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Intellectual Property Rights and Competition Policy

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Abstract

Intellectual property rights and competition policy are intimately related. In this paper I survey the economic literature analyzing the interaction between intellectual property law and competition law and how the boundary between these two policies is drawn in practice. Recognizing that intellectual property rights and competition law can interact in many different ways, the presentation focuses on several key issues. The economic literature on the interaction between competition law and intellectual property rights shows that these regulatory systems are consistent in terms of basic principles. Significant tensions exist, however, and it is difficult to balance IPR and competition law in practice. The significant differences in approach between the United States and the European Union simply reflect the underlying reality that efforts to achieve a sensible balance do not result in policy harmonization.

Keywords: IPR, competition policy, antitrust policy, cross-licensing, refusal to license, patent pools, tying, patent litigation

JEL codes: L41, K21, O34, O31

1. Introduction

Intellectual property rights (IPR) and competition policy, or antitrust policy, are of necessity intimately related. An essential aim of intellectual property law is to reward innovation and creation through the granting of exclusive rights to utilize a new invention, new information or a cultural good. In most situations the exercise of those rights is not likely to interfere with competition, for there are liable to be numerous competing products on the market. Thus, in essentially competitive economies the granting of most patents, copyrights, and trademarks amounts to a thin wedge of market power that is unlikely to harm consumers. On the contrary, IPR can enhance dynamic competition by inducing investments in new processes and differentiated products.

There are exceptions, however, in which a particular exclusive property right, perhaps in combination with other IPR, market advantages, and technical standards, can support extensive monopoly positions that may be subject to anticompetitive conduct or results. This problem is most evident in cases where the owner of a critical technology or component refuses to license it or demands exorbitant fees or imposes onerous conditions that can limit legitimate competition. Similarly, an IPR holder may try to extend her exclusivity to other markets in which she does not have formal protection through tied sales or other product linkages. Competition authorities in the United States, the European Union, Canada, and elsewhere recognize the importance of ensuring that critical technologies and products are deployed in ways that do not unduly restrict competition or market access. Achieving such a balance is a difficult proposition, for the multiple linkages between IPR and competition policies are complex and depend on

market circumstances. Understanding this complexity is particularly important for developing nations, many of which are currently devising competition laws to complement the stronger intellectual property regimes they have recently adopted.

In this paper I survey the economic literature analyzing the interaction between intellectual property law and competition law and how the boundary between these two policies is drawn in practice. Recognizing that intellectual property rights and competition law can interact in many different ways, the presentation focuses on several key issues. In Section 2, I consider competition policy as an institutional complement to IPR while in Section 3, I analyze tensions between competition policy and intellectual property protection in practice. Section 4 turns to the possible effects of competition policy on different stages of the innovation process. Section 5 considers issues regarding how antitrust policy may erect limits to settlement of IPR cases. I offer a few concluding remarks in the last section.

2. Competition and Innovation

Competition and innovation are two central processes in market economies, for they are the means through which efficiency and growth are generated and enhanced. Rivalry between competing firms tends to foster an efficient allocation of resources. It also strengthens the incentive to innovate in order to obtain a competitive advantage over rivals, or avoid the competitive disadvantage of technologically being left behind. For instance, Baumol (2004, p. 3) argues that the unprecedented and unparalleled growth in capitalist economies is the result of the "...competitive pressures, not present in other types of economy, that force firms in the relevant sectors of the economy to unrelenting

investment in innovation and that, contrary to widespread belief, provide incentives for the rapid dissemination and exchange of improved technology throughout the economy.”

However, neither competition nor innovation can be taken for granted. Both market failures and policy failures can distort the competition and innovation processes. As a result, careful regulation is critical, for both unregulated and regulated markets can be inefficient. The basic rules, such as laws governing firm behavior and institutions protecting private property, influence the performance of markets and their desirability should be seen within this context. Two types of political and economic regulation, competition policy and intellectual property rights, play a particularly important role in protecting and stimulating competition and innovation in decentralized market economies.

The main objective of competition law, on the one hand, is to regulate firm behavior that might harm the competitive process. Competition policy (or “antitrust policy” in American terminology) is, consequently, of vital importance for the efficient functioning of market economies. It has been described as one of the fundamental ground rules of the market economy (Vickers 2005).

This idea is not new. It has a long tradition, particularly in the United States. Chief Justice Hughes wrote in *Appalachian Coals v United States*¹ that “The purpose of the Sherman Anti-Trust Act is to prevent undue restraints of interstate commerce, to maintain its appropriate freedom in the public interest, to afford protection from the subversive or coercive influences of monopolistic endeavor. As a charter of freedom, the act has a generality and adaptability comparable to that found to be desirable in constitutional provisions.”

¹ *Appalachian Coals v United States*, 288 U.S. 344 (1933)

The purpose of intellectual property law, on the other hand, is to promote innovation and productive knowledge creation. The legal exclusivity granted by intellectual property rights reduces transaction costs, fosters dissemination of knowledge and stimulates investment in valuable ideas in a decentralized fashion consistent with the fundamental principles of market economies.²

The central role played by IPR in the foreseeable future is widely recognized. For instance, Gallini and Scotchmer (2001) argue that intellectual property is the foundation of the modern information economy and Gilbert (1995) stresses that intellectual property is the engine of economic growth in advanced economies.

Competition policy and IPR interact in many important dimensions. At the aggregated policy level, the effectiveness of antitrust policy is positively correlated with intellectual property protection. Countries with an effective antitrust policy also tend to have effective protection of intellectual property. In particular, the correlation between an index for antitrust effectiveness and an index of IP protection from the *Global Competitiveness Report 2006-2007* is 0.90.³ Figure 1 illustrates the perceived effectiveness of antitrust and IP protection for the 118 countries in that report's sample. It shows that countries with an antitrust policy that is more effective than average, such as the United States (US) and Germany (DE), also tend to have more effective intellectual property protection than average. It also shows that countries with a lax competition policy, such as Albania (AL) and Russia (RU), also tend to have weak, or lacking, protection of intellectual property.

² See Scotchmer (2004) for an extensive discussion.

³ World Economic Forum (2006-2007). These indexes are based on answers to questionnaires administered to officials of major international companies.

[FIGURE 1 HERE]

These two policies - competition law and intellectual property protection – are, consequently, complementary at an institutional and political level. Perceived effectiveness of competition policy goes together with that of IPR and the relationship is relatively strong, as the high correlation implicit in Figure 1 indicates.

It is worth noting that the effectiveness of both competition policy and intellectual property protection is positively related to average incomes across nations. The correlation between the index for IP protection and per-capita GDP (purchasing power parity adjusted) is 0.84. The corresponding correlation between the index for competition policy and per-capita GDP is 0.74. Figure 2 illustrates the relationship between intellectual property protection and income, while Figure 3 illustrates the relationship between antitrust policy and income. The main difference is that countries with a low average income per capita seem to have slightly more effective competition policy than IP protection.

[FIGURE 2 HERE]**[FIGURE 3 HERE]**

These simple correlations indicate that there is a strong positive relationship between income, antitrust policy and intellectual property protection at the aggregated level. At a more detailed level, however, there is substantial tension between the

exclusivity granted through IPR and the application of competition law. Finding the right balance between IP protection and competition policy is important. On the one hand, Gilbert (1995, p. 16) argues that "...[r]esponsible antitrust enforcement creates conditions that allow entrepreneurial initiative to flourish by assuring that innovators, having crossed the threshold of discovery, are not stopped in their tracks by a wall of closed and anticompetitive markets." On the other, the U.S. Federal Trade Commission (2003, pp. 3) notes that "...a failure to strike the appropriate balance between competition and patent law and policy can harm innovation." Imbalances between IP protection and competition law can thus have a negative effect on innovation, competition, or both.

