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# Antitrust Issues in Schumpeterian Industries

By RICHARD SCHMALENSEE\*

A half-century ago, Joseph Schumpeter (1950 Chapters 5–8) presented a vision of modern capitalism in which monopolies are common but frequently swept aside by a “perennial gale of creative destruction” (p. 84). This gale is driven not by price competition, but by “competition from the new commodity, the new technology ... competition which strikes not at the margins of the profits of the existing firms but at their foundations and their very lives” (p. 84). I focus here on the personal-computer (PC) software (hereafter simply “software”) industry, which resembles this vision. I discuss some important issues this industry poses for antitrust policy and, in the final section, illustrate with examples from the *Microsoft* case.

## I. Software as Schumpeterian

Michael Katz and Carl Shapiro (1999) identify four features of software markets with major antitrust implications: (i) low marginal costs, (ii) systems and network effects, (iii) rapid technological change, and (iv) durability.<sup>1</sup> I focus here on the first three of these.

(i) Software firms compete statically, by selling existing products, and dynamically, by developing new products. After the (endogenous) fixed costs to design, develop, and test a new software product have been incurred, the marginal cost of producing another copy is trivial. Capacity constraints never bind; quality (fea-

tures, speed, reliability, ease of use, etc.) is critical.

(ii) Systems effects, in which the value of one component of a system depends on complementary components, are ubiquitous. The value of any software platform, such as Windows or Java, depends largely on the quality and quantity of applications written to run on that platform. Software vendors generally profit (and raise welfare) by encouraging production of high-quality complements.

Network effects, in which the value of something to any one user rises with its usage by others, seem important in some software product categories (e.g., word processors), but not all (e.g., personal finance packages). Because of scale economies and network effects, there is usually a clear leader in most software categories. But because of buyer heterogeneity, niche products often retain pockets of loyal users: Apple (desktop publishing) and OS/2 (banking) provide examples. These are “winner take most” businesses.

(iii) Contrary to simple network industry models, switching costs and lock-in do not appear to be important in the case of software. Major innovations occur repeatedly, and category leaders are frequently displaced by better products. In operating systems, MS-DOS displaced CP/M, and after a struggle with OS/2, Windows displaced MS-DOS. Such displacements have frequently been triggered by major innovations in complements, particularly in hardware and software platforms. Products previously confined to niches have emerged as leaders after such episodes. Thus Excel, first available only for the Macintosh, became important in the Intel-compatible world only after faster hardware facilitated a general transition to graphical user interfaces. Nothing suggests that the pace of software or hardware innovation is slowing.

Software innovation often involves adding features and functionality (see e.g., Schmalensee, 1999 section IV). Spell-checkers were once a product category, for instance, but spell-checking

\* Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02142. I am indebted to David Evans, Albert Nichols, and Bernard Reddy of NERA (National Economic Research Associates, Inc.) for valuable comments and conversations. I have drawn extensively on work done in preparation for my written expert testimony (Richard Schmalensee, 1999) and subsequent oral testimony on behalf of the Microsoft Corporation. The opinions expressed herein are not necessarily shared by anyone at NERA or Microsoft, however.

<sup>1</sup> For related general discussions, see Timothy Bresnahan and Shane Greenstein (1997), David Evans et al. (1999), Schmalensee (1999), and Kenneth Elzinga and David Mills (2000).

is now simply a feature of word processors. This competitive process shifts boundaries between software categories.

## II. Some General Issues

I concentrate here and below on three of the many interesting antitrust issues raised by the economic characteristics of software markets: (i) diagnosing monopoly power, (ii) market definition, and (iii) diagnosing predatory conduct.<sup>2</sup>

(i) Because all software products are differentiated, all successful software firms have some market power, and price discrimination is common. Because a price well above marginal cost is required to cover fixed cost, perfect competition is not a well-defined benchmark.

Moreover, leaders in software markets generally fail the traditional tests for "monopoly power," in the antitrust sense of substantial market power. Not only is price well above marginal cost, leaders in "winner take most" markets have high market shares and lack close substitutes. Since most software firms fail, there would be no entrants into the business if category leaders were not highly profitable. Finally, in many software categories, network, system, and scale economies protect market leaders against entry by products of comparable quality, though they may offer little protection against innovators, and the pace of innovation is generally brisk.

