

# **Interoperability and Market Foreclosure In the European Microsoft Case**

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## Abstract

In this paper we discuss some of the most important economic issues raised in *European Commission vs. Microsoft* (2004) concerning the market for work group servers. In our view, the most important economic issues relate to (a) foreclosure incentives and (b) innovation effects of the proposed remedy. We discuss the economic basis for the Commission's claims that Microsoft had incentives to exclude rivals in the work group server market through degrading the interoperability of their server operating systems with Windows. We also examine the impact of compulsory disclosure of information on interoperability and argue that the effects on innovation are not unambiguously negative as Microsoft claim. We conclude with some general implications of the case for anti-trust enforcement in high innovation sectors.

Keywords: leverage, interoperability, abuse of a dominant position, innovation.

JEL Classifications: O3, L1, L4

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## 1. INTRODUCTION

The cases in the US and Europe against Microsoft have been perhaps the most high profile anti-trust cases in the last 20 years. In the various Microsoft cases, antitrust authorities in the US and Europe took on what was at some points the most valuable company in the world and its CEO Bill Gates, the world's richest man. After 5 years of investigation, on 24<sup>th</sup> March 2004<sup>1</sup>, the European Commission held Microsoft guilty of an abuse of a dominant position under Article 82 and imposed the largest fine ever for such an antitrust violation in Europe – € 497 million. The Commission also demanded major forward looking behavioural remedies including compulsory licensing of intellectual property and forced unbundling. This degree of behavioural intervention is highly unusual and has led to continued conflict about the implementation of the remedies.

The Decision found that Microsoft had abused its dominant position in the PC operating system market in two ways:<sup>2</sup>

- “deliberately restricting interoperability between Windows PCs and non-Microsoft work group servers, and
- by tying its Windows Media Player (WMP), a product where it faced competition, with its ubiquitous Windows operating system.”

As remedies for these violations the European Commission ordered Microsoft:

- “within 120 days, to disclose complete and accurate interface documentation which would allow non-Microsoft work group servers to achieve full interoperability with Windows PCs and servers.”

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<sup>1</sup> <http://ec.europa.eu/comm/competition/antitrust/cases/microsoft/investigation.html> downloaded 30.1.07

<sup>2</sup> <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/04/382&format=HTML&aged=1&language=EN&guiLanguage=en> downloaded 30.1.07

- “within 90 days, to offer to PC manufacturers a version of its Windows client PC operating system without Windows Media Player.”

The case is fascinating as it touches on one of the key issues concerning the conduct of competition policy in the "new economy": How should we think about the role of anti-trust in high tech industries dominated by rapid innovation?

In this chapter we give an overview of the economic issues in the Microsoft case. Space constraints mean that we focus on the part of the case relating to the work group server market. But we also touch on the media player case (see Kühn et al, 2005, for a more detailed analysis). We also briefly contrast the European and U.S. Microsoft cases. Many of the economic issues and foreclosure mechanisms in the server case are closely related to those in the “Browser Wars” around which the US case was centered (see Rubinfeld, 2004, for a more detailed discussion of the 2001 U.S case).

The structure of the chapter is as follows: in section 2 we look at the “Big Picture” and give a case overview. In Section 3 we sketch the timeline of the legal evolution of the case. Section 4 describes the products and Section 5 briefly looks at two topics that were extensively discussed in the case – interoperability and market definition. The next two sections are the economic meat of our discussion – the incentives to foreclose (section 6) and the impact of remedies on innovation incentives (Section 7). We make some concluding remarks on lessons learned in Section 8.

## **2. THE BIG PICTURE**

Before plunging into the details it is worthwhile to have an overview of the case. The Commission’s essential argument was that Microsoft leveraged its market power from

its primary market for PC operating systems<sup>3</sup> into the secondary, complementary market for work group server operating systems. In the terms of Article 82, it abused its dominance of PC operating systems to gain market power through the refusal to supply interoperability information.<sup>4</sup> According to the Commission, Microsoft had the *ability* to do this because it controlled over 90% of the market for PC operating systems (henceforth OS'es) and this monopoly was protected by a powerful "applications" barrier to entry (see Section 5).

Workgroup servers are low end servers that link with PC clients (see Section 3 below for more on this). For the OS of work group servers to be effective they have to work well with the PC OS, which is dominated by Windows. Microsoft has the ability to reduce the *interoperability* of rival vendors of work group server OSES because it controls the interfaces (protocols, Application Programmer Interfaces known as APIs<sup>5</sup>) of the PC OS. This control of access to the functionality of the PC OS gives Microsoft the power to exclude potential rivals that produce complementary products to the PC OS by denying them access to the PC OS functionality.

Naturally, the ability to monopolise a secondary market does not mean a dominant firm has *incentives* to monopolise this market. The Chicago School tradition (e.g. Bork, 1978) emphasises that there are many efficiency reasons why the monopolist of market A will want to enter and monopolise market B (e.g. to solve the

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<sup>3</sup> The Commission also pointed to Microsoft's dominant position in the supply of Personal Productivity Applications such as spreadsheets, word processing, etc, (i.e. the Office Suite). Although this aided their ability to limit interoperability, all of the economic arguments would carry through if these applications were controlled by a third party, so we focus on PC OS.

<sup>4</sup> The parallel case on the Windows Media Player alleged that Microsoft leveraged the market power derived from the PC operating system into the market for encoding software for media content. It did so by bundling decoding software (the core of the Windows Media Player) with the Windows operating system.

