductive or irrelevant soon.

b. **Remedies' Limitations Imposed By Network Effects Of Software**

The second special factor to be considered is that the Microsoft case focuses on markets with network effects, where the value to a buyer of an extra unit (say of Windows) is higher when more units are sold, everything else being equal. The existence of network effects has crucial implications on market structure and the ability of antitrust authorities to affect it. In markets with strong network effects, even in the absence of anti-competitive acts, the existence of network effects in markets such as the market for operating systems of PCs, results in very significant inequalities in market shares and profits. The resulting equilibrium market structure can be called a "natural oligopoly" where very few firms dominate the market. The structural features of natural oligopoly for software market cannot be altered by antitrust intervention without very significant losses for society. The very nature of markets with network effects implies that the ability of antitrust authorities to alter market stricture in such industries is limited. I discuss this

issue next.

In assessing the Microsoft case, it is important to remember that the case focuses on markets with network effects. Network effects define crucial features of market structure that have to be taken into consideration in understanding competition and potentially anti-competitive actions in these markets.

A market exhibits network effects (or network externalities)[(4)] when the value to a buyer of an extra unit is higher when more units are sold, everything else being equal. In a traditional network, network externalities arise because a typical subscriber can reach more subscribers in a larger network.[(5)] In a virtual network,[(6)] network externalities arise because larger sales of component A induce larger availability of complementary components B1, ..., Bn, thereby increasing the value of component A. The increased value of component A results in further positive feedback.[(7)] For example, the existence of an abundance of Windows-compatible applications increases the value of Windows.

There are a number of crucial features of markets with network effects that distinguish them from other markets. First, markets with strong network effects where firms can chose their own technical standards are “winner-take-most” markets. That is, in these markets, there is extreme market share and profits inequality.[(8)] The market share of the largest firm can easily be a multiple of the market share of the second largest, the second largest firm’s market share can be a multiple of the market share of the third, and so on. This geometric sequence of market shares implies that, even for small n, the nth firm’s market share is tiny.

For example, abundance of applications written for Windows increases the value of Windows and induces more consumers to buy Windows. This increases the incentive for independent applications writers to write applications for Windows, and this further increases sales and market share for Windows. Moreover, consumers are willing to pay more for the brand with the highest market share (since it has more associated applications), and therefore profits associated with this brand can be a large multiple of profits of other platforms. This implies a very large market share for Windows, a small market share for the Mac, a very small market share for the third competitor, and almost negligible shares for the fourth and other competitors.

Second, due to the natural extreme inequality in market shares and profits in such markets at any point in time, there should be no presumption that there were anti-competitive actions that were responsible for the creation of the market share inequality or the very high profitability of a top firm. Great inequality in sales and profits is the natural equilibrium in markets with network externalities and incompatible technical standards. No anti-competitive acts are necessary to create this inequality.[(9)]

Third, because "winner takes most" is the natural equilibrium in these markets, attempting to superimpose a different market structure, (say one of all firms having approximately equal market shares), is futile and counterproductive. If a different market structure were imposed by a singular structural act (say a breakup of a dominant firm), the market would naturally deviate from it and instead converge to the natural inequality equilibrium. If forced equality were imposed as a permanent condition, it would create significant social inefficiency, as discussed below.

Fourth, in network markets, once few firms are in operation, the addition of new competitors, say under conditions of free entry, does not change the market structure in any significant way. The addition of a fourth competitor to a triopoly hardly changes the market shares, prices, and profits of the three top competitors.(10) This is true under conditions of free entry. Therefore, although eliminating barriers to entry can encourage competition, the resulting competition does not significantly affect market structure. In markets with strong network effects, antitrust authorities cannot significantly affect equilibrium market structure by eliminating barriers to entry.

Fifth, the fact that the natural equilibrium in network industries is winner-take-most with very significant market inequality does not imply that competition is weak. Competition on which firm will create the top platform and reap most of the benefits is, in fact, very intense.

