

What's wrong with royalties in high technology industries?

Paper prepared for George Mason University School of Law and Microsoft Corporation's second annual conference on The Law and Economics of Innovation: "Patents and the Commercialization of Innovation", May 15, 2008

Damien Geradin^(*)

I. Introduction

Over the past few years, there has been an unprecedented degree of interest among competition authorities, scholars, legal practitioners, industry analysts, and trade associations with respect to the level of royalties that are charged by holders of intellectual property rights ("IPRs"), especially when their patents are essential to an industry standard.

In particular, the last couple of years saw a lot of action on the antitrust front in the United States and Europe. The US Federal Trade Commission ("FTC") adopted a decision in which it found that by concealing its ownership of certain patents, Rambus persuaded the members of JEDEC, a Standard-Setting Organization (SSO), to adopt two standards for computer memory (SDRAM and DDR SDRAM) incorporating those patents which, in turn, significantly contributed to Rambus's unlawful acquisition of monopoly power.¹ The remedy imposed by the FTC consisted in imposing a cap on the level of royalty rates that could be charged by Rambus to the firms needing access to its technology to implement the standards in question. This decision was, however, reversed in April 2008 by the US Court of Appeals for the District of Columbia Circuit.² In the two years preceding, the US Department of Justice (DoJ) granted business letter clearances to two SSOs – VITA and IEEE – to implement new IPR policies essentially designed to control the IPR costs for the standards they promulgate.³ Further, in April 2007, the DoJ and the FTC jointly released a report on "Antitrust Enforcement and

^(*) Professor of Competition Law and Economics at Tilburg University and Director of the Global Competition Center, College of Europe, Bruges; Partner, Howrey LLP, Brussels. The author thanks Anne Layne-Farrar for her helpful comments. Geradind@howrey.com

¹ See In the Matter of Rambus, Inc., Docket No. 9302, available at <http://www.ftc.gov/os/adjpro/d9302/060802commissionopinion.pdf>.

² See Reuters, "Appeal court overturns FTC order against Rambus", April 22, 2008, available at <http://www.reuters.com/article/technologyNews/idUSN2230474020080422>

³ See Thomas O. Barnett, Response to VMEbus International Trade Association (VITA)'s Request for Business Review Letter, Dep't Just. Antitrust Division (2006), available at <http://www.usdoj.gov/atr/public/busreview/219380.htm>; Thomas O. Barnett, Response to Institute of Electrical and Electronics Engineers, Inc.'s Request for Business Review Letter, Dep't Just. Antitrust Division (2007), available at <http://www.usdoj.gov/atr/public/busreview/222978.htm>

Intellectual Property Rights”, in which the level of royalties charged by essential patent holders is analysed at length.⁴

The interest is not, however, limited to the United States. For instance, the European Commission is currently investigating the compatibility of licensing regimes and conduct within SSOs against EC competition law.⁵

Reflecting the debate at the policy level, scholars have produced a large body of legal and economic literature on IPR and standardization issues, including patent hold-up (where the patent holder exploits ill-gotten market power in “excessive” licensing fees) and royalty stacking (where multiple patents must be licensed and thus the royalty rates stack up to “excessive” amounts).⁶ There is no consensus in this literature. While some scholars argue that the above issues are both serious and widespread, and thus require reforms of the IPR policies of SSOs (or of patent law in general),⁷ others consider that these issues have been grossly exaggerated and that most of the proposed reforms are not only unnecessary, but would be generally harmful for social welfare.⁸

Against this background, this paper addresses the issue of whether something has gone wrong with royalties in high technology industries. This paper seeks to answer this question by looking at a number of simple, concrete scenarios where firms holding essential IPRs seek to obtain a return on their patent portfolios through licensing or cross-

⁴ See, FTC, “Antitrust Enforcement and Intellectual Property Rights: Promoting Innovation and Competition”, available at <http://www.ftc.gov/reports/innovation/P040101PromotingInnovationandCompetitionrpt0704.pdf>

⁵ The European Commission sent a Statement of Objections to Rambus in August 2007 on the ground that it infringed EC Treaty rules on abuse of a dominant position (Article 82) by claiming unreasonable royalties for the use of certain patents for ‘Dynamic Random Access Memory’ chips (DRAMs) subsequent to a so-called “patent ambush”. See Memo/07/330, “Commission confirms sending a Statement of Objections to Rambus”, Brussels, 23 August 2007. In October 2007, the European Commission also decided to open formal anti-trust proceedings against Qualcomm following complaints lodged with the Commission by Ericsson, Nokia, Texas Instruments, Broadcom, NEC and Panasonic, alleging that Qualcomm’s licensing terms and conditions are not Fair, Reasonable and Non-Discriminatory (“FRAND”) and, therefore, may breach EC competition rules. See MEMO/07/389, “Commission initiates formal proceedings against Qualcomm”, 1 October 2007.

