"COMPETITION, INNOVATION, AND ANTITRUST
ENFORCEMENT IN DYNAMIC NETWORK INDUSTRIES"

Addressed By

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I. **Introduction**

The ongoing legal confrontation between the Antitrust Division of the Department of Justice and Microsoft has struck a chord with the public, and has generated substantial

commentary about competition and innovation in the computer software industry and in high technology industries more generally. The current debate surrounding Microsoft's requirement that original equipment manufacturers "bundle" the Microsoft Internet Explorer browser with Microsoft's Windows 95 operating system has centered on an immediate concern that has implications for one of the fastest growing sources of commerce in our economy -- the internet.

However, the debate surrounding the application of the antitrust laws to rapidly evolving high technology companies such as Microsoft has broader implications for antitrust enforcement as our economy moves into the 21st century. While Department of Justice policy makes it inappropriate at this time to comment on the specifics of current investigations, there are a few broad themes relating to enforcement in high technology industries characterized by so-called "network effects" that I believe are worthy of attention.

Some might believe that we need new antitrust laws to enforce pro-competitive behavior in our high technology industries. I am confident, however, that the existing array of antitrust tools, including the Sherman Act and the Clayton Act, are adequate to the task. The significant task at hand is to clarify the application of these laws to industries such as computer software and hardware in which technology is evolving rapidly and product prices and innovation (new products, improvements in product quality, etc.) are at issue. In dynamic high technology industries the antitrust enforcement stakes are raised. On one hand, because the path of innovation today will significantly affect future product quality and price, the potential benefits of enforcement are huge. On the other hand, because the path of innovation is highly uncertain and

technology is rapidly changing, the potential costs of enforcement errors are also large. These higher stakes make it essential that sound antitrust enforcement principles be developed and appropriately applied. I believe that rapidly evolving high technologies industries should not be immune from antitrust enforcement. Rather, it is vital that while being appropriately cautious about criticizing aggressive pro-competitive behavior, the antitrust authorities make every effort to ensure that dominant incumbent firms with monopoly power (firms with the ability to raise prices above and/or reduce quality below competitive levels and/or to exclude competitors) not use their substantial market power to harm innovation, to retard technological progress, and ultimately to harm consumers [1].

I begin with an overview of some of the important economic principles that often apply to the evaluation of the unilateral behavior of firms in network industries. (I leave the discussion of principles involving coordinated behavior relating to research and development and standard setting for another occasion.) Following each discussion of economic principles, I suggest some of the antitrust enforcement implications that follow. In the final section I outline some of the broader issues relating to the antitrust enforcement of high technology industries. My goal is not to give specific clear antitrust enforcement rules that can be applied immediately to every network industry. Rather, I hope to provide a useful framework in which the issues surrounding the behavior of firms in dynamic high technology network industries can be evaluated.

II. Economic Principles and Their Antitrust Implications

A. Monopoly Power in Dynamic Network Industries.

Because there has been so much discussion of network industries, it is worth taking a moment to clarify this important concept. The word *network* applies to the underlying economics of an industry, not to the hardware or software associated with the product. Network industries are created by network effects, whereby each individual's demand for a product is positively related to the usage of other individuals. Many markets are characterized to one degree or another by this phenomenon. Network effects might arise in the context of computer software, for example, because users prefer a word processing program that is the program of choice of other users. In some cases, network effects are mediated through complementary goods as well. Again in the software context, developers are likely to write to an operating system that is favored by many people, while conversely, the greater the number of popular software applications, the more successful an operating system is likely to be.

While interest in network industries has grown recently because of increasing economic activity involving dynamic industries where there has been substantial innovation and rapid technological change (such as computers and communications), more traditional industries where fads or bandwagon effects may arise (such as designer jeans) are also characterized to some degree by a form of the same phenomenon. It is useful to distinguish between two basic types of networks in dynamic industries: communications networks (where consumers value a large network of users with whom to communicate, such as compatible telephone systems and compatible fax machines), and "virtual" networks or "hardware-software" networks, where there

is not necessarily any communication between users on the network. [2] Not all networks require
communication. Suppose, for example, that many software users prefer a particular operating
system. This could encourage software developers to produce more applications for this platform, generate greater competition in these complementary markets, and support the growth
of a widespread technical support community specific to these products. The network effect
arises in this case because the increased software development will enhance the value of the
particular operating system and therefore increase its demand. To the extent that products and
services complementary to a particular operating system are not transferable at low cost to other
operating systems, economies of scale in producing these complements will tend to create
(virtual) network effects in operating systems, even without communication among users of the
network.

In industries in which network effects are significant, there is an increased likelihood that a
single firm may come to dominate the market and to persist in that dominance. However, markets
with a single dominant firm need not be markets in which there is a single technological *standard*
that is met by all firms. Nevertheless, it is often case that in industries with network effects users
will naturally tend to gravitate toward using compatible products that are compatible with products owned by the greatest number of other users. For this reason, a firm that initially has a
larger community of users than does its rivals may become dominant if the products of rivals are
not compatible with its own. Such a firm may, in fact, have an incentive to adopt competitive

strategies that support a single standard by preventing the products of rivals from achieving compatibility. [3] Where it chooses to do so, or if the cost of guaranteeing compatibility across networks are high, the products of rivals can become relatively less desirable to users even if they appear to be of comparable (or possibly even higher) quality from a purely "technical" standpoint.

When the dominant firm's product becomes the standard for the industry, firms that are developing alternative standards may find it difficult to compete effectively.

