A Case for Letting a Firm Take Advantage of Locked-In Customers

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Introduction

Many products are said to exhibit "network effects." This means that the value a consumer realizes from the product increases as the number of consumers using the product increases. Telephones, fax machines, computer operating systems, internet browsing software, and word processing software are several of the more obvious and widely cited examples of goods with network effects (two of which, operating systems and web browsers, have become central to the antitrust prosecution of the Microsoft Corporation). However, it has been pointed out that many other products—for example, some books—also exhibit network effects (readers gain the added benefits...
of being able to discuss the book when many others read the same book).³

According to network theorists, when incompatibilities exist between different variations of a product, it is possible for a producer of one of the variations to secure a competitive advantage over producers of other variations by being the first one to achieve a critical market share, the net result of which is that the market “tips” toward the dominant producer, causing its market share to expand with consumer demand that, in turn, reflects growing consumer benefits caused by the producer’s growing market dominance.⁴ With the retreat of other producers from the market, consumers may find themselves “locked in” to the most widely used variation of the product simply because it is widely used, with perhaps superior variations of the product having a difficult time entering the market and attracting consumers. The cost of actually switching to another technology or product (which involves the costs of retraining, and new equipment and software, as well as the establishment of new office routines and, possibly, cultures) reinforces this lock-in.⁵ This suggests to some that a firm that is aggressively lowering price and expanding output could be a potential monopolist and a suitable candidate for antitrust action, if its product generates network effects. Indeed, the Justice Department has argued that Microsoft’s monopoly stems from network effects, coupled with the protection against market entrants afforded Microsoft by the 70,000 existing Windows applications, the source of the so-called “applications barrier to entry.”⁶


5. See, e.g., Paul A. David, Clio and the Economics of QWERTY, 75 AM. ECON. REV. 332, 334-36 (1985). In the article, David argued that the QWERTY keyboard continues to dominate the arrangement of keys on keyboards simply because QWERTY was adopted early on in the history of typewriters in order to minimize the extent to which keys would become entangled as they struck the paper. Id. at 333-34. Supposedly, the cost of retraining typists has prevented the adoption of superior keyboards. Id. at 336.

While there are efficiencies realized from the widespread use of one variation of the product from what can be called demand-side economies of scale, the concern is that such action can lead not only to a monopoly position, but to a monopoly position for an inferior product.\(^7\) When there is evidence that this is happening, antitrust action is commonly recommended with a remedy of breaking up the monopoly (or potential monopoly), as was done by the Justice Department and judge in the Microsoft case.\(^8\)

The case for antitrust action to counter inefficiencies arising from network effects and lock-in has been vigorously attacked. At the forefront of this attack are Liebowitz and Margolis, who argue on both empirical and theoretical grounds that there is little risk of inferior technologies and products becoming entrenched by lock-ins caused by network effects.\(^9\) For example, Liebowitz and Margolis dispute the inferiority of the QWERTY\(^10\) keyboard arrangement and of the VHS\(^11\) format for videorecorders, which are commonly cited examples of the inferior out-competing the superior because of the lock-in effect. Of course, with constant technological improvements there are cases of existing technologies being widely used and benefiting from network effects and significant switching costs, despite being inferior to new technologies. But if the gains from switching are greater than the costs of doing so, incentives exist for entrepreneurs—so-called "network sponsors"—to overcome the built-in resistance to change. Each consumer may face the prisoners' dilemma of being unwilling to switch to the new technology even though all would be better off if all (or most) switched. The entrepreneur-owner of the new technology, however, can internalize this effect by sharing the gains of the efficiency improvements with customers through subsidies in the form of low, possibly negative, prices over some period of time. Not all network effects are necessarily network externalities, with the latter leading to potential market inefficiencies that might require collective correction.