⁶ See, for instance, Daniel Swanson & William Baumol, “Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power,” 73 *Antitrust Law Journal* 1; Douglas G. Lichtman, “Patent Holdouts and the Standard-Setting Process”, *University Chicago Law and Economics, Olin Working Paper No. 292*, May 2006, available at SSRN: <http://ssrn.com/abstract=902646>; Mark Lemley and Carl Shapiro, “Patent Hold Up and Royalty Stacking”, Mark Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, (2007) 85 *Texas Law Review*, 1989; John Golden, “Patent Trolls” and Patent Remedies”, 85 (2007), *Texas Law Review*, 2111; Greg Sidak, “Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent Infringement: A Reply to Lemley and Shapiro”, (2008) 92 *Minnesota Law Review* 713.

⁷ See, e.g., Gil Ohana, Marc Hansen & Omar Shah, “Disclosure and Negotiation of Licensing Terms Prior to Adoption of Industry Standards: Preventing Another Patent Ambush”, (2003) 24 *European Competition Law Review*, 644; Robert Skitol, “Concerted Buying Power: Its Potential for Addressing the Patent Holdup Problem in Standard-Setting”, (2005) *Antitrust Law Journal* 727.

⁸ See Damien Geradin and Miguel Rato, “Can Standard-Setting Lead to Exploitative Abuse? A Dissonant View on Patent Hold-up, Royalty-Stacking and the Meaning of FRAND”, (2007) 3 *European Competition Law Journal*, 101.

licensing. As will be seen, the licensing strategy of these firms essentially depends on whether they are vertically-integrated or non vertically-integrated. Vertically-integrated firms engage in research and development activities, patenting at least some of their inventions, and also manufacture products based on their own innovations and the innovations produced by others. Non vertically-integrated firms, in contrast, specialize in one or the other layers of production. Pure upstream firms conduct research and development activities and patent their innovations, but they do not engage in manufacturing. Pure downstream firms specialize in manufacturing, but do not engage in R&D.⁹

In order to narrow the scope of the discussion, this paper focuses on royalties paid by firms seeking to implement an industry standard.¹⁰ Standard-setting activities aim to achieve device interoperability and product compatibility.¹¹ There are many SSOs, some of which, like ETSI, have a prominent role in the development of standards in high technology industries.¹² Although standardization processes tend to vary among SSOs, most SSOs encourage member firms to disclose upfront, i.e. prior to the adoption of a standard, the IPR that they consider may be “essential” for its implementation.¹³ Once disclosure is made, or contemporaneously with disclosure, IPR owners are typically asked to provide an assurance or commitment that, should their IPR be essential for a standard, they will license them on fair, reasonable and non-discriminatory (FRAND) terms to members of the SSO and outsiders.¹⁴

Once a standard has been formally adopted, manufacturers wishing to implement the standard have to obtain licenses from the firms holding the “essential” patents as otherwise they would take the risk of being sued for patent infringement. As will be seen below, not all licenses are royalty-bearing as, for instance, when firms engaging in license negotiations each hold essential patents to a given standard they may thus decide to agree on a cross-license with limited or no royalty payment. Cross-licenses may

⁹ For a good discussion of the conflicting incentives of these firms, see David Teece & Ed Sherry, “Standards Setting and Antitrust”, (2003) 87 *Minnesota Law Review*, 1913, at 1929.

¹⁰ Note that royalties are but one element of the consideration agreed upon between the parties. Other elements susceptible of pecuniary valuation, such as a cross-licence to the licensees’ IPR or an upfront fee, are taken into account and their value is often significantly higher than that the royalty itself.

¹¹ See D. Geradin, “Standardization and Technological Innovation: Some Reflections on Ex-ante Licensing, FRAND, and the Proper Means to Reward Innovators”, (2006) 29(4) *World Competition*, 511.

¹² The European Telecommunications Standards Institute (ETSI), headquartered in Sophia Antipolis, France, was formed in 1988 by the European Conference of Postal and Telecommunications Administrations (“CEPT”) and is officially recognized by the European Commission as the organization responsible for standardization of information and communication technologies within Europe. Its mission is to “develop globally applicable deliverables meeting the needs of the Information and Communications Technologies (“ICT”) community.” See generally Mark Lemley, “Intellectual Property Rights and Standard-Setting Organizations”, 90 (2002) *California Law Review*, 1889

¹³ ETSI defines “Essential IPR” as meaning “that it is not possible on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, [to] comply with a standard without infringing that IPR.” ETSI IPR Policy (version of 23 November 2005) at Art. 15.

¹⁴ See Geradin and Rato, “supra note 8; Anne Layne-Farrar et al., “Pricing Patents for Licensing in Standard Setting Organizations: Making Sense of FRAND Commitments” 74 *Antitrust Law Journal* 671 (2007).

involve royalty payments when the firms' patent portfolios have different value, necessitating a "balancing" payment from one to the other. Essential IP holders not engaged in manufacturing or whose manufacturing activities are limited are typically not (or are less) interested in royalty-free cross-licenses as royalties are their only (or main) source of revenues.