Industry standards take many forms, and the existence of an industry standard is neither a necessary nor a sufficient condition for the marketplace to be dominated by a single firm. In some instances, as with the DOS/Windows PC operating system, standards are proprietary and, some have alleged, have been strategically manipulated by their owner to make entry more difficult and competition less effective -- despite continuing competition at the margin by firms such as Apple and others. In other instances, industry standards are nonproprietary and there exists considerable competition among firms within the same network. Examples include competition among manufacturers of fax machines (the products of which have achieved compatibility with one another by adhering to a common standard for encoding information), competition among television manufacturers (who design their products to be able to utilize the same format), and competition among manufacturers of VCR machines and VCR tapes. Moreover, even where standards are proprietary, there can be considerable competition to become the standard, and there can be strong competition among co-existing networks ("multiple standards") where network effects are sufficiently limited or offsetting factors sufficiently strong to permit multiple

networks to survive in the marketplace. [4]

With dynamic network industries there are few generalizations that apply across the board.

One might be drawn to the conclusion that network effects necessarily generate a dominant standard, but this is not necessarily the case. As I just suggested, if competing products associated with different standards offer significantly different attributes, differing standards (and products) that appeal to different tastes or groups may coexist. One example is the market for high-speed, high-quality computer games, in which Sega, Nintendo, and Sony (with its Playstation player) all compete and there is no dominant standard. Interestingly, leadership in this market has changed over time as products have gone through their life cycles, with Atari the initial leader, Nintendo a successful challenger to Atari, and Sega, a more recent rival of Nintendo. Here, while it may or may not be the case that individual platforms provide each of these firms with some degree of market power over "locked in" consumers, competition among platforms for new users is intense and it is not obvious that any single firm will become dominant in the marketplace.

Another example is mainframe computing, in which IBM and DEC each have different operating system interface standards, have competed with each other by offering products with features and capabilities of interest to customers, and have attempted to induce independent software and hardware vendors to plug into those standards to make their products more attractive.

It is important to understand that there are both benefits and costs associated with dominance by a single firm setting a single standard. In markets with standards created by network effects, users gain by adapting compatible technologies. Economies of scale (lower

average costs of production with increasing scale) are often present (but need not be). [5] Typically,
standards go hand in hand with economies of scale when there are scale economies in the production of complementary products. For example, there are increasing returns in programming applications for a particular operating system, since many applications on which
demand for a particular operating system is ultimately based are more costly to write for two
operating system standards than for one. However, the fact that network effects will in some
circumstances make it efficient to have a single network does not in and of itself imply that it is
most efficient for the winning standard to be owned and controlled by a single firm. In fact, in
many instances standards are developed and controlled by a formal standards body (as, for
example, with the ISO MPEG-2 compression standard, the context for a patent-pool Business
Review Letter the Department of Justice issued last year) or by a collection of industry participants. I should be clear that I am not asserting here that standards should necessarily be
controlled by industry committees or by a regulatory authority. There are, however, important
and complex issues, both economic and legal, surrounding the appropriate scope of intellectual
property protection, and related questions dealing with the costs and benefits of permitting important standards to be controlled completely by a single firm. [6]

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Network industries often (but not necessarily) involving *tipping*, a point at which the joint existence of two incompatible products may be unstable, with the possible consequence that a
single product and standard will dominate. Tipping can occur very rapidly (and long before disinterested outside observers realize it has happened). If firms are competing on the

basis of
innovation and if network effects make it likely that the better product will win the battle to dominate a market, then the competitive process can be beneficial. To the extent that tipping
maximizes the size of the network, it does create consumer benefits. However, tipping also creates monopoly power that can be used for anticompetitive ends. [7] With tipping, exclusionary
practices that deny access to established standards can be particularly effective. A partial explanation is that with network industries psychology (the perceptions of users about the extent
that the market will tip) often becomes intertwined with economics. It is possible, for example,
that tipping can arise with no change in product design or product price, simply because the
expectations of a substantial number of users about the likely eventual size of the network change.
As a result, a firm currently competing or planning to compete in a tipping market has a substantial
incentive to affect expectations by increasing the perception that its product is likely to become the network standard. It is the crucial significance of expectations that explains why
dominant firms in network industries may have an incentive to engage in the tactic of *vaporware*
-- the preemptive, intentional announcement of a product release -- in an effort to prevent rival
products and potential alternative standards from developing sufficient momentum to unseat the

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incumbent or to discourage a firm from entering a market in the firm place. [8]

The possibility of a market's tipping can also affect the pricing strategies of firms. In dynamic high technology markets, it is often efficient for firms to compete jointly for today's and
tomorrow's markets. As a result, a number of firms may have an incentive to utilize "penetration
pricing" to win the battle to control a market. Such a penetration strategy may involve

pricing
below short-run marginal cost, so that a firm can increase its probability of winning the battle to
be the market standard. However, a firm that has substantial market power, and therefore a leg
up in the battle for dominance, may find a low-introductory-pricing strategy to be an effective
predatory strategy. Distinguishing between penetration and predatory pricing is therefore
conceptually difficult. A predatory strategy is a strategy that would not be profitable without the
recoupment of foregone profits make profitable because a competitor has left the market. In this
context, a predatory strategy can neither be characterized by whether a product price at a
particular point in time is low, zero, or even negative, nor by whether a firm currently dominates a
market. Rather a predatory pricing policy is likely to be one in which a firm's current pricing
cannot be profitably sustained even if the firm succeeds in achieving dominance and therefore
obtains the benefit of economies of scale and access to revenue streams from complementary
markets (revenues that could not be accessed more effectively by other means). It may also be
useful to treat pricing by a company that is trying to enter a new market by launching a new
product with less suspicion than pricing by an firm with an already-established product.

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Predatory pricing is not the only possible predatory strategy that a firm may use in trying
anticompetitively to eliminate current competition or deter future competition. Other predatory
strategies can be used effectively by a dominant firm to thwart efficient entry and/or to deter
efficient innovation, and these may be of particular concern in dynamic high technology
industries.