Sixth, there is a more fundamental concern about the application of antitrust in network industries.(11) In industries with significant network externalities, under conditions of incompatibility between competing platforms, monopoly may maximize social surplus. When strong network effects are present, a very large market share of one platform creates significant network benefits for this platform which contribute to large consumers' and producers' surpluses. It is possible to have situations where a breakup of a monopoly into two competing firms of incompatible standards reduces rather than increases social surplus because network externalities benefits are reduced. This is another way of saying that de facto standardization is valuable, even if done by a monopolist.(12)

Seventh, in network industries, the costs of entry may be higher but the rewards of success may also be higher compared to non-network industries. Thus, it is unclear if there is going to be less entry in network industries compared to traditional industries. If a requirement for entry is innovation, one can read the previous statement as saying that it is unclear if innovation would be more or less intense in network industries. The dynamics of the innovation process in the winner-take-most environment of network industries are not sufficiently understood by academic economists so that they could give credible advice on this issue to antitrust authorities. However, in the last two decades we have observed very intense competition in innovative activities in network industries financed by capital markets.

Eighth, the existence of an installed base of consumers favors an incumbent. However, competitors with significant product advantages or a better pricing strategy can overcome the advantage of an installed base.(13) Network effects intensify competition, and an entrant with a significantly better product can unseat the incumbent. In network industries, we often observe Schumpeterian races for market dominance. This is a consequence of the winner-take-most natural equilibrium combined with the high intensity of competition that network externalities imply.

4. Evaluation Of The Proposed Remedies in the RPFJ

Evaluating the RPFJ in the framework of an industry with strong network externalities and fast technical change, I conclude that this is a fair settlement that imposes appropriate remedies for the violations for which Microsoft was found liable. The RPFJ contains some terms that may be seen as favorable to Microsoft, while, in most of its terms, it is favorable to the plaintiffs. Overall, in my opinion, the settlement is more favorable to the plaintiffs than what the final result of a remedies hearing would have been, given the Appellate Court decision.

There are substantial benefits in settling the case rather than continuing litigation that is likely to result in a very similar final outcome. There is substantial uncertainty associated with the judicial process, which is awfully slow compared to the rate of progress in the computing industry. Given the position of Microsoft in the computing industry, the added uncertainty of an extended remedies trial would affect adversely not only Microsoft, but also the rest of the computing industry.

The provisions of the settlement that may be seen as favorable to Microsoft are: (i) no structural changes, that is, no breakup of the company; (ii) Microsoft is not restricted from adding functions to the Windows operating system; (iii) there are no general restrictions imposed on product bundling by Microsoft; and (iv) there is no wide disclosure of source code; mandated disclosures are limited to interfaces. I discuss each one briefly.

(i) No structural changes

In my opinion, a structural change would be too draconian, especially after the narrowing of the liability by the Appellate Court, and would result in other inefficiencies. It is correctly avoided, and, after the Court of Appeals Decision, USDOJ correctly announced that it would not pursue a breakup (even before it entered into a settlement agreement).

(ii) No restrictions on adding functions to Windows

Freezing Windows in its present from and functionality and mandating that consumers would have to pay extra for future additional functions to Windows would be very

detrimental to consumers' welfare. The addition of functions to Windows while its price has been kept relatively low results is a big benefit to consumers. It would be contrary to the public interest to take actions that would decrease the benefit that consumers receive from this market. Moreover, since this is an industry with very fast technological change, freezing the functionality of a product would quickly make it irrelevant. This is not and should not be the intent of the application of antitrust law.

(iii) No bundling restrictions

The Appellate Court did not uphold the finding of liability of the lower court on tying, which was based on a per se reasoning. The Court of Appeals found that the per se analysis was inappropriate in this case for a number of reasons. The Appellate Court sent back the tying claim to the lower court to be judged (if the plaintiffs were to pursue it) under a rule of reason approach. Under this approach, the plaintiffs would have had to prove, in general terms, that the harm done by the tying was larger than any pro-consumer or pro-competitive benefits of the tying act. The plaintiffs decided not to pursue this course of action. This was wise, since it was likely that it would be very hard to meet the standard of the Appellate Court. Thus, it makes sense that the RPFJ does not impose general restrictions on bundling.

