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the Interoperability Issue in the Microsoft Europe Case

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The Interaction between Antitrust and Intellectual Property:
the Interoperability Issue in the Microsoft Europe Case

Alessandro Diego Scopelliti*§

Abstract

The present work analyzes the interaction between antitrust policy and intellectual property protection, with particular reference to the cases of refusal to supply, when it concerns ideas or inventions protected by an IP right. For this purpose, the paper preliminarily discusses the governing principles of antitrust policy on abuse of dominance and refusal to deal, as they have been implemented in the decisions of the EU Competition Authority, and it presents the specific issues related to the implementation of antitrust policy in the innovative industries.

Then, the paper examines in particular the Microsoft Europe Case, as decided by the European Commission in 2004, focusing on the issue of the interoperability between the operating systems for personal computers and the operating systems for work group servers. The theoretical model, developed as an extension of the framework proposed by Choi and Stefanadis (2001) to the case of refusal to deal, suggests an explanation of the case, alternative to the one adopted by the Commission, if not necessarily in the final outcome of the decision, at least in the analytical arguments and in the dynamics of the market structure. In particular, we show that the refusal to supply the compatibility between the two complementary products was determined not only by the intention to leverage its dominant position to the adjacent market of server operating systems, but especially by the concern for keeping the monopoly on its core market, that is the one of PC operating system, given the future evolution of the software market, due to the diffusion of cloud computing.

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1. Introduction

The present paper aims at analyzing the interaction between antitrust policy and intellectual property protection, in order to discuss the practice followed by the Antitrust Authorities in the cases regarding refusal to supply, especially when it concerns ideas or inventions protected by an IP right. In these situations, the legitimate right of the IP holder to exclusively exploit the invention may be limited by a compulsory licensing decision of the Competition Authority, if the required information cannot be available in another way and if the denial to share it may substantially eliminate competition. In fact, this refusal to deal may produce a foreclosure effect for the competitors who need that intellectual property content, as an essential facility in order to produce their goods or deliver their services.

In general, the market interested by this foreclosure effect can be either a downstream market, when the refused facility is a required input for the production of a downstream product in a vertically structured industry, or an adjacent market, when the IP holder denies some information which are necessary for allowing the compatibility between complementary products. In particular, in this chapter we will focus on the latter issue: in fact, in order to examine the controversial relation between antitrust and intellectual property, we will consider a paradigmatic case, that is the Microsoft Europe Case, as decided by the European Commission in 2004, and more precisely we will study the issue of the interoperability between the operating systems for personal computers and the operating systems for servers.

This analysis of the refusal to supply intellectual property, with particular attention to the Microsoft case, will be also useful to have an intuitive understanding of a broader policy issue, concerning the effects of antitrust policy on technological progress: i.e. how the decisions of a competition authority may affect the incentives of the existing firms for investments in innovation, especially when the leader is obliged to share its advanced technology with the competitors[1]. Indeed, a key argument often proposed by dominant firms before the Competition Authorities in order to justify the refusal to supply is that the disclosure of this information would restrict their intellectual property right and then would reduce the expected award for their innovation effort. As a consequence, according to this view, such decisions of the Antitrust Authorities about compulsory licensing would lessen the incentives for innovation in the future, both for the leader, and for the

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[1] In fact, a compulsory licensing decision can be considered as a typical example of a policy aimed at increasing the degree of competition in the market: in fact, if the firms operating in a given market, thanks to such a decision of the Antitrust Authority, are entitled to share the same technology level or the same scientific knowledge elaborated by the leader, they can benefit from the same competitive conditions, so they engage a market competition based on prices, rather than on product qualities or technological features.

followers, given that nobody would be interested in investing in R&D, knowing that he could be required to reveal the results of this innovation activity to other undertakings.

Then, as it is clear from this problem, in several situations we can observe a clear trade-off between the protection of intellectual property and the implementation of antitrust policy, particularly in the cases of abuse of dominance. The solution of this possible conflict is determined case by case by the Antitrust Authority, which takes the relevant decisions on the basis of some general guidelines, also supported by some legal jurisprudence.

For this reason, it can be useful to consider the governing principles of antitrust policy on abuse of dominance and refusal to deal, as they have been implemented in the decisions of the Competition Authorities. To this end, we recall the general concept of the abuse of dominant position within the EU Competition Policy and we discuss the issues related to its implementation in the innovative industries. Then, we pay attention to the cases decided by the European Commission within the legal framework provided by art.82 TEC for the abuse of dominant position and we define the conditions under which a refusal to supply can be regarded as an abusive conduct for a dominant firm. On the basis of these premises, we analyze in particular the Microsoft Europe Case, by proposing an explanation of the case, alternative to the one adopted by the Commission, if not necessarily in the final outcome of the decision, at least in the analytical arguments and in the dynamics of the market structure.

2. Antitrust Policy and Intellectual Property in the Cases of Abuse of Dominance

In principle, the problem about the interaction between antitrust policy and intellectual property protection could exist both for the analysis of the abuse of dominance and for the investigation of the collusive agreements. In fact, also collusive agreements can include some provisions about intellectual property, such as the arrangements regarding patent pooling or cross-licensing[2], and also these agreements can raise concerns for the antitrust policy if they produce some foreclosure effect for the firms not taking part in these arrangements[3]. Nevertheless, the investigation about the cooperative arrangements between IPR holders is usually conducted by the Antitrust Authorities according to a more lenient approach, either because specific exemptions for

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[2] In particular, a patent pool is an agreement under which a group of patent holders exploits and licenses, as a bundle, all the patents the members hold; while a cross-license is an arrangement among two or more firms, where each of them is granted the right to use the technologies patented by the other parties.

[3] For example, the exclusion of a firm from a pooling agreement can have an anticompetitive effect if the excluded firm cannot effectively compete in the market for a given good, which requires the licensed technology, and if the participants collectively have market power in the relevant market.

technological transfer are provided by the antitrust laws, or because the analysis of these agreements sometimes shows the existence of some pro-competitive effects overcoming the anti-competitive ones. So, at the end, the tension between antitrust policy and intellectual property protection assumes a special relevance in the cases concerning the abuse of dominant position[4].

The general rule on the abuse of dominant position is provided by the art. 82 of the Treaty of the European Union, whose first paragraph states that:

"Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market in so far as it may affect trade between Member States."

The traditional analysis of the abuse of dominance in the EU Antitrust Policy requires two stages: firstly, the identification of a dominant position; secondly, the definition of the abusive conduct. Within this order, the second step is strictly consequential to the first one, because some conducts can be considered as abusive only if they are implemented by dominant firms. In fact, the EU Competition Law doesn't consider per se illegal the existence of a dominant position, especially if it is obtained thanks to a competition based on the merits. But the dominant firms, because of their large market power, must have a particular responsibility in the adoption of their conducts. This explains why some practices which are perfectly allowed to a small firm could be prohibited to a dominant firm.

The most important problem about the abuse of dominance in the innovative industries concerns the definition of the relevant market and consequently the determination of the market shares held by a given undertaking. In fact, high-technology industries present two particular features, which can raise some doubts about the utility of the traditional approach. Firstly, the boundaries of the market cannot be easily defined, because the market is subject to a continuous evolution, given the introduction of new products or the quality improvements for the existing products. Secondly, the type of competition which is relevant in these industries is the competition for the market, rather than the competition in the market. In fact, several firms may be interested in entering a given market and then they compete in order to invent a new product, more advanced than the previous one, which can better satisfy the demand from the consumers. But once that the firm has won this competition in order to get the market demand, it becomes the market leader and then it acquires a monopolistic position. In this case, there cannot be a competition in the market, based on different prices, simply because in this Schumpeterian setting only one firm owns the advanced technology and all the customers are interested in the new version of the product. Of

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[4] The abuse of dominant position in the EU Competition Law corresponds to the notion of monopolization regulated in Section 2 of the Sherman Act.

course, this doesn't mean that there is not competition in such market, given that many firms can potentially enter the market and then challenge the dominant position of the incumbent. As a consequence of that, the competition for the market is the type of competition that must be pursued as an objective in high-technology industries.