<sup>5</sup> Applications Programmer Interfaces are interfaces that an application programmer can use to have his application call up specific underlying functions of the operating system. They thus provide the link between the functionalities of the underlying operating system and the application that is written to the operating system. APIs are typically proprietary, so that an application has to be written to a specific operating system and cannot be used for a different operating system without substantial modification.

double marginalization problem arising in markets with complements) but there is no leverage of market power beyond what can be achieved in market A alone. The Commission argued that Microsoft's incentives were not so benign and that there were anti-competitive reasons for degrading interoperability and monopolising the work group server OS market.

The Commission argued that there are both static and dynamic incentives to foreclose rivals from the workgroup server market. The dynamic reasons are probably most important as Microsoft was clearly concerned that a strong presence of rivals in the server OS market could threaten the profits it enjoyed from its Windows monopoly of the PC market in the future. For example, by running future applications mostly on servers customers could reduce their reliance on the PC OS functionality by effectively substituting server functionality for PC functionality. By extending the Windows platform dominance from the PC OS market to the server OS market, Microsoft could reduce the probability of such competition in the future (see Section 6 for more details).

Various internal e-mails by Microsoft senior executives suggest that this strategy was not conjured from thin air by the Commission. For example, in 1997 Bill Gates wrote *"What we're trying to do is use our server control to do new protocols and lock out Sun and Oracle specifically.....the symmetry that we have between the client operating system and the server operating system is a huge advantage for us"*

This may have just been cheap talk, of course, but Microsoft's share of the work group server market did rise dramatically in the late 1990s from about 20% at the start of 1996 to over 60% in 2001 as shown in Figure 1. By this point Novell, the combined UNIX platforms (IBM, Sun) and Linux could muster only about 10%

market shares each. The Commission argued that at least some of the forty percentage point increase was due to anti-competitive actions.

### **3. THE LEGAL TIMELINE**

The case began with a complaint by Sun Microsystems in December 1998 lodged against beta versions of Windows 2000. The complaint revolved around the limited interoperability of Windows with the OS of other server vendors due to a switch to proprietary communications protocols. These protocols were software interfaces which made it very difficult for non-Microsoft server OS to communicate with the Windows OS. Many of these protocols had been non-proprietary open standards when initially adopted by Microsoft (e.g. the Kerberos security protocol developed at M.I.T.), but gradually through often secretive extensions, became closed to rivals.

These problems had been around for several years (since 1996 the arrival of NT 4.0 and Windows 95). But the number of proprietary protocols had greatly increased with the new version Windows 2000.

The Commission issued a Statement of Objections against Microsoft on August 1<sup>st</sup> 2000 taking up the complaints over the interoperability issues in the workgroup server market. It then issued a second Statement of Objections in August 31<sup>st</sup> 2001 adding the media player issues, which the Commission had started to investigate on its own initiative. An (unprecedented) third Statement of Objections was sent out on 6<sup>th</sup> August 2003 refining some of the issues. The Oral Hearing took place between 12<sup>th</sup> and 14<sup>th</sup> November 2003 and in March 2004 the Commission issued its Decision finding Microsoft in violation of Article 82 and imposed the remedies.

Microsoft appealed against the decision in front of the Court of First Instance. It also sought interim relief, which would have suspended the implementation of remedies until a judgment on the appeal. However, this application was rejected by the Court of First Instance in December 2004. The appeals case was heard by the Court in 2006. On 17<sup>th</sup> September 2007 the Court upheld the Commission's decision in just about every part<sup>6</sup>, although it did annul the role of the Monitoring Trustee (see below). Although Microsoft could still appeal, but it seems unlikely to do so.

The remedies on the server side have been a point of contention between Microsoft and the Commission ever since the Court denied interim relief. Microsoft was required to make a full technical description available of the protocols and interfaces that would enable rival server OSes to fully interoperate with Windows. This raised complicated issues of the existence of intellectual property rights and compensation for Microsoft in form of "reasonable" licensing fees, as well the required scope of disclosures.

To oversee the implementation of the remedy, the Commission appointed an independent Monitoring Trustee acceptable to both the Commission and Microsoft, Professor Neil Barrett. But both the Trustee and Commission came to the conclusion that Microsoft delayed the process and did not supply complete and accurate interoperability information. As a result, another Statement of Objections was issued on 21st December 2005. When the response to this statement of objections remained unsatisfactory for the Commission, Microsoft was fined another €280.5 million for failing to comply with the Commission's decision on 12th July 2006<sup>7</sup>. Since the Decision prospectively also applies to future versions Windows, there have also been

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<sup>6</sup> <http://www.microsoft.com/presspass/presskits/eucase/docs/T-201-04EN.pdf>

<sup>7</sup> <http://ec.europa.eu/comm/competition/antitrust/cases/microsoft/implementation.html>. downloaded 31.1.07



ongoing discussions between the Commission and Microsoft about compliance with the decision in the new Vista OS.

#### **4. THE ROLE OF SERVERS IN MODERN COMPUTERS AND THE DEFINITION OF MARKETS FOR SERVER OPERATING SYSTEMS**

In the late 1980s and beginning of the 1990s computing architecture went through a paradigm shift. The mainframe-orientated system was overthrown by the "PC client/server" computer architecture that is familiar today<sup>8</sup>. Instead of computer intelligence being centralised and users interacting via "dumb" terminals, processing power was more decentralised, distributed between PCs with their own operating systems and increasingly powerful servers linking these PCs together in networks.

Computing can be performed locally on stand-alone appliances such as using a laptop computer away from the office. Most computing, however, is performed on multi-user networks in which users communicate through 'clients' and in which much of the computing activity takes place behind the scenes on 'servers'. The clients in a client-server network take many forms. Some are 'intelligent,' such as a desktop computer; others are 'non-intelligent,' such as a dumb terminal (e.g. an ATM machine). Servers vary in size and in the nature of the tasks they are asked to perform. The mixture of servers in a client-server network depends on the kinds of computing that the network is designed to support. The server requirements of a small office, for example, are considerably different than the server requirements of a large international bank.