To illustrate the potential value of such a strategy, assume that a firm is considering the possibility
of innovating in one or more product markets that are complementary to the product controlled by a dominant firm. [9] The competitor is unlikely to make such an effort unless it expects to earn (at a minimum) a normal economic rate of return. As a result, the dominant firm
can for predatory reasons make the innovations of competitors unprofitable -- in a variety of
ways. First, it can calculate the maximum price consumers would be willing to pay for a "system"
comprised of its product and that of the newly developed complement, and charge consumers
enough for its monopolized component that the innovator is unable to charge sufficiently for its
complement to enable the innovator to earn a reasonable return. Second, the dominant firm can
make it clear that its product is or will be designed so as to be incompatible with the innovator's
product. Third, dominant firms can discourage the innovator by offering or making plans to offer
a close substitute for the competitor's innovative product at a "predatory" price. [10] Finally, by
threatening to integrate its dominant product together with its (perhaps somewhat late to market)
version of the innovator's product, the monopolist may be able uniquely to avail itself of ubiquity
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distribution -- making success of the innovator's product unlikely. [11]

Why should the dominant firm discourage the competitor's innovative efforts? One answer is horizontal -- the firm may wish to discourage innovation that might create a product or
products that threaten the firm's current market position. Another answer, however, is vertical --
the dominant firm might wish to discourage innovation in a complementary vertical market.

Such
innovation by the firm could create substantial benefits and be (on balance) in the social interest.
However, it is also possible that by deterring innovation in the complementary market, the dominant firm will have created a stronger barrier to entry into the market for its dominant product; in the end this stronger barrier will allow the dominant firm to recoup any foregone profits. *Two-level entry* into the dominant firm's product market and the complementary product
market simultaneously can be substantially more difficult than one-stage entry. (In effect, a firm
that wants to compete in the dominant firm's market must by necessity enter into the complementary market as well.) [12]

There are a number of complexities here that must be sorted out. First, a dominant firm will have a legitimate interest in innovating and entering into complementary product markets,
since (among other things) this will enhance the value of the dominant firm's product; one must
therefore be able to distinguish predatory from non-predatory strategies. Second, if integration by

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a dominant firm creates some efficiencies, innovation in complementary markets by others may be
deterred not so much because the incumbent is "predating," as by the competitive threat created
by the efficiencies itself.

Antitrust Implications

With network industries, especially those in which tipping is a real possibility, allegations of anticompetitive behavior need to be treated quickly and seriously. Once the market has tipped
it may be difficult or even undesirable to undo any anticompetitive effects that have arisen (e.g., to
switch locked-in users to another standard or to impose compatibility requirements that are
otherwise not in effect.) It is appropriate, therefore, to evaluate a firm's pricing strategy

along the
lines suggested previously to see whether a low, zero, or even negative price is symptomatic of a
penetration pricing strategy that could have been chosen by other (similarly situated) competitors
in the industry, or whether the pricing strategy is a predatory. Such a strategy would presumably
not have been chosen but for the dominant firm's market power, and would have the goal of eliminating competition with the prospect of obtaining, maintaining, or increasing monopoly
power and ultimately recouping any short-run profits that were foregone. As I also suggested, a
pricing strategy of a dominant firm can be predatory if it is rational for the firm to eliminate a competitor's incentive to innovate in the development of the next generation product (by manipulating investor expectations or otherwise threatening the financial viability of innovating
investment). In dynamic high technology network industries predation that discourages innovation can be an effective anticompetitive strategic tool. However, in the process of doing its
own innovation, a dominant firm can substantially deter entry into the market for its dominant

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product simply because it is successful in competing on the merits. The challenge for antitrust law
is to distinguish legitimate pro-competitive innovation strategies that harm competitors simply
because they are successful from those that are motivated for predatory reasons.

It is tempting to conclude that competition on the merits among firms in high technology network industries will ensure that if a dominant standard arises, that standard will necessarily be
the most desirable from a social point of view. We can be reasonably assured, however, that an
inferior product can win the battle to become the market standard. While consumer choice will
give a competitive advantage to a better technology and a better product, the best

products will
not necessarily win the battle to become the network standard. Further, since groups of consumers may differ in their valuation of the attributes of a particular standard, we cannot be
certain that the majority of users will be pleased with the chosen standard. In the computer software business, for example, users may differ in their valuation of operating systems. Some
operating systems may be particularly easy to use for the average consumer, while others may be
particularly suitable for applications programmers to write to. Having said this, it would nevertheless be inappropriate as a rule to second-guess the market's choice of a standard, if that
choice resulted from competition on the merits.

This line of thinking might suggest the possible *ex post* application of antitrust enforcement; one would wait until a standards battle had been fought and then, with hindsight,
evaluate the winning standard. If a particular standard were not deemed to be the "best", corrective intervention would be given serious consideration. There are at least three reasons to
be hesitant to utilize such a policy prescription. First, it is not easy to evaluate what is best, even
ex post, since preferences of consumers and users may vary. Second, what may be clear with

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hindsight, may not have been clear when the relevant economic choices were made. For legal
rules to be meaningful, they must be sensible ex ante; they cannot simply be applied ex post with
hindsight. Third, even if there is a clear "winner", it may be very costly to remedy the situation.
Aside from the obvious cost of imposing a new standard on the market, ex post intervention could
adversely affect ex ante incentives. Specially, firms that are actively competing on the merits to
become dominant may be overly cautious in pursuing beneficial innovation and pricing

strategies
for fear of later "corrective intervention." (If you know that success will be punished, you are less
likely to innovate.)