If one accepts the traditional tests, one must conclude that the software industry, which strikes most observers as intensely competitive, is full of monopolists that should be subjected to the strict behavioral standards of Section 2 of the Sherman Act. The Antitrust Division seems to agree. The argument against this position is that leadership positions in software are often fragile. Category leaders are not generally threatened by "me too" products competing on price, but as in Schumpeter's vision, they risk being obliterated by the superior products that regularly emerge from intense dynamic competition. (Do you remember WordStar or dBASE II?)

Traditional tests for monopoly power do not measure this sort of fragility. In particular, when

innovation is rapid, market shares that depend almost entirely on intellectual property are likely to lack predictive power. To assess fragility, one must either consider the intensity of dynamic competition directly or look for indirect evidence of its effects. It seems sensible to give more weight to fragility in evaluating the plausibility of a predation claim (Could the alleged predator expect to have monopoly power long enough to recoup the costs of predation?) than in deciding whether Section 2 applies (Is the firm likely to have monopoly power for a substantial period?).

(ii) Market definition in software markets is problematic because products tend to add features and functionality over time. Plaintiffs will tend to prefer yesterday's narrow product categories, which might put word processors and spell checkers in separate markets, while defendants will look to emerging future market conditions, which may imply a market only for products broader than today's office suites. But because high market shares have less predictive value than usual, market definition is in any case unlikely to be critical to a proper assessment of monopoly power and its fragility.

Market definition in software is likely to be more important in connection with allegations of tying and predatory product design. It is a clear antitrust violation for a firm with monopoly power in product A to require that its customers also buy product B. But when WordPerfect added a spell-checker, was that an illegal tie between a leading word-processing program and a spell-checker or simply the construction of a better tool for document creation? Similarly, was WordPerfect engaging in predation by "giving away" a spell-checker, thereby threatening producers of spell-checkers that might be potential entrants into the sale of word processors (or document-creation tools)? Or was it simply following the standard, generally profitable strategy of adding features and functionality? Given the fluidity of software product specifications, it seems clear that questions like these should not be settled by mechanical market-definition exercises.

(iii) Economists tend to define predatory acts as, roughly, acts that are rational only if they chasten or eliminate competitors. Courts, aware of the cost of discouraging competition, tend to require more, including short-term losses from

<sup>2</sup> For broader discussions, see David Teece and Mary Coleman (1998) and Katz and Shapiro (1999).

the acts at issue and a plausible expectation of future recoupment of those losses. Clear evidence of intent may help a court decide whether a particular act was predatory. In Schumpeterian industries, however, with “winner take most” markets, neither the basic definition above nor evidence of intent is economically useful.

If there can be only one healthy survivor, the incumbent market leader must exclude its competition or die. Any strategy that does not exclude competition will not result in survival. There is no useful non-exclusion baseline, which the traditional test for predation requires. Moreover, if near-monopoly is inevitable, welfare is not generally increased by restraining the ferocity of competition for that position, particularly if competition is channeled in directions that benefit consumers, such as innovation or low prices.

As to intent, in a struggle for survival that will have only one winner, any firm must exclude rivals to survive. The intent to exclude is the intent to survive. In a “winner take most” market, evidence that A intends to kill B merely confirms A’s desire to survive.

### III. Illustrations from *Microsoft*

All three of the issues discussed above, and many others besides, arose in the *Microsoft* case.<sup>3</sup> (i) Plaintiffs applied the traditional tests discussed above, which labeled Windows a monopoly. Plaintiffs argued that this finding properly subjected Microsoft to Section 2 of the Sherman Act and made predatory conduct plausible, because Microsoft could anticipate a stream of monopoly rents long after it had eliminated present competitive threats.

The defendant attempted to show (in part through my testimony) that Windows’ market position was fragile, in two basic ways. First, it presented direct evidence of dynamic competition: for example, past displacements of category leaders, current investments in alternative platforms (e.g., Linux, Java, Web-based applications) and their complements, the ability of alternative platforms to attract applications

writers, and the seriousness with which Microsoft and the rest of the industry viewed threats to Windows’ hegemony.

Second, defendant argued that Windows’ pricing was inconsistent with plaintiffs’ assertion that Microsoft was a monopolist secure behind high entry barriers.<sup>4</sup> With entry impossible, Microsoft should charge the short-run profit-maximizing price for Windows. At the time of trial, Intel-based PC hardware was competitively supplied at an average price,  $C_h$ , of at least \$1,600. By setting the price of Windows,  $P_w$ , for which the marginal cost is zero, Microsoft sets the price of Intel-based PC systems,  $P_s = P_w + C_h$ . Microsoft licenses Windows to computer makers for about \$65 a copy. Finally, let  $R$  be the (discounted, exogenous) revenue in addition to  $P_w$  that Microsoft can expect as a result of selling a copy of Windows, including revenue from applications programs and Windows upgrades. Plaintiffs’ estimate of  $R$  was \$160.