Striking the right balance between antitrust policy and intellectual property law is very difficult (see Hovenkamp, 2005 for a discussion). A number of problems, in particular the ambiguous effects of IP protection and antitrust policy in specific cases, suggest that it could, in fact, be impossible to find the right balance in practice. There appears to be little agreement on where the line should be drawn regarding anticompetitive use of patents and other forms of intellectual property (cf. Rubinfeld and Maness 2004).

3. The Tensions between Competition Policy and Intellectual Property Protection

Many policymakers and commentators in the European Union and the United States believe that IP protection and competition policy are complements in principle. At a general level the objective of both systems is to promote economic efficiency and enhance consumer welfare. Competition policy and IPR strive to create an economic

environment in which innovation is stimulated by both competition and the promise of earning returns on investments in innovation (see Katz and Shelanski 2005).

3.1. Policy Consistencies

This current, and predominant, view that intellectual property rights and competition law are consistent in principle is, however, relatively new. For example Hovenkamp (2005) argues that commentators easily exaggerate any conflicts between IP and antitrust law and that courts have too readily found conflicts where there really were none. For instance, in *Xerox*⁴ the Court stated that, "The conflict between the antitrust and patent laws arises in the methods they embrace that were designed to achieve reciprocal goals. While the antitrust laws proscribe unreasonable restraints of competition, the patent laws reward the inventor with a temporary monopoly that insulates him from competitive exploitation of his patented art."

A contemporary view, however, is that protection of intellectual property is essential for providing firms and individuals with incentives to innovate while competition policy is essential for an efficient allocation of consumption and production. In its report on patents and competition, the U.S. Federal Trade Commission (2003) noted that from a policy point of view there is no inherent conflict between using competition policy and protecting intellectual property. This view has also been articulated in recent U.S. case law. For instance, in *Atari*⁵, the Court wrote that, "...the aims and objectives of patent and antitrust law may seem, at first glance, wholly at odds. However, the two bodies of law are actually complementary, as both are aimed at encouraging innovation, industry, and competition."

⁴ *SCM Corp. v. Xerox Corp.*, 645 F.2d 1195, 1203 (2d Cir. 1981)

⁵ *Atari Games Corp. v. Nintendo of America*, 897 F.2d 1572, 1576 (Fed. Cir. 1990)

In general the two policies are consistent to the extent that they strengthen incentives to compete. It is accordingly worth noting that patents describe inventions, not markets, and that an intellectual property right typically does not create a monopoly or market power (Hovenkamp, 2005). It may not even provide the owner the power to exclude others from using an innovation. Instead it merely gives a right to try to exclude others through legal enforcement of IPR in courts (Lemley and Shapiro, 2005).

In addition, the purpose of intellectual property rights is to promote disclosure of information, which can be significant for competition in the long run (Gallini, 2002). The gains from disseminating information and knowledge, plus the use of technology permitted by licensing and other arrangements should, therefore, be balanced against the static, short run social costs that arise because the disclosed inventions are not freely available.

3.1. Policy Tensions

While the above reasoning suggests that IPR and competition policy are consistent in principle, there are, nevertheless, tensions arising from the significant differences in focus under competition law and intellectual property law in practice. Both patent and antitrust laws broadly strive to increase welfare but do so through channels that often diverge (Carrier, 2002). In addition, a tension exists because competition policy looks mainly at the short run and promotes practices that tend to drive prices toward cost, while IP protection is granted with the longer-run perspective of encouraging innovation through rewarding limited periods of exclusive rights or penalties against unauthorized copying (Hovenkamp, 2005). Firms sometimes earn profits on

intellectual creations that are considerably higher than short-run costs, in contrast to the basic stance of competition policy.⁶

Defining the boundaries between competition law and IP law is not a trivial problem. There are two possible approaches to this issue. One solution is to let either IP law or competition law dominate the other. In case of a conflict, the principles of the dominant policy will govern the outcome. However, this is currently not the favored policy in either the EU or the United States.

In particular, neither U.S. nor EC law grants antitrust immunity to the use of IPR. To the contrary, competition law is applicable to both intellectual property and tangible property. This principle is stated explicitly in *Atari*⁷, in which the Court finds that, “The fact that a patent is obtained does not wholly insulate the patent owner from the antitrust laws. When a patent owner uses his patent rights not only as a shield to protect his innovation, but as a sword to eviscerate competition unfairly, that owner may be found to have abused the grant and may become liable for antitrust violations when sufficient power in the relevant market is present.”

Thus, the second approach is for courts and policymakers try to balance different interests when applying competition law to intellectual property rights. However, as Gallini and Scotchmer (2002) point out, there is no obvious calculation that courts should use to achieve a balance between *ex ante* incentives to innovate against *ex post* deadweight losses from diminished competition.

⁶ In *Microsoft* (COMP/37.792 Prohibition with fines decision, 24.03.2004) the Commission, as a basis for its intervention against the company’s abuse of a dominant position, noted (on page 128) that “...for its client PC operating system product, Microsoft operated on a profit margin of approximately 81%. This is high by any measure.”

⁷ *Atari Games Corp. v. Nintendo of America, Inc.*, 897 F.2d at 1576

There are a number of factual and institutional sources for the tensions between competition law and IPR. The first is uncertainty about the optimal design of intellectual property rights (Hovenkamp 2004). This uncertainty arises from the complex relationships among public policy, innovation, and market structure, making it difficult to determine the best policy for promoting innovation and protecting consumer welfare (Katz and Shelanski 2005). Consider, for example, the basic question of whether innovation is suboptimally funded in market economies. On the one hand, empirical studies suggest that the private reward to innovation in the United States is suboptimal. Mansfield *et al.* (1977) show that the social rate of return from the investment in innovation is high but the private rate of return is substantially lower. Griliches (1992) summarizes the empirical literature on private returns to R&D and concludes that the significant number of studies up to that time all pointed to the conclusions that R&D spillovers exist and may be large, and that social rates of return significantly exceed private rates. Moreover, Jones and Williams (1998) argue that if the social return is conservatively estimated to be 30 percent and there is a private rate of return to capital of 7-14 percent, optimal R&D spending as a share of GDP would be more than two to four times larger than actual expenditures. Thus, according to this research the optimal rewards to investments in R&D should be higher.

On the other hand, other studies find that research productivity has declined sharply over the last four decades in the United States. Lanjouw and Schankerman (2004a) report that by 1990 the number of patents, divided by the number of scientists and engineers, had fallen to just 55 percent of the level two decades earlier. Evenson (1993) finds an even steeper decline in Europe.

Moreover, whether IPR is an effective tool for stimulating innovation is regularly questioned in the economics literature. It is regularly found that the value of patent protection is significantly lower than associated research and development expenditures (Schankerman 1998; Lanjouw 1998; Gallini 2002).

That a country might design its IPR system badly is the subject of recent criticisms of the U.S. patent system. Many argue that the system is out of balance and overly favors the interests of inventors at the expense of users and competing innovative firms (U.S. Federal Trade Commission 2003; Jaffe and Lerner 2004; Lemley and Shapiro 2005; Maskus 2006).