Without such internalization of network effects, it is hard to explain the large number of new products and technologies that

\(^7\) Arthur, *Competing Technologies*, supra note 1, at 116-17.
\(^10\) Liebowitz & Margolis, *The Fable*, supra note 9, at 7-8.
overcame the network/switching cost advantage of previously dominant products and technologies. Examples of how firms overcome lock-in have become common, including cellular phone companies (Pacific Bell) that have offered free or reduced-price phones for new customers, software companies (Microsoft) that have lowered the prices for users of competing applications, banks (Citibank) that have offered credits for customers' initial Internet transactions, and Internet retail sites (MotherNature.com) that have provided advertised discounts on customers' initial purchases.

In 1998, the Justice Department accused Microsoft of engaging in "predatory pricing" tactics with the intent of crushing Netscape, a potential rival for the computer platform market, by giving away Internet Explorer, and by integrating Internet Explorer into Windows at no additional cost.\(^\text{12}\) In addition, Microsoft was accused of, at times, charging below-zero prices by offering Internet service providers an upfront fee (what the Justice Department called "bribes") for making Internet Explorer their recommended browser.\(^\text{13}\)

Of course, a consumer subsidy to overcome the lock-in effect of an existing product is an investment that sellers expect to generate positive returns through higher prices for their products once consumers get "locked in" again.\(^\text{14}\) Obviously such investments are risky, as the new products may not be sufficiently superior to replace existing products, or may have a short reign in the marketplace even if they do. We can think of the high prices temporarily realized from establishing a large and "locked-in" market share as an incentive for technological improvements and as a means by which consumers reimburse suppliers for helping them overcome the prisoners' dilemma. Put another way, without the potential for some degree of "lock-in," network firms might not have sufficient incentive to lower their initial prices for the purpose of creating the network and providing users with the attendant network benefits as the network expands. This suggests caution in attempts to use antitrust remedies


\(^{13}\) Franklin Fisher, one of the Justice Department's economic experts made this argument. Transcript of Proceedings before the Hon. Thomas P. Jackson, June 1, 1999 (A.M. Session) at 39, United States v. Microsoft Corp., 97 F. Supp. 2d 59 (D.D.C. 2000) (No. 98-1232); see also Complaint at 9-10, Microsoft Corp. (No. 98-1232).

\(^{14}\) Paul Klemperer has argued that with switching costs, price wars are likely. Paul Klemperer, Price Wars Caused by Switching Costs, 56 Rev. Econ. Stud. 405, 415 (1989) [hereinafter Klemperer, Price Wars]. Indeed, the intensity of the price wars can be a function of the switching costs.
to prevent firms from exploiting "locked-in" consumers. Even if a firm is able to exploit network effects and switching costs by locking in consumers indefinitely, breaking up the firm under the banner of increased competition will actually do less to protect consumers than standard models would indicate, and may even harm consumers.

In the next section we develop a model of a firm selling a product that generates network effects, but not network externalities. That is to say, the demand for its product in each period increases as the number of units currently in use increases. Under the assumption that the firm is able to expand until it dominates the market and is able to fully exploit all network effects, we extend the analyses of others15 and examine the effect of threatening to break up the firm into separate competing units (or in other ways that impair the ability of the firm to exploit locked-in consumers). If credible, we find that the breakup threat is certain to produce a price reduction that is less than the standard monopoly model would predict, and may even result in a current price increase. Any resulting increase in efficiency is less than the standard model would predict, even when ignoring the very real possibility that the antitrust action reduces network benefits to consumers and retards the introduction of new technologies.

II. The Model

Consider a firm that is producing a product that generates a network effect. To capture this effect, we represent the price, $P$, in each time period as a negative function of the quantity sold currently and a nonnegative function of the cumulative quantity of all past sales, adjusted for decreases due to deterioration and discard. In period $t$, for example, the price, or inverse demand function, is given by

\[ P_t (Q_t, \sum_{i=1}^{t-1} \lambda^{t-i} Q_i), \]

with $P_1 < 0$ and $P_2 \geq 0$, where the subscripts represent partial derivatives with respect to the indicated variable, $Q_i$ is the quantity sold in period $i$, and $\lambda \in (0, 1)$ is the deterioration and discard rate

each period. We assume that the marginal cost of production is zero in each period.