If dominance can be socially desirable, and a dominant position earned by appropriate pro-
competitive (and sometimes innovative) behavior does not merit antitrust enforcement, what is the
significance of dominance? One important answer is that dominance in one market can affect
(positively) the likelihood of success in markets for complementary products (which will in turn
increase the incentive to compete to win the first market). There are several reasons for this,
some of which are clearly procompetitive and some which may be anticompetitive. In many
instances a firm that has achieved dominance in one market for productive reasons (and not luck
or predatory actions) is likely to be able to exploit significant economies of scope (in research,
design, marketing, support, etc.) that make it the low cost producer and supplier of
complementary products. Further, consumers may prefer to purchase their complements from a
firm that has a monopoly in a related product. The ability of consumers to evaluate product
quality ex ante is typically imperfect, but consumers often do perceive that a monopolist may have
a particularly strong economic interest in providing high quality complements (so as to enhance
the reputation and demand for their monopoly product). Thus, while entry by a monopolist into a

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complementary market need not always be competitively benign, the fact that we see so many
firms in the economy -- even those with little or no market power -- operating in related markets,

suggests that there may be an efficiency explanation for this phenomenon that should be taken into account even when evaluating the behavior of firms with substantial market power.

The antitrust analysis of firm behavior becomes particularly difficult when it comes to evaluating the particular price and non-price competitive strategies that firms use to increase the likelihood that they will become dominant in one or more related markets. As I explained previously, these policies may be pursued because they provide advantages to the firm that also benefit consumers, they may be pursued because they allow a firm to increase its market power or to exploit its existing market power, or a combination of the two. For example, a low penetration price that leads to increased sales in a network industry can increase the dominance of a firm's product and can be pro-competitive if it reflects a sustainable strategy in a winner-take-all battle for a market. However, it could also be part of a dominant firm's strategy to monopolize a related market (and/or help maintain its existing monopoly position) by driving out competitors and deterring new entry. Where would-be rivals are not in a position to match or otherwise counter the strategies employed by a dominant incumbent, efficient entry may be thwarted. If it is predatory, it is likely to be part of a strategy not available to other competitors that is directed towards the elimination of competitors with the hope that short-term profits foregone can be recouped at a later date. Similarly, attempts to foreclose a rival's channels of distribution or other business arrangements that exclude competitors can be anticompetitive.

Two broad principles seem particularly significant here. First, as suggested earlier, if it is appropriate for antitrust to intervene in tipping markets, it is essential that intervention take place

at an early stage. Once the point is passed at which expectations in the marketplace have been
significantly affected, it will be more difficult to intervene successfully. [13] Second, intervention can
be inefficient, particularly in the long run, if it penalizes dominance that is the result of innovative
efforts and not the result of fortuitous events or anticompetitive practices. Such a policy will
"have the effect of taxing technological improvements," [14] and taxing something generally means
you get less of it. (To be sure, ill-considered intervention can also be inefficient even in the short
run, to the extent that it prevents even a dominant firm from responding aggressively, but fairly, to
competition.)

One final, important reminder. These antitrust principles apply to dominant firms -- defined to characterize firms that have substantial market power. Business conduct by dominant
firms that should be given careful scrutiny and which may be anticompetitive, is likely to be harmless if carried out by firms with little or no market power. Moreover, the fact that practices
are put into effect by firms with little market power suggests that there are real efficiencies associated with those practices. When exercised by firms with substantial market power, however, the same conduct could on balance be anticompetitive because it distorts competition
more than it aid it.

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B. **Innovation and Market Competition**

In evaluating markets with relatively homogeneous products and a fixed or slowly-evolving technological base, the Antitrust Division often focuses on the price effects of potentially

anticompetitive behavior. In dynamic network industries, however, technological change and
innovation as well as price receive substantial attention. Innovation affects not so much the prices
that consumers pay for given products, but more importantly innovation affects the quality of
products in the marketplace and especially whether dramatically new and better products will
come into existence. It is the force of innovation that can lead to higher quality products being
offered at lower prices to consumers in the future. An understanding the particulars of
competition in dynamic network industries is a vital part of a sound antitrust policy. [15]

In dominant network industries the market is often a moving target, evolving as
technology changes in response to innovation. It is important, therefore, to focus not only on
static competition within the market as it is currently constituted, but also on dynamic competition
for the market of the future, i.e., competition to control the next market standard (if there is one).
For example, IBM historically dominated the mainframe operating system market; at the time of
the emergence of PCS as popular products, the role of IBM as a competitor in the newly
developing PC operating system market had significant implications for innovation in operating
systems for this product. A more current example may be Sun's cross-platform Java initiative,
which presents a potential competitive threat to the Windows platform.

Antitrust Implications

We have seen that with competition in dynamic network industries the forces that drive
the winner to be the most efficient are not always as reliable as they would be in non-network
markets. Further, it is sometimes socially costly to move from a less to a more efficient standard.
(i.e. there may be *lock-in effects* making it difficult to change a standard, and the social

cost of
changing the standard may exceed the benefit of changing.) [16] Thus, while innovations that benefit
consumers are clearly to be encouraged, evaluating whether a particular innovation is desirable, or
ascertaining the *rate* at which particular innovations are made, is a more difficult exercise. The
implication once again is that early intervention that encourages competition on the merits is to be
preferred to late intervention after the standard has been determined.

Dynamic network industries present substantial opportunities for firms to manipulate standards for anticompetitive advantage. [17] However, in dynamic network markets, control over a
standard today does not necessarily create any long-term advantage, since it may not be easy to
leverage or otherwise successfully migrate a user from one standard to another. Dynamic network markets are often characterized by *path dependence*, i.e., the path of innovation is often

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determined by historical events that may or may not be tied to efficient pro-competitive behavior. [18] As a result, the timing of antitrust intervention can be significant. [19]

Intervention need not be required, however. Dynamic changes can, even absent intervention, cause a firm to lose dominance. For example, IBM lost much of its former dominance in computers, thanks to dynamic developments, such as the major, exogenous technological advances in microchip technology that enabled smaller and much cheaper computing platforms (first mini-computers, and shortly thereafter the PC), to do much the same
work that mainframes had long done (and at only a fraction of the cost).