In particular, the expansion of patentable subject matter has been criticized as lacking sound motivation. For instance, Eisenberg (2002) discusses the extension of patentability to inventions based on genetic information. She concludes that patents are poorly suited to the protection of such information because the patent system has so few safety valves to constrain the rights of property holders in order to sustain a balance with public interests.

In addition, the significant increase in the multiplicity of patents, referred to as “patent thickets” and “patent floods”, are considered by many to impede the ability of firms to conduct R&D activity effectively (Eisenberg 1989; Shapiro 2001). Hunt (2006) develops a model in which both R&D and patents are inputs into firm production structures. His analysis reveals that an increase in a firm’s patenting can also induce a decline in R&D intensity. This result depends on the fact that a patent can protect an innovation but it also allows the holder to possibly extract some rents from other firms. The ability to extract rents from other firms results from overlapping intellectual property

rights, especially in industries that advance through cumulative innovations, or due to the breadth of patent claims. Alternatively firms can extract rents from others by obtaining patents for technologies or products that they have not really invented. On the one hand, the more a firm patents, the more its products are protected from imitation and the higher is the revenue from its own production. On the other hand, the more other firms patent, the larger are the revenues that has to be shared. In a situation when patents overlap and the cost of patenting decreases, firms choose to patent more but research is decreasing as the inventing firm has to share more of its rents with other firms.

The second source of tension between IP policy and competition law is the uncertainty about the effectiveness of antitrust intervention in specific cases. In particular, the ability of competition authorities to intervene productively in dynamic industries has been questioned.

At one end of the spectrum, some analysts argue that competition policy has been successful at the general level. In one notable article, Baker (2003) argues that U.S. history provides evidence that antitrust enforcement has been both successful and necessary. The empirical evidence he cites suggests that the benefits of antitrust enforcement, particularly in deterring harms from anticompetitive conduct throughout the economy, are significantly larger than its costs. At the other end, Crandall and Winston (2003) point at the fact that there is little empirical evidence that past interventions in specific cases have provided much direct benefit to consumers or significantly deterred anticompetitive behavior. It is worth noting from this debate that proponents of antitrust intervention emphasize the value of competition policy for the performance of markets,

while opponents focus on the lack of evidence of productive intervention in specific cases.

It is not only the value of competition policy that is uncertain and hard to assess, particularly in specific cases. Nevertheless, most economists tend to agree that the relationship between prices and market concentration is positive. However, it is considerably more difficult to draw any general conclusions about the relationship between market concentration and innovation. In particular, the nature of both product market competition and the R&D process can be such that the number of firms does not matter much for innovation (Van Cayseele, 1998). Recent empirical studies suggest that there is an inverted U-shaped relationship between innovation and competition. In other words, moderately concentrated industries have the highest rates of innovation while perfectly competitive and monopolized markets are less innovative (Aghion *et al.* 2005).

A third root of unease between IP regulation and competition law is the different administrative procedures that govern the application of competition policy and intellectual property rights. Some commentators suggest that IP policy is heavily captured in the United States and the extent of this capture may be attributed in part to the fact that the main policymaking agency, the United States Patent and Trademark Office (USPTO), is specialized and responds mainly to the concerns of prospective and actual IP rights holders (Hovenkamp, 2004). Many have noted that the USPTO considers inventors to be its clients, without regard to competition or consumer welfare (Jaffe and Lerner 2004). In contrast, the U.S. Federal Trade Commission and the Antitrust Division of the Justice Department, which have primary responsibility for public antitrust policy, have more diverse objectives.

The fourth determinant of tension between IP law and competition policy is the uncertainty about the exact value of decentralized decision-making in market economies. One of the most important advantages of IPR is that, as an incentive system for innovation, they based on private information and strategic investments across the scope of the economy. Intellectual property rights give firms incentives to select productive investments based on their private information about costs and benefits of R&D. Potentially more valuable intellectual property typically stimulates more effort. Finally, IPR imply that the costs of an invention are borne by the consumers of the intellectual property, who must pay the markups over marginal cost if they wish to purchase a new good or technology.⁸ The nature of the IP system as a general framework that essentially grant the same legal rights irrespective of the value and the cost of the innovation implies, almost by necessity, that some innovations are over-rewarded. The resulting market power and the implications this has for profit-maximizing conduct by the holder may be hard to reconcile with the principles of competition policy.

A fifth, and related, source of potential inconsistency is the problem of inter-temporal commitment. Intellectual property rights are designed to give incentives for investment in research and development *ex ante*, i.e. before the exact value of the innovation is known, while competition policy, with the exception of merger control, is applied *ex post*, i.e. after the market power of a particular innovation is revealed. This difference can give rise to a political commitment problem (Regibeau and Rockett, 2007). Competition authorities and courts may be tempted to limit or revoke the IP protection once it is known that a given innovation was capable of supporting extensive market power or would be particularly socially valuable if widely licensed.

⁸ For a more comprehensive discussion see Scotchmer (2004).

Regibeau and Rockett (2007) suggest that this commitment problem should be solved through a separation of intellectual property rights and competition law. They argue that the government should make a commitment not to revisit *ex post* the rights granted by IP law, and also commit not to make large changes in property rights regimes unless very large changes in *ex post* regulation occur.

The final source of tension between the two regulatory regimes is the problem of international commitment, which bears similarities to the inter-temporal commitment issue. A national government could be tempted to use competition law to redistribute rents from foreign IPR holders to domestic consumers or competing firms. In particular competition policy potentially gives national governments an instrument to circumvent the commitment to national treatment in international IPR agreements.

International conventions governing intellectual property protection include provisions requiring that their members offer national treatment to foreign innovators and creators. For instance, Article 2 of the Paris Convention for the Protection of Industrial Property (1883) states that, "Nationals of any country of the Union shall, as regards the protection of industrial property, enjoy in all the other countries of the Union the advantages that their respective laws now grant, or may hereafter grant, to nationals; all without prejudice to the rights specially provided for by this Convention. Consequently, they shall have the same protection as the latter, and the same legal remedy against any infringement of their rights, provided that the conditions and formalities imposed upon nationals are complied with." Similarly, Article 5 of the Berne Convention for the Protection of Literary and Artistic Works (1886) states that, "Authors shall enjoy, in respect of works for which they are protected under this Convention, in countries of the

Union other than the country of origin, the rights which their respective laws do now or may hereafter grant to their nationals, as well as the rights specially granted by this Convention." Correspondingly, Article 3 of the TRIPS Agreement (the Agreement on Trade-Related Aspects of Intellectual Property Rights, 1994) states that "Each Member shall accord to the nationals of other Members treatment no less favourable than that it accords to its own nationals with regard to the protection of intellectual property."

However, there is no corresponding requirement of national treatment in competition law, which remains the preserve of individual countries and is not subject to international conventions. In other words, while most governments have made international binding commitments to grant foreign IPR holders the same rights as domestic holders *ex ante*, they may be tempted to redistribute rents through antitrust intervention *ex post* (see Klodt, 2001)

3.3. A Specific Issue Regarding Competition Policy in Europe

There is one area in which there is particular tension in European law between intellectual property rights and competition policy. According to Article 82 of the EC Treaty, a dominant firm's conduct can be abusive without being anticompetitive. According to European competition law, it is illegal for a dominant firm to abusively exploit its market power. In other words, European competition law prohibits pure exploitation of market power, through, for example, price discrimination or excessive pricing (Vickers, 2005). This is particularly problematic for the IP system, because efficient use of intellectual property rights often involves pricing that is both discriminatory across customers and significantly above marginal cost. Thus, this kind of restriction on *ex post* pricing power may raise an impediment to effective *ex ante*

incentives for investments in innovation. The policy is rooted in the belief, enshrined in the statement of general objectives in Article 2 of the EC Treaty, that competition is essential for raising standards of living. According to Gal (2004) it also reflects the fact that within the EU there is less confidence in the ability of market forces to limit monopoly power and a stronger belief in the ability of regulators to intervene effectively in the interests of distributional justice.