The firm's objective is to maximize the discounted present value of profits over some time horizon $T$, given by

$$\pi = P^1 (Q_1, 0) Q_1 + \sum_{i=2}^{t} P^i (Q_i, \sum_{i=1}^{t-1} \lambda^{t-i} Q_1) Q_i D^{t-1}$$

where $D = 1/(1+r)$, with $r$ being the discount rate. We assume that the time horizon $T$ is such that at time $T$ the accumulated sales (net of deterioration and discard) are sufficiently large that the network effect is complete, or $P_2^t = 0$.

The $Q_i$s that maximize (2) necessarily satisfy

$$\frac{\partial \pi}{\partial Q_1} = \left[ P^1 + Q_1 P_1^1 \right] + \sum_{t=2}^{T} Q_i P_2^i \lambda^{t-1} D^{t-1} = 0$$

$$\frac{\partial \pi}{\partial Q_i} = \left[ P^i + Q_i P_i^i \right] D^{t-1} + \sum_{i=t+1}^{T} Q_i P_2^i \lambda^{i-1} D^{i-1} = 0$$

$$\frac{\partial \pi}{\partial Q_T} = \left[ P^T + Q_T P_T^T \right] D^{T-1} = 0$$

These necessary conditions yield to a straightforward interpretation. The first term in each equation in (3) is the current period marginal revenue. The second term in the first $T-1$ equation in (3) is the present value of future marginal revenue from current sales and is positive. Therefore, the current period marginal revenues are negative in the first $T-1$ periods, and the quantities sold in periods 1 through $T-1$ are increased until the marginal losses from current period sales are equal to the marginal gain from enhanced future demand through the network effect. In period $T$ the marginal network effect is zero and therefore the current period marginal revenue is also zero. There is no further advantage in expanding sales beyond the amount that maximizes current revenue. The negative marginal revenues in the earlier periods represent the investment mentioned in the introduction that begins yielding a return to the firm in period $T$ when it begins behaving like a conventional monopolist—
equating current period marginal revenue to marginal cost (zero in our model).

What do conditions in (3) tell us about the effect of government action designed to prevent the firm from exploiting the monopoly position, beginning in period T, assuming that it achieves that position? Consider first the effect of a credible threat to prevent the future price from increasing to the monopoly level. Such a threat clearly reduces the return the firm can expect to realize by investing in the network effect. By reducing the positive value of the second terms in the first T-1 equations in (3), a cap on future prices calls for a less negative current marginal value in the early periods. So the attempt to protect consumers against high future prices results in higher current prices as the firm reduces output.16 Not only are current prices increased, but also the value of the product is decreased as the reduction in output reduces the network advantage realized by consumers.17

Attempts to protect consumers against exploitation by a potentially successful network monopolist by breaking it up (or in any other way holding future prices and profits down) can also generate counterproductive results. If the breakup is anticipated the result will be qualitatively the same as imposing a price cap on the future price. Not being able to capture the future monopoly benefits from subsidizing sales currently, the firm will respond by reducing sales (and network benefits) and charging higher prices in early periods.

But what if the firm is broken up at some point before the network monopoly is complete, say in period j < T? Such a breakup

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16. The analysis here, which suggests that network effects lead to suppressed initial prices, is similar to the work of Lee and Kruetzer, who developed the theory of "lagged demand." See generally David Kreutzer, Lagged Demands and a "Perverse" Response to Threatened Property Rights, 20 ECON. INQUIRY 579 (1982). It is likewise similar to the analysis of Becker and Murphy, who were concerned with the development of a theory of "rational addiction." See generally Gary S. Becker & Kevin M. Murphy, A Theory of Rational Addiction, 96 J. POL. ECON. 675 (1988).