C. **Installed Base**

As stated earlier, dominance earned as the result of a valid competitive process, in itself, should not be of concern to the antitrust authorities. However, having substantial market power
can provide an opportunity for a firm to pursue anticompetitive strategies that raise rivals' costs

and effectively foreclose opportunities. With control over a large *installed base*, a dominant firm
clearly has an incentive to innovate to grow the demand for its products among new users as well
as among its existing, locked-in installed base. Further, the dominant firm will find it advantageous to bring to market a product that is particularly attractive to its current installed

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base. Catering to the installed base in this manner can be efficiency enhancing. However, an
innovation strategy that is likely to detract from the ability of others to compete in that line of
business, perhaps by making it difficult to produce a compatible product, is troubling. Also of
concern is the possibility that the dominant firm will innovate more slowly and incrementally than
if it had no market power.

The debate about the effects of dominance on innovation is one that is not likely to be fully
resolved in the near future. Because a dominant firm has a near monopoly, it (like any
competitor) has an incentive to innovate so as to maximize its chance of controlling that moving
target (the market). However, the dominant firm also will take into account the effect of its
innovative effort on the profitability of its existing franchise. As a result, the quantity and quality
of innovation in an industry could be adversely affected if the industry has a single dominant firm
that goes beyond competition on the merits to utilize business practices that protect it from
effective competition from other firms. While that firm does have an incentive to innovate, the
degree of innovation is likely to be affected by the firm's installed base. Further, there may be
less incentive on the part of the dominant firm's rivals to expend the R&D funds necessary to win

the dynamic competition for the market, since the likelihood of a successful effort will be small. [20]
An ambiguity remains, of course, since the rewards from success may be greater, leaving the net
effect indeterminate.

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With consumer preferences for uniformity in products and compatibility in complementary
products, dominant firms operating with a single standard are likely to develop in dynamic network industries. It is important to understand, however, that not all network industries will
involve single standards, and moreover, multiple standards may, under some circumstances, be
more efficient. In such situations, efforts by dominant firms with substantial installed bases to
encourage uniformity may reflect narrow self-interest rather than consumer welfare.

Fragmentation (multiple standards) does have its costs; in some cases it can cause consumer confusion**;** in other cases, product designers may have to develop their products for
multiple platforms rather than only one. However, fragmentation can be socially beneficial. For
one thing, consumers with different tastes can be accommodated. [21] For another, fragmentation
can encourage more and higher quality innovations, particularly those that are directed towards
winning the battle for new markets. While firms can innovate to try to become the next standard,
such innovation is more likely to be profitable if there are more "successful" firms in similar markets to begin with, e.g., if there are multiple operating systems with multiple installed bases
that can be migrated by their owners to the future.

A recent example of the potential benefits of fragmentation is illustrated by the January 22,
1998 decision of Netscape to make the source code for its next-generation browser, Communicator 5.0, available for free on the internet. As Carl Shapiro and Hal R. Varian

recently
discussed, [22] public access to the source code will allow programmers to customize Communicator

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for their own particular preferences. The resulting "fragmentation" has the potential to build support for Netscape's product, particularly if the modifications of the program remain compatible with each other. Whether the benefits of customization to the varied users of browser
software will be sufficiently enticing to a large number of users to improve Netscape's competitive position, or whether fragmentation and potential incompatibilities will create more
problems than solutions, remains to be seen.

Antitrust Implications

With dynamic network industries, antitrust enforcement focuses not only on the prices of products, but also on the potential effects of anticompetitive behavior on innovation. Importantly,
it is innovation in the industry as a whole, not solely innovation by the dominant firm that is the
concern of antitrust enforcement. In such dynamic industries in which there is substantial innovation and quality-adjusted product prices are declining, there remains an important role for
antitrust enforcement. The relevant question is not whether there is innovation, but whether the
quantity and quality of innovation would be significantly improved were the dominant firm to
make its business decisions on the basis of real economic efficiencies, and not on the expectation
of benefiting from the firm's market power associated with its substantial installed base of users,
and with its attempt to acquire or maintain substantial market power.

D. **Leveraging**

Leveraging occurs when a firm uses its advantage from operating in one market to gain an

advantage in selling into one or more other, generally related markets. Leveraging by dominant
firms may take place for a variety of reasons that can be pro-competitive or anticompetitive,

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depending on the circumstances. With respect to the former, leveraging can be seen as a form of
vertical integration in which the firm may improve its distribution system, economize on information, and/or improve the quality of its profits. Further, if the dominant firm can produce a
related product better (perhaps in the process maintaining an open interface standard), or if it
enters a related product market because there is insufficient competition in that area, there is
unlikely to be an antitrust problem.

Leveraging can, however, be anticompetitive if its serves as a mechanism by which a dominant firm is able to raise its rivals' economic costs of competing in the marketplace. Whether
such leveraging is in fact anticompetitive is a complex issue, however, since there are potential
efficiencies that may be at issue. For example, in its effort to be adopted as the next generation
standard (or trying to move consumers from one equilibrium to another), the owner of one element of a system may want to enter complementary markets by engaging in alliances as part of
a strategy of attracting users to its network. [23] Such an effort could on balance be anticompetitive,
and could in fact be motivated by an effort to increase its competitors' costs of developing an
effective competing product, and as a result, foreclose competition. However, there may be real
economic advantages (e.g., compatibility, efficiencies in distribution) that flow from the offering
of two products that work especially well together.