Moreover, the abuse of dominant position in the EU Competition Law has been recently object of a broad discussion, promoted by the European Commission in order to revise the application of art.82 to the exclusionary practices in the perspective of an economic approach. Such approach focuses on the objective of improving consumer welfare[5], as stressed in the Report of the Economic Advisory Group on Competition Policy[6]: "in so doing, it avoids confusing the protection of competition with the protection of competitors and it stresses that the ultimate yardstick of competition policy is in the satisfaction of consumer needs."

As it is also explained in this report, an economics-based approach to the application of article 82 implies that the assessment of each specific case will not be undertaken on the basis of the form that a particular business practice takes (for example, exclusive dealing, tying, etc.) but rather will be based on the assessment of the anti-competitive effects generated by business behaviour. This implies that competition authorities will need to identify a competitive harm, and assess the extent to which such a negative effect on consumers is potentially outweighed by efficiency gains.

Another important consequence of this approach is in terms of procedure: the economic approach implies that there is no need to establish a preliminary and separate assessment of dominance. Rather, the emphasis is on the establishment of a verifiable and consistent account of significant competitive harm, since the anti-competitive effect is what really matters and is already proof of dominance. This approach has also natural implications in terms of the burden of proof in specific cases. Competition authorities have to show the presence of significant anti-competitive harm, while the dominant firm should bear the burden of establishing credible efficiency arguments.

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[5] In general, the main objective of the antitrust policy should be the maximization of the consumers' welfare, within a competitive market structure, rather than the protection of the business interests of the single firms against the abusive conduct of a leader or the collusive effect of a cartel. In practice, we have often observed the opposite in the implementation of the EU Antitrust Policy, as many economists have correctly argued. And even if the two objectives are not conflicting each other, the pursuit of one objective doesn't necessarily imply the satisfaction of the other one. On this issue see for instance Etro F. (2007), *Competition, Innovation and Antitrust*, Springer - Verlag

[6] Gual J., Hellwig M., Perrot A., Polo M., Rey P., Schmidt K. and Stenbacka R. (2005), *An Economic Approach to Art.82*, Report by the Economic Advisory Group on Competition Policy

2.1 The Abuse of Dominance and the Refusal to Supply in the EU Antitrust Policy

In general, the refusal to supply the information protected by intellectual property cannot be considered per se as an abusive conduct, even for a dominant undertaking, simply because the exclusion of the other agents from the exploitation of a given facility is a typical prerogative of the owner of any property right, whatever is the object of this legal protection, a physical good or an intellectual idea. Moreover, the introduction of an economic approach in the interpretation of the antitrust discipline in the last few years has excluded the application of per se rules and has required a specific demonstration of the damage produced for effective competition in the market and especially of the loss generated in terms of consumers' welfare. And in fact, according to the case law developed by the Court of Justice of the European Union on this issue, such refutation may be considered as an anti-competitive behaviour only if some conditions are satisfied: if the requested intellectual property is indispensable for the other firms to compete; if the refusal to deal causes the complete foreclosure of the market; if the refusal prevents the emergence of markets for new products for which there is substantial demand; and if the refusal is not objectively justified[7]. In such situations, defined as "exceptional circumstances", such conduct of a dominant firm, holder of the intellectual property right, is supposed to have an exclusionary purpose and then it is considered as an abuse of dominance.

A central issue, in the application of these conditions, is the so called new product test. In fact, in order to establish a duty to license intellectual property, the Commission must verify that the product to be developed is effectively a *new kind* of product, and not simply a quality improvement of an existing type of product. This requirement is consistent with the view that a refusal to supply is unlawful if it produces a prejudice to consumers: vice versa, if consumers receive a market option that didn't exist previously and for which there is demand, there is a clear benefit to consumer welfare. In particular, a new product is one which satisfies potential demand by meeting the needs of consumers in ways that existing products don't do. So the new product enlarges the set of choices available to consumers and expands the market by bringing in consumers who were not satisfied before. Of course, the application of this criterion implies several concrete problems: while in some cases the novelty of a given product is evident, in many other situations different degrees of novelty

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[7] Initially, these conditions were determined in several antitrust cases concerning the refusal to supply physical facilities, such as the infrastructures of a port. More recently, they were established also for the refusal to supply intellectual property, such as the information regarding the TV programs broadcasted by different TV companies. In particular, these circumstances were held by the European Court of Justice in the decision on the case Magill, concerning the refusal by some Irish TV companies to license the program listings to Magill, the compiler of a comprehensive weekly TV guide. In that case, such refusal was judged as an abusive conduct under art.82 and then the Court stated an order for a compulsory license of the listings material from the TV companies, in order to allow Magill to produce its guide.

can be distinguished. Moreover, another disputable profile of this test is the identification of the substantial demand, given that it is difficult to analyze the demand for a product that still doesn't exist. Anyway, the need to check the existence of this potential demand requires that the development of the product is in a quite advanced stage, such that the information protected by the intellectual property is essential to complete the design of such product.

2.2 A Competition Policy for Intellectual Property Rights?

An important issue, also discussed in policy debates, is whether antitrust intervention should differ in the cases involving intellectual property rights, for example through the introduction of some specific exemptions in the implementation of competition law. In fact, both in the EU and in the US, for the purpose of antitrust policy, intellectual property is considered as comparable to physical property, so it doesn't receive a stronger protection. Nevertheless, intellectual property presents some specific characteristics, because of its role in promoting research and development: indeed, legal protection enhances market power of right-holders, such that they can raise prices above marginal costs; but, at the same time, it gives to innovators the possibility to profit from the fruits of their efforts. Then, once that the two countervailing arguments are compared, it can be argued that, from the consumers' point of view, some market power in the supply of goods or services can be an acceptable price to pay for the creation of new or improved goods or services.

So, the current view in antitrust policy is that the owners of intellectual property rights are entitled to profit from the exclusionary power of their rights, but they can do it without creating other restraints on competition. This implies, in practice, a distinction between a primary market and a secondary market (or after market). Let define as primary the market of the specific product for which the intellectual property is granted: in this market the IP owner can fully exercise his right and then can exclude other agents from the exploitation of the protected content. In this case, the dominant position of the IP holder is also compatible with the antitrust law, given that it represents the outcome of a competition based on the merits: in fact the IP owner has gained a monopolistic market power thanks to the introduction of some fundamental innovations which are demanded and appreciated by the consumers. Moreover, let consider as secondary the market for a different product, which is however dependent on the product in the primary market: in this context the IP holder cannot exclusively exploit the intellectual property right, and especially cannot use it in such a way to leverage its monopoly power in the primary market to acquire a dominant position in the secondary market. In fact, that dominance in the aftermarket would not be determined by a competition on the merits, but by an abuse in the exercise of an IP right granted for a different market.

So, on the basis of this distinction, used both by the European Court of Justice[8] and by the US Jurisprudence on essential facilities, we can argue that the refusal to supply intellectual property to a competitor operating in the same (primary) market cannot be defined as an abuse, while the same refusal to an undertaking in another (secondary) market can be considered as an antitrust violation to the extent that it can be proven to stifle competition in after markets.

This distinctive criterion has been adopted as a compromise solution between different interests: on one hand, the idea of protecting intellectual property at least in the specific market of the product for which the IP right has been granted; on the other hand, the intent to avoid unreasonable exclusionary effect due to the exercise of an IP right in markets for different products. Nevertheless, this distinction can be – and in fact has been - criticized for several reasons. Firstly, because it is difficult to define the boundaries between the primary market and the secondary market, especially when the new product that another firm wants to develop is however very similar to the product which incorporates the innovation protected by a patent. Secondly, because it cannot be excluded that the intellectual property content supplied to a competitor in the secondary market can be exploited by the same firm in order to enter the primary market. In particular, this latter issue cannot be ruled out even when the new product supplied by the licensee firm in the secondary market is clearly different from the one sold by the IP holder in the primary market. We consider a clear example of this problem right in the Microsoft Europe case: in fact, in that situation, the firm interested in the interoperability information in order to develop a compatible server operating system was also a possible entrant in the market for PC operating systems. In these cases, even if the disclosed information are not immediately usable in order to build up a new product for the primary market, the supply of intellectual property by the right-holder may certainly incentivize the imitation process by the licensee firm. Then, in presence of these concerns, we can wonder whether it is worth to establish a compulsory licensing of the IP right even for the secondary market.