(iv) No wide mandatory disclosure of source code

The source code is the intellectual property of Microsoft. Confiscating intellectual property is a very extreme measure that would discourage innovation. Imposing forced disclosure or licensing would be very close to considering the operating system an essential facility and imposing regulation. It is not necessary to take these extreme measures to remedy the present violation.
The provisions of the settlement that are favorable to the plaintiffs are: (i) The broad scope of definition of middleware products; (ii) the requirement to disclose middleware interfaces; (iii) the requirement to disclose server protocols; (iv) freedom to install middleware software; (v) ban on retaliation; (vi) uniform pricing of Windows for same volume sale; (vii) ban on exclusive agreements; contract restrictions; and (viii) strict on-site enforcement.

(i) The broad scope of definition of middleware products

The settlement defines "middleware" to include browsers, e-mail clients, media players, instant messaging software, and future new middleware developments. Most of these middleware products have no chance to ever become a platform that would become a threat to the Windows operating system. Therefore, by applying the settlement terms on all middleware as defined above, the plaintiffs much more favorable terms than they would have received from a remedies trial. In such a trial, given the monopolization

liability, only middleware that could be a threat to Windows would have been relevant, and the settlement (or other) terms would have been applied only to such middleware. Here the plaintiffs achieved better terms in the settlement than they were likely to get in a full remedies trial.

(ii) The requirement to disclose middleware interfaces

Microsoft will be required to provide software developers with the interfaces used by Microsoft's middleware to interoperate with the operating system. This will allow development of competing (non-Microsoft) products that come very close to most Microsoft functions. Under the liability of monopolization, this is a reasonable requirement for middleware that has some chance of becoming a platform that will compete with Windows. When this requirement is applied by RPFJ to all middleware, the plaintiffs are getting better terms in the settlement than they were likely to get in a full remedies trial.

(iii) The requirement to disclose server protocols

The settlement imposes interoperability between Windows and non-Microsoft servers of the same level as between Windows and Microsoft servers. Servers and their interoperability with Windows were not part of the monopolization liability, and the plaintiffs would be unlikely to get this term in a full remedies trial.

(iv) Freedom to install middleware software

Computer manufacturers and consumers will be free to substitute competing middleware software on Microsoft's operating system.

(v) Ban on retaliation

Microsoft will be prohibited from retaliating against computer manufacturers or software developers for supporting or developing certain competing software. This is a reasonable restriction since Microsoft was found liable of monopolization.

(vi) Uniform pricing of Windows for same volume sale

Microsoft will be required to license its operating system to key computer manufacturers on uniform terms for five years. Microsoft will be allowed to provide quantity discounts. This eliminates the possibility of offering different prices to manufacturers that buy the same quantity. The effects of this restriction on total consumers' and producers' surplus are unknown. The likely effect of the restriction will be a transfer of wealth from Microsoft to computer makers (OEMs). There is no conclusive evidence in economic

theory that this restriction will increase total surplus of the combined consumers plus OEMs plus Microsoft surplus. On the contrary, if different OEMs faced different demand curves for PCs (because of variations in the PCs they produce), and this information was known to Microsoft, total surplus could be increased if Microsoft could charge different prices to different OEMs for the same quantity of sale. However, the imposition of this restriction can help avoid possible retaliation of Microsoft, so in the present context, it may be in the public interest.

(vii) Ban on exclusive agreements; contract restrictions

Microsoft will be prohibited from entering into agreements requiring the exclusive support or development of certain Microsoft software. This is a reasonable restriction since Microsoft was found liable of monopolization.

(viii) Strict on-site enforcement

A panel of three independent, on-site, full-time computer experts will help to enforce the terms of the settlement. The panel will have full access to all of Microsoft's books, records, systems, and personnel, including source code. The panel will also have the authrity to resolve disputes about Microsoft's compliance. This provides for a very strict enforcement mechnism and is a major victory for the plaintiffs who have compained in the past that Microsoft deviated from old agreements with the antitrust authorities. I would caution that this panel should not be used as a regulatory body. If regulation is ever to be imposed on the PC industry, it should come as an Act of Congress rather than as a gradual expansion of powers of this panel. As I have stated in the attached paper, there are many reasons why we should avoid for some time imposing regulation on the PC industry. The above discussion shows that the proposed settlement covers a number of dimensions and imposes a number of requirements that are not strictly arising from the monopolization violation. In my opinion, as part of this settlement, the defendant has conceded to the plaintiffs more than the plaintiffs were likely to achieve in a full remedies trial.