At the short-run profit maximum,  $[P_s - (C_h - R)]/P_s = 1/E$ , or  $E = (P_w + C_h)/(P_w + R)$ , where  $E$  is the elasticity of demand for Intel-based PC systems. The discussion just above implies that, if Microsoft is maximizing short-run profit,  $E > (65 + 1600)/(65 + 160) = 7.4$ , which is plainly inconsistent with monopoly power. Put another way, \$65 is a small fraction of any plausible estimate of the short-run profit-maximizing price of Windows. Perhaps Microsoft is investing in expanding the Windows network to make Windows more attractive and entry more difficult (Drew Fudenberg and Jean Tirole, 1999). But it would be irrational to do this if plaintiffs were right and Windows’ market position were not fragile.

(ii) In *Microsoft*, plaintiffs argued that Windows’ monopoly power arose primarily because more applications programs had been written for it than for any other software platform. Moreover, they argued, because of Windows’ popularity and because most applications writers wrote for it first, Windows was protected by an “applications barrier to entry.” Netscape’s Navigator dominated the browser market and ran on several operating systems. Netscape

<sup>3</sup> For related general discussions of the economic issues, see Evans (1999) and Schmalensee (1999).

<sup>4</sup> For details and sensitivity analysis, see Bernard Reddy et al. (1999) and Schmalensee (1999 appendix B).

threatened to make Navigator a competitive software platform by adding a rich set of applications programming interfaces (API's) that would attract applications writers away from Windows, though it never carried out this threat. Navigator also carried a Java virtual machine (JVM), which made it possible to run programs written in Sun's Java language on any machine, running on any operating system, on which Navigator had been installed. Plaintiffs argued that in response to these platform threats, Microsoft integrated its browser, Internet Explorer (IE), into Windows. Unlike Navigator, Windows with IE exposed a rich set of API's that made it easier to produce Internet-enabled applications on the Windows platform.

Plaintiffs defined the relevant markets as operating systems for Intel-compatible PC's and browsers. The defendant contended that the plaintiffs' case and the competition between Microsoft and Netscape were about *platforms*. Of course, a "platform market" would include such diverse objects as operating systems, browsers, and a programming/run-time environment. But that simply argues against mechanically defining a market.

Focusing on platforms as the arena of competition exposes a serious inconsistency in the plaintiffs' analysis of entry. The plaintiffs' case assumes that, absent illegal conduct by Microsoft, Netscape and/or Java might have attracted enough applications to displace Windows. But to do this, they would have had to surmount the "applications barrier to entry." If these new entrants could have done this, others could also, and the applications barrier did not give Windows much protection. But if Netscape or Java could not have lured lots of applications writers away from Windows, Microsoft's competitive actions did not affect the market outcome.

Moreover, the plaintiffs' market definitions were essential for their allegations of tying and predation. The plaintiffs argued that Microsoft illegally tied a browser to its operating system. The defendant said it had added browsing functionality to its platform, as it had added other functionality throughout its history. (At the same time, Netscape was talking about moving in the opposite direction, adding API's to its dominant browser to compete with Microsoft's platform.) Similarly, the plaintiffs argued that it

was predatory for Microsoft to "give away" IE to anyone who purchased the Windows operating system, while Microsoft argued that adding IE made the Windows platform more attractive to consumers and applications writers and would thus ultimately make it more profitable.

(iii) The plaintiffs argued that Microsoft's integration of IE into Windows was predatory because Microsoft could have made more money by selling IE separately for a positive price. Even if this were true in the short run (and there was no evidence), if selling IE had made it materially less likely that Windows would remain the leading platform, selling IE would have been foolish. Microsoft argued that integration of IE was a competitive act that benefited consumers both directly (by providing a browser) and indirectly (by enhancing the Windows platform and enabling better applications).

Finally, plaintiffs used Microsoft documents and e-mails to argue that Microsoft aimed to crush Netscape. But in a "winner take most" business, any profit-seeking firm must have such an objective. Microsoft's intention to compete hard enough to maintain its market position necessarily entailed excluding Netscape from a major role in the platform business. Similarly, in 1995 Marc Andreessen, a founder of Netscape, expressed his intention to compete in the platform business by asserting that Netscape intended to reduce Windows to an unimportant collection of "slightly buggy device drivers" (Michael Cusumano and David Yoffie, 1998 p. 40).

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