So, the final issue is whether an effective protection of intellectual property rights, also for innovation-enhancing purposes, can eventually require a specific antitrust discipline, also implying some exceptions to the application of the competition law. At present, some exemptions are admitted by the EU Antitrust Law only for the collusive agreements: in fact, art.81 par.3 of the EU Treaty provides a specific exemption for the agreements and concerted practices which contribute to promoting technical or economic progress, while allowing consumers a fair share of the resulting

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[8] Let consider for example the decision in the case Magill: there the primary market was the one of TV broadcasting, while the secondary market was the one of guides for television programs. The refusal to supply the information, required by Magill in order to compile television program listings, was judged by the European Court of Justice as an abusive conduct, because it had foreclosure effects on a secondary downstream market, different from the primary market where instead the TV Companies were entitled to freely exercise their copyright.

benefit. On the basis of these Treaty provisions, some regulations have been adopted for the agreements concerning technological transfer. On the contrary, no exemption is admitted for the general rule on abuse of dominance, under art. 82 TEC: then a dominant firm, holder of an intellectual property right, has to pay particular attention to its conducts, because each exclusionary practice in a secondary market, if not supported by an objective justification, can be considered as an abuse of dominance, also in the exercise of an intellectual property right.

3. The Antitrust Microsoft Europe Case

After discussing the main principles governing the refusal to supply intellectual property within the EU Antitrust Policy, we want to focus on the Microsoft Europe Case, as decided by the European Commission in 2004. In particular, we analyze the implementation of the EU antitrust rules to the case and we propose a dynamic leverage theory in order to describe the strategic behaviour of this corporation within the software market. More specifically, this explanation will point out the endogenous dynamics of such market and then will draw attention to the Microsoft's attempt to influence the market structure, in such a way to defend its dominant position in the market of PC operating systems, against possible threats for the future.

But, in order to understand the complexity of the Microsoft Europe Case, it is worth to briefly recall some facts about the various antitrust cases regarding this corporation both in the EU and in the US, as well as to explain some features about the structure of the relevant markets in the case we are considering.

3.1 Some Facts about the Microsoft Antitrust Cases in the US and in the EU

Microsoft Corporation, known as the producer of Windows, the most widely used operating system for personal computers, has been the object of several antitrust procedures both in Europe and in the US, because of its very large – near monopolistic – market share, and specifically for its monopolistic business practices towards consumers and its discriminatory strategies against competitors. For our purposes, the study of the Microsoft antitrust cases is interesting because many of these controversies involved issues about intellectual property protection in the software market: in particular, whether a given exclusionary conduct adopted by such a dominant firm can be considered simply as a way to exercise an intellectual property right or better as an abuse of dominance and under which conditions such undertaking can be obliged to license to the competitors some protocols protected by intellectual property.

The first Microsoft case in antitrust policy was started by the US Department of Justice in 1998, after several complaints regarding alleged antitrust violations by Microsoft in the PC operating systems market and in the browsers market[9]. In particular, the following points were raised: first, the maintenance of monopolization in the market of Intel-compatible PC operating systems, through various anti-competitive conducts, like exclusionary provisions in licensing agreements with original equipment manufacturers, as well as exclusive dealings with internet access providers; secondly, the tying of the Windows operating system with Internet Explorer, which had a foreclosing effect towards the other competitors in the browsers market, in particular Netscape Navigator.

In Europe, the first antitrust case against Microsoft (known as "Microsoft Europe") was promoted by the European Commission, which adopted an infringement decision in March 2004 for abuse of a dominant position (art.82 TEC) and imposed the largest fine ever in European competition policy, € 497 million. The decision stated that Microsoft had abused its dominant position in the PC operating systems market in two ways: by deliberately restricting inter-operability between PC Windows and non –Microsoft work group server operating systems; and by tying Windows Media Player with Windows operating system. This decision by the European Commission was later confirmed by the Court of First Instance in September 2007, following an appeal lodged by Microsoft.

In January 2009, another Microsoft case was started by the European Commission, regarding the tying of Internet Explorer with Windows, framed in terms very similar to the previous US case. According to the Commission's Statement of Objections, Microsoft may have infringed Article 82 of the EC Treaty by abusing its dominant position in the market for client PC operating systems through the tying of Explorer: indeed this conduct, by making Microsoft's web browser available on more than 90% of the PCs worldwide, would distort competition on the merits between competing web browsers, by providing Internet Explorer with an artificial distribution advantage which other web browsers are unable to match.

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[9] For an analysis of the US Microsoft case, see Evans D. S., Nichols A. L. and Schmalensee R. (2001), *An Analysis of the Government's Economic Case in U.S. versus Microsoft*, Antitrust Bulletin; see also Fisher F. M. and Rubinfeld D. L. (2000), *United States versus Microsoft: An Economic Analysis*, in Evans D.S., Fisher F. M., Rubinfeld D. M. and Schmalensee R. (2000), *Did Microsoft Harm Consumers? Two Opposite Views*, AEI Brooking Center for Regulatory Studies

3.2 The Analysis of the Relevant Markets in the Microsoft Europe Case

In the analysis of the Microsoft Europe Case, we will focus on one of the two aspects examined by the European Commission in its decision, that is the refusal to supply inter-operability information regarding Windows PC operating system to other producers of work group server operating systems, such as Sun Microsystems. We are interested in examining the inter-operability issue rather than the tying of Media Player, because the analysis of this particular conduct allows us to study a peculiar aspect of the anti-competitive strategy followed by Microsoft in the last few years: it tends to monopolize other adjacent markets for two simultaneous reasons, not only for the gain arising from extending its market power to another complementary product, but especially for defending, in a forward-looking perspective, its monopoly in PC operating systems against potential competition in that market.

In order to explore the coexistence of these two incentives in Microsoft's conduct and for understanding the framework of the case, it is necessary first to analyze the structure of the relevant market. Two are the relevant markets considered in this case.

The first one is that of PC operating system software[10], so let us specify what it really means. In the text of the decision, the operating systems were defined as "system software products that control the basic functions of a computer and enable the user to make use of such a computer and run application software on it". In the analysis of demand-side substitutability, the European Commission mentioned also the distinction between client PC operating systems for Intel-Compatible and for non Intel-Compatible PCs (for example, Apple Macintosh), given that a client PC operating system designed to run on an Intel-compatible PC cannot run on a non Intel-Compatible PC unless it is modified and vice versa. But, differently from the US Department of Justice[11], the EU Commission left open the question whether the relevant market for Microsoft included only OS for Intel-Compatible PCs, given that the answer didn't really influence the outcome of the assessment of its market power.

Indeed, in the discussion of supply-side substitutability, the Commission pointed out that the production of a PC operating system presents increasing returns to scale, given that almost all the

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[10] Some interesting insights on the specific issues of software market are discussed in Katz M. L. and Shapiro C. (1998), *Antitrust in Software Markets*, in Eisenach J. A. and Lenard T. M. (edited by) (1998), *Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace*, Kluwer Academic Publishers

[11] The US Department of Justice limited the definition of the relevant market to the OS for Intel-Compatible PCs on the basis of a demand substitutability consideration. As suggested by the results of the SSNIP test (Small but Significant Non-transitory Increase in Prices), a price increase of Windows would not significantly induce consumers to switch to MAC OS, because of the costs of acquiring new hardware and compatible software applications, as well as for the effort to learn the new system.

costs for producing such software are fixed costs due to the development of an initial or new version of it. Then, while these fixed costs are very high, once the initial version has been developed and tested, the marginal cost of producing an extra copy is very low. Such fixed development costs also explain the existence of an important barrier to entry for other firms potentially interested in supplying a new operating system.