17. The effect of the threat is particularly detrimental to consumer welfare where all or most costs of production are upfront costs, that is, the marginal cost of production is zero, or close to zero (which is presumed to be the case in many lines of software, especially operating systems, given that copies of an operating system can be loaded on new computers by original equipment manufacturers by simply copying files from one computer to the next with few material resources and little time involved). In the absence of lock-ins or switching costs, potential network sponsors would be reluctant to make the upfront investment in the development of their products for fear that their investments would rightfully be treated as sunk costs in ongoing competitive struggles with other firms in which the price would be pushed toward marginal cost, which is close or equal to zero. Katz & Shapiro, Network Externalities, supra note 4, at 424; Klemperer, Price Wars, supra note 14, at 405.
might cause a current increase in output and a lower price as several
firms are now competing for market share, but it might not. And
even if it does motivate more output and a lower price, the effect will
be smaller than the standard monopoly model predicts. Being more
precise, we rewrite the jth equation from the necessary conditions (3) as

\[
0 = \sum_{t=j+1}^{T} Q_t \lambda^{t-j} D_t + (1 - \delta) \sum_{i=1}^{j} P_{i}^{j} + (1 - \delta) \sum_{i=1}^{j} P_{i}^{j}
\]

with \( \delta = 0 \).

If the firm is broken up in period j, the parameter \( \delta \) increases
from zero, indicating that it no longer accounts for the entire market
for the product. The question is: What is the effect of an increase in
\( \delta \) on the left-hand side of (4), the current and future marginal revenue
in period j? Differentiating (4) with respect to \( \delta \), evaluated at \( \delta = 0 \),
yields

\[
0 = \sum_{t=j+1}^{T} Q_t \lambda^{t-j} D_t + (1 - \delta) \sum_{i=1}^{j} P_{i}^{j} + (1 - \delta) \sum_{i=1}^{j} P_{i}^{j}
\]

From (4) it follows that (5) = 0 when \( P^i = 0 \), (5) > 0 when \( P^i > 0 \),
and (5) < 0 when \( P^i < 0 \). In the case where \( P^i > 0 \), then breaking up
the firm (assuming production costs remain unaffected) results in an
expansion of output to maintain a marginal revenue of zero. This is
the standard result and is what one would hope for when combating
monopoly influence. But, as we shall see, even in this case the effect
is not as strong as the standard monopoly model leads us to expect. If
\( P^i = 0 \), then breaking up the firm would have no effect on current
output. And if \( P^i < 0 \), then breaking up the firm would have the effect
of actually reducing current output and increasing price.

Considering the effect of a zero, or even a negative (or less than
marginal) production costs, price is not as far fetched as it may seem.
With network effects, giving away a product, or even paying people to
use it, can increase the present value of the product, and the present
value of future revenues, sufficiently to make up for non-positive
prices in early periods. Indeed, the possibility of non-positive prices
is more likely than the present model indicates. In our model, the
only positive spillover from current sales of the product is enhanced
future demand. But commonly, the firm has several complementary
products and there are intratemporal, as well as intertemporal,
positive spillovers from expanding the use of one of the products. Breaking up such a firm would not only reduce the intertemporal advantage in keeping the price of a product low, it could eliminate entirely the intratemporal motivations to do so, which increases the likelihood that breaking up the firm will cause a price increase.

For example, Microsoft has an array of products that run from the operating system (Windows) to applications (Word and Excel) to content sources (Encarta) to advertising on its Internet service site (MSN). When Microsoft holds down the price of Windows, it encourages the development of the Windows network as more computer users buy Windows, more programmers develop applications, and even more computer users buy Windows because there are more applications available and more users with whom their work is compatible. Microsoft also encourages the sale of personal computers and more software packages, more Internet use, and advertising on the web, much of the benefit of which will be garnered by Microsoft. By having the array of products, Microsoft has managed to internalize the benefits of holding the price of Windows in check, which adds to its incentives to do just that.