It is important that competition in markets for complementary products be based on the

merits and not be diminished by the strategic behavior of a firm with a dominant position in a

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market. One particularly troubling aspect of leveraging is the possibility that innovation incentives of competitors will be decreased. Such a blunting of incentives can occur if the leveraging practice is undertaken not primarily as part of a vigorous competitive strategy, but in part to decrease the likelihood of competitor entry, so that the dominant firm will continue to be victorious in the competition for the next market. As I discussed earlier, this likelihood of success will reduce the incentives of other competitors to innovate to the extent that these competitors perceive that the opportunities to profit from their innovations are hindered. [24] All of this is particularly significant because markets in which there is rapid technological progress are often markets in which switching costs are high -- users find it costly to switch to a new technology that is not fully compatible with the older technology. The result is an increase in entry barriers.

Leveraging can be accomplished by a variety of practices (e.g., tying, bundling, exclusive dealing, low pricing), each of which may have anticompetitive or procompetitive aspects, or a combination of the two. Inevitably, an evaluation of each particular practice in context will be necessary before a clear conclusion can be reached. With commercial *tying*, a firm conditions the purchase (or license) of one product -- the tied product -- on the purchase (or license) or another product -- the tying product. There are a number of procompetitive reasons that a firm might choose a tying arrangement, including cost savings (it could be less expense to offer a package) and quality control (it could be easier to sort out the source of quality problems with a tied sale than if the products are sold separately). However, tying can be anticompetitive and it can

be an
effective leveraging practice.

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Traditionally, tying has been viewed as a device that allows a firm to price discriminate. [25] However, tying can also be a practice that forecloses competition in network markets. Suppose,
for example, that a dominant firm has a product with a current technology that is supported legally by its intellectual property rights. Suppose further that the firm offers to license its technology only to those firms that agree to also license that firm's complementary product, and
suppose that the complementary product builds on the firm's next generation technology. Such a
tying arrangement could allow the dominant firm to create a new installed base of users of its next
generation technology in a manner that would effectively foreclose the opportunities of competing
firms to offer their products in the battle for the next generation technology. [26]

Another potential leveraging device is the practice of *bundling*. *Pure bundling* occurs (in this context) when the dominant firm sells its monopoly product together with its version of a
complementary product at a single price (that is less than the sum of the products sold individually). In effect, the dominant firm tells its customers: "You don't get my monopoly product at a discount unless you take my version of this separate product as well." (Contrast this
with tying, where the tied product can be purchased separately.) Dominant firms may bundle

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products to their anticompetitive advantage when unbundling would be socially desirable. [27] [28]

Interestingly, firms with market power may also find it advantageous to offer their products as a
mixed bundle (i.e., separately offering a bundled product and two unbundled products). Office

productivity suites are currently sold in such a mixed bundling format, with each potential purchaser given the option of purchasing the entire suite or the individual software applications that comprise the suite. While mixed bundling can also be an effective exclusionary device, an evaluation of the effect of bundling on competition will, of necessity, be dependent on the market at issue and the particulars of the bundling arrangement. [29]

Antitrust Implications

Whether through tying, bundling, or a host of other practices, the leveraging of market power from the sale of one product to the sale of a related, complementary product is worthy of antitrust scrutiny. Inevitably an evaluation of the anticompetitive effects of leveraging behavior will be fact-dependent. Leveraging practices can provide consumer benefits that flow from the fact that a single firm is jointly producing and selling two products. However, leveraging may also be anticompetitive if it provides a means by which the firm is able to monopolize or attempt to monopolize other complementary product markets. Where it threatens to do so, an important

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and disturbing effect may be to discourage innovative behavior by actual or potential competitors.

III. Some Principles for Antitrust Enforcement in Dynamic Network Industries

The preceding discussion should not be seen as suggesting that there is a need for an entirely new application of current antitrust law, or for that matter for new laws. To the contrary, the current antitrust framework is fully adequate for the task ahead. It is important, however, that we think carefully about the particular application of antitrust principles in the complex

dynamic
world of network industries. As these principles are applied to dynamic networks, the following
broad tenets should not be forgotten.

A. **The antitrust laws exist to protect competition.**

The benefits of competition are many and varied. Competition helps to keep prices low and to enhance consumer choice in the marketplace. In high technology network industries
competition can be particularly significant, because it affects not only the prices consumers are
charged for existing products, but more importantly because it encourages innovations that
improve the quality of future generations of products. Ensuring the health and continued vibrancy
of the competitive process, in which firms are encouraged to innovate and consumers are ultimately offered a choice from among the best that businesses have to offer, is a crucial motivating principle at the Antitrust Division of the Department of Justice.

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B. **The antitrust laws are not designed to penalize successful companies when their success is based on behavior that creates efficiencies and benefits consumers**.

Success achieved through better products and vigorous competition is to be commended,
not condemned. We have seen time and time again in certain types of markets, and particularly
those "network industries" where consumers find it beneficial to use products favored by other
consumers, that success can translate into a very high, perhaps even a dominant share of the
business for one firm, while the unsuccessful will often flounder and sometimes fail. The government has no desire to unnecessarily restrict a firm's use of business practices that

further its
goal of profitably selling its valued products to consumers.

C. **The antitrust laws are directed towards restricting specific practices that are likely to be anticompetitive because such practices are not in the long run interests of consumers.**

It might appear, especially with winner-take-all markets, that the government is a conduit for complaints by disaffected rivals that might not succeed in the marketplace by competing on the
merits. While complaining competitors and especially complaining customers are important
sources of information that the Antitrust Division relies on during the course of its investigations,
and while for obvious reasons complaints by competitors must be, and are, viewed by the Division
with a healthy degree of caution and skepticism, it follows neither as a matter of economic logic,
nor as a basis for sound antitrust policy, that such complaints are invariably illegitimate or groundless. Allegations and complaints are judged according to the same standards we use in
applying the antitrust laws generally: Are the practices in question occurring, and if so, are they
antithetical to the interests of competition and of consumers?