Indeed, scope for rigorous regulation of monopoly pricing has been established in EC case law. In *General Motors*⁹ the European Court of Justice (ECJ) found that a dominant firm, by imposing a price that is "...excessive in relation to the economic value of the services provided," may infringe Article 82. In addition, in *Michelin*¹⁰, the ECJ has stated that, "...an undertaking in a dominant position has a special responsibility not to allow its conduct to impair undistorted competition on the common market,"

In *GVL*¹¹, the ECJ stated that, "...a refusal by an undertaking having a *de facto* monopoly to provide its services for all those who may be in need of them but who do not come within a certain category of persons defined by the undertaking on the basis of nationality or residence must be regarded as an abuse of a dominant position within the meaning of the first paragraph of Article 86 of the Treaty". Moreover, in *Michelin II*¹² the Court found that quantity rebates not based on cost efficiencies are not economically justified and could be discriminatory within the meaning of Article 82 and thus illegal.

⁹ *General Motors Continental NV v Commission of the European Communities*. Judgment of the Court of 13 November 1975. Case 26-75. European Court reports 1975 Page 01367

¹⁰ Judgment of the Court of 9 November 1983. *NV Nederlandsche Banden Industrie Michelin v Commission of the European Communities*. Case 322/81. European Court reports 1983 Page 03461

¹¹ *Gesellschaft zur Verwertung von Leistungsschutzrechten mbH (GVL) v Commission of the European Communities*. Judgment of the Court of 2 March 1983. Case 7/82. European Court reports 1983 Page 00483

¹² *Manufacture française des pneumatiques Michelin v Commission of the European Communities*. Judgment of the Court of First Instance (Third Chamber) of 30 September 2003. Case T-203/01. European Court reports 2003 Page II-04071

Waelbroeck (2005) argues that there is a general tendency in Europe simply to presume that there are systematic anticompetitive effects in any rebate scheme of a dominant company and to underestimate their pro-competitive effects.

The prohibition of excessive and discriminatory prices in European competition law is problematic in relation to intellectual property rights. Substantial fixed costs and significant *ex ante* risk in research require the promise of sufficient profitability to induce the investment. These profits are sometimes based on the *ex post* ability to sustain significant price-cost margins and price differentiation across markets.

The European rules governing dominant-firm conduct contrast sharply with the principle governing the application U.S. antitrust law, where a monopolist is permitted, even encouraged, to compete aggressively on the merits. As early as in *Alcoa*¹³ the Court declared that, "...a successful competitor, having been urged to compete, must not be turned upon when he wins." More recently, in *Trinko*¹⁴ the Supreme Court stated that the incentive to strive for monopoly is an important element of the free-market system because it induces risk-taking that produces innovation and economic growth.

4. The Innovation Process

In the previous section I described the general tensions between competition policy and IP regulation. Here I discuss a number of specific issues related to the application of competition law to the different stages of the innovation process. First, competition policy applies to competition at the research stage and influences incentives to invest in R&D. Second, the IP system itself, including both the application of, and

¹³ United States v. Alcoa, 148 F.2d 416, 429 (2d Cir. 1945).

¹⁴ Verizon v. Trinko, LLP, 540 U.S. 398 (2004)

litigation over, intellectual property rights can be used by firms to obtain strategic advantages, which may harm competition. Third, IPR give rights holders the power to determine sales conditions and prices, sometimes giving rise to significant market power. This situation raises the question of whether the rights owners should be permitted to use and extend that market power through particular business strategies, such as cross-licensing and product tying. Fourth, in the process of litigating IPR the parties often reach settlements to resolve their disputes. However, because the settlement agreements may involve actual or potential competitors they could be used to facilitate collusion or to reduce competition, thereby attracting attention from a competition policy perspective.. I discuss each of these issues sequentially in the following sub-sections.

4.1. Incentives to Invest in Research and Development

Competition law potentially effects R&D in several ways. In particular, it regulates mergers and joint ventures between horizontal competitors in R&D. It also regulates agreements between innovators and thus has an effect on the incentives to invest in the development of, both initial and subsequent, innovations.

Joint ventures and mergers between competitors can influence the incentives for innovation and, in turn, the performance of future product markets. One problem from a regulatory point of view is that cooperation or agreements between firms involving investment in R&D may have little effect in existing markets. The conventional methods of assessing anticompetitive effects, based on such benchmarks as market shares and concentration indexes in existing goods, are therefore not applicable.

As a solution to this problem antitrust agencies have developed the concept of “innovation markets” to assess the possible anticompetitive effects of mergers and

agreements among firms that may become competitors at some point.¹⁵ The justification for defining and assessing competitive effects in hypothetical innovation markets is that antitrust policy should be concerned with agreements that are likely to result in a reduction in resources devoted to R&D, which is likely to have an adverse impact on price or non-price competition in the future (Gilbert and Sunshine, 1995). While straightforward in principle, the idea of innovation markets still remains controversial. Hoerner (1995) suggests that it is a redundant concept since conventional competition analysis takes into account potential competition, i.e. the constraints imposed on firms in the relevant market by potential or future competitors. It has also been criticized on the ground that the underlying assumption of a negative relationship between market concentration, on the one hand, and innovation and consumer welfare, on the other, may be invalid (Rapp 1995).

Cooperation between firms can take many forms. A first strategy is merger between competitors. A merger can change innovation incentives and influence both the pace and the nature of innovation. Innovation itself is important for the evolution of market structure and competition. As Katz and Shelanski (2005) emphasize, innovation can render static measures of market structure unreliable or irrelevant. Furthermore, the effects of innovation may be relevant to the kind of remedy antitrust authorities choose to adopt. This implies that antitrust agencies need to understand the relationship between market structure and innovation. It also implies that competition authorities must be able to identify potential competition arising from innovation. Because of uncertainty and informational limitations, these two issues appear to be difficult, if not impossible, to address in practice. More generally, Katz and Shelanski (2005) suggest that the

¹⁵ For a general discussion see Davis (2003).

conventional goals of competition policy, in particular low prices and high output, are inconsistent with the objective of promoting efficient innovation. They argue that it is necessary to develop a framework for deciding how to realize appropriate tradeoffs between static and dynamic objectives.

A second form of cooperation is research joint ventures (RJVs), which are prior agreements among research firms. Such ventures are established to increase the mutual profits of member firms by providing incentives to invest more efficiently. RJVs do not, however, necessarily increase social welfare.

A research joint venture can have multiple effects. First, it increases dissemination of new innovations to member firms (see e.g. Grossman and Shapiro, 1986). Second, it reduces the free-riding problem, allowing participating members to coordinate their investments in research (e.g. D'Aspremont and Jacquemin, 1988). Third, it permits member firms to optimize the investment in R&D, avoiding duplication of investment expenditures and allocating R&D to the more efficient firm (cf. Gandalf and Scotchmer, 1993). Finally, it can change incentives to compete in the final product market (Baumol, 1992; Martin, 1995).