Like all computers, servers consist of both hardware (e.g. the processors and storage facilities/memory) and software (e.g. the operating system and server

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<sup>8</sup> See Bresnahan and Greenstein (1996) for an economic analysis of this transition.

applications). Server hardware is manufactured using various types of processors. Intel processors are used in many servers, and Microsoft's Windows operating system is compatible only with hardware that uses Intel processors. Novell's NetWare and SCO's UNIX variants are also designed to run on Intel processors. The leading hardware manufacturers for Intel-based servers include Compaq/HP, Dell and Gateway.

Server vendors mostly sell Intel-based systems on a non-integrated basis. An organisation usually purchases server hardware from one vendor with the server operating system installed from another vendor. Sometimes the organization will install the server operating system itself. Server systems are also sold on an integrated basis in which the vendor supplies both the server hardware and a proprietary operating system that has been specially designed for the vendor's hardware (e.g. Sun Microsystems).

Servers differ in the tasks they perform in a computer network. To understand how the requirements for servers differ depending on the different tasks involved we now discuss the most important functions performed by servers. These are needed to generate the benefits of using computer networks.

One of the principal benefits of a computer network is that it allows an organisation to share computer resources among multiple users. Clients connected to a network can share printers and files. Application programmes can be maintained on central servers and then 'served' to clients on an as-needed basis. In addition, computers connected to a network can run distributed applications. Distributed applications are computer programmes in which different blocks of the programme are executed on different computers within the network. Servers will facilitate these networking tasks.

So-called “*workgroup servers*” are used to perform a number of the basic infrastructure services needed for the computers in a network to *share resources*. Work group servers most commonly handle security (authorisation and authentication of users when they connect their clients to the network), file services (accessing or managing files or disk storage space), print services (sending print jobs to a printer managed by the server), directory services (keeping track of the location and use of network resources), messaging and e-mail, and key administrative functions in the management of the work group network. In addition to infrastructure services, work group servers also execute certain kinds of server-side applications.

But there are also very different tasks performed by servers. In many organisations, there is a pressing need to manage enormous (and growing) amounts of data that are critical to the mission of the organisation. Inventory control, airline reservations and banking transactions are just a few examples. The ‘mission-critical’ data used for these purposes need to be stored, updated, quality controlled, and protected. They also need to be readily available to authorised users. The servers that perform these mission-critical data functions are frequently referred to as “*enterprise servers*”. Enterprise servers tend to be larger and significantly more expensive than work group servers. Around 2001 a workgroup server usually had one microprocessor, modest memory (around four gigabytes) and typically provided services for between 25 and 35 clients. Enterprise servers, in contrast, tended to have at least eight processors, usually cost more than \$100,000 and in some circumstances can cost more than \$1 million. The uses to which mission-critical data are put, and the methods by which they are stored, accessed and used, vary widely across organisations. Thus, in contrast to the standardised applications that run on work

group servers, application programmes for enterprise servers tend to be custom written and specific to a particular organisation.

The case focused on workgroup servers for several reasons. First, the protocols involved in the interoperability issues all focused on protocols used for the execution of workgroup server functions. These are protocols that are not necessarily used for the functions executed by enterprise servers. Second, since enterprise servers rely largely on customized software whole solutions tend to be customized, which requires less reliance on standardized interfaces than standardized applications programs do.

## **5. SOME TECHNICAL ISSUES IN THE CASE**

### ***Interoperability***

The Commission gave many examples of where it believed Microsoft had limited interoperability. For example, the critical area of security services (e.g., authentication and authorisation) in Windows 2000 are based on a protocol called Kerberos. Kerberos was developed in the 1980s at MIT and has been used since then on a number of open standard networks, mostly UNIX-based<sup>9</sup>. Kerberos is a public protocol. However, in implementing Kerberos for Windows 2000, Microsoft added proprietary extensions that create interoperability problems. When presented with a

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<sup>9</sup> Simplifying, in a network that uses the Kerberos protocol; there is a server (the 'Kerberos server') that acts as a 'trusted intermediary'. When a user logs on to the network, the Kerberos server verifies the user's identity and issues a ticket that, in effect, vouches for the user's identity and specifies the network resources (e.g. files, printers, application programmes, databases, distributed objects) to which the user is allowed access. Once issued, these Kerberos tickets can be used for authentication and authorisation around the network, as long as the user remains on-line. One of the advantages of the Kerberos system is that authentication and authorisation can take place without the need to send passwords back and forth across the network -- a process that runs the risk of password theft.

Kerberos “ticket” (basically, a computer passport), the Windows 2000 server will only permit access to the services requested if the authorisation information appears in the Windows format. Conversely, if a non-Windows 2000 server is presented with a Kerberos ticket in the Windows 2000 format, it cannot process the request for authorisation. This means that, if a network wanted to use Windows 2000 on any machine it needs to run Windows on *all* of the servers or encounter significant burdens. Similar problems were alleged with other basic work group server tasks such as file and print (the CIFS protocol) and Directory services (Active Directory).

A great deal of discussion in the case centred on the factual question of whether or not interoperability between Microsoft and non-Microsoft OSes was really limited. Microsoft argued that interoperability was “good enough” – much information was disclosed and there were many ways to get around any compatibility problems through installing other “bridge” software (either on the PC client or server), reverse engineering, etc. In the end, talking to customers, survey evidence and expert testimony convinced the Commission that there were genuine serious compatibility issues. The key evidence was that bridge solutions were extremely rare and essentially never worked satisfactorily. The greatest barrier to such solutions is that they require considerable reverse engineering. However, such reverse engineering is slow and any success can be made completely obsolete through the next version of the Microsoft PC OS. Given the short product cycle in software products it appeared unlikely that satisfactory bridge products could work around the ever increasing interoperability problems.