This paper is divided into three Parts. Following this introduction, Part II reviews different hypothetical scenarios, illustrating common misconceptions (or misinformation) regarding the determination of the level of royalties that are paid by standard implementers. This Part also shows that the focus of competition authorities should not be so much to control royalty rates mutually agreed between licensors and licensees, a complex task for which competition authorities are not well suited, but rather to ensure that vertically-integrated firms do not restrict downstream competition through anti-competitive licensing practices.¹⁵ Protecting downstream competition will do more for consumer welfare than any form of control of royalty rates. Part III presents some conclusions.

II. Are royalties too high? A review of several scenarios

While common wisdom among industry actors is that the level of royalties sought by essential IP holders in high technology industries is generally "too high", information on the level of royalties that applies to the implementation of a given standard is often misleading. Take the example of the WCDMA standard applied in the mobile telecommunications industry. While authors of a case study on the royalty rates applicable to this standard indicated that cumulative royalty levels can be as high as 30%,¹⁶ Nokia, the world's leading handset maker, said publicly that it does not pay more than 3% royalties for implementing WCDMA.¹⁷ Although the inconsistency between such figures is very puzzling, it can easily be explained by looking at some hypothetical scenarios, which are discussed below.

¹⁵ Of course, specialist firms can have incentives for anticompetitive behaviours as well (strategic non-disclosure and subsequent hold up, for instance), but this potential does not suggest vertically-integrated firms are exempt from competition scrutiny. To the contrary, we will see that integration is not a solution to opportunistic licensing but instead offers its own dangers.

¹⁶ See Lemley and Shapiro, *supra* note 6, at 2026.

¹⁷ See "Nokia WCDMA Handsets" ("Nokia confirmed that until 2007 it has paid less than 3 per cent aggregate license fees on WCDMA handset sales under all its patent license agreements. This number represents Nokia's aggregate gross royalty payments made under all the numerous patent license agreements applicable to its WCDMA handsets"), available at <http://www.letsgomobile.org/en/1218/wcdma-handsets/>

A. Four hypothetical scenarios

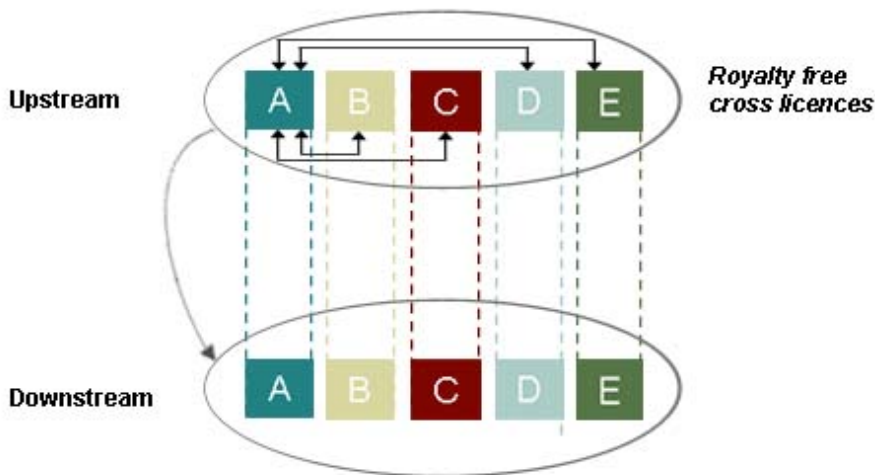
In high technology industries, standards often rely on proprietary technologies owned by a number of different firms. As a result, significant differences may occur as to the ownership structure of the IP in question.

Scenario 1: The essential IP is held by five vertically-integrated firms

Let's assume, for the purpose of this scenario, that five vertically-integrated firms (A, B, C, D and E) own all the essential patents for a given standard and have relatively symmetrical holdings (i.e., roughly equally valuable portfolios). Let's also assume that these firms consider that, should it be licensed, their patent portfolio would be worth a royalty rate of 5%, calculated on the basis of the sales of the products implementing the standard in question.

In this scenario, the five vertically-integrated firms will typically grant each other royalty-free licenses covering their respective essential patents. Pursuant to such cross-licenses, no royalty will be exchanged among these firms. The cumulative royalty rate paid by each of these firms will thus be zero. Figure 1 illustrates this scenario.

Figure 1



These vertically-integrated firms will then compete on the downstream market for the relevant product. Of course, this scenario does not tell us anything about the level of competition that will exist in the downstream market. While A, B, C, D and E may decide to compete vigorously, they may also choose not to challenge each other and go for a strategy of high prices. That is, they may behave as an oligopoly, with a tacit agreement to avoid price competition.