In the market for PC operating systems (defined without any distinction for PCs), Microsoft had a market share higher than 90%, both in units of product and in revenues, which was persistent over time and even increasing in the last few years. Then it had a strongly dominant position in the market through its Windows products[12], as it was also acknowledged by Microsoft[13].

The second relevant market is that of workgroup server operating systems. In the Commission's decision they were defined as "operating systems designed and marketed to deliver collectively file, print and group and user administration services to relatively small numbers of client PCs linked together in a small to medium-sized network". This definition clearly shows the importance of interoperability between workgroup servers and personal computers, given that the services provided by the first ones are targeted for the second ones.

Microsoft also supplies workgroup server operating systems, where it faces competition from a set of other vendors with their own proprietary technologies. But, at the same time, Microsoft's PC operating system near-monopoly gives it control over the proprietary protocol specifications that allow a PC to interoperate effectively with a server operating system, then building an additional (artificial) barrier to entry. This peculiarity of Microsoft's position also explains the rapid rise of its share in this market: indeed, while it had a market share equal to 55.6% in unit shipments and to 54.7% in revenues in 2000, just two years after, its market share was equal to 66.4% in unit shipments and to 65.7% in revenues. Moreover, it is important to remark that this 11% increase of Microsoft's market share in workgroup server operating systems from 2000 to 2002 was contemporaneous to the launch of a new version of Microsoft Windows, that is Windows 2000. In fact, many of the already limited disclosures that had been undertaken by Microsoft with respect to Windows NT have been discontinued with the development of Windows 2000. This empirically shows the negative correlation between the level of supply of interoperability

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[12] Usually, market share is one of the elements considered in the assessment of the market power for the analysis of a dominant position, together with some other aspects, such as the existence of entry barriers, the technology used by the competitors, the degree of excess capacity held by rival firms, the time persistence of a certain pattern. But clearly, in this case, the presence of such a high market share was enough for proving the market power of Microsoft, which is of course strengthened by other factors.

[13] For completeness, it must be said that in a first stage Microsoft contested the application of the traditional approach for market definition and assessment of market power to the new economy's industries, characterized by an exponential growth in technology level, able to determine a rapid evolution of market structure.

information on Windows PC operating system and the size of Microsoft's market power in the workgroup server operating systems. Then it is clear how Microsoft could easily improve this market power in the adjacent market, simply by reducing the disclosure of interface protocols on Windows PC.

On the basis of the high market shares, but especially in consideration of the links between the PC operating systems market and the workgroup server operating systems market, the European Commission concluded that Microsoft had a dominant position also in the market for workgroup server operating systems.

The market structure discussed until now is that one described in the decision of the European Commission. But the rapid evolution of the software market is likely to modify very soon some of these features, in particular as far it concerns the role of servers in providing services to the personal computers[14], in such a way to compromise even the function of the PC operating systems. Indeed, if the past quarter-century was characterised by a decentralisation of computing, with information processing and storage placed on every desktop and laptop, the coming era will bring greater consolidation of computing power in "clouds", or large-scale, distributed computing facilities. The economies of scale arising from consolidating computing in fewer places, and the availability of fast internet connections that make it easy to exploit these internet-based resources definitely explain this change. The consequence of this evolution is that, for many consumers, it will be possible to use these services simply by connecting a simple handheld device or an inexpensive laptop to the web, rather than by employing a powerful computer running Microsoft Windows or Apple OSX operating systems. In this way, the transformations of the software market could significantly reduce the importance and the utility of the PC operating systems.

4. The Decision of the European Commission in the Microsoft Case

On the basis of the previous description of the concerned markets, it is now possible to briefly recall the contents of the decision, in particular as far it regards the remedies imposed for Microsoft's conduct[15]. Indeed, exploiting its dominant position in the PC operating systems market,

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[14] An interesting explanation of these future evolutions is provided in the following article: Financial Times, *Cloud Control*, 26th March 2009.

[15] For a discussion of the Microsoft Europe case, in the general framework of the refusal to deal, as a category of the abuse of dominant position, see O'Donoghue R., Padilla J. (2006), *The Law and Economics of Art.82 EC*, Hart Publishing, in particular chapter 8. For the problems related to the refusal to license intellectual property in EU competition policy, especially in the Microsoft Europe case, see Korah V. (2006), *Intellectual Property Rights And the EC Competition Rules*, Hart Publishing, in particular chapter 8

Microsoft had refused to supply the protocol specifications related to the Active Directory in Windows, which were requested by competing stand-alone vendors of server operating systems, and in particular by Sun Microsystems, or had done so on discriminatory terms. That had produced the effect of reducing the interoperability of competitors' products with its dominant Windows PC operating systems.

The Commission therefore required, as a remedy, that Microsoft should draw up detailed lists of protocol specifications to enable third parties to interconnect with Microsoft Windows client and server operating systems. The way the Commission justified a duty to license was the following:

1) Microsoft's conduct was part of a general pattern of conduct, including another abuse (tying of Media Player);

2) Microsoft discriminated by supplying certain vendors but not others;

3) Microsoft ended past disclosures of interoperability information;

4) Microsoft's conduct determined a risk of elimination of competition on the server OS because interoperability information was of "significant competitive importance" and there were no substitutes for Microsoft's providing this information;

5) a duty to disclose the specifications did not affect Microsoft's incentives to innovate, since source code information would not be disclosed.

The decision of the European Commission on this case is based on a static analysis of Microsoft's conduct in the market for server operating systems, aimed at verifying the gains coming for Microsoft from a monopolization of this adjacent market: in particular, we want to emphasize the static perspective of that analysis because it assumes the structure of the relevant market as given and doesn't consider the possible modifications of the market, due to the innovation process or to the conduct of the concerned firms.

Then, in the decision, the refusal to supply interoperability information to the other producers of server operating systems is considered as an exclusionary strategy aimed at foreclosing the competitors in that market by leveraging on Microsoft's dominant position in the market for PC operating systems. In order to show this argument, the Commission follows a three-step assessment, suggested by the economic analysis of leverage[16]. First, Microsoft had an incentive to expand its market power from client PC operating systems' market to the adjacent work group server operating systems' market. Secondly, Microsoft's conduct (i.e. refusal to disclose information on interface) was an effective means to eliminate competitors. Thirdly, the elimination of competitors in the workgroup server OS market must have been harmful to consumers.

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[16] See Lévêque F. (2005), *Innovation, Leveraging and Essential Facilities: Interoperability Licensing in the EU Microsoft Case*, World Competition, March.

In our discussion, we will focus on the first of these aspects, that is the issue whether Microsoft had an incentive to leverage its dominance from the market for PC operating systems to the market for workgroup server operating systems and whether its conduct could be explained by a wish to exclude potential entry into the market of operating systems for personal computers.

5. A Dynamic Leverage Theory for Compatibility Decisions

The approach followed by the Commission in examining the Microsoft case was based on a disputable assumption: the absence of threats to Microsoft's monopoly in the operating systems (OS) for personal computers. As explained before, with reference to the future evolution of the OS market, this view doesn't exactly correspond to the reality. Indeed, the development of new online servers, able to process and store information from clients' personal computers as well as to provide online services and facilities without the intermediation of PC operating systems, can in the future increasingly compromise the applications entry barrier that has guaranteed up to now the dominant position of Microsoft in PC operating systems market.