D. **What's good for a successful company need not always be what's good for the economy.**

Firms that have attained substantial market power by fair and legitimate means ("through superior skill, industry or foresight") are free under the antitrust laws to benefit from that power
by charging what the market will bear for the goods and services they bring to market. Thus, to
the extent that a firm captures a dominant share by innovating, developing and marketing more

attractive price/quality offerings than its rivals, that firm deserves to profit. In fact, it is the prospect of earning substantial profits which helps drive the technological advances our economy
has witnessed over the past two decades. However, strategies that successful companies find
most profitable need not be pro-competitive or beneficial to the economy as a whole. Specific
practices that discourage competing firms from innovating and which are likely to result in slower
than desired improvements in product quality can be counter to the interests of consumers. The
antitrust laws appropriately consider the likely long run effect of a dominant firm's competitive
practices on product prices, product quality, and innovation in the industry as a whole. In particular, we must watch for practices that prevent the adoption of superior products by potential
entrants, or the use of a dominant firm's power to reduce the rewards to innovation.

E. **Successful firms are not permitted under the antitrust laws to engage in predatory or exclusionary conduct, the effect of which is to insulate themselves from the forces of competition**.

In high technology industries, advancements often build on the successes of previously developed products. To ensure that future products and technologies are the very best that the
talents of those in our economy are capable of turning out, the "race" to develop and successfully
market these products must not be skewed by firms using their existing market position to unfairly

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handicap competitors. Thus, when a dominant firm adopts policies that impede competitors,
consumers are harmed. Moreover, business practices that handicap the ability of rivals to compete distort the competitive process in still other ways. In competitive markets, the lure of
excess profits can be expected to call forth substantial investment by rivals in improved

technologies. The ultimate beneficiaries of this competitive dynamic to displace an existing dominant firm are consumers. This process is, however, muted to some extent when a dominant
firm impedes entry through anticompetitive behavior. In such circumstances, earning a satisfactory return requires would-be rivals to not only produce more attractive products, but also
to scale artificial entry barriers that the dominant firm has erected in the marketplace. Recognizing
this, would-be rivals are less likely to make the necessary considerable (and risky) investments and
innovation may suffer as a consequence.

F. Neither the fact that the rate of advancement of technology is rapid, nor the fact that the price of many products is falling, should be a barrier to the appropriate "surgical" application of antitrust principles to restrict anticompetitive behavior.

The appropriate question is not whether a firm's behavior will dull completely all incentives by its competitors to innovate, nor is it whether the firm will continue innovating after
handicapping its rivals. A variety of forces are at work, pushing toward improved technologies
and lower prices in the high-technology marketplace, and it would be foolish to assert that these
would grind to a halt if a dominant firm engages in anticompetitive behavior. The appropriate
question for antitrust enforcement is not so much whether advances are taking place in the market
or will continue to do so, but whether we can expect better performance from the competitive
process in the absence of anticompetitive conduct.

G. **Antitrust interventions will, to the extent possible, be undertaken with a minimal degree of disruption and cost to the firms involved,**

and to the competitive process.

The Antitrust Division takes seriously the risk that remedies for anticompetitive practices will not be applied carefully to achieve a pro-competitive result. No firm should be exempt from scrutiny under the antitrust laws. By encouraging all firms to compete to be the consumers' choice, the antitrust laws increase consumer welfare. Strong competition helps to insure that firms produce high quality goods at low prices, and that innovation is stimulated. Failure to enforce the antitrust laws, such as by allowing a firm with monopoly power to improperly use that advantage to weaken competitive constraints on its behavior, not only runs counter to the competitive ideal, it is also poor public and economic policy. When antitrust intervention is determined to be appropriate, it may be important to move early and quickly to minimize disruption in the marketplace.

IV. **Conclusion**

The application of antitrust enforcement principles to dynamic network industries is intellectually demanding and yet vitally significant. We have seen that a variety of competitive practices adopted by firms without market power in network industries are likely to be efficiency based, whereas practices of a dominant firm may have anticompetitive implications (as well as efficiencies) for competition among market competitors and for competition in complementary markets. Distinguishing those practices that are on balance anticompetitive from those that a involve competition on the merits is an important, yet difficult exercise. I hope that the foregoing discussion will be helpful in that regard. In any case, it is essential that in our efforts to further the

interests of consumers we pay attention to the effects of business practices not only on the prices
that consumers pay currently for their products, but also on the incentives and opportunities of
firms to innovate, so that consumers might benefit in the future as well.
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FOOTNOTES

[1] My comments build on previous comments made by former Deputy Assistant Attorney General Carl Shapiro in his March 27, 1996 address to the 44th Annual Antitrust Spring Meeting of the American Bar Association. More recently, Assistant Attorney General Joel Klein has reflected on the role of antitrust enforcement in a high technology world. ("The Importance of Antitrust Enforcement in the New Economy", Address before the New York State Bar Association Antitrust Law Section Program, January 29, 1988.)

[2] For a thorough discussion of the economic characteristics of computer software markets and the antitrust implications that follow, see Michael L. Katz and Carl Shapiro, "Antitrust in Software Markets," paper prepared for the Progress and Freedom Foundation conference, Competition and the Microsoft Monopoly," Feb. 5, 1998.

[3] Network effects apply to a wide array of industries with potentially varying legal consequences. See Mark A. Lemley and David McGowan, "Legal Implications of Network Economic Effects," *California Law Review*, forthcoming.

[4] Mark A. Lemley, "Antitrust and the Internet Standardization Problem," 28 *Conn. L. Rev.* 101, 1996, suggests that by creating a barrier to entry, standardization can make recoupment and therefore predatory anticompetitive behavior more likely.

[5] The term *increasing returns* has been popularized by Brian Arthur (*Increasing Returns and Path Dependence in the Economy*, Ann Arbor, University of Michigan Press, 1994) as a description of the substantial change in output as technology improves.