5. Evaluation Of Other Remedies Proposals

Here I evaluate other proposals, which I find detrimental to the public interest, and I recommend that they should be rejected.

i. **Structural Relief**

a. **Vertical Breakup**

Structural relief is a draconian measure that should be reserved for those cases where

absolutely nothing else would work. In my opinion, it is very likely that the conduct remedies of the present proposed settlement will work, and there is no reason to resort to draconian measures. Two types of remedies have been proposed. The first is the "vertical breakup" imposed by Judge Jackson (and vacated by the Appellate Court) that would divide Microsoft in an operating systems company and an applications company. Some have made the argument that the breakup is a surgical cut and therefore will disrupt the industry the least. This is countered by the facts. A breakup of Microsoft is an extremely disruptive outcome, and it would, practically speaking, eliminate Microsoft as a flexible and formidable competitor.

The argument, that, since AT&T's 1982 breakup was successful, so would Microsoft's, is incorrect. AT&T was divided into the long-distance company (AT&T), and seven regional operating companies, each of which remained a regulated local telecommunications monopoly until 1996. The destruction of AT&T's long-distance monopoly encouraged competition, which brought sharply lower prices and immense consumer benefits.(14) There are a number of key differences between the two companies and their competitive situations. And these differences make it very likely that a Microsoft breakup, besides harming Microsoft, would harm consumers and the computer industry.

In 1981, AT&T was a 100-year-old regulated monopoly with many layers of management. For historical reasons, the local phone companies within the old AT&T, such as New York Telephone, were managed separately from the "long lines" division. Thus, it was not difficult to separate the divisions since they functioned on many levels as separate companies. AT&T also had an abundance of managers to help cope with the breakup. By contrast, Microsoft is a young, entrepreneurial company run by very few top executives (about 25), and its divisions are very fluid. While this has made Microsoft one of the most efficient and successful companies around, it also means that a break-up would pose significant managerial problems and severely reduce the company's flexibility. Finally, AT&T was a regulated utility and regulation guaranteed that the companies emerging from the breakup stayed interconnected. In contrast, the Microsoft breakup is likely to lead to incompatibilities and further loss of efficiency.

The vertical two-way breakup plan was premised on the hope that an autonomous applications company would create a new operating system to compete with Windows. But more than 70,000 applications run on Windows, creating what the government calls "the applications barrier to entry" in the operating-system market. However capable the new applications company, it still wouldn't be able to single-handedly create a successful rival operating system. Separately, even with a new applications company's support, Microsoft's biggest operating-system competitor, Linux, is unlikely to become a serious desktop threat to Windows.

A vertical breakup is likely to have detrimental effects. First, the breakup is likely to result in higher prices. If DOJ is correct and Microsoft kept its OS prices low so that it

could exercise its monopoly power in the adjacent browser market, the post-breakup Baby Bill[(15)] that inherits the operating systems will have no incentive to keep the price low. The OS Baby Bill will no longer have the incentive to disadvantage any applications companies. Thus, the OS Baby Bill will now exercise the monopoly power it has and raise the price of the operating system to the detriment of consumers. If Microsoft has significant monopoly power because of the "applications barrier to entry," higher prices will be the direct result of the breakup. Second, as explained earlier, the breakup is likely to eliminate the efficiencies that make Microsoft a flexible and formidable competitor.

The breakup is likely to temporarily eliminate the incentive for interference from OSs to applications and vice versa. Of course, the same could have been accomplished by conduct restrictions without the cost and the disruption of the breakup. Moreover, without permanent restrictions on the post-breakup functions of the companies, the OS and the applications Baby Bills may enter into each other's business soon after the breakup. It is very likely that a few years after the breakup, one of the resulting companies will dominate both markets.

b. **Hybrid Breakup**

A second breakup proposal is the "horizontal breakup." This extreme proposal would break up Microsoft into three identical companies, with each company acquiring the source code of all the programs that Microsoft currently sells, and one third of its employees.[(16)] This "horizontal breakup" is sometimes presented in combination with the "vertical breakup" imposed by Judge Jackson (and vacated by the Appellate Court). In this "hybrid breakup," first Microsoft is broken into two or three companies according to the type of program produced, and then the operating systems company is broken into three parts creating four of five companies altogether.