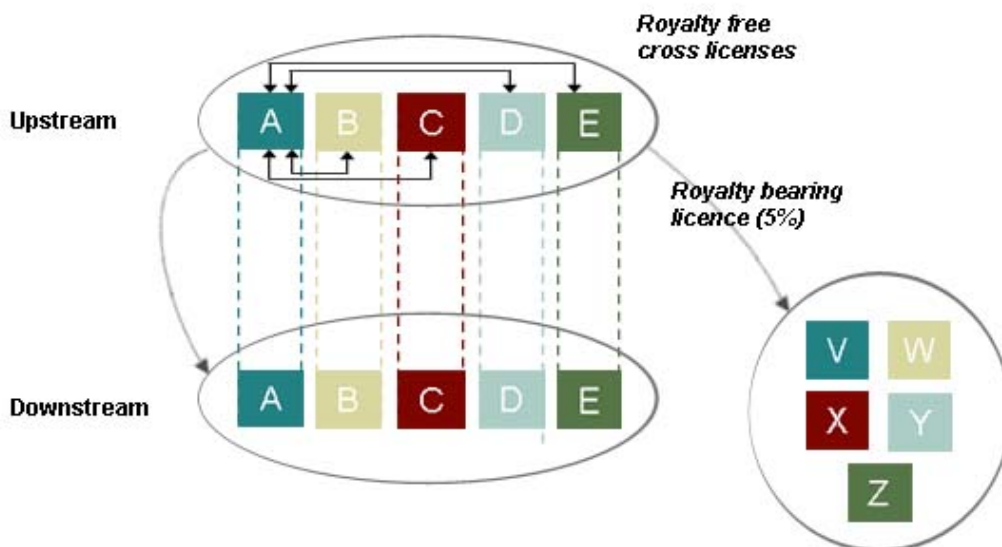
Alternatively, the vertically-integrated firms may decide to charge each other a royalty rate of 5% and pass the royalty cost on to downstream customers. This operation would be profitable as each of these firms would have to pay 20% royalties (four licenses for each firm, each at 5%), which they would explicitly or tacitly agree to pass on downstream, but each firm would also collect 20% royalties, which would directly contribute to their bottom line. A strategy of artificially inflating the price of essential inputs in this fashion would, however, violate EC competition rules, as it would be no different than a price-fixing cartel, and it would thus run the risk of being caught by competition authorities. Experience in the mobile communications services industry teaches that this scenario is nevertheless plausible.¹⁸

Scenario 2: The essential IP is held by five vertically-integrated firms and five pure manufacturers need a license to compete downstream

Scenario 2 differs from scenario 1 in that it not only involves the five vertically-integrated firms referred to above, but also five pure manufacturers (V, W, X, Y and Z), which want to enter the downstream market for the relevant product and compete with the vertically-integrated firms. Figure 2 illustrates this scenario.

¹⁸ For some examples, see: Notice on the application of the competition rules to access agreements in the telecommunications sector - framework, relevant markets and principles, O.J. 22 August 1998, C 265/02: "There is, however, obvious potential for anti competitive effects of certain access agreements or clauses therein. Access agreements may, for example: (a) serve as a means of coordinating prices"; Revised ERG Common Position on the approach to Appropriate remedies in the ECNS regulatory framework Final Version May 2006, p. 37: "Economic theory suggests that – under certain circumstances – the setting of reciprocal high or low termination charges can be used as an instrument of tacit collusion between networks which are in competition on the retail market". Generally, see Jean-Jacques Laffont and Jean Tirole, *Competition in Telecommunications*, MIT Press (2000), pp. 190-95 and Damien Geradin and Michel Kerf, *Controlling Market Power in Telecommunications - Antitrust vs. Sector Specific Regulation*, Oxford University Press (2003), p.46.

Figure 2

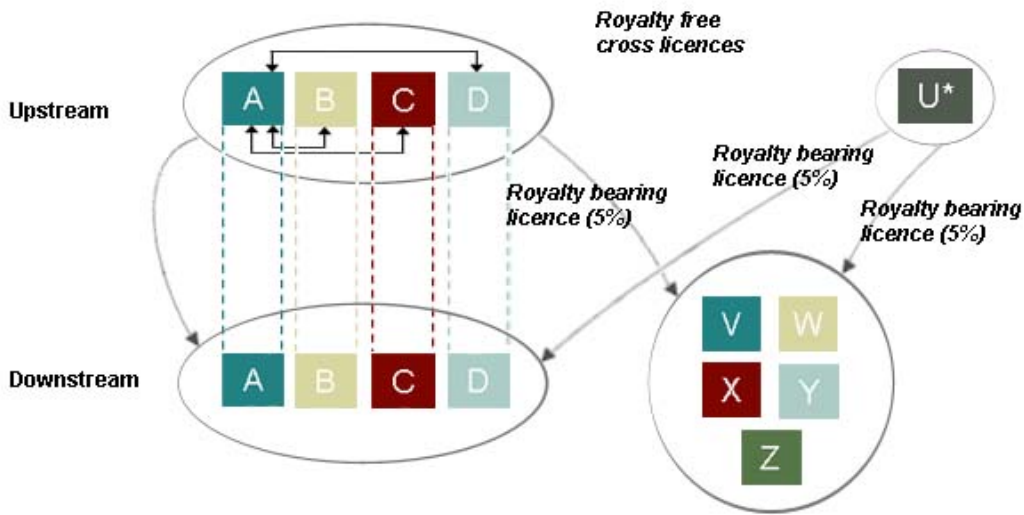


As in scenario 1, vertically-integrated firms will typically grant each other royalty-free licenses covering their respective essential patents. By contrast, these firms will charge a 5% royalty to each of the pure manufacturers needing a license covering their essential patents. Such pure manufacturers, which by definition do not hold essential IP, cannot “buy” access to the vertically-integrated firms’ essential patents through a cross-license. This means that each of these manufacturing firms will face a cumulative royalty burden of 25% (five licenses, each at 5%). The average cumulative royalty rate, over all ten firms, will in turn amount to $((0\% \times 5) + (25\% \times 5)) / 10 = 12.5\%$.