Horizontal cooperation between competitors in R&D has a positive effect on social welfare to the extent that the stimulation of innovation and the reduction of the cost to develop new technologies and products dominates the potential negative effect of reduced competition, e.g. due to tacit or explicit collusion, in the final product market.

Grossman and Shapiro (1986) discuss the antitrust treatment of RJVs. They conclude that such entities have several benefits, allowing firms to overcome free-rider

problems associated with imperfect patent protection, stimulating diffusion of knowledge and greater exploitation of scale economies.

D'Aspremont and Jacquemin (1988) present a model of cooperative R&D. Firms first conduct research leading to a reduction in unit cost and then compete in the product market according to the Cournot conjecture. It is assumed that an innovation that reduces one firm's unit cost also reduces the competitor's cost with some fraction and hence there is a spillover from the innovator to its competitors. The spillover can be incomplete and, in that case, the cost of the innovator is reduced more than the cost of a competitor. Goods sold in the final market are homogenous, while the research cost function is quadratic in how it reduces the production cost. In the case of competitive R&D, each firm chooses a level of investment that maximizes its unilateral profit. In contrast, cooperative research maximizes joint profits for all members of the research joint venture. The analysis shows that cooperative R&D results in lower production costs compared to those from competitive R&D whenever spillover effects are substantial.¹⁶ Choi (1989) analyzes the incentives to form an RJV in a two-firm model with stochastic innovations. In his model the possibility of imitating the other firm's technology creates a spillover between competitors. He shows that it is profitable for firms to establish a research joint venture, if imitation is sufficiently easy.

Kamien *et al.* (1992) point out that an RJV may have two effects on the innovation process. In addition to allowing participating firms to choose an optimal level of investment in R&D, it also permits them to share R&D outcomes. The latter effect results in a complete technological transfer between firms in the joint venture, i.e. all participating firms can fully exploit an innovation and the unit cost of each firm is

¹⁶ See also Spence (1984) and Katz (1986).

reduced equally much. The possibility of sharing R&D results has a potentially positive effect on efficiency because the firms can use the same innovation and avoid duplication of research activities. However, it also augments the free-riding problem as each firm in the joint venture can fully exploit the new knowledge created in the innovation process.

Spillovers reduce the unilateral incentive to invest in R&D due to a strategic externality. Specifically, the transfer of knowledge from successful innovations makes competitors more aggressive and this, accordingly, reduces the *ex ante* willingness of any firm to invest in R&D. However, it also increases combined profits when firms coordinate their R&D activities. Kamien *et al.* find that RJVs with coordinated R&D activities and complete sharing of information are socially preferable to uncoordinated R&D competition. The information-sharing under coordination creates a public-good effect, which results in scale economies and makes research cooperation efficient.¹⁷

Countering this potentially positive effect on efficiency, research cooperation between competitors can increase the likelihood of tacit or explicit price collusion in the product market. One reason is that coordination may be facilitated as information is exchanged, not only on R&D-related issues, but also on product market strategies. Another is that it may stabilize a price cartel, because threatening other firms to terminate a profitable RJV or threatening to exclude a deviator can help the participants support otherwise unsustainable prices in the product market (Baumol 1992). More formally, Martin (1995) analyzes R&D joint ventures and tacit product-market collusion in an infinitely repeated game. He shows that an RJV can have implications for product market performance and conduct. The threat to break up a profitable venture can work as

¹⁷Gandal and Scotchmer (1993) analyze the more general question of how a research joint venture can solve the problems of overinvestment and underinvestment in R&D.

a punishment strategy and help participant firms sustain collusion that would not be sustainable in its absence.

Martin's analysis is primarily relevant for process innovations. Lambertini *et al.* (2002), on the other hand, extend the analysis to product innovations. They prove that an RJV may destabilize collusion since, by developing a common product with which to compete, participating firms no longer engage in horizontal product differentiation.

Cabral (2000) also analyzes a repeated game. In his model the firms produce homogenous goods and compete in prices. There are complete spillovers of product improvements, the development of which depends on the unobservable efforts of competing firms. He shows that it is optimal for firms to reduce research efforts below efficient levels in order to sustain price collusion, even though efficient R&D could be achieved in equilibrium.

RJVs are generally compatible with competition law. The situation is particularly unproblematic when the co-operation results in lower prices and higher quality. The main concern is that a joint venture can reduce competition in the final product market and safeguards to ensure effective competition in other dimensions than R&D are consequently well motivated.

Disciplines from competition law can also apply to the relationship between sequential innovators. In the case of sequential innovation, the challenge is to reward early innovators fully for the technological basis they lay down, but also to reward later innovators adequately for their improvements and new products as well (cf. Scotchmer 2001).

A basic question is whether collusion *ex ante* or *ex post* could be a solution to this problem. Chang (1995) analyzes cumulative innovation and examines whether courts should allow a patentee and competing inventors with improved versions of the patented product to enter collusive agreements in R&D. He finds that collusive licensing agreements should typically not be permitted as it could create incentives for inefficient entry by imitators.

4.2. Strategic Use of the IP System

A second issue relevant for sequential innovations is so-called “patent thickets”. In some industries, particularly biotechnology and information technologies, it is common that a new entrant, in order to engage in research or production, must obtain a large number of licenses from existing and previous innovators and producers. This problem raises the cost of product commercialization and may create substantial entry barriers for new firms. For example, Bessen and Meurer (2006) point to the fact that the large number of patents facing a typical innovator makes careful assessment of avenues open for competition burdensome and costly.

Patent thickets may, therefore, impede the ability of firms to conduct research effectively (Eisenberg 1989). Heller and Eisenberg (1998) describe this problem as the tragedy of the anti-commons, in which excessive numbers of property rights holders can set up roadblocks to the exploitation of information. Upstream patents permit owners to set up “tollbooths” on the road to product development, slowing the pace of downstream innovation in biomedical products. Shapiro (2001) argues that problems with patent thickets become especially thorny in conjunction with the risk of hold-up, which is the

danger that new products will inadvertently infringe on patents issued after these products were designed.

In terms of empirical evidence, the problem may be insignificant in practice, at least at the general level. Walsh *et al.* (2003) find that drug discovery has not been substantially impeded by the multiplicity of patented prior inventions and they find little evidence that university research has been impeded by concerns about patents on research tools.

One form of unilateral strategic behavior, with similar effects as a patent thicket, is referred to as “patent flooding”. This phenomenon occurs when a firm files a multitude of patent applications that claim minor variations on a competitor’s existing technology. Sankaran (2000) suggests that the strategic objective of the patent flooder is to surround the target company's technology with patents and patent applications, making it impossible for the latter firm to commercially exploit its technology without the risk of infringing the flooder's rights. Rubinfeld and Maness (2004) point to considerable evidence that patent flooding has become more prevalent in recent years. Those authors stress that, while the strategy of accumulating large numbers of patents may be in the long-term economic interests of individual firms, it can also provide a way for a firm with sufficient market power to engage in activities that could substantially disadvantage competitors.

An early formal analysis of the strategic use of patents was set out by Gilbert and Newbery (1982). They prove that an incumbent has an incentive to spend more than any other contestant in the race to obtain a new patent. Preemptive patenting allows the incumbent to keep its monopoly position and, because the sum of oligopoly profits is

always less than monopoly profits, a new patent is always more valuable to a monopolist than to any single contestant. The realism and practical relevance of Gilbert and Newbery's analysis has been debated. In particular, it has been argued that it is practically impossible to preempt other firms through patenting due to the large number of possible innovations that can compete with an existing product or process. While one successful innovation is enough for an entrant, it may be necessary for the incumbent to patent a large number of innovations to deter entry, which can be very costly and difficult.