Breaking up a single firm into several competing firms has the well-known effect of increasing the marginal revenue of each firm over that of a single firm in the industry. By itself, the increase in marginal revenue provides a strong motivation for the firms to increase output and lower price. Since this motivation is unopposed in the standard model, the effect of breaking up a single firm is an unequivocal increase in output and reduction in price. With network effects, the situation is complicated by the fact that breaking up a single firm reduces the internalization of the network effects. The ability a single firm has to capture the additional future revenue from increasing its current output is reduced as more firms are created. With several firms, the additional future demand that each firm's current sales creates is captured in large measure by other firms. Therefore, breaking up a single firm reduces the future marginal revenue from current sales, which at least partially (and possibly more than) offsets the increase in the current marginal revenue from current sales. 18

18. Benjamin Klein has developed a similar line of argument, but using graphical techniques, to explain why a firm with complementary products might charge sub-zero prices, which leads to the conclusion that a breakup of the firm can lead to positive prices. See Benjamin Klein, Microsoft's Use of Zero Bundling to Fight the 'Browser Wars,' in Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace 217-254 (Jeffrey A. Eisenach & Thomas M. Lenard eds., 1999).
The analysis suggests an interesting possibility in the case of a cartel of firms producing a product generating a network effect. As opposed to the standard cartel model, it could be that each firm's marginal revenue (current and future combined) is less than its marginal cost (zero in our model). Collectively the firms are better off if each takes into consideration the future benefits its sales are generating for the other firms and resists the temptation to adjust sales to bring its marginal revenue in line with its marginal cost. But if this temptation is not resisted, the cartel will, like most cartels, begin to break up. The striking difference in this case is that, as opposed to the standard cartel, this cartel will break up as a result of each firm reducing output and increasing price.

II. Some Efficiency Considerations

Of primary interest when discussing the effect of actions to prevent a firm from exploiting a network effect to secure a monopoly position is how much, if any, efficiency is increased by the action. The standard of comparison is determined by maximizing the surplus from the product,

$$S = \int_0^T P^1(\tau, 0) d\tau + \sum_{t=2}^T \int_0^T P^2(\tau, \sum_{i=1}^{t-1} \lambda^{T-i} Q_i) d\tau d\tau'$$

with respect to each period's output. The $Q_i$s that maximize $S$ necessarily satisfy the conditions

$$P^i + MFS_i = 0 \quad i = 1, 2, \ldots, T$$

where $MFS_i$ is the present value of the marginal future surplus from expanding output in period $i$. Since $MFS_i > 0$ for all $i < T$ (we continue to let $T$ represent the period in which the marginal network effect is zero even though the time this occurs varies with the $Q_i$s), condition (7) requires that $P^i < 0$, $i = 1, 2, \ldots, T-1$.

The first thing to recognize is that it is not necessarily the case that, at least during the early periods, the firm, if left free to maximize profits through the creation of a network monopoly (the conditions in (3)), will underproduce and overcharge compared to the surplus maximizing conditions given in (7). For any given $Q_i$ and accumulated stock of the good in period $i$, $P_i$ is greater than the single firm's current marginal revenue in period $i$, or $P^i + Q_i P_i^i$. But for any
given sequence of Qs from period i to period T and any given accumulated stock in period i, the second term in (7), \(MFS_i\), is also greater than the second term in the i\(^{th}\) equation in (3), \(\sum_{j=i+1}^{T} Q_j P_j^{\lambda_j} D^{j-1}\).

This follows from the fact that the second term in (7) captures all the future surplus from selling an additional unit in period i, while the second term in (3) captures only the additional revenue the firm receives from selling the additional unit in period i. So, the socially efficient output in period i may also be the one that satisfies the single firm profit maximizing condition in the same period. We are not suggesting that this is likely, just that it is possible. We also acknowledge that as time T is approached it becomes increasingly certain that the single-firm output will become smaller than the socially efficient output. The difference between \(P^i\) and current period marginal revenue in period i does not diminish in any systematic way as T is approached, but the difference between \(MFS_i\) and \(\sum_{j=i+1}^{T} Q_j P_j^{\lambda_j} D^{j-1}\) goes to zero as both vanish in period T. So even though the single firm may produce close to, or even more than, the socially efficient quantity early on as it is attempting to establish a network monopoly, it will begin behaving more like a traditional monopolist as its monopoly position becomes established.