Scenario 3: The essential IP is held by four vertically-integrated firms plus one pure upstream firm and five pure manufacturers need a license to compete downstream

This scenario is similar to scenario 2, but for one aspect: assume now that the essential patents for a given standard are shared among four vertically-integrated firms (A, B, C and D) and one upstream-only firm (U*). Let’s assume that, like the vertically-integrated firms referred to in the first two scenarios, U* considers that its patent portfolio is worth a royalty rate of 5%. Figure 3 illustrates the scenario.

Figure 3

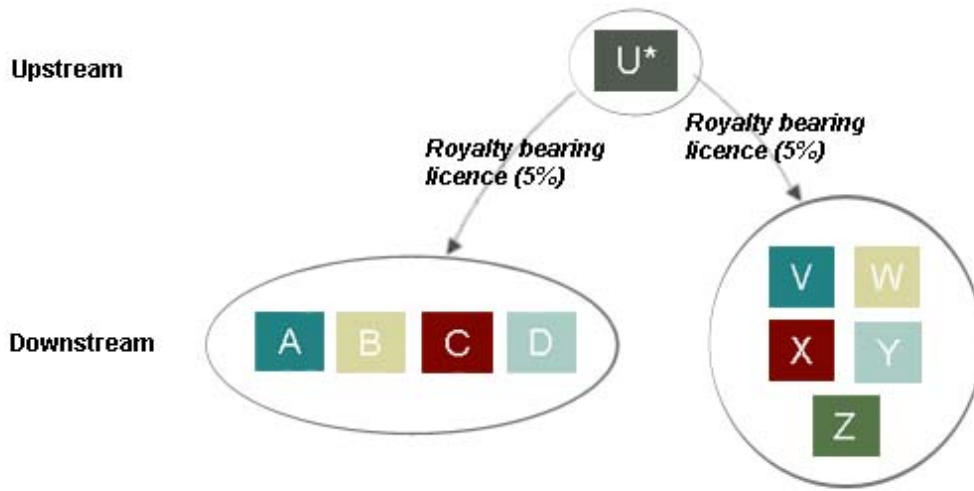


U* is, not surprisingly, unwilling to agree on a royalty-free cross license with the vertically-integrated firms. Unlike the vertically-integrated firms, which make the bulk of their revenues by selling downstream products (i.e., mobile handsets, laptops, etc.), royalties are U*'s main or only source of revenues. In this scenario, each of the vertically-integrated firms will thus pay a cumulative royalty rate of 5% (one licence from U* at 5%), while the non vertically-integrated firms will continue to pay cumulative rate of 25% (five licences each at 5%). The average cumulative royalty rate paid by the nine firms willing to implement the standard therefore amounts to $((5\% \times 4) + (25\% \times 5)) / 9 = 16.11\%$. In this scenario, the royalty rate advantage for vertically-integrated firms compared to pure downstream firms is thus lower than in scenario 2 (20% compared to 25%).

Scenario 4: The essential IP is held entirely by a pure upstream firm and four vertically-integrated firms and five pure manufacturers need a license to compete downstream

In this scenario, all the essential IP is owned by an upstream firm, which requests a royalty rate of 5% to license its IP. Figure 4 illustrates the scenario. The vertically-integrated firms are in the same situation as the pure manufacturers, despite the fact they engage in R&D, as they do not own any essential IP to the standard in question (either because they focused on technologies relevant to other standards or because their research on the standard in question has been unsuccessful and they do not have any patentable technology). In this case, the average cumulative royalty rate will amount to $(9 \times 5\%) / 9 = 5\%$.

Figure 4



B. Discussion

A number of valuable insights can be gained from considering the above scenarios.

First, these scenarios explain the presence of inconsistent reports as to the cumulative royalty rates applicable to firms wishing to implement a given standard. In fact, vertically-integrated firms with significant portfolios of essential patents will, thanks to their ability to cross-license, face a much lower royalty burden than pure manufacturers holding no IP. A distinction has thus to be made between the *minimum* cumulative royalty rate, the *maximum* cumulative royalty rate and the average *cumulative* royalty rate. Different firms will face these different rates, and thus will have very different views of the reasonableness of the royalties charged.

Consider, for instance, scenario 2 in which the minimum cumulative royalty rate (which applies to the vertically-integrated operators) is zero, the maximum cumulative royalty rate (which applies to pure manufacturers) is 25%, and the average cumulative royalty rate (which represents the cumulative royalty rates across all firms active downstream) is 12.5%. Those complaining about high cumulative royalty rates must thus refer to the maximum cumulative royalty rate paid by firms with no essential IP, while conveniently ignoring that most standard implementers can significantly lower their cumulative royalty costs through cross-licensing. This omission gives a distorted view of the royalty situation for the implementation of a given standard because it ignores the value of the contributions the licensees make to the standard. The maximum rate may thus be mistakenly used to suggest reforms aimed at reducing what are claimed to be excessively high cumulative royalty rates when in fact they reflect genuine differences in contributions.