Besides the loss of flexibility that any breakup would create, a horizontal or hybrid breakup would also produce significant incompatibilities with harmful effects to computer users, applications writers, and Microsoft shareholders. Post-breakup Microsoft companies coming out of a horizontal or a hybrid breakup will have incentives to create incompatible versions of Windows for two reasons. First, post-breakup Microsoft companies will try to differentiate their operating systems to avoid strong competition, leading to small price-cost margins. This is true even in industries without network externalities and has been well established in the economics literature on product differentiation.[(17)] Second, post-breakup Microsoft companies will try to make their operating systems incompatible with each other in a race to become the dominant OS, since the dominant firm receives the lion's share of profits in a winner-takes-most world. This is established in the network economics literature.[(18)] Differentiating the operating systems by Baby Bills would inevitably reduce the range of software that would be compatible with each user's computer. As a consequence, consumers' surplus would

decrease. The emerging incompatibilities would be a huge headache for both independent applications writers and corporate IT departments. Such incompatibilities would also hurt shareholders, since the combined value of the resulting Baby Bills will be smaller than that of the original Microsoft.

ii. **Auctioning the Windows code**

Another remedy proposal is auctioning the Windows source code. Given the fluctuating stock market value of Microsoft, Windows source code may be worth as much as $200 billion. No company can bid that much cash in an auction. (Practically speaking, only a handful of foreign governments could). This implies that the source code of Windows would be sold forcibly at a small fraction of its worth – and that would severely reduce the value of shareholders' equity. Auctioning the Windows code would not only effectively confiscate Microsoft's intellectual property, it would also seriously reduce the incentive for innovation not only for Microsoft but for all potential innovators. Moreover, source code evolves. Over time, different firms will add and alter the Windows code. Soon, incompatibilities will arise, with all the negative consequences of diminution of network effects described earlier.

6. Conclusion

In my opinion, the RPFJ is a good and fair settlement that achieves the objectives of remedial relief without damaging the software industry. I would urge caution against a deeper intervention in the software industry, where fast technological change and very significant network effects make it very difficult to predict the medium and long run effects of such intervention.

7. Attachment A: Curriculum Vitae of Nicholas Economides

8. Attachment B: "United States v. Microsoft: A Failure of Antitrust in the New Economy

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FOOTNOTES

1. *United States v. Microsoft Corp.*, Stipulation and Revised Proposed Final Judgment (November 6, 2001).

2. *United States v. Microsoft Corp.*, Competitive Impact Statement (November 15, 2001).

3. These are:

1. Nicholas Economides (2001a), "The Microsoft Antitrust Case," *Journal of Industry, Competition and Trade: From Theory to Policy*, vol. 1, no. 1, pp. 7-39 (August 2001), lead article.
2. Nicholas Economides (2001b), "The Microsoft Antitrust Case: Rejoinder," *Journal of Industry, Competition and Trade: From Theory to Policy*, vol. 1, no. 1, pp. 71-79 (August 2001).
3. Nicholas Economides (2001c), "United States v. Microsoft: A Failure of Antitrust in the New Economy," Symposium: Cyber Rights, Protection, and Markets, *UWLA Law Review*, (April 2001), lead article.

4. The word externality means that a good's value is not intermediated in a market. For the purposes of this paper, we will use the words "network effects" and "network externalities" interchangeably.

5. See Nicholas Economides, *The Economics of Networks*, 14 Int'l J. Indus. Org. at 675-699, (visited Apr.23, 2001) at http://www.stern.nyu.edu/networks/top.html (visited January 15, 2001).

6. 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 Windows 98 can be thought of as a virtual network.

7. Despite the cycle of positive feedbacks, it is typically expected that the value of component A does not explode to infinity because the additional positive feedback is expected to decrease with increases in the size of the network.

8. See Nicholas Economides & Frederick Flyer, *Compatibility and Market Structure for Network Goods*, Discussion Paper EC-98-02, Stern School of Business, N.Y.U., 1998, (visited Apr.23, 2001) at http://www.stern.nyu.edu/networks/98-02.pdf.

9. See Robert E. Litan, Roger G. Noll, William D. Nordhaus, & Frederic Scherer, *Remedies Brief Of Amici Curiae On Civil Action No. 98-1232 (TPJ)* at www.aeibrookings.org/publications/related/brief.pdf (visited Apr.23, 2001). Litan *et al*. (2000) err in reasoning that Microsoft's very high profitability is a clear indication of monopolization in the antitrust sense. High profitability for the top platform is natural in this winner-take-most market.