In the end this issue was not central to the economic analysis of the case. As long as the interoperability problems created can significantly increase the costs of achieving interoperability with the PC OS by competing, foreclosure effects can be generated in the economic theories that support the case of the Commission. Interoperability restrictions by a dominant firm like Microsoft can then only be justified by efficiency benefits that are gained from restricting the access to protocol information.

### ***Market Definition***

As is usual in these cases, there was a huge amount of discussion concerning the existence or not of a market for work group servers OS. Although rather arcane to academic economists, market definition is usually a major issue in anti-trust cases.

The really key issue in this case was not the work group server OS market, however, but rather the market for PC operating systems. The Commission's theory asserted that Microsoft had monopoly power in PC OS and used this to leverage into other markets. So the critical issue was whether or not there was a well defined market for PC OS. If this was not the case, attempts by Microsoft to use its power here would be swiftly undermined as many consumers could easily switch to rival PC OS vendors if they were unhappy with the reduced interoperability of Windows with their servers.

For PC OSes it appears clear that there is little substitutability between Windows and other operating systems. If a UNIX based PC operating system or even Apple's OS would lower their prices by, say, 5% this can be expected to have a minute effect on the sale of Microsoft OSes. Part of the reason comes from an application network effect. There are a large number of software applications (e.g. Office type Word Processing, Spreadsheets, etc.) that are written specifically to the

Windows APIs. This means that these programs cannot easily be made to run on an alternative operating system, creating for users an enormous cost of switching the operating system. The failed attempt of IBM's OS/2 in the first half of the 1990s is an example how OS switching can be undermined because of compatibility problems with application software. On the basis of such evidence, it is highly unlikely that there is significant substitution in the period in question between Microsoft's PC OS and that of other companies.

Microsoft pointed to the possibility of a disruptive entrant that could change the whole face of computing. They argued that the risk of such potential entry disciplined their behaviour. Theoretically, it is questionable whether this should be the case. Microsoft should only lower prices once competitive entry occurs. But Microsoft insisted that Linux was an example of price constraining competition. However, the example seemed to show the opposite. Linux achieves low penetration rates on PCs despite being priced very competitively: at zero price. This suggests that Microsoft's dominance was unlikely to end soon. In the end, there was some consensus over Microsoft's dominance of a well defined market for PC OSes among most commentators (even Microsoft did not contest this very strongly)<sup>10</sup>.

There was much more disagreement, however, over the workgroup server OS market. As discussed above in section III there were clearly demand side characteristics that distinguished workgroup servers from more powerful enterprise servers. Prima facie these types of servers appeared to be at best very imperfect substitutes (or could even be considered complements in multi-tiered corporate

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<sup>10</sup> Although see the debate between Evans et al (2001) and Werden (2001) for some issues.

computing networks). Recent econometric work seems to have confirmed this intuition<sup>11</sup>.

Microsoft argued that software running on enterprise and workgroup server had to be considered perfect substitutes in terms of physical characteristics. They pointed to their own software that they used indistinguishably on any type of server. This argument is irrelevant for market definition if firms can discriminate in their pricing policies between different uses of a server operating system. Indeed, evidence was presented that Microsoft in fact price discriminated between workgroup, web, and enterprise server OSes by offering different licences at very different terms. In addition there was strong evidence that market shares differed strongly across these different server types. For example, the advance of Linux in server markets (see Figure 1) was somewhat limited to “edge” tasks like that of web serving rather than the core infrastructure tasks of workgroup servers like file, print, security and directory services. These pieces of evidence clearly demonstrated both that Microsoft had sufficient market power to price discriminate and that substitution in the workgroup server market was limited.

The evidence on Linux finding a niche primarily on web servers also supported another important point on market definition. Web servers are not subject to the interoperability problems with Microsoft’s PC OS that workgroup servers are. The reason is that web serving is done using exclusively public (open) protocols. However, an operating system that can be sold for web serving or even as an OS for enterprise servers would find it difficult to prosper as a workgroup server because of the low interoperability between non-Microsoft enterprise OS and the PC OS. In a world of limited compatibility (and if this was not the case then the Commission had

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<sup>11</sup> See Van Reenen (2004, 2006) or Ivaldi and Szcolin (2006)



no argument at all) the markets could be effectively separated<sup>12</sup> - even without reference to the price discrimination evidence.

From an economic point of view, however, the existence or otherwise of a work group server market was largely a sideshow. Although Figure 1 and the arguments above suggest that Microsoft did have *de facto* market power in the work group server market, the Commission's case did really not hinge upon this, as we will explain as we proceed to develop the theory of the case.

## **6. KEY ECONOMIC ISSUES I: ECONOMIC INCENTIVES TO FORECLOSE**

As stressed in section II, a theory of incentives is critical for economists seeking to understand the case. Not all of these incentive based theories are clear from the Decision.

### ***The One Monopoly profit theory***

To see the issues at stake consider Figure 2. Firm A the monopolist (PC OS) faces firm B in a complementary market (server OS). When will firm A exclude firm B from the adjacent market? Microsoft's essential argument rested on the Chicago view that a monopolist in one market will never have anti-competitive incentives to leverage. The basic reason is the "One monopoly profit theory". Degrading interoperability would cost Microsoft lost revenues as consumers would not be

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<sup>12</sup> The economic logic of this is compelling even though it may be troubling for lawyers as it mixes the abuse accusation with the market definition, two stages of the case that are usually considered independently.

willing to pay as much for a Windows OS for their PC due to its lower performance with non-Microsoft servers. Instead of going to the expense of attempted monopolization of servers through interoperability degradation, Microsoft could simply charge a higher price for its PC OS and extract all the rents from the server market in this way. Consequently, the entry of Microsoft into the server market must have benign reasons, such as its desire to end double marginalization (the excessive profits earned by oligopolistic server vendors) or the superior efficiency of Windows technology.