Second, scenario 1 shows that vertically-integrated firms, which do not pay any royalties, can be at a significant cost advantage compared to pure manufacturers, which face a cumulative royalty rate of 25%. Although this royalty cost difference appears to make entry on the downstream market for the relevant product more difficult, it does not in itself amount to an anti-competitive abuse. Since the patent portfolio held by the vertically-integrated manufacturers (or, as in scenarios 3 and 4, held by pure upstream firms) generally results from costly research and development (R&D) efforts which need to be adequately compensated, pure downstream firms should pay more to join in a market in whose creation they did not contribute. Allowing firms to freely benefit from the investments of others would have several negative consequences. First, it would encourage inefficient entry. Second, the results of such R&D efforts would be expropriated to the benefit of those firms (in this case the pure manufacturers), which would not have undertaken similar efforts. This would negatively impact incentives to invest in R&D.

Moreover, the fact that pure manufacturers have to pay royalty rates to essential IP holders, which can thus place them at a cost disadvantage, should give them an incentive to engage in R&D and develop their own portfolio of essential patents – if only to be in a position to cross-license and thereby lower their royalty payments.¹⁹ Having these firms engaging in R&D, would have two main benefits. First, it would increase the level of innovation in the relevant sector, which is a socially desirable goal. Second, by reducing their royalty cost disadvantage vis-à-vis vertically-integrated firms, these firms would be able to compete more vigorously on the downstream market for the relevant product, thereby putting pressure on end consumer prices and increasing consumer choice.

The fact that royalty payment differences between vertically-integrated firms and pure manufacturers may be legitimate does not mean, however, that the licensing strategy of the vertically-integrated firms should be left unchecked. These firms often have both the means and the incentives to engage in anticompetitive conduct. First, vertically-integrated operators may be tempted to discriminate against pure manufacturers, especially considering that, unlike pure upstream firms, vertically-integrated firms take their profit downstream.²⁰ One way to eliminate downstream competition would be to refuse to grant licenses to pure manufacturers, a strategy which is unlikely to be possible in standard setting contexts since an outright refusal to license would obviously violate FRAND commitments. Vertically-integrated firms might however foreclose their downstream competitors by imposing un-FRAND royalties, which would amount to a constructive refusal to supply. Foreclosure strategies based on the selling of necessary inputs at prohibitive (and/or discriminatory) prices have, for instance, been observed in network industries.²¹

¹⁹ Alternatively, these firms could decide to maintain their focus on manufacturing, but associate strategically with a design shop. This approach is common in the chip industry, where “fabless” design firms having their chips manufactured by foundries can be an efficient division of labour.

²⁰ See Swanson and Baumol, *supra* note 6.

²¹ See generally, Geradin and Kerf, *supra* note 18.

Alternatively, the vertically-integrated firms might charge rates that allow pure downstream firms to operate, but which soften price competition dramatically, allowing the vertically-integrated firms to earn considerable margins. Moreover, vertically-integrated firms could engage in a margin squeeze by combining high royalty rates with aggressively low prices for the relevant downstream product.²² Finally, as was discussed in the context of the first scenario, cross-payments of royalties among vertically-integrated firms may be a strategy to engage in price-fixing cartels. Vertically-integrated firms may thus adopt licensing strategies that hurt pure manufacturers since vigorous downstream competition is likely to negatively affect their profit margins.

Third, the above scenarios lead to the counter-intuitive observation that there may be a negative correlation between the cumulative level of royalties and the degree of competition in the downstream market. In scenario 1, the average cumulative royalty rate amounts to zero since none of the vertically-integrated firms pay any royalty. In this scenario, the downstream market for the relevant product is, however, limited to five players, and thus the downstream market is characterized by oligopolistic features.²³ For reasons that have been abundantly been discussed in the economic literature, oligopolistic markets may not be competitive.²⁴ In scenario 2, the average cumulative royalty rate is higher than in scenario 1 since it amounts to 12.5%. Yet, if the pure manufacturers manage to overcome their 25 % royalty cost disadvantage by being particularly cost efficient, the downstream market will count ten players and thus will likely be much more competitive, with positive consequences in terms of prices, consumer choice and innovation.

As the economic literature also points out, whether an input cost increase, such as higher royalty rates, is passed on to end consumers in the form of higher prices depends on the level of downstream competition and consumers' elasticity of demand.²⁵ Higher average cumulative royalty rates do not necessarily translate in higher end consumer prices. These rates are due to the presence of firms without essential IP, the presence of which can stimulate downstream competition, thereby putting pressure on end consumer prices.