[6] Joseph Farrell has argued that copyright protection should be narrow when it involves interfaces. See "Standardization and Intellectual Property," *Jurimetrics Journal*, vol. 30, Fall, 1989.

[7] Network effects are not necessary for tipping; tipping can occur in any market with substantial scale-related economies, whether on the supply side or the demand side.

[8] Truthful pre-announcements can, of course, be pro-competitive to the extent that they provide valuable and timely advance information to producers of complements and to final consumers.

[9] In many cases the dominant firm will find it profitable for non-predatory reasons to want to extend its successful performance into the complementary market; extension in itself is not a problem.

[10] This could represent traditional predatory pricing if the monopolist would find it profitable to engage in this investment and pricing strategy only on condition that the entrant be driven out of the market.

[11] I am presuming that such an action would otherwise (absent the possibility of recoupment) not be profitable.

[12] The idea that vertical mergers may impede entry because of the requirement for entry at two levels has received extensive discussion in the economic literature. See, for example, William S. Comanor, *Vertical Mergers, Market Powers, and the Antitrust Laws*, 57 Am. Econ. Rev., Papers & Proc.254, 1967, pp. 259–62 . The concept was endorsed by the 1984 Merger Guidelines, Â§ 4.212, *reprinted at* 4 Trade. Reg. Rep. (CCH) Â¶ 13,103.

[13] It will generally be easier to open existing interfaces than to change existing standards.

[14] Kenneth Arrow, *Declaration*, in United States of America v. Microsoft Corporation, Motion to Enter Final Judgment, Civil Action No. 94-1564 (SS), January 17, 1995.

[15] The importance of innovation as a driving force in economic growth has been a subject of frequent commentary. Technology and innovation markets were recognized explicitly in the 1995 DOJ-FTC's "Antitrust Guidelines for the Licensing of Intellectual Property," The importance of new and improved products is discussed in *Federal Trade Commission Staff, Anticipating the 21st Century: Competition Policy and the New High-Tech, Global Marketplace* (May, 1996), pp. 11-24 .

[16] See Brian Arthur, "Competing Technologies, Increasing Returns, and Lock-in by Historical Events," *The Economic Journal*, 99, March 1989, pp. 116-131. Arthur suggests that lock-in can result when the following are important: (a) fixed costs; (b) learning effects; (c) coordination effects; and (d) adaptive expectations.

[17] In static markets, there often is less controversy over standards because the technology is relatively fixed and the standards are settled. In the bolting industry, for example, there are standards for the width of the threads, their depth, their angle of inclination, etc. These standards are settled, even though the standards are different in the U.K. and the U.S. A similar story applies to electric outlets for plugs and to light bulb sockets. (This is not to say

that incumbents in static markets do not have an incentive to abuse an existing standards committee to keep out rival technologies.)

[18] See Douglas C. North, *Institutions, Institutional Change and Economic Performance*, New York, Cambridge University Press, 1990, p.112, for an elaboration.

[19] Michael Katz and Carl Shapiro, "Systems Competition and Network Effects," *Journal of Economic Perspectives*, Vol. 8, No. 2., Spring 1994, pp. 93-115, suggest that path dependency and timing are likely to be less significant in a strategic setting because a dominant firm can and will act to tip the market in its preferred direction.

[20] Kenneth Arrow demonstrates that monopolists may innovate less than firms in very competitive markets. See "Economic Welfare and the Allocation of Resources for Invention," in National Bureau of Economic Research, *The Rate and Direction of Inventive Activity: Economic and Social Factors*. Princeton: Princeton University Press, 1962, pp. 609-25. See also Frederick M. Scherer and David Ross, Industrial Market Structure and Economic Performance, Boston: Houghton Mifflin Company, 1990, for some cross-sectional tests of this proposition.

[21] Note that if it is not costly to ensure compatibility, and if firms have an incentive to work toward it, in some instances a single network can accommodate consumers with different tastes.

[22] "A Judo Blow Against Microsoft," Wall Street Journal, 2-2-98, p.A-22.

[23] Because users may be hesitant to commit to any given system unless they believe it will be adopted by many others, the "network owner" may engage in a variety of strategies (including expanding into complementary products and offering a wide variety of complementary products at reasonably attractive prices) as a way to insure potential buyers against the possibility of a small, low-value network.

[24] Two-stage entry is likely to be significantly more costly/unlikely than entry only into the initially monopolized market.

[25] Suppose, for example, that a dominant firm is not able to fully monitor the sales of a particular product (perhaps because of piracy). A tying arrangement which allows the firm to "meter" the sales of a complementary product could provide a mechanism by which the firm can increase its monopoly rents. More generally, tying can be an effective device for raising rivals costs and thereby strategically foreclosing competition. See, for example, Frank Mathewson and Ralph Winter, "Tying as a Response to Demand Uncertainty," RAND Journal of Economics, 28, p. 566-583. See also, Michael Whinston, "Tying, Foreclosure, and Exclusion," American Economic Review, 1990, pp. 837-859.

[26] See, for example, Joseph Farrell and Garth Saloner, "Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation," American Economic Review, 1986, vol. 76, pp. 940-555.

[27] For an analysis of the implications of Microsoft's bundling of its TCP/IP protocol stack into Windows 95, see Willow Sheremata, "Barriers to Innovation: Monopoly, Network Externalities, and the Speed of Innovation," 42 Antitrust Bull., forthcoming.

[28] Note, however, that pure bundling may be pro-competitive. (For a general discussion of pure and mixed bundling, see, for example, Pindyck and Rubinfeld, Microeconomics, 4th Edition, Prentice-Hall, 1998, Section 11.5.

[29] With mixed bundling, forcing a buyer to take the tied product at a discounted price can be seen as a form of tying.