There are many reasons why the Chicago critique of the leveraging theory breaks down that are addressed by modern foreclosure theory (See Rey and Tirole, 2001, for a survey). For this case it is useful to distinguish between long-run (dynamic) and short-run (static) incentives in understanding why the standard Chicago argument will break down.

### *Dynamic Incentives to foreclose*

The lack of any long-run incentive to foreclose in the “one monopoly profit theory” arises primarily from the assumption of the Chicago school that the monopolist has a permanent unchallenged position with no threat of future entry in his primary market. This assumption is unlikely to hold for Microsoft’s position in the PC OS market. Although in the short-run it is protected by the applications barrier to entry, in the longer-run a variety of threats existed to its stream of rents. Consumers desire a computer operating system for the applications it provides and Windows has the advantage that it has a wide range of applications written to its interfaces (APIs) due to its ubiquity. But major platform threats emerged in the late 1990s associated with the growth of the Internet. One version of the threat was that increasing numbers of applications could be delivered through servers and the need for a sophisticated and

expensive OS on the PC client would erode. Server OSes typically run on open standards (variants of UNIX) and APIs so developers could increasingly write to these standards and APIs rather than Windows. Since they are operating systems that have to support a similar range of applications as PC OSs, server operating systems can credibly be expected to offer a rich set of APIs to programmers. This would mean that the server OS became a potential alternative applications platform. This could then introduce effective competition into the PC OS market. If applications only needed a slimmed down version of the PC client OS users would not necessarily need PC OS upgrades to buy into new OS functionality supporting their applications. (this is why it was called the “thin client model”). Effectively, a server platform based on a server OS could have become a potential competitor for the PC platform running a Windows OS. One way to prevent this danger was for Microsoft to monopolize the server market through degraded interoperability - even if this meant in the short-run sacrificing profits.

This dynamic argument is closely related to the U.S. “Browser Wars” case. There, Microsoft monopolized the market for web browsers by giving away Internet Explorer. The Department of Justice’s argument was that the web browser of the new entrant Netscape posed a threat to Microsoft not because it cared about profits of browsers *per se*, but rather because software developers were increasingly writing applications for Netscape interfaces (in conjunction with Java) rather than Windows interfaces. As the number of applications written to these non-Microsoft APIs increased, the applications barrier to entry in PC OS would weaken allowing new entrants into Microsoft’s primary monopoly. This argument is even more credible in the European workgroup server case, since a server operating system could even more

credibly expose a rich set of APIs to application program developers than Netscape in conjunction with Java.

There are other related dynamic incentives to monopolize the workgroup servers market because there are many other software markets that are complementary to servers and for which interoperability with servers is of great importance. These include web-enabled phones and PDAs. What is key about dynamic foreclosure theories is that an action that shifts short-run market share can have long-run benefits to the monopolist through depressing rivals' investment and innovation incentives (for example, see Bernheim and Whinston, 1998; Carlton and Waldman, 2002)<sup>13</sup>. In many cases these arguments may be suspect as there is no obvious mechanism whereby this could take place. In the Microsoft case the mechanism is well established due to the applications network effect. Shifts in share towards Microsoft in the server market (current and expected) will mean that developers will start switching away from writing to non-Microsoft interfaces. Customers will shift away from rivals because there are fewer applications and this will further reduce developer's incentives to write software. This applications network effect makes foreclosure arguments much more plausible than in other industries. Note that developers' incentives are reinforced by the incentives to invest in innovation. Falling share will, in general, mean that rival server vendors have lower incentives to invest in improving their software which again will lower their attractiveness to customers in a "vicious circle" of decline.

### ***Static Incentives to foreclose***

The dynamic arguments work even though, in the short run, the monopolist may suffer some losses. However, foreclosure arguments are even more compelling

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<sup>13</sup> See also Whinston (1990, 2001)

when there are short-run incentives to foreclose. One short-run incentive effect is the desire to more effectively use second degree price discriminate in the primary market (in this case the PC's OS) through monopolizing the secondary market. Such imperfect price discrimination possibilities are assumed away in the One Monopoly Profit theory as it relies on the monopolist's ability to fully extract all the rents from the primary market. This assumption is generally not satisfied because monopolists cannot perfectly price discriminate due to arbitrage. Large businesses with less elastic product demand, for example, can pretend to be small businesses when they buy their computers.

In the context of the Microsoft case consider the idea that there are two types of customers, large firms (who are less sensitive to the price of the PC OS) and small firms (who are very sensitive to the price of the PC OS). A price discriminating monopolist would like to charge a high price to the large firms and a low price to the small firms. Arbitrage will limit the ability to do this however, so that systematic differential pricing of PC OSs is typically not possible among different businesses. But consider the case that large firms also place a high valuation on a complementary product – servers - whereas small firms do not because the gains from sharing computing resources are smaller. In this case, by monopolizing the server market and charging a higher price for the PC and server OS bundle, the PC OS monopolist effectively “restores” second degree price discrimination in the primary market<sup>14</sup>.

From a welfare perspective price discrimination has ambiguous effects because output may rise. But in this case the welfare effects are likely to be negative as reducing interoperability immediately degrades the quality of rival products and causes a welfare loss to consumers who purchase those goods.

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<sup>14</sup> These ideas are formalized and tested for the PC and server markets in Genakos, Kühn and Van Reenen (2006). There does appear to be evidence that this incentive matters for Microsoft's behaviour.