The applications entry barrier is a consequence of the network externalities characterizing the software market, which can be explained through a two-way reasoning: consumers are willing to buy a given PC operating system as it allows to run several applications and tend to value its utility depending on the number of applications developed for it; at the same time, the producers of PC software are interested in developing applications for the operating systems which are more widespread, in order to exploit the broadest possibilities for diffusion of their own products. In other words, the success of a PC operating system strongly depends on the quantity of applications that can be runned on it: this is the reason why the number of PC programmes developed for Microsoft Windows constitutes an entry barrier in the OS market. Indeed, possible entrants are discouraged from entry because, in order to acquire a significant market share, they need to convince software developers to produce applications for a new operating system not yet known to consumers. Then, if a platform available through a web browser, as Java through Netscape, can implement several applications independently from the usage of a specific PC operating system [17] or if an online server

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[17] This is the main issue in the US Microsoft case. In fact, it is often recalled as "The war of browsers", between Internet Explorer and Netscape Navigator, because through the decision to tie the browser Explorer to the operating system Windows, Microsoft managed to strongly reduce the market share of Netscape, initially the leading browser. Nevertheless, also in this case, the primary interest of Microsoft was not in browsers market, but in operating systems market. In fact, using this exclusionary practice against Netscape, Microsoft managed to limit the diffusion of Java, a middleware developed by Sun Microsystems, able to support software applications for multiple operating

can process and store information from clients' personal computers without the need of a PC operating system, this can limit the importance of the applications entry barrier in favour of Microsoft in the software market. On the other hand, it can also reduce the size of the market for PC operating systems, simply because of the reduction in demand.

For this reason, a dynamic analysis of the future threats to Microsoft's monopoly in clients' PC operating systems market can provide a much more satisfactory explanation of Microsoft's incentives for expanding its market power to the workgroup server OS market than the static perspective which underlies the Commission's decision. Of course, the refusal to supply interoperability information to Sun Microsystems can be seen as a part of a general line of conduct aimed at decreasing the compatibility between Microsoft Windows and the workgroup server operating systems of other producers. However, it must be pointed out that this conduct was a means not just for monopolizing another market, but especially for protecting Microsoft's dominant position in the PC operating systems market. Indeed, a determinant reason why Microsoft wanted to leverage its monopoly position to the workgroup server OS market was to fend off potential entrants to the PC operating systems' market, i.e. its core market.

In light of these observations, Microsoft's conduct can be explained on the basis of a dynamic leverage theory, elaborated as an extension of the model proposed by Choi and Stefanadis[18]. This is a model developed for analysing tying decisions with complementary products, and its purpose is to explain how tying can affect the investment incentives of entrants and buttress an incumbent's monopoly position. It offers a theoretical framework that is particularly useful for high-technology sectors, given that the potential entrant has to implement a risky R&D investment, but can enter the market only if this innovation effort is successful and makes it possible to develop a new technology. The probability of success depends also on random factors, but it is anyway an increasing function of the level of investments. Once the incumbent decides to tie two complementary products, given that it is a monopolist in one of them, the entrant can gain access to consumers only if an entrant in the other product is successful, or if it manages to enter both

systems and then perceived by Microsoft as a threat to Windows as a platform for software development. In particular, thanks to an agreement with Netscape, Navigator became the main channel by which the Java runtime environment got access to the PC of Windows users. Then the integration of Internet Explorer (completely free) within Windows, even without the possibility to remove it, allowed not only to enlarge Microsoft's market share in the browser market, but especially to protect the dominant position of Windows in the operating systems market and then to deter entry in that one.

[18] Choi J. P. and Stefanadis C. (2001), *Tying, Investment and the Dynamic Leverage Theory*, The RAND Journal of Economics, Vol. 32, No.1, pp.52-71

markets at the same time[19]. In this way, tying makes the success of investment less certain, decreasing the entrants' incentive for investment and innovation.

In many cases of compatibility between complementary products, such as in the Microsoft case, the decision to deny interoperability can produce the exclusionary effect on the producer of one of the products in the same way as in tying models. To see this, let us consider a case where an incumbent operates in two markets, A and B, being monopolist in A and competing with other firms in B. As in the model we presented above, the incumbent firm, by refusing interoperability between A and competing versions of B, the incumbent can leverage its monopoly position to the market for B in order to foreclose rivals. But it can also fend off potential entrants into its own market. Consumers who need both complementary products – the joint users – are induced to buy the version of B that is produced by the incumbent, since this is the only version compatible with A, which they also need in order to build up a system[20]. In this way, a linkage is created between A and the incumbent's version of B, which may be even stronger than in a tying case and, by way of consequence, more effective in foreclosing competitors. The exclusionary mechanism therefore is almost the same, especially if we consider as a term of comparison a tying decision with high commitment level, which creates a stable connection between two products.

5.1 The Case of Two Independent Firms

On the basis of the above observations, it is now possible to present the framework of a model. We will firstly analyze the basic model[21], with two independent firms, and then its extension to the case of an integrated entrant.

Let us consider 2 complementary products: A and B. Firm 1 is present in both products. It produces A_1 and B_1 at unit cost c_h each. In each of the two markets, there is a potential entrant that can sell products A_2 and B_2 (substitutes for A_1 and B_1). By making an investment in R&D in the amount of I_{i2}, each potential entrant obtains, with probability $p(I_{i2}) = \varepsilon + I_{i2}$ (with $\varepsilon < I_{i2}$) [22], a

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[19] In the first case there are two independent firms, each of them interested in the market for one product; in the second case there is an integrated entrant, interested in both markets. As it will be clear from the following discussion, the second hypothesis can be more relevant from our point of view, for an application to Microsoft Europe case.

[20] Clearly, those who are interested only in B can buy it from the competitors, while those who need only A have to buy it necessarily from the incumbent.

[21] In the analysis of the standard case, with two independent firms, we will follow the variant of Choi and Stefanadis (2001) which is presented in Motta M. (2004), *Competition Policy: Theory and Practice*, Cambridge University Press

[22] We assume that the probability of success depends more on the investment level than on random factors.

successful innovation (implying unit cost reduction from c_h to c_l). The cost of investment I_{i2} is equal to: $C(I_{i2}) = \gamma(I_{i2})^2/2$ where $\gamma > c_h - c_l$

We assume that the utility function of consumers is given by: $U_{Aj,Bj} = \vartheta - p_{Bj} - p_{Aj}$

Then the game is organized as follows:

1) Firm 1 decides on compatibility between A and B

2) Firms A_2 and B_2 take investment decisions

3) Active firms name price in a Bertrand competition.

Let us solve the game backwards.

Price Sub-Game

In the case of *no compatibility*, an entrant can operate in the market only if another entrant is successful, otherwise only the incumbent is active.

a) If only the incumbent is active, it sets a price ϑ and then it earns $\vartheta - 2c_h$

b) If both entrants are active, each sets a price c_h and then makes profits $c_h - c_l$

In the case of *interoperability*, a successful entrant in only one product can market it, then 3 situations can be considered.

a) If only the incumbent is active, it sets a price ϑ and then it earns $\vartheta - 2c_h$

b) If both entrants are active, each sets a price c_h and so makes profits $c_h - c_l$

c) If only one entrant is active, there is a continuum of equilibria. The incumbent obtains a share λ of the innovation rent, with $\lambda \in [0,1]$, so its profits are $\vartheta - 2c_h + \lambda(c_h - c_l)$, while the entrant gets $(1-\lambda)(c_h - c_l)$.

Investment Sub-Game

Under *compatibility,* the profits by an entrant are:

$$\pi_{i2} = \{p(I_{i2})[1 - p(I_{k2})]\}(1-\lambda)(c_h - c_l) + p(I_{i2})p(I_{k2})(c_h - c_l) - C(I_{i2})$$

where the first term indicates the profits obtained when the other entrant is not successful, while the second term presents the profits gained when both the entrants are successful.

Substituting the functions for $p(I_{i2})$ and $p(I_{k2})$, as well as for $C(I_{i2})$, firm 2 maximizes the profit function with respect to I_{i2}. From the FOC, given that at the symmetric equilibrium $I_{A2}^* = I_{B2}^* = I_2^*$, the optimal investment is:

$$I_2^*(\lambda) = \frac{[1 - \lambda(1-\varepsilon)](c_h - c_l)}{\gamma - \lambda(c_h - c_l)}$$

Under *no compatibility*, the profits by an entrant are:

$$\tilde{\pi}_{i2} = p(\tilde{I}_{i2})p(\tilde{I}_{k2})(c_h - c_l) - C(\tilde{I}_{i2})$$

At the symmetric equilibrium, the optimal investment is:

$$\tilde{I}_2^* = \frac{\varepsilon(c_h - c_l)}{\gamma - (c_h - c_l)}$$

A comparison between the optimal levels of investment in the two cases shows that $I_2^*(\lambda) = \tilde{I}_2^*$ only when $\lambda=1$. Otherwise, if $\lambda<1$, given that $\partial I_2^*(\lambda)/\partial\lambda < 0$, this implies that $I_2^*(\lambda) > \tilde{I}_2^*$. The optimal investment level under compatibility is equal to the one under no compatibility only when the incumbent gets all the innovation rent; then the entrant, since it doesn't get any profit, is induced to invest less. On the contrary, when the incumbent obtains only part of the innovation rent, the entrant has positive profit and then it is willing to invest more.