This observation is confirmed by extending the second scenario. If, for instance, three of the five pure manufacturers were not able to address their royalty cost disadvantage and thus were forced to exit the downstream market, this would translate in a significant decrease in the average cumulative royalty rate from 12.5% to $((0\% \times 4) + (25\% \times 2)) /$

²² See Damien Geradin and Robert O'Donoghue, "The Concurrent Application of Competition Law and Regulation: The Case of Margin Squeeze Abuses in the Telecommunications Sector", (2005) 2 *Journal of Competition Law and Economics* 355.

²³ "An oligopoly is a market characterized by a small number of firms who realize they are interdependent in their pricing and output policies. The number of firms is small enough to give each firm some market power". See Glossary of Industrial Organisation Economics and Competition Law, compiled by Shyam Khemani and Daniel Shapiro, commissioned by the Directorate for Financial, Fiscal and Enterprise Affairs, OECD, 1993.

²⁴ See Kip Viscusi, John Vernon, and Joseph Harrington, Jr., *Economics of Regulation and Antitrust*, Third Edition, Cambridge (2000), p. 135.

²⁵ See for example, Luke Froeb, Steven Tschantz and Gregory J. Werden, "Pass-Through Rates and the Price Effects of Mergers," *International Journal of Industrial Organization*, Vol. 23, 2005.

10 = 5%. Yet, the downstream market would be less competitive, limited now to seven players. This would in turn likely have a negative effect on consumer prices and choice, and innovation. After all, consumer welfare is much more likely to be positively affected by vigorous downstream competition than by minor price adjustments on intermediary inputs (in this case, essential patents).

This observation is important since it is often argued that high cumulative royalty rates negatively affect end consumers and that, as a consequence, measures should be taken to reduce such rates. This claim, however, would be true only if such high royalty rates were paid by the majority of firms (not the minority of pure downstream entities), if the cost savings realized from lower royalty rates were automatically passed on to end consumers, and if the royalty rates were extremely high so that they had a measurable affect on downstream prices. In addition to these possibilities, however, is another scenario in which high royalties could raise consumer prices: the vertically-integrated firms could charge exclusionary royalty rates to their downstream competitors, thereby softening price competition. This latter scenario would be anticompetitive and likely to violate EC competition law (as a form of market foreclosure and/or tacit collusion). In most scenarios, however, a higher average cumulative royalty rates will typically indicate the presence of pure manufacturers, representing increased downstream competition.

Fourth, the above scenarios show that the so-called “royalty stacking” problem,²⁶ whereby essential patents are spread across a large number of firms so that the royalties may stack on top of each other and make the standard very costly to implement, is significantly attenuated through cross-licensing. Thus, in scenarios 1 and 2, the cumulative royalty rate paid by the vertically-integrated firms is equal to zero. Scenario 3, however, shows that even vertically-integrated firms will have to pay royalties to a pure upstream firm, which, because royalties represent its only source of revenues, will not be satisfied with a royalty-free cross-licensing agreement.

But will these royalty payments necessarily lead to higher consumer prices as vertically integrated firms are likely to claim? The answer is no for the following reasons. First, the prices of the relevant product will not solely depend on the costs faced by vertically-integrated firms, but on the degree of competition in the downstream market. Except in perfectly competitive markets, sellers may not necessarily fully reflect input price increases in their selling prices. In some circumstances, input cost changes may induce firms to engage in price fixing cartels designed to agree on the level of cost passed on in price increases to the customers.²⁷ When manufacturers earn substantial profit margins, increased input prices can often represent a transfer across firms with no impact on consumer prices at all. That is, the upstream firm captures more of the overall market rents, so that the manufacturer’s margin is reduced but consumer prices remain

²⁶ See Lemley and Shapiro, *supra* note 6; Damien Geradin et al., “The Complements Problem within Standard Setting: Assessing the Evidence on Royalty Stacking”, forthcoming *Boston University Journal of Science & Technology Law* (2008).

²⁷ See BBC News, “BA accused over air cargo cartel”, (reporting that British Airways had been accused of colluding in setting prices of fuel surcharges and other levies in the provision of air freight services), available at <http://news.bbc.co.uk/1/hi/business/7158981.stm>

unchanged. Moreover, the 25% royalty cost advantage enjoyed by vertically-integrated firms over pure manufacturers in scenario 2 is reduced to 20% in scenario 3 when the upstream specialist enters, thereby making it easier for pure manufacturers to compete on the downstream market. This could translate into lower prices as more downstream firms are able to enter and compete.

Finally, scenario 4 significantly differs from scenarios 2 and 3 since the essential IP is entirely owned by upstream firm U*. This scenario allows stronger competition in the downstream market for the relevant product since the pure manufacturers do not suffer any royalty cost disadvantage compared to vertically-integrated firms, which for the sake of implementing this standard lose the benefit of their vertical integration. Moreover, the risk of distorted competition is also limited in this case since the upstream innovator has no incentives to discriminate among its various licensees, regardless of whether they are vertically integrated or not.²⁸ This scenario is also likely to stimulate innovation since the vertically-integrated firms will have incentives to engage in R&D and develop a patent portfolio essential to the standard in question or to develop technologies which will lead to the development and adoption of a new, more advanced standard. The upstream firms will also have strong incentives to continue innovating as this is the only way for them to maintain their royalty revenues over time.