Both long-run and short-run incentives are part of modern foreclosure theory. Although often expressed legally in the language of “acquiring profits” in the secondary market, foreclosure is really about extracting rents more effectively from the monopolist’s primary market both today and in future periods.

## **6. KEY ECONOMIC ISSUES II: REMEDIES AND INNOVATION**

Software markets are fast moving and highly innovative and some new economy advocates have suggested that existing European Competition law is inadequate in such markets. In particular, Microsoft argued that the proposed remedies of forced disclosure of interoperability information would have a severely negative effect on innovation as it would lead to the wholesale “cloning” of Microsoft’s valuable intellectual property. Whatever the supposed short-run gains, they argued that the long-run costs in terms of lower innovation by Microsoft would swamp these purported benefits.

These are legally difficult areas as the Commission was under no legal obligation to consider the effects on innovation, despite their economic importance. They chose to do so however and claimed (*Commission, 2004, ¶ 783*) “.... *a detailed examination of the scope of the disclosure at stake leads to the conclusion that, on balance, the possible negative impact on Microsoft’s incentives to innovate is outweighed by its positive impact on the level of innovation of the whole industry*”

In order to consider these claims we must investigate what the Commission’s remedies and their likely impact on innovation incentives on Microsoft, on its rivals and therefore on the market as a whole. It is worth bearing in mind that there is no

theoretically unambiguous answer to these inherently difficult – but important – questions.

***What did the Commission ask for in its Remedies?***

The Commission asked Microsoft to reveal interoperability information (interfaces, protocols, etc.) necessary to allow rivals to interoperate with Microsoft’s Windows platform. This amounts to a compulsory licensing remedy. The Commission conceded that Microsoft could charge a reasonable fee for such licenses reflecting the intellectual property embedded in the information. An independent Monitoring Trustee was chosen to arbitrate on the appropriate degree of information and Microsoft was left with the choice of how best to allow this to occur subject to the reasonableness of the licensing conditions (we discuss what “reasonableness” might mean below).

It is worth noting an important analytical distinction between demanding information to enable *interoperability* compared to *imitation*. The Commission wants the former to enable firms to connect to Microsoft’s PC OS monopoly in the same way telecom regulators force fixed line incumbents to share their network with firms selling complementary services even if the incumbent also offers these services (such as mobile telephony where the fixed line incumbent often also operates in the mobile market). Another analogy would be that a monopolist of cars was required to disclose how rival tire manufacturers would be able to be compatible with the wheels of the car. If the remedy allowed *imitation* - of the key security features of the PC OS – there would be a stronger concern over innovation. Consequently, the remedy *did not* require release of Windows source code – the “crown jewels”.

Interestingly, windows source code is not what the rival server vendors wanted in any case. Instead they were after a detailed technical description of the interfaces to enable them to design their own code to interoperate with Windows. The description of the remedy as allowing “cloning” is therefore inaccurate. There was no desire to obtain what software engineers describe as the “implementation”<sup>15</sup>. Indeed, use of the information beyond that necessary for interoperability would be a violation of intellectual property rights by the rival server OS producers.

***Effects of the remedy on the incentives of server OS rivals to invest in innovation (R&D)***

The remedy effectively reduces the price for some interoperability features from infinity to a price that would lead to rivals being able to offer interoperable solutions. The main effect of giving interoperability information to rivals is that the level of interoperability with Microsoft products increases making rival products more valuable, increasing their sales. This will increase their return to R&D (relative to the world without interoperability information) as any innovation will be spread over a larger number of units sold. The remedy essentially reduces the cost of rival innovation and should, therefore, increase innovation incentives.

Secondly under the remedy, rivals would no longer have to incur costs to overcome barriers to client-server interoperability created by Microsoft’s disclosure policy. This includes creating bridge software, etc. This is an innovation of a sort, but it is duplicative and socially wasteful.

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<sup>15</sup> An issue arises whether providing interoperability information would of necessity reveal so much that rivals could imitate. This can be protected by technical and legal provisions. Part of the “necessity” reflects Microsoft’s own design decisions of its software, however.



Both of these effects should increase rivals' R&D incentives to improve quantity and quality of their productive innovations.

*Effects of the remedy on Microsoft's incentives to invest in innovation*

Again there are several considerations. First, with better disclosure, rivals will be able to compete on a level playing field. To the extent that this reduces the expected market share and increases price competition from now higher quality rival products the remedy may lead to some reduction in Microsoft's incentive to invest. However, unlike its rivals, Microsoft will still obtain substantial profits from general operating system innovation in the PC OS market, where it will continue to enjoy a monopoly position. There is therefore little reason to expect that Microsoft's incentives to innovate on OS solutions would substantially fall.

A further effect may also contribute strongly to increased innovation incentives: Through innovation a firm can escape harsh competition with rivals and secure rents for a transitory period. This effect will tend to increase the investment incentives of all firms including Microsoft. The theoretical and empirical literature is somewhat ambiguous on the net impact of all of these effects, but on balance it is believed that intensifying competition will usually lead to increased innovation (e.g. Vives, 2005).<sup>16</sup>

Finally, Microsoft may change the quality as well as the quantity of its R&D. There could be positive effects on quality because Microsoft will no longer have incentives to block innovations that raise quality but have high interoperability with non-Microsoft servers. There is some evidence that Microsoft has sacrificed its own innovative potential (especially in areas where the innovations would be cross-

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<sup>16</sup> There is some support for the notion that in high innovation industries like OS software the intensity of innovation is enhanced by more competition. An example comes from the computer industry: Macieira (2006) estimates that in the supercomputer industry an increase in competition would not only increase the rate of innovation of the industry as a whole but also the rate of innovation of the industry leader.

platform) in order to protect the Windows desktop monopoly. This was known internally to Microsoft as the Windows “strategy tax” – the need to close down research lines that, although leading to innovative products, could potentially weaken the lock-in of Windows<sup>17</sup>.