Interoperability Decisions

Under *compatibility*, firm 1's expected profits are:

$$\pi_1^*(\lambda) = \left[1 - (\varepsilon + I_2^*(\lambda))^2\right](\vartheta - 2c_h) + 2(\varepsilon + I_2^*(\lambda))\left[1 - (\varepsilon + I_2^*(\lambda))\right]\lambda(c_h - c_l)$$

where the first term presents the profits that the incumbent obtains if it is the only firm active in both markets, while the second term indicates the part of the profits that firm 1 can obtain by extracting part of the innovation rent when one of the entrants is successful.

Under *no compatibility*, firm 1's expected profits are:

$$\tilde{\pi}_1^*(\lambda) = \left[1 - (\varepsilon + \tilde{I}_2^*)^2\right](\vartheta - 2c_h)$$

In order to decide whether to allow for inter-operability, the incumbent has to compare the expected profit in the two cases. The expected level of profits under compatibility depends on the value of λ, both directly through the second term, and indirectly through the value of $I_2^*(\lambda)$.

In particular, when $\lambda=0$, no interoperability is preferred as

$$\pi_1^*(\lambda) = \left[1 - (\varepsilon + I_2^*(0))^2\right](\vartheta - 2c_h) < \tilde{\pi}_1^*(0) = \left[1 - (\varepsilon + \tilde{I}_2^*)\right](\vartheta - 2c_h)$$

given that $I_2^*(0) > \tilde{I}_2^*$. Since each entrant can obtain the entire innovation rent, it is willing to invest a lot in R&D, then increasing its probability of success and decreasing the expected profit level of the incumbent.

On the contrary, when $\lambda=1$, interoperability is profitable because

$$\pi_1^*(1) = \left[1 - (\varepsilon + \tilde{I}_2^*)^2\right](\vartheta - 2c_h) + 2(\varepsilon + \tilde{I}_2^*)\left[1 - (\varepsilon + \tilde{I}_2^*)\right]\lambda(c_h - c_l) > \tilde{\pi}_1^*(1) = \left[1 - (\varepsilon + \tilde{I}_2^*)^2\right](\vartheta - 2c_h)$$

given that: $I_2^*(1) = \tilde{I}_2^*$. Since the incumbent can fully exercise a price squeeze thanks to its monopoly on one market and then profit from the increasing demand due to the complementary product, it is interested in allowing for compatibility.

So, in conclusion, there exists a value $\hat{\lambda} \in (0,1)$ such that $\tilde{\pi}_1^*(\lambda) \geq \pi_1^*(\lambda)$ for $\lambda \leq \hat{\lambda}$. It means that over (under) this threshold for λ interoperability is (is not) the profit-maximizing strategy for the incumbent. Then, in principle, we cannot say that the incumbent has always an incentive in denying inter-operability to the entrants. In fact, we can identify a trade-off for the incumbent in these decisions:

a) no compatibility decreases the risk of entry, then increasing its profits (exclusion effect);

b) no compatibility reduces the profit of the incumbent in presence of only one entrant (price squeeze effect).

Depending on which effect prevails, the incumbent determines the optimal interoperability strategy. But, in order to take this decision, it has to know before what price squeeze it can exercise on its product. If it is low, the incumbent would find optimal to deny interoperability. For instance, if there is not perfect complementarity between the two products, and then if some consumers are interested only in one of them, the increase of the demand for the entrant can only partially benefit the incumbent: indeed, if one entrant is active, the incumbent is able to obtain only a share $(1-\beta)\ \lambda$ of the innovation rent, where β is the fraction of the consumers interested only in the product sold by the entrant.

This observation can be useful in order to explain Microsoft's conduct, when we consider the structure of the relevant markets in this case. In fact, PC operating systems and server operating systems are complements for some consumers and substitutes for other ones.

They are complements because the value for customers of a server operating system increases when the quality of the PC operating system increases, and then also when the compatibility between the two operating systems is higher. Such complementarity is, however, not relevant for all consumers because some of them never connect their personal computer to a workgroup server, and also because some buyers of server operating systems are not interested in purchasing new versions of a PC operating system.

Moreover, operating systems for personal computers and servers are also substitutes for some customers because there are functions that can be integrated either into the client PC operating system or into the server operating system. In fact, at present personal computers are generally equipped on a stand-alone basis; but, as already discussed, the future evolution in the software market, characterized by the development of the cloud systems, can imply the diffusion of a more server-centric approach where desktop may mainly be a screen.

So, since only some consumers are interested in both products while some other ones are interested just in one of them, there exists just a partial complementarity between the two operating systems. This has an important implication for the discussed model: if among all the buyers of workgroup server operating systems, the fraction of the consumers interested only in the latter ones

were to be quite substantial, this would significantly reduce the possibility for Microsoft to get a share of the innovation rents from the entrant and would reduce the profitability of the compatibility decision. Moreover, given that now workgroup servers can release an increasing number of services directly to personal computers without the intermediation of a PC operating system, the fraction of customers only interested in server operating systems is expected to increase in the future and then this further reduces the profitability of a compatibility decision in Microsoft's perspective.

This remark could also explain a given change in Microsoft's interoperability strategy: indeed, for an initial period of time, it had been supplying the interface information and only in a second period it had decided to interrupt the disclosure of these protocols. So, from this point of view, the abusive conduct of Microsoft can be better qualified, rather than as a refusal to provide interoperability, as a disruption of the previous provision of interface information to the competitors in a secondary market. We emphasize this point because the theory that we have just discussed could someway motivate this change in Microsoft's interoperability strategy, without using the leverage argument proposed by the Commission.

In fact, given that the product relationship between PC operating systems and server operating systems, initially defined in terms of complementarity, is evolving in the next few years towards an increasing degree of substitutability, this would justify the decreasing profitability of a compatibility decision. So, following this argument, the refusal to continue to license these protocols to the other producers of server operating systems would be determined by an ex-ante evaluation of the non-profitability of an interoperability decision, rather than by the intention of monopolizing the adjacent market through a leveraging conduct. In fact, in the framework of the model, the interoperability decision is a function of the profit value that a firm can obtain under different setups: then we can interpret the disruption decision taken by Microsoft as if in period 1, with high complementarity of the two products, interoperability was the most profitable decision, while in period 2, with low complementarity of the two operating systems, no compatibility was the profit-maximizing strategy. Of course, in order to exhaustively show this argument, we should calibrate the model: then we ought to know the exact values of the parameters λ and β, but in particular we should compute, on the basis of market analyses, how the value of β (the fraction of customers only interested in server operating systems) changes over time, depending on the evolution of the software market and on the preferences of consumers.

5.2 The Case of One Integrated Entrant

After analyzing the case of two independent firms as entrants, we can now examine the extension of the model to the case of one integrated entrant[23], which can be more useful in order to explain the issue of interoperability decisions in the Microsoft Europe case. Indeed, from the viewpoint of Microsoft, as clarified in the defence behind the European Commission, the decision to deny compatibility was also justified by the fear that Sun Microsystem could use the required information in order to develop new products useful for entering the PC operating systems market. In fact, even if the request of disclosure didn't concern the source code of Windows, Sun Microsystem, as it was the developer of a middleware platform such as Java, could become in the future a potential competitor for Windows in the PC operating systems market[24]. Moreover, it is important to remember that, before that request from Sun Microsystems, and for previous versions of Windows, Microsoft had already disclosed this type of interface information, for example through a previous license of information to AT&T. This would confirm that the refusal to supply the specifications of the protocols to Sun Microsystems was also due to the potential threat it could pose to Windows' monopoly in the PC operating systems market.