Given the eventual inefficiency of a potentially successful network monopolist, is it likely that public policy aimed at reducing the firm's exercise of monopoly power will improve efficiency? As discussed in the previous section, a credible commitment to prevent the firm from benefiting from a future network monopoly with a price ceiling or a future breakup has the effect of reducing the incentive to expand current output by reducing future marginal revenue with respect to that output. There is the interesting possibility that such a reduction in output can increase in-period efficiency because the firm may be selling less than the socially efficient amount in an early period. But the reason for the commitment to regulate is that the firm will eventually be producing too little, and so a policy that reduces output will soon be reducing rather than increasing efficiency.

A policy of breaking up a firm into several competing firms before it has established a full network monopoly (or, again, by other means of holding down its future prices and profits) can also be counterproductive. If the breakup occurs when the firm's price is negative, we have seen that it will cause a decrease in current output by reducing the incentive effect of that output on future demand.
Unless this occurs when the firm is producing more than called for by the conditions in (6), the effect will be the opposite of what efficiency requires, at least initially. Of course, later in time when the single firm would have been charging a positive price, the effect of having broken it up will be to increase output and improve efficiency. So it is possible that breaking up a potential network monopolist will improve overall efficiency. But, the presence of network effects will severely limit the efficiency gains that can be generated by competing firms. Replacing a single firm with several competing firms will bring each firm’s current marginal revenue more in line with the marginal social value of the product. But, the more firms there are the greater the discrepancy between each firm’s future marginal revenue from current sales and the future marginal value of the social surplus generated by current sales. So while increasing the number of firms is promoting efficiency on one margin, it is undermining efficiency on another margin. The standard argument favoring numerous competing firms over one firm loses much of its force when network effects are present.

Of course, the efficiency gains from breaking up a firm creating a network monopoly are sure to turn positive and rise as the network becomes increasingly established, at least as indicated by a comparison of necessary conditions (3) and (7). The smaller the marginal network effect from current sales, the more our analysis becomes a standard monopoly versus competition comparison and the greater the advantage of several competing firms over a monopoly supplier. Efficiency could, no doubt, be improved if a firm could be kept unaware of any antitrust threat until it had established a network monopoly and then was broken up. At least, it could be improved in this one case. The problem is that any efficiency achieved in this one case will lead to expectations on the part of other firms whose products create network effects that will motivate inefficient responses. Once the possibility that successful network monopolists will be broken up becomes recognized, new firms with new technologies will be less aggressive at cutting prices and expanding output to establish new, or replace existing, networks. This can reduce not only the social value these firms create directly, but it can also reduce the indirect value they create through the discipline their existence exerts over existing market power by established network monopolists—a control more responsive to consumer preferences and consistent with dynamic efficiency than is realistically possible from antitrust action.
IV. Creating Networks

Many discussions of networks presume that "network effects" are a part of nature, much as gravity or chemical reactions are. When an operating system firm—the "network sponsor"—sells more copies of its operating system, then applications firms will write more applications, more or less naturally, without any encouragement from the operating system firm. That may sometimes be the case, but certainly not always. Developers may be reluctant to join the network for any number of reasons, not the least of which is that the network in question might not be the successful network. That is, as developers prepare to write applications for one network (Apple), the market could "tip" toward some other network (Windows). The developers' investments could then be worthless. The developers' investment risk costs are heightened by the fact that the size and durability of the network is outside of their direct control, and is controlled by the network sponsor, which is a problem in risk allocation that can be remedied with appropriate side payments.

As Katz and Shapiro have argued, given that much of the investment in networks can be upfront, the actual investment made by applications developers (and the network sponsor) will depend upon their expectations about how the market will evolve over time, which can be influenced by how much the network sponsor is willing to spend up front to ensure that the market tips toward its network product and not toward some other firm's product. The network sponsor, in other words, may want to shoulder some of the applications developers' risk costs just to manage expectations, that is, encourage the expectation among applications developers that the network sponsor's product will be the product toward which the market will tip. The greater the potential profits from the market tipping and lock-in, the greater amount the network sponsor would be willing to spend up front to encourage the development of the network, and the development of locked-in customers. This is a slightly different way of restating a central point of our argument, which is that even the customers need not mind being locked in securely, given that the network could develop more rapidly, and with greater consumer benefits, than if the network sponsor does not encourage the development of applications and lock-ins.