One question remaining, however, is whether the upstream firm is sufficiently price constrained so as to be unable to charge excessive rates. This question raises a second question, namely what an “excessive” rate is and who should make that determination. But more generally, the first question cannot properly be answered without drawing an important distinction between “patent trolls”, firms which seek to monetize patents they may have acquired from third parties by suing firms which may have infringed these patents, and firms engaging in significant R&D with the objective of playing a long-term role in the sector. While patent trolls will generally not care whether they become pariahs of an industry as they operate under a short term strategy, other firms will be constrained by their need to maintain a reputation as credible actors. Otherwise, upstream firms’ technology may be systematically left out of future standards.

III. Conclusions

The licensing of standardized technologies is a complex subject on which a lot has been written over the last few years. The bulk of the literature suggests that the FRAND regime no longer works and that something needs to be done to control royalties, as excessively high royalties threaten the implementation of standards. Royalty stacking is one of the concerns behind the view that something has gone wrong with royalties in high technology industries.

²⁸ See Damien Geradin and Nicolas Petit, “Price Discrimination under EC Competition Law – Another Doctrine in Search of Limiting Principles?”, 2(3) *Journal of Competition Law and Economics*, 479 (2006) and Geradin et al., “Elves or Trolls? The Role of Non-Practicing Patent Owners in the Innovation Economy” Working Paper, April 2008.

Standard implementers, who claim that in some sectors cumulative royalty rates can be so high that standards might become too costly to implement, have proposed a variety of reforms. Among the proposals are allowing joint negotiations of licensing terms,²⁹ encouraging ex ante disclosure of such terms,³⁰ and imposing royalty caps on essential IPR.³¹ Against this background, this paper has sought to demonstrate that these concerns often reflect a number of misconceptions and a fair amount of misinformation when it comes to evaluating the royalties that are paid by standard implementers. In particular, this paper makes the following observations.

First, there is a great deal of confusion between the *minimum* cumulative royalty rate, the *maximum* cumulative royalty rate and the *average* cumulative royalty rate that apply to the implementation of a standard. While scholars, policy-makers and industry officials have referred to royalty rates as high as 30% in some sectors, they usually fail to mention that those cumulative rates are not common, but instead apply to implementers that have not technologically contributed to the creation of the standard. Those with essential IP tend pay much lower rates and in some cases do not pay any royalty at all. As we have seen above, it is not illegitimate in itself that firms which did not engage in relevant R&D pay two-digit royalty figures to be entitled to implement the technologies developed by others. Risk should, after all, have its rewards. Thus, relying on the highest cumulative royalty rates (e.g., 30%) paid only by a limited number of industry players to argue that royalty rates are generally too high and that reforms are needed to lower them cannot be taken seriously.

Second, there is no automatic connection between the level of cumulative royalty rates and the prices paid by end consumers. This is because the downstream producers' ability to pass on such rates depends on a number of market factors, as indicated above. More generally, unless cumulative royalties were extremely high, the prices paid by end consumers are much more likely to be influenced by the degree of downstream competition. Thus, high *average* cumulative royalty rates may simply arise from the fact there are many players in both upstream and downstream markets, and thus a great deal of competition in the market for the relevant product. As end consumer prices must be the focus of competition authorities, one goal should be to ensure that (efficient) pure manufacturers are not excluded from the downstream market.

Third, pure upstream firms and vertically-integrated firms do not have similar incentives. While vertically-integrated firms compete downstream and can thus have incentives to restrict competition at that level, pure upstream firms have no incentives to reduce downstream competition. Quite the contrary, since royalty rates are their main or only

²⁹ See Ohana et al., supra note 7; Skitol, supra note 7.

³⁰ See, for instance, the DoJ Business Review Letters discussed at note 4.

³¹ See for instance "Groups push for action on intellectual property", Financial Times, 21 November 2005 (reporting that a number of mobile carriers made proposals at ETSI to suggest that IPR terms should be agreed before a standard is even set, and argue in favour of putting a cap on the "maximum royalty payment from individual IPR users to the combined IPR holders"); The Register, "Mobile patents war shifts to email", available at http://www.theregister.co.uk/2005/11/29/mobile_email_patents_war/; Andrew Updegrave, "Ex Ante Disclosure: Risks, Rewards, Process and Alternatives", *Consortium Standards Bulletin*, June 2006, Vol. V, No. 6, at 13.

source of revenues, their focus is on increasing downstream output and thereby maximizing royalty payments. Upstream firms not only are lacking incentives to discriminate, but on the contrary may adopt strategies designed to encourage or facilitate entry into the relevant downstream market (for instance, by providing technological support and other forms of relevant assistance to new entrants).

Finally, the reforms that have been proposed to modify the FRAND regime should be based on accurate information and should be evaluated to determine that they will not cause problems that are worse than the alleged diseases they offer to treat. Along these lines, competition authorities should refrain from regulating royalties, a complex task these authorities are not well placed to undertake. Instead, their focus should be to protect and promote downstream competition.