For this reason the idea of an integrated entrant can be appropriate to describe the role of Sun Microsystem in this game, given that it is at the same time the requester of the information disclosure for the development of a compatible workgroup server operating system, but also a potential competitor for Microsoft in the PC operating systems market.

In this version, the model follows the same sequence of the game and then is solved backward. For the price subgame, we refer to the standard version of the model, with the only difference that this time A_2 and B_2 are an integrated firm: so, when the investment of the entrant is successful in both products A_2 and B_2, this implies that firm 2 is active in both markets; while, when the investment is successful only in one of the products, then firm 2 is active only in that market. So let consider the optimal investment by the entrant and finally the interoperability decisions by the incumbent.

Investment Sub-Game

Under *compatibility,* the profits by the integrated entrant are:

$$\pi_{i2} = \{p(I_{i2})[1-p(I_{k2})] + p(I_{k2})[1-p(I_{i2})]\}(1-\lambda)(c_h - c_l) + 2p(I_{i2})p(I_{k2})(c_h - c_l) - C(I_{i2}) - C(I_{k2})$$

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[23] The case of an integrated entrant is also presented in the paper by Choi and Stefanadis (2001). But their theoretical framework presents the probability of success from investment in R&D in an implicit functional form. In our derivation, in order to derive explicit results for the optimal level of investment, we assume as before a linear functional form for this probability function.

[24] In this perspective, the Microsoft Europe case presents many similarities to the US Microsoft case.

where the first term indicates the profits obtained when the R&D investments of the entrant are successful only in one product, while the second term shows the profits gained when the integrated firm manages to enter both markets. Firm 2 maximizes the profit function with respect to I_{i2} and I_{k2}.

From the FOC, given that at the symmetric equilibrium $I_{A2}^* = I_{B2}^* = I_2^*$, the optimal investment is:

$$I_2^*(\lambda) = \frac{[1 - \lambda(1 - 2\varepsilon)](c_h - c_l)}{\gamma - 2\lambda(c_h - c_l)}$$

Under *no compatibility*, the profits by the entrant are:

$$\tilde{\pi}_{i2} = 2p(\tilde{I}_{i2})p(\tilde{I}_{k2})(c_h - c_l) - C(\tilde{I}_{i2}) - C(\tilde{I}_{k2})$$

where the first term indicates the profits obtained when the integrated firm manages to enter both markets (because of the denied interoperability, this is the only case where it can get a profit).

At the symmetric equilibrium, the optimal investment is:

$$\tilde{I}_2^* = \frac{2\varepsilon(c_h - c_l)}{\gamma - 2(c_h - c_l)}$$

As before, a comparison between the optimal levels of investment in the two cases shows that $I_2^*(\lambda) = \tilde{I}_2^*$ only when $\lambda=1$. Otherwise, if $\lambda<1$, given that $\partial I_2^*(\lambda)/\partial \lambda < 0$, this implies that $I_2^*(\lambda) > \tilde{I}_2^*$. The optimal investment level under compatibility is equal to the one under no compatibility only when the incumbent gets all the innovation rent; then the entrant, since it doesn't get any profit, is induced to invest less. On the contrary, when the incumbent obtains only part of the innovation rent, the entrant has positive profit and then it is willing to invest more.

Interoperability Decisions

From the viewpoint of the incumbent, the case of one integrated entrant doesn't present any significant change in the expected profit function. Nevertheless, the interpretation of the equations is slightly different because of the existence of the same potential competitor in both markets.

Under *compatibility*, firm 1's expected profits are:

$$\pi_1^*(\lambda) = \left[1 - \left(\varepsilon + I_2^*(\lambda)\right)^2\right](\vartheta - 2c_h) + 2\left(\varepsilon + I_2^*(\lambda)\right)\left[1 - \left(\varepsilon + I_2^*(\lambda)\right)\right]\lambda(c_h - c_l)$$

where the first term indicates shows the profits that the incumbent gets when it is the only firm active in both markets, while the second term indicates the part of the profits that firm 1 can obtain by extracting part of the innovation rent when the entrant is successful just in one market.

Under *no compatibility*, firm 1's expected profits are:

$$\tilde{\pi}_1^*(\lambda) = \left[1 - \left(\varepsilon + \tilde{I}_2^*\right)^2\right](\vartheta - 2c_h)$$

which indicates the profits gained when the entrant, because of no interoperability, doesn't manage to enter any of the two markets.

In order to decide whether to allow for inter-operability, the incumbent has to compare the expected profit in the two cases. The expected level of profits under compatibility depends on the value of λ, that is the share of the innovation rent that it can appropriate through the price squeeze on the monopolized product.

So, the conclusions obtained for the case with two independent entrants can apply also in this framework. In particular, there exists a value $\hat{\lambda} \in (0,1)$ such that $\tilde{\pi}_1^*(\lambda) \geq \pi_1^*(\lambda)$ for $\lambda \leq \hat{\lambda}$. It means that over (under) this threshold interoperability is (is not) the profit-maximizing strategy for the incumbent.

What are the implications of this extension of the model for the analysis of the Microsoft Europe case? The main contribution consists in understanding the incentives that can influence the interoperability strategy of an incumbent firm, such as Microsoft, monopolist in market A and competing with other firms in market B, in the case that its monopoly in market A is under threat. In particular, for the purpose of the model, this threat has to come from a firm investing or operating in market B, which could be the case with Sun Microsystems. Indeed, the latter is a producer of work group server operating systems (product B), but it could be interested in entering in the future the market for PC operating systems (product A), also by using the know-how and the technologies already acquired through previous R&D investments in software market (think, for example, of the technologies employed for developing middleware platforms such as Java).

As the model shows, the incumbent could be interested in allowing compatibility of its product A with competing versions of B, in so far as it can increase its profit by getting a share of the innovation rent, when the entrant is active only in market B. In particular, we want to stress the importance of the last condition: the incumbent can exercise a price squeeze on product A, exploiting the increasing demand due to the complementary product B, provided that it keeps the monopoly on A. Indeed, if firm 2 were to be successful in both markets A and B, it would capture the entire demand for both products and then firm 1 would not obtain any profit at all. So, from the viewpoint of firm 1, the decision to grant interoperability depends not only on the obtainable share of the innovation rent, but also on the probability of success of the integrated firm 2 in market A. This implies that the incumbent would not find it profitable to allow compatibility not only when

the price squeeze margin is too low ($\lambda \le \hat{\lambda}$), but also when the entrant has a high probability of success in market A (as exogenously determined by a high ε) [25].

Consequently, when firm 1 is worried about a possible entry of firm 2 in market A, it will prefer to deny interoperability, because in this way it can also reduce, even indirectly, the incentives of firm 2 for R&D investments in market A. Indeed, as we saw in the investment subgame, for any value of λ such that λ<1, the optimal investment under incompatibility is in any case smaller than the optimal investment under interoperability. This is because the integrated entrant knows that, in the case of no interoperability, it will obtain a profit only if it is successful in both markets, and obviously entering two markets is more difficult than succeeding in one of them: the joint probability $p(I_{A2})$ $p(I_{B2})$ is always lower than the single probability $p(I_{B2})$, unless $p(I_{A2})=1$ (clearly, if this was the case, it would no doubt enter market A). Then, given that in the time sequence of the game the interoperability decision comes before the investment choice, the incumbent, by refusing compatibility, could induce a reduction in the investment level of the integrated entrant and, as a result, also decrease the probability of its success in market A [26].