Thus, there are several problems with the patent system (and other forms of IPR that I do not describe here). It is, however, less clear that the problems with IPS can, or should, be solved with a forceful application of competition law. In particular, it has been argued that a number of reforms can improve the existing legislation, e.g. by reducing the incentives for abuse and strategic use of the IP system. For instance, Shapiro (2004, 2006) suggests that permitting a legal defense against infringement by asserting prior user rights would have attractive properties and solve a number of problems with the patent system.¹⁸ According to Shapiro, prior user rights would automatically reduce the rewards for defensive patenting, patent thickets, and patent flooding, strategies that the U.S. patent system currently encourages. A similar argument is made by Maurer and Scotchmer (2002). They suggest that an "independent innovation defense" would improve the IP system. The possibility of entry by firms that achieve a similar innovation through independent means would induce patent holders to license the technology quickly, lowering the market price and reducing wasteful

¹⁸ Jaffe and Lerner (2004) and Maskus (2006) suggest additional reforms.

duplication of R&D. In this way, the threat of independent innovation would limit the patent holders' profit to levels closer to that needed to cover her costs of investment.

4.3. Use of IPR

While the IP system itself might be abused, firms also have some scope for using the intellectual property they own in anticompetitive ways. Competition policy applies in certain situations to the direct use of intellectual property rights. Competition rules regulate horizontal agreements and are, therefore, relevant for disciplining abusive patent pools and cross-licensing agreements. The antitrust rules also regulate unilateral behavior and can be relevant for sales conditions, such as product-tying and refusals to supply.

4.3.A. Cross-Licensing and Patent Pools

The first area in which competition rules apply to the use of intellectual property rights is cross-licensing and patent pools. Cross-licensing of intellectual property rights occurs when one firm grants a license to another firm to exploit its rights in exchange for a license to use intellectual property of the other firm. A patent pool, on the other hand, is an agreement between several holders of patents, which are complementary and necessary for the development of derivative products or processes, to license all the intellectual property rights in the pool at a single price, i.e. as a bundle. While cross-licensing and patent pools are different phenomena they both raise a number of related competition issues.

Licensing of IPR is a common business practice and important for the dissemination and the use of new technologies and innovations. As market exchanges, licenses enhance efficiency and play an important role in incentives to innovate.

Competitors in the same industry often license technology from each other, which avoids expensive duplication of R&D, supports efficient exchange of information, and can solve problems with blocking patents.

Nevertheless, there are cases in which licensing arrangements can be problematic for competition. One possibility is that several independent firms may hold IPR for innovations that are complementary inputs for producers in a downstream market. In such cases, independent licensing may result in double marginalization and inefficiency. In fact, a patent pool, which is a joint license among these firms for a bundle of patents or other intellectual property rights, can solve this problem. There is, however, a risk that competition would be harmed if competing firms were allowed to set prices that maximize profits for substitutable technologies. The goal of competition policy is to permit the former but prohibit the latter for of co-operation.

In general, an agreement between competitors to cross-license patents or other IPR could, however, raise competition concerns. In particular, it may facilitate collusion. Competitors that hold different intellectual property rights can, particularly, choose to cross-license rights. They may have a strategic incentive to set license fees that mutually make them less aggressive, and consequently reduce competition, in the product market. By setting a variable license fee for the intellectual property rights they can raise the marginal cost of each other, which gives an incentive to reduce output.

From a competition policy point of view the central, but highly difficult, issue is to find workable methods to permit efficient agreements, while prohibiting inefficient

agreements.¹⁹ These legal and economic questions are not new (as noted by Gilbert, 2004).

These questions also relate to patent pools. Initially, patent pools were treated favorably by the U.S. Supreme Court. In 1902 the Court held that a patent pool of 22 firms, accounting for over 90 percent of all manufacturing and sales of float spring tooth harrows, was lawful.²⁰ Interestingly, among other things the agreement fixed the prices of licensed products and required that licensees sell only the licensed products. The Court nevertheless found that the patent law gave absolute freedom in the use or sale of rights to the holders of patents. Later the U.S. Supreme Court recognized that patents were not exempt from antitrust laws. In recent decades economic analysis has grown more important in legal assessments of patent pooling and cross-licensing arrangements (Gilbert 2004).

Patent pools can have multiple competitive effects. The possible benefits include lower prices for complementary inputs (as members in the pool internalize the cross-price effects in their joint pricing decision), reduced transaction costs (due to the informational advantages of having a predefined bundle of patents offered at a single price) and stronger incentives for R&D investment (when profits increase as a result of more efficient pricing). The main drawback is the risk of reduced competition between holders of (substitutable) patents in the pool.

Shapiro (2001) shows that patent pools raise welfare when patents are perfect complements, but could harm welfare when they are perfect substitutes. Patent pools can solve the “complements problem” and allows the members to set a single optimal license

¹⁹ Mauer and Scotchmer (2007) offer a general overview of licensing and competitive effects.

²⁰ A spring tooth harrow is a harrow that uses spring steel bars shaped in half-moons to accomplish the breaking up and smoothing of soil.

fee. Shapiro demonstrates that with complementary patents this can benefit manufacturing firms and consumers, through lower royalty and license fees, and patent holders themselves, through increased use of their patents. For substitutable patents, on the other hand, a patent pool can work as a collusive agreement, resulting in higher license fees that ultimately hurt the consumers.

Lerner and Tirole (2004) further analyze the strategic incentives to establish patent pools. They use a model that incorporates the full range between perfectly substitutable and complementary patents. The analysis shows that a patent pool is likely to increase welfare when patents are sufficiently close complements. It also shows that independent licensing of the patents in the pool can be pro-competitive and it is consequently rational from a social point of view to require that IPR in a pool can be licensed both as a bundle and independently.

4.3.B. Tying

The second area in which competition rules apply to the use of IPR is product tying. Tying is the practice of making the sale of one product, the tying good, conditional on the purchase of another distinctive product, the tied good. For instance, a firm that produces one product in a competitive market can tie this good to another product, which is protected by a patent. Hovenkamp (2005) observes that the law regarding tying arrangements sets up one of the most significant encounters of IP and competition policy.

Multiple theories have been proposed to explain the motives for tying. On the one hand, Landes and Posner (2003) argue that it is an effective means of supporting

price discrimination. On the other hand, Whinston (1990) suggests that tying can be used to exclude rivals and extend monopoly power.

The traditional view on tying was based on the so called “leverage theory”. According to this theory, a firm with monopoly power in one market can monopolize a second market using the leverage provided by its position in the first market. The traditional leverage theory, however, has been heavily criticized for its lack of theoretical underpinnings, in particular by scholars associated with the Chicago School (Posner 1976; Bork 1978). According to the critique, it is profitable for a monopolist to tie products for the purpose of price discrimination but not for exclusionary purposes. Charging a markup on the tied goods can increase the total profits for the producer. However, according to the critique, the firm never has an incentive to engage in tying for the purpose of monopolizing the tied-good market.