Understandably, if the market is prone to tip and to leave consumers and applications developers locked in, the applications

developers also have to fear that the operating system firm/network sponsor will, once it has achieved its monopoly position, begin to extract monopoly rents, curbing its sales in the process, but also the sales of the developers' applications. The more they have to fear the monopoly practices of the network sponsor, the more reluctant they can be to write applications for the network. To overcome their reluctance, the firm sponsoring the network may either have to lower its upfront price or aid the developers by covering their development costs or providing outright payment to developers for writing to the network. Such payments can be viewed as pre-payment of monopoly rents that the developers expect will be extracted later when the network sponsor achieves its monopoly position. This leads to the interesting conclusion that the so-called monopoly, the dominant network sponsor, may have largely dissipated the expected monopoly rents among the developers and consumers, prior to when the monopoly rents are extracted.

The upfront payment problems of the network sponsor can be, as mentioned earlier, a consequence of the fact that the network sponsor may not be able to make a credible commitment to not take advantage of any monopoly position that is achieved in the future. The developers have to fear that the network sponsor will renege on its commitment, say, to hold its future prices to competitive levels. If it does achieve monopoly status, but does not renege, then its stock price can be suppressed because of the absence of the potential monopoly profits that could be extracted. This means that savvy investors can take over the network firm and hike prices and profits. Seen from this perspective, the network sponsor/potential monopolist can favor antitrust enforcement. Antitrust enforcement can make the network sponsor's commitment not to charge monopoly prices in the future credible (or more credible than otherwise), which means that the network sponsor would not have to lower its price or increase its side payments to applications developers (by as much as otherwise).

Barring antitrust enforcement, the network sponsor can ease the fears of outside developers by licensing its network product to several producers. It can also develop complementary products, which, for an operating system firm, would mean applications of its own (as Microsoft has done). The network sponsor would then have an incentive to hold down the price of its product, thereby easing the need to make side payments to outside developers. The greater the array of complements the network sponsor has, the greater the assurance that outside developers will have that the network sponsor will not in the future hike the price and curb the sales of the network.
good. Hence, a breakup of a horizontally integrated operating system/applications firm can, once again, reduce the incentive of the network firm to hold its prices down. It can thus reduce the incentive the applications developers have to stay with the network, the net result of which can be a contraction of the network and lost consumer benefits.

Applications developers can also be concerned that the network sponsor will be timid about defending the network against takeover by some other network standard. The more durable the network is perceived to be, the more applications developers are willing to invest upfront. Hence, it follows that the network sponsor can reduce its upfront payments to developers by showing them that it stands ready to compete ferociously to suppress any new competitive threat to its network standard, which, coincidentally is precisely what Microsoft did when it was confronted with the prospects of its Windows standard being overrun by a new computing platform based on Netscape’s Navigator. The judge in the Microsoft case interpreted Microsoft’s zero and negative prices for Internet Explorer as “predation” with the obvious consequence of raising the “dangerous probability” that Microsoft would be able to act like a monopoly in the future.20

V. Concluding Comments

Lock-in is not all bad. Nor are switching costs all bad. They might reduce the ease with which new firms can attract customers from established producers. However, switching costs can also be a reason that new firms with potentially superior products will incur what are often substantial upfront development costs associated with many network goods (software, for example). They also provide a grounds for why firms interested in developing a network would be willing to “underprice” their product initially, which can have the benefit of helping to build the network more quickly. In such network environments, threats to break up firms (because they are perceived to be the dominant producer and, hence, monopolies or because their pricing may appear “predatory” ) and deny the firms the benefits of networks through lower prices (and other means of encouraging customers to switch from established firms) and through the internalization of network externalities, can have the effect of

raising prices. Such an outcome must be construed as perverse, given conventionally professed goals of antitrust enforcement.
Bibliography