In summary, there are likely to be positive effects on rivals’ innovation from the remedy and ambiguous effects on Microsoft’s incentives. While no one can sign the eventual outcome, the discussion highlights that it is far from clear that the remedy will chill industry-wide innovation. There are as many reasons for believing that it could have a positive effect on aggregate innovation.

### ***Interoperability at what Price?***

The most contentious issue after the Commission Decision have been the conditions under which the interoperability information should be licensed and what information was necessary to achieve full interoperability. The Commission left the exact conditions out of its initial decision because it involved intricate review of technical information which was beyond the scope of the investigation and which was delegated to the Monitoring Trustee.

Microsoft’s initial suggestions were far from acceptable to industry rivals, the Commission and the Trustee. Microsoft proposed that the protocol and interface information could only be purchased as one bundle and specified a licence fee for each rival software copy shipped in the order of magnitude of the Microsoft software itself. This would have clearly continued the exclusive effect simply through high prices. Indeed, the position of rivals was far removed from this. Many industry insiders doubted that any innovation of significance was embedded in the interfaces

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<sup>17</sup> See Banks (2001). For example ‘Many of Microsoft’s best innovations were killed before they ever came to market. Inside Microsoft such sacrifices were known as paying the “strategy tax” ’ (p.71)

themselves. Just changing the language of the protocol would not be a substantive innovation that had material value and therefore should not be compensated. Indeed, to the extent that Microsoft has innovation embedded in processes that use the protocols such innovations should not matter for the assessment of the license fee because the protocols themselves do not constitute the innovation. Typically interface and protocol information in other software sectors are licensed at only nominal fees so that the demands of Microsoft appeared by far exaggerated.

A second contentious issue is the amount and type of information that Microsoft has to provide. To interconnect with Microsoft's software rivals do not need code, which no one could interpret, but information about how exactly the interface works. When the Trustee strongly stated that Microsoft was not forthcoming with sufficient information to make this possible, the Commission stepped in with a Statement of Objection and eventually the large fine for non-compliance. However, this tug of war has led to considerable delay in the effective implementation of the remedy, which would be in the interest of Microsoft if the practice did indeed have significant exclusionary effects.

## **VII THE MEDIA PLAYER PART OF THE CASE**

While in the general public the case against bundling the Windows Media Player with the PC OS has been perceived as another case analogous to the US Browser War case this is in fact not the case. The rival Real Player, unlike the combination of the browser and Java, was unlikely to ever expose a rich enough set APIs to programmers

to credibly develop into an alternative operating system platform. The theory of the case is therefore quite different from that of the workgroup server part of the case.

The Media Player case is really about competition for clients that produce media content. To such clients Microsoft and Real sell at considerable prices software solutions that encode media content into proprietary digital media formats that make files transferable over the internet and may allow media streaming. Media content providers themselves sell the media content to the desktops of individuals. There are large benefits to content providers to specialise on one format, not the least because of the technical support involved. Besides quality characteristics like transmission speed that is influenced by the format and the encoding software media content providers also care about how many desktops they can easily reach. This depends on whether the desktop already has a decoder for the particular format installed or not. By bundling Windows Media Player with the PC OS, Microsoft assured ubiquity on the desktop, a property that rivals have to struggle with. This gives Microsoft a competitive advantage and market power in the market for encoding software that has nothing to do with the actual quality of its product.<sup>18</sup>

A remedy for this case could have come from ordering total unbundling and prohibitions on exclusivity contracts with OEM manufacturers of PCs. This would have then allowed PC users to decide on the set of Media Players they wanted loaded on their desktop at the time of purchasing the computer. Alternatively, Microsoft

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<sup>18</sup> A more detailed discussion of this part of the case can be found in Kühn, Stillman, and Caffarra (2005)

could have been forced to allow the loading of all three decoders, i.e. Media Player, Real Player, and Quicktime when the machine was shipped.<sup>19</sup>

Unfortunately, the Commission chose a remedy that did not address the basic issues. Instead of an unbundling measure the Commission forced Microsoft to sell a version without Media Player but also allowed selling a version with Media Player. Microsoft then has incentives to sell both at the same price. A customer can then only gain by buying a version with Media Player and the ubiquity advantage of Microsoft in the market for encoding software is preserved. The basic anticompetitive issue in this part of the case was therefore not resolved by the remedy.

## VIII CONCLUSIONS

In this chapter we have focused on the work group server part of the European Commission vs Microsoft (2004) case, which is perhaps the most high profile European anti-trust case of all time. Microsoft was found to be in violation of Article 82 of the Treaty of Rome through abusing its dominant position. It was fined and instructed to meet several behavioural remedies including compulsory licensing of information to enable rivals to inter-operate with its operating system.

We end with some remarks on the case and suggest that there may be more general lessons to be learnt about anti-trust enforcement in high tech markets and elsewhere.

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<sup>19</sup> Although there are many other media players there are only these three that have decoders for their own, proprietary, format. When they play files they actually use the decoders of the other programs in the background. For example, Real Player does not “play” Windows Media Files. It simply calls up the Windows Media Player to decode the file and then displays the video in the Real Player frame. In contrast to proprietary interfaces there are large gains from making media formats proprietary because on those there is considerable innovation.