However, more recently, it has been shown that tying for exclusionary purposes can be rational in models with oligopolistic tied-good markets or increasing returns to scale. For example, Whinston (1990) shows that tying can be an effective and profitable strategy to alter market structure by making it unprofitable for competitors to operate in a tied-goods market with significant entry costs. The intuition for Whinston’s result is relatively straightforward. He supposes that entry is blocked in the patented market while competitors can entry (incurring some costs) and operate profitably in a second market whenever products are sold independently. If the monopolist in the first market can credibly tie its goods, it shifts incentives in the second market. Every unsold unit in the second market results in foregone profits in the monopoly market. The monopolist accordingly behaves more aggressively in the second market to increase sales of its

monopolized product. The market shares of its competitors shrink in the tied good. For sufficiently high entry costs, it is unprofitable for potential competitors to enter and the second market becomes more concentrated. This permits the monopolist to charge higher prices in both markets. Note that entry deterrence (exclusion) is essential for the profitability of tying in Whinston's model. If the competitor had already incurred the entry cost, tying cannot be a profitable strategy.

In Choi and Stefanadis (2001), entry takes place through innovation. They show that bundling, or tying, reduces potential entrants' R&D incentives and hence the probability of entry. Carlton and Waldman (2002) analyze product tying in a dynamic model. They show that a monopolist can use tying of a complementary product to deter future entry in the primary (patented) market. This result is quite different from that in Whinston (1990), where tying can extend market power and deter entry in the markets for complementary goods.

Carlton and Waldman, in contrast, show that tying can preserve monopoly and deter future entry in the tying market. In their model, there is one firm with a monopoly in the primary market in the first period, due, say, to a patent, and the firm also operates in a second market for a complementary product. The complementary good can also be produced by a second firm. It is assumed that successful entry in the complementary goods market is necessary for future entry in the primary market. Goods in the primary market are equivalent, while the second producer has a superior product in the market for complementary goods. In this theoretical framework they show that product bundling by the patent owner can be used to reduce the sales of the second producer and prevent future entry into the primary market.

Nalebuff (2004) considers a situation in which a multi-product incumbent faces a single-product entrant. He analyzes entry deterrence when the incumbent does not know in which market the entry will occur and shows that tying allows the incumbent to credibly deter entry in both markets without having to lower the price in either market. In Choi (2004), market foreclosure through tying does not necessarily lead to exclusion of the rival firm in the goods market, but rather foreclosure in R&D market. He shows that the tying firm's R&D incentives in the tied-good market increase since it can spread out the costs of R&D over a larger number of units, whereas the rival firms' R&D incentives decrease. If this positive effect via R&D competition dominates the negative effect via price competition, bundling can be beneficial for the tying firm even in the absence of exit by rival firms, which is required for tying to be profitable in Whinston's original model. In other words, the change in R&D incentives through tying enables the firm to increase its dynamic rents.

The recent interest in tying is intimately related to competition in high-technology industries. In these industries, such as software, hardware and telecommunications, intellectual property rights are often very important and typically a critical factor that determines the competitive advantages of firms. Sometimes markets are also characterized by scale economies and network effects that give rise to a "winner-take-all" situation. This could result in market dominance for a single producer, possibly based on intellectual property rights, which allows the incumbent to charge prices substantially higher than costs, thus giving a super-normal rate of return *ex post*. One key question in competition policy is whether the incumbent should be permitted to extend its market power to other markets through "tying" and other business strategies. The answer to this

question depends on the effects of such behavior for consumers. The economic literature remains divided on this topic. Some contributions show that it is efficient, while others show that it is anti-competitive and harmful to consumers. There consequently exist arguments both in favor and against a restriction in competition law of tying by firms with substantial market power.

4.3.C. Refusals to License

The third area in which competition rules apply to the use of intellectual property rights is refusals to license. The refusal to supply an essential input may violate competition law in Europe. According to established EC case law, a dominant firm can be guilty of abusing its position, in violation with Article 82, if it refuses to license its intellectual property to another firm. If the IP is an essential input for a new product, the refusal to license constitutes an abuse because effectively it excludes all competition.

In *United Brands*²¹ the European Court of Justice found that a dominant firm "...cannot stop supplying a long standing customer who abides by regular commercial practice, if the orders placed by the customer are in no way out of the ordinary." In *Magill*²² the Court wrote, "The appellants' refusal to provide basic information by relying on national copyright provisions thus prevented the appearance of a new product, a comprehensive weekly guide to television programmes, which the appellants did not offer and for which there was potential consumer demand. Such refusal constitutes an abuse under heading (b) of the second paragraph of Article 82 of the Treaty."

²¹ *United Brands Company and United Brands Continental BV v. Commission*, Case 27/76, E.C.R. 207, [1978] 1 C.M.L.R. 429

²² *Joined Cases C-241/91 P and C-242/91 P RTE and ITP v Commission* [1995] ECR I-743

In *IMS*²³ the European Court of Justice found that the presentation of data by IMS Health, Inc. to its customers had become an industry standard. This ruling was sufficient to issue a requirement that dominant firms should license even if they enjoyed copyright protection in the data and database format.

Finally, in *Microsoft*²⁴ the European Commission found that the IPR held by Microsoft did not justify its failure to supply interface information to competitors, which would allow competing software to interact with the Microsoft Windows operating system. It found that Microsoft had abused its intellectual property to extend its dominant position to operating systems for servers.

In the U.S. system a dominant firm is generally not subject to antitrust action for an unconditional, unilateral refusal to supply intellectual property. In *Trinko*²⁵ the U.S. Supreme Court emphasized strongly that it is *not* unlawful for a firm to exploit its market power. It stressed that the general rule is that the monopolist has the right to refuse to deal with other firms and that exceptions to that rule will be rare. The Court argued that a duty to share technology with one's competitors could be counterproductive since it lessens the incentives for both the firm and its rivals to invest in resources that afford a competitive advantage. Forced technology sharing also requires the courts to determine when resources are indispensable and at what price they should be made available. The Court found that these decisions are better left to the market.

5. Litigation and Settlement

²³ *IMS Health GmbH & Co. OHG v NDC Health GmbH & Co. KG*, 29 April 2004, Judgment of the Court of Justice in Case C-418/01

²⁴ *Microsoft Europe*, COMP/37.792, 24.03.2004, Prohibition with fines decision

²⁵ *Verizon v. Trinko, LLP*, 540 U.S. 398 (2004)

The previous section discussed a number of areas in which competition rules apply to the use of intellectual property rights. The literature also recognizes that settlements of IPR disputes raise a number of challenging issues. For instance, a settlement can serve as a tool for firms to collude or moderate competition.

The importance and use of IPR have increased significantly during the last few decades. Annual patent applications in the United States by domestic inventors increased 150 percent, from around 60,000 to nearly 150,000, during the period 1985-1999 and there was a doubling of new patents granted per year (Gallini, 2002).

Lanjouw and Schankerman (2001b) find that the filing rates in infringement cases are systematically related to the economic value of the patents and to characteristics of their owners. Empirical studies suggest that excessive litigation could be a severe problem. Khan (2005) argues that the introduction of the patent examination system during the 19th century reduced the relative number of patent lawsuits and that this substantially spurred inventive activity. However, Lerner (1995) finds that the threat of litigation deters biotech firms from innovating in some technology fields. Firms with high litigation costs appear less likely to patent in the same subclass as rivals. These firms seem particularly reluctant to patent after grants to firms that have low litigation costs. In addition, Lanjouw and Lerner (2001) and Lanjouw and Schankerman (2004b) find that the use of preliminary injunctions by large firms discourages R&D by small firms.