The conclusions drawn from the model can easily be used to explain the present antitrust case: a typical feature of Microsoft's conduct, as also emerged in the US Microsoft case, is the propensity to implement discriminatory practices towards competitors as a defence against potential entry. Consequently, when it perceived a threat to its monopoly in the PC operating systems, and evaluated it as concrete [27] because of a significant probability of success for the investments by the potential competitors, the profit-maximizing choice for Microsoft was to deny interoperability, in order to avoid that firms operating in the server operating systems market could in the future enter the market for PC operating systems. In other words, between the two alternatives of either granting compatibility and sharing the innovation rent of the entrant (but with a higher risk for its monopoly

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[25] If ε was defined as a random variable, firm A would need to know the expected value of ε in order to evaluate the exogenous determinants of this probability $p(I_{A2})$. But even if it was a constant, different for each entrant, the incumbent could have an asymmetric information problem, because it could find it difficult to evaluate the quality and the effectiveness of the research activity by the entrant, in terms of potential innovation outcomes, also because of the secrecy on its results. This information asymmetry could determine an overvaluation of this probability of success, then inducing the incumbent to deny interoperability just to defend its monopoly in A against eventual threats, even when the share of innovation rent obtainable under compatibility is quite high.

[26] Clearly, this doesn't mean that denying interoperability is enough for avoiding that firm 2 can implement successful innovations and then enter market A.

[27] This model doesn't include information problem in the analysis of the game. But, as suggested in note 25, the evaluation of the probability of success, at least for its exogenous component ε, can play a key role in the interoperability decision and then a further extension of the model could also introduce imperfect information, in order to study this type of interaction in a more realistic way.

in PC operating systems), or refusing interoperability and foreclosing its competitors in both markets (but at the cost of renouncing to the additional profits due to the demand for the complementary product), Microsoft chose the second option. It adopted this aggressive conduct in order to anticipate and prevent the initiatives of possible entrants interested in the PC operating systems' market: in this sense, the idea to attack competitors instead of waiting to be attacked has frequently been implemented by Microsoft as a business strategy over the last few years.

6. Conclusions

This paper has analyzed the interaction between antitrust policy and intellectual property protection, with particular attention to the cases of abuse of dominance regarding refusal to deal, when the denied facility is an idea or an invention protected by an IP right. In particular, in this framework, the present work has provided an economic analysis of the Microsoft Europe Case, and in particular of the part which concerns the refusal to supply the required protocols for the interoperability between personal computer operating systems and work group server operating systems. In particular, the anti-competitive conduct adopted by Microsoft (as an incumbent monopolist in the first market) is examined through a strategic perspective, in order to illustrate the incentives for the incumbent to provide or deny compatibility between its own product and competing versions of the complementary product. For this purpose, the work extends some dynamic interactions, previously considered in tying models, to the issue of interoperability between complementary products, in a market characterized by strong network effects, as it is the software market.

The decision of the European Commission in this case represents a very important milestone for the solution of refusal to deal issues in a rapidly evolving market, such as the software market: by imposing a duty to disclose the interface information related to Windows to Microsoft's competitors in the market for workgroup server operating systems, the Commission has implicitly considered the interface as an essential facility for the development of that market and has also established a duty for the incumbent to make available the interoperability information to its rivals.

The perspective adopted by the European Commission on this case was an essentially static one: it consisted in asking how Microsoft's profits would change if it did or did not engage in the exclusionary practices it was accused of, assuming that the rest of the market structure remained the same. But, as it results from a dynamic analysis of the concerned markets, the exclusionary practice followed by Microsoft had two facets: excluding rivals from the work group server operating systems market and defending its core business – the market for PC operating systems. A consideration on the future evolution of the software market and an evaluation of the entry threat in

the PC operating systems market show how the incentive to deter entry in the latter market was in fact for Microsoft a determinant reason for denying interoperability, as it can be inferred also from some analogies with the features of the exclusionary conduct observed in the US Microsoft Case.

References

- Anderman S. D. and Schmidt H. (2007), *EC Competition Policy and IPRs*, in Anderman S. D. (2007) (edited by), *Intellectual Property Rights and Competition Policy*, Cambridge University Press

- Carlton D. W. and Waldman M. (2002), *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, Rand Journal of Economics, Vol.33, pp.194-220

- Choi J. P. and Stefanadis C. (2001), *Tying, Investment and the Dynamic Leverage Theory*, The RAND Journal of Economics, Vol. 32, No.1, pp.52-71

- Costa S. (2003), *La Difficile Eredità del Caso Microsoft: le Questioni Teoriche e i Rapporti tra Economia e Diritto della Concorrenza*, Atti della XV Conferenza della Società Italiana di Economia Pubblica, Pavia, 3-4 Ottobre 2005

- Encaoua D. and Hollander A. (2002), *Competition Policy and Innovation*, Oxford Review of Economic Policy, Vol.18, No.1

- Etro F. (2007), *Competition, Innovation and Antitrust*, Springer - Verlag

- Etro F. (2008), *Market Leaders, Antitrust Policy and the Software Market*, The ICFAI Journal of Industrial Economics, Vol. 5, No.1

- Etro F. (2009), *Endogenous Market Structures and the Macroeconomy*, Springer - Verlag

- Evans D. S., Nichols A. L. and Schmalensee R. (2001), *An Analysis of the Government's Economic Case in U.S. versus Microsoft*, Antitrust Bulletin

- Fisher F. M. and Rubinfeld D. L. (2000), *United States versus Microsoft: An Economic Analysis*, in Evans D.S., Fisher F. M., Rubinfeld D. M. and Schmalensee R. (2000), *Did Microsoft Harm Consumers? Two Opposite Views*, AEI Brooking Center for Regulatory Studies

- Genakos C., Kuhn K. U. and Van Reenen J. (2007), *Leveraging Monopoly Power by Limiting Interoperability: Theory and Evidence from Computer Markets*, Working Paper, Centre for Economic Performance, London School of Economics

- Gilbert R. J. (2008), *Competition Policy for Intellectual Property*, in Buccirossi P. (2008) (edited by), *Handbook of Antitrust Economics*, MIT Press

- Gilbert R. J. and Katz M. L. (2001), *An Economist's Guide to U.S. versus Microsoft*, Journal of Economic Perspectives, Vol. 15, No. 2, pp.25-44

- Gual J., Hellwig M., Perrot A., Polo M., Rey P., Schmidt K. and Stenbacka R. (2005), *An Economic Approach to Art.82*, Report by the Economic Advisory Group on Competition Policy

- Kallay D. (2004), *The Law and Economics of Antitrust and Intellectual Property*, Edward Elgar Publishing

- Katz M. L. and Shapiro C. (1998), *Antitrust in Software Markets*, in Eisenach J. A. and Lenard T. M. (edited by) (1998), *Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace*, Kluwer Academic Publishers

- Korah V. (2006), *Intellectual Property Rights and the EC Competition Rules*, Hart Publishing

- Kuhn K. W. and Van Reenen J. (2008), *Interoperability and Market Foreclosure in the European Microsoft Case*, in Lyons B. (2008) (edited by), *Cases in Competition Policy: the Economic Analysis*, Cambridge University Press

- Lévêque F. (2005), *Innovation, Leveraging and Essential Facilities: Interoperability Licensing in the EU Microsoft Case*, World Competition, March

- Motta M. (2004), *Competition Policy. Theory and Practice*, Cambridge University Press

- O'Donoghue R. and Padilla J. (2006), *The Law and Economics of Art.82 EC*, Hart Publishing

- Régibeau P. and Rockett K. (2007), *The Relationship between Intellectual Property Law and Competition Law*, in Anderman S. D. (2007) (edited by), *Intellectual Property Rights and Competition Policy*, Cambridge University Press

- Segal I. and Whinston M. D. (2007), *Antitrust in Innovative Industries*, American Economic Review, Vol.97, No.5

- Tirole J. (1988), *The Theory of Industrial Organization*, MIT Press

- Vickers J. (2009), *Competition Policy and Property Rights*, Discussion Paper, Department of Economics, University of Oxford

- Viscusi W. K., Harrington, J. E., Vernon, J. M., *Economics of Regulation and Antitrust*, Fourth edition, Cambridge, Massachusetts, The MIT Press

- Whinston M. D. (1990), *Tying, Foreclosure, and Exclusion*, American Economic Review, Vol. 80, No. 4.