10. See Economides & Flyer, supra note 8. The table below, taken from this paper, shows market coverage and prices as the number of firms with incompatible platforms increases. Maximum potential sales was normalized to 1.

Table 1: Quantities, Market Coverage, And Prices Among Incompatible Platforms

Number of firms I	Sales of largest firm q_1	Sales of second firm q_2	Sales of third firm q_3	Market coverage $\Sigma^I_{j=1} q_j$	Price of largest firm p_1	Price of second firm p_2	Price of third firm p_3	Price of smallest firm p_I
1	0.6666			0.6666	0.222222			2.222e-1
2	0.6357	0.2428		0.8785	0.172604	0.0294		2.948e-2
3	0.6340	0.2326	0.0888	0.9555	0.170007	0.0231	0.0035	3.508e-3
4	0.6339	0.2320	0.0851	0.9837	0.169881	0.0227	0.0030	4.533e-4
5	0.6339	0.2320	0.0849	0.9940	0.169873	0.0227	0.0030	7.086e-5
6	0.6339	0.2320	0.0849	0.9999	0.169873	0.0227	0.0030	9.88e-11
7	0.6339	0.2320	0.0849	0.9999	0.169873	0.0227	0.0030	0

Note that the addition of the fourth firm onward makes practically no difference in the sales and prices of the top three firms.

11. In the Microsoft case, both sides had the chance to address this issue, but failed to do so.

12. Economides & Flyer, supra note 8, show that, in market conditions similar to the ones in the OS software market, social welfare (total social surplus) can be higher in monopoly. The table below, taken from this paper, shows profits, consumers' and total surplus in a market where firms produce incompatible products, as the number of competitors I increase.

Table 2: Profits, Consumers' And Total Surplus Among Incompatible Platforms

Total number of firms I	Profits of largest firm Π_1	Profits of second firm Π_2	Profits of third firm Π_3	Total industry profits $\Sigma^I_{j=1}\Pi_j$	Consumers' surplus CS	Total surplus TS

1	0.1481			0.1481	0.148197	0.29629651
2	0.1097	7.159e-3		0.1168	0.173219	0.29001881
3	0.1077	5.377e-3	3.508e-4	0.1135	0.175288	0.28878819

13. A clear example of this is the win of VHS over Beta in the United States consumer video recorders market. Beta was first to market and had a significant installed base in the five years of the coexistence of the two competing standards. However, because VHS (i) introduced earlier a recording tape of longer duration; (ii) used wide and inexpensive licensing of its technology; and (iii) its licensees had a much wider distribution system, VHS emerged as the winner, and Sony stopped selling Beta recorders to the US consumer market.

14. At the same time, the AT&T breakup did not introduce competition at the local exchange level, and the Regional Bell Operating Companies ("RBOCs") were allowed to monopolize local telecommunications services as well as access to long distance services. The success of competition in long distance has been hampered by the continuing monopoly of the local exchange, five years after the Telecommunications Act of 1996 was supposed to open the local exchange to competition.

15. This is a word play on "Baby Bells" that came out of AT&T and the first name of the CEO of Microsoft, Bill Gates.

16. See Litan, supra note 9.

17. See Claude D'Aspremont, Jean Jaskold-Gabszewicz, & Jacques-Francois Thisse, *On Hotelling's Stability in Competition*, 47 Econometrica at 1145-50. See also Anver Shaked & John Sutton, *Relaxing Price Competition Through Product Differentiation*, 49 Rev. Econ. Stud. at 3-14. See Nicholas Economides, *The Principle of Minimum Differentiation Revisited*, 24 Eur. Econ. Rev. at 345-368.

18. See Economides & Flyer, supra note 20, and Nicholas Economides, *Industry Fragmentation After A Microsoft Breakup* (2001) (on file with the author); Nicholas Economides, *The Microsoft Antitrust Case*, J. Indus., Competition & Trade: From Theory to Policy (Aug. 2001); see also Nicholas Economides, *The Microsoft Antitrust Case: Rejoinder*, J. Indus., Competition & Trade: From Theory to Policy (August 2001).