Patents, patent litigation, and patent settlements increasingly influence competition. Settlements of patent disputes come in many forms, including licensing and cross-licensing agreements, patent pools, mergers, and joint ventures. While they may be

pro-competitive, settlements can also reduce competition and harm consumers. First, a settlement can facilitate collusion through a legally binding agreement that, for instance, sets a jointly profit-maximizing license fee. Second, a settlement can be used by an incumbent firm to make a credible side-payment to a potential competitor in return for its not entering the market with a competing technology or product. There is accordingly a strong case for applying competition law to settlements of disputes relating to intellectual property rights. Shapiro (2003) suggests that, from a competition policy standard, one should require that patent settlement leaves consumers at least as well off as they would have been from ongoing patent litigation.

Finally, IP system may be used by firms to obtain strategic advantages through raising rivals' costs. The theory that firms could strategically raise rivals' costs was first formulated by Salop and Scheffman (1983). They showed that it is likely profitable for a dominant firm to raise the costs of other competitors since it shifts their supply curves or reaction functions inward and this increases the demand facing the dominant firm. However, as Krattenmaker and Salop (1986) point out, a firm that does raise its rivals' costs may not gain from that action unless it can raise its price above the competitive level, not a necessary outcome.

For purposes of this paper, the question is whether patent portfolios may be used effectively to raise rivals' costs, say through hold-up decisions or litigation and harassment. This possibility is raised by Rubinfeld and Maness (2004), who argue that if firms use their patent portfolios to act strategically and raise competing firms' costs there would be legitimate antitrust concerns. However, Scheffman and Higgins (2003) notes that empirically it is generally difficult to ascertain whether the strategic attempt to raise

other firms' costs is the source of any gain, because competition itself may be the reason that rivals are damaged.

6. Conclusions

The recent economic literature on the interaction between competition law and intellectual property rights shows that these regulatory systems are consistent in terms of basic principles. Significant tensions exist, however, and it is difficult to balance IPR and competition law in practice. There are numerous factual and institutional sources of these tensions. It is generally impossible to find a fully optimal balance between IPR incentives for innovation and antitrust intervention for competition.

There is a growing consensus among economists that the U.S. patent system suffers from several problems that make it inefficient and encourage anti-competitive behavior. However, competition law does not provide an easy solution to these problems. For example, the problems arising from excessive protection of intellectual property and litigation must be solved within the IP system itself. Means of doing this include introducing prior user rights in the patent system and raising the standards for granting patents.

In Europe, the competition rules governing dominant firm behavior, in particular the regulation of excessive and discriminatory prices, exist to safeguard consumers. However, these regulations are difficult to reconcile with the objectives of intellectual property protection, for an essential purpose of IPR is to permit rights holders to maximize returns on investment through differentiated prices and price markups. At the

same time, the EU takes a more activist role in forcing dominant firms to license their technologies if they are deemed to be essential inputs.

Overall, then, the connections between IPR and competition policy are complex and not easily managed. The significant differences in approach between the United States and the European Union simply reflect the underlying reality that efforts to achieve a sensible balance do not result in policy harmonization.

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Figure 1

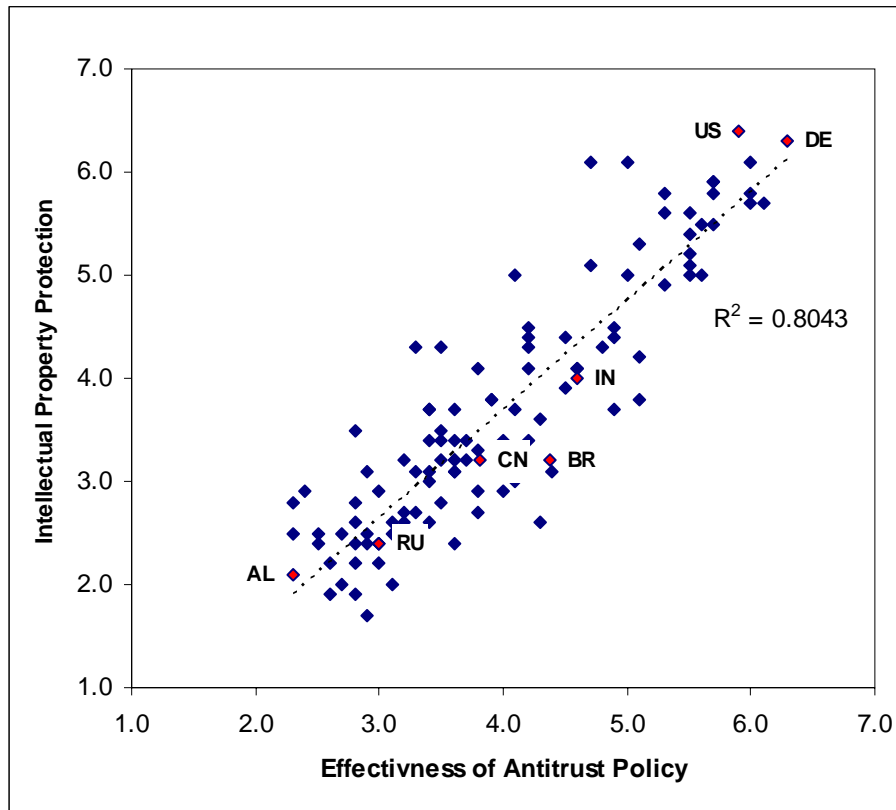


Figure 2

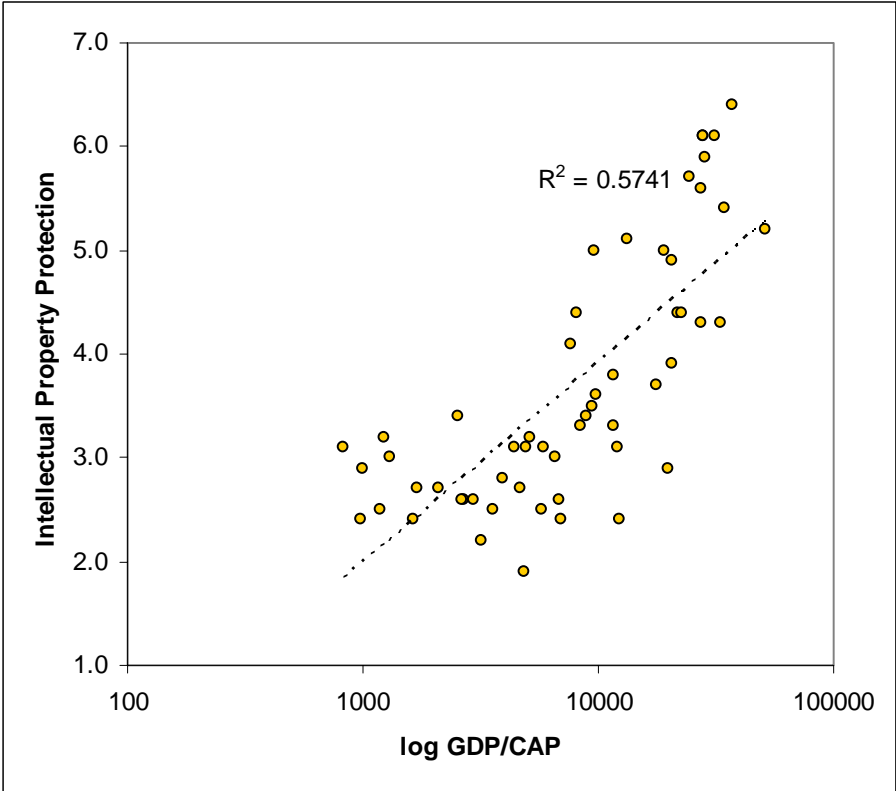


Figure 3