First, it is worth remembering that the case has gone on for nine years with three Statements of Objections issued and still no final resolution. This is partly a reflection of the complexity of the technical issues, legal necessity of due process and the financial strength of the Microsoft Corporation. Many of the server rivals have long since died. An obvious problem is that the legal timescale is so long compared to the rapid evolution of these markets. By the time a remedy is in place, the marketplace has moved quickly beyond the problems over which the case was fought. Even if the judgement and remedy are appropriate is it “too little too late”? On the other hand, some impact may have been retained because the Commission's decision is prospective so that it gives the Commission leverage over all future Windows versions.

Furthermore, we believe that, although caution is always warranted before intervention, anti-trust authorities cannot take a completely laissez-faire approach to innovation markets. Much of the positive impact of competition policy is through deterring anti-competitive behaviour without the need for ever taking legal action. In fact, software markets are replete with examples of similar complementarity issues and the case may have contributed to higher deterrence effect against anticompetitive exclusionary behaviour.

A second observation concerns the status of foreclosure theory. Part of the Commission's case was an explicit consideration of economic incentives and an analysis of the effects of the remedy on innovation. These are clearly important from an economic perspective, even though European legal practice is often ambivalent about getting into these issues. Despite the difficulty of bringing empirical evidence to

bear compared to say, a standard share calculation in a market definition exercise<sup>20</sup>, consideration of innovation and foreclosure was unavoidable in making a credible economic case. One of the challenges facing modern economics is to develop guidelines for the type of empirical evidence that could be used to test the likelihood of foreclosure being a problem in different markets.

The European Commission has come in for much criticism in its use of foreclosure theories in merger cases. For example, the Commission blocked the proposed merger of General Electric and Honeywell after it had been cleared by the U.S. authorities only to see their judgement (although upheld) severely criticised the Court of First Instance in 2005 (see Vives, 2007). In 2002 the Court actually overturned the Commission's blocking of the Tetra/Sidel merger in 2001 which was based on over-speculative theories. In a sense, foreclosure theories in a merger case are inherently highly speculative. Opponents of the merger must produce arguments that a particular type of foreclosure behaviour is more likely to occur as a result of the merger, although there are no exclusionary practices in the pre-merger situation. The evidential position is better in an abuse of dominance case because the exclusionary behavior is already alleged to have happened, so there can be an empirical discussion over whether the behaviour has in fact occurred, whether it could have pro-efficiency justification and whether there was any material effect on the marketplace as a result of this behaviour. This was the case in Microsoft where an *ex post* evaluation was possible. Furthermore, the exclusionary mechanisms of Microsoft were lent credibility by internal e-mails from senior executives. This is the type of evidence that is rarely seen but is legally persuasive.

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<sup>20</sup> Or more sophisticated attempts at market definition and merger analysis using econometrics such as Hausman et al (1994).

Unfortunately, although foreclosure may be easier to detect in an Article 82 case compared to a merger case, remedying the problem is much harder. In a merger there is always the clear choice of simply blocking the proposed transaction. Remedies under Article 82 are harder to frame and even harder to enforce. The Commission and Microsoft have been in long-standing wrangling over the terms of the disclosure remedy and it is still not perceived to be effective<sup>21</sup>. Microsoft's main rivals have reached out of court settlements, so one concern may be that smaller firms and potential new entrants could be the main parties to suffer. Most importantly, this type of settlement does not necessarily help consumers of computer software.

We are unlikely to have heard the end of this case.

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<sup>21</sup> <http://news.bbc.co.uk/1/hi/business/5153570.stm> downloaded 30.1.07



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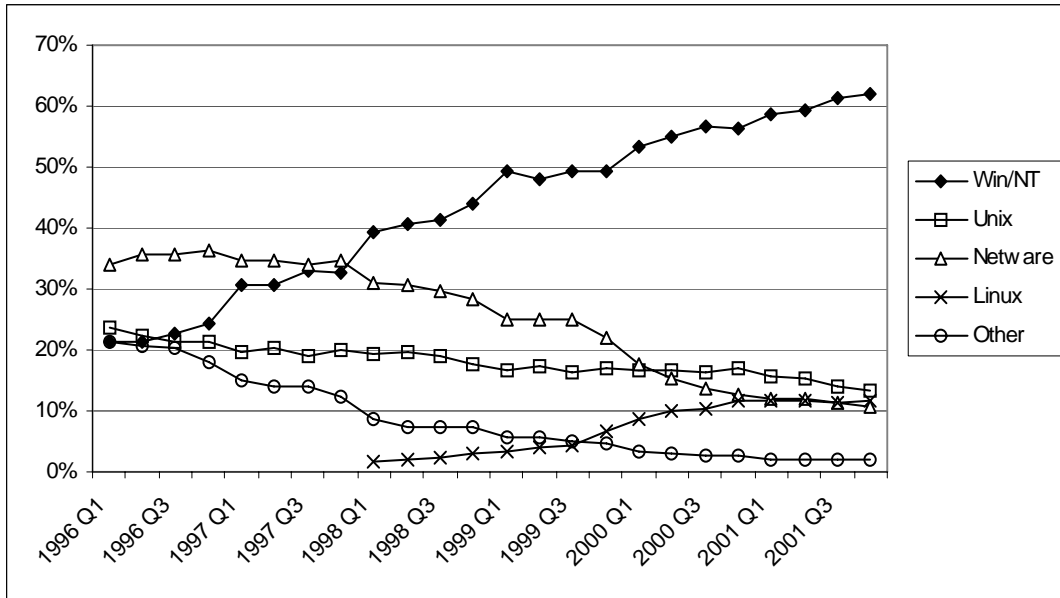
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**Figure 1: The growth of Microsoft's share in the work group Server market  
1996-2001**



**Source:** IDC Quarterly Server Tracker

**Notes:** Initial Server Shipments units of all servers under \$100,000

**Figure 2: Leveraging Incentives**

