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PATENT VALUE APPORTIONMENT RULES FOR COMPLEX, MULTI-PATENT PRODUCTS*

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I. INTRODUCTION

The vast majority of the products developed by the information technology (“IT”) industry are technologically complex, incorporating hundreds or thousands of different components, and many of these components read on an increasingly large number of patents held by a number of third parties.¹ That is, for instance, the case of personal computers, digital cameras, and smartphones.² Assessing patent value when multiple, complementary patents held by different patent holders are involved is a complicated exercise, which may need to be carried out in both litigation (e.g., patent infringement lawsuits) and non-litigation (e.g., technology licensing) contexts.

U.S. federal patent law authorizes a patentee who successfully

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1. Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, 1 INNOVATION POL’Y & ECON. 119, 120-21 (2000); Ted Sabety, *Nanotechnology Innovation in the Patent Thicket: Which IP Policies Promote Growth?*, 15 ALB. L.J. SCI. & TECH. 477, 479 (2005).

2. This problem, however, is not unique to the IT industry, but can also arise in the life sciences area. See, e.g., Keith I. Jones, Michael E. Whitham & Philana S. Handler, *Problems with Royalty Rates, Royalty Stacking and Royalty Packing Issues*, in INTELLECTUAL PROPERTY MANAGEMENT IN HEALTH AND AGRICULTURAL INNOVATION: A HANDBOOK OF BEST PRACTICES 1121 (2007), available at <http://www.iphandbook.org/handbook/ch11/p09/>. (“Virtually all products now developed using biotechnology, genetic engineering, and chemistry are technology complex, incorporating many different inputs. While this alone complicates R&D efforts, there is also the added complexity of potentially relevant intellectual property (IP) rights held by third parties, attached to these inputs. For example, R&D for a new vaccine might have used numerous inputs with corresponding third-party proprietary rights attached: research tools, recombinant techniques, DNA sequences, transformation vectors, cell lines, adjuvants, and delivery services.”).

proves that its patent has been infringed to recover profits lost or damages that are due to the infringer's unlawful conduct, "but in no event less than a reasonable royalty" for the use of the patented invention.³ A royalty payment is comprised of two components: a *royalty rate* and a *royalty base*, upon which the rate is applied.⁴ Defining a reasonable royalty rate is in many ways an art as opposed to a science, and, as such, rates are perennially the subject of heated debate.⁵ But the royalty base is not free from controversy. Given the growing complexity of products, whether the royalty base for a given patent should include only the component(s) of the product that the patent directly reads on or the product as a whole seems an important question that has been hotly debated in courts⁶ and also by scholars⁷ and policy-makers.⁸

Against this background, the objective of this article is not to review the case law of U.S. federal courts dealing with apportionment, a task for which we are not qualified, but rather to offer some thoughts on the economic principles or rules that can be applied to address the determination of the royalty *base* and *rate* in concrete situations. In this respect, litigation contexts are not the only circumstances in which patent value apportionment and licensing rates are disputed—cooperative standard setting is another instance where multiple complementary patents must be licensed against a

3. 35 U.S.C. § 284 (2000) ("Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.").

4. LARRY M. GOLDSTEIN & BRIAN N. KEARSEY, TECHNOLOGY PATENT LICENSING: AN INTERNATIONAL REFERENCE ON 21ST CENTURY PATENT LICENSING, PATENT POOLS AND PATENT PLATFORMS 158 (2004).

5. See generally Mark A. Lemley & Carl Shapiro, *Patent Hold-Up and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007). But see, John M. Golden, Commentary, "*Patent Trolls*" and *Patent Remedies*, 85 TEX. L. REV. 2111 (2007); Einer Elhauge, *Do Patent Holdup and Royalty Stacking Lead to Systematically Excessive Royalties?*, 4 J. COMPETITION LAW & ECONOMICS 535 (2008).

6. See *Uniloc USA Inc. v. Microsoft Corp.*, No. 03-CV-0440, 2011 WL 9738 (Fed. Cir. Jan 4, 2011); *Lucent Techs., Inc. v. Gateway*, 580 F.3d 1301 (Fed. Cir. 2009); *Cornell University v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279 (N.D.N.Y. 2009); *IP Innovation L.L.C. v. Red Hat, Inc.*, 705 F. Supp. 2d 692 (E.D.Tex. 2010).

7. See, e.g., Brian J. Love, *Patentee Overcompensation and the Entire Market Value Rule*, 60 STAN. L. REV. 263 (2007); Amy Landers, *Let the Games Begin: Incentives to Innovation in the New Economy of Intellectual Property Law*, 46 SANTA CLARA L. REV. 307 (2006).

8. See *Patent Reform Act of 2007: Hearing on, H.R. 1908 Before the Subcomm. On Courts, Internet, and Intellectual Prop. of the H. Comm. on the Judiciary*, 110th Congress (2007).

single product or service.⁹

From a mathematical perspective, of course, the individual elements of a royalty payment are irrelevant in isolation, as one variable can adjust with the other. Whether we apply a 1% royalty rate to a \$100 product price or a 10% royalty rate to a \$10 value component, the per unit royalty payment will be \$1. What, then, is behind all of the controversy? What is mathematically clear or theoretically supportable as compared to what is realistic and practical in the real world is often (if not typically) an entirely different matter. Such is the case with royalty determinations, and hence, the dispute over so-called “apportionment” and “entire market value” rules for patent value in either licensing or damages situations.¹⁰ In one camp are those who hew to the theoretical ideal, arguing that a royalty base relying on anything broader than the value of the component(s) at issue will mislead impressionable juries into granting too-high royalty rates and excessive damages (in relation to the underlying contribution from the patented technology).¹¹ And indeed, a recent judgment found that the plaintiff had attempted to use the entire market value rule in just such a manner, to mislead the jury to a higher damages figure.¹² In the other camp are those who understand the mathematical flexibility and/or who recognize the practical difficulties of actually applying component pricing in many instances.¹³

In this article, we assess the arguments of both camps in the context of complex, multi-patent, multi-patent holder settings. In such environments, complementary input problems, which are at the root of the debate, naturally arise. Among the more famous of these is the theory of Cournot complements, which establishes that when different entities supply complementary inputs necessary for the creation of a single good, both will add their own profit margins to the pricing of those inputs without fully accounting for the pricing of other inputs. With each supplier adding its own margin, end user prices will be

9. See, e.g., Damien Geradin, Anne Layne-Farrar & Jorge Padilla, *The Complements Problem Within Standard Setting: Assessing the Evidence on Royalty Stacking*, 14 B.U. J. SCI. & TECH. L. 144 (2008).

10. See, e.g., Eric E. Bensen, *Apportionment of Lost Profits in Contemporary Patent Damages cases*, 10 VA. J.L. & TECH. 1 (2005); Eric E. Bensen & Danielle M. White, *Using Apportionment to Rein in the Georgia Pacific Factors*, 9 COLUM. SCI. & TECH. L. REV. 1 (2008).

11. See Bensen, *supra* note 10, at 6; Bensen & White, *supra* note 10, at 8-9.

12. See *Uniloc USA Inc. v. Microsoft Corp.*, No. 03-CV-0440, 2011 WL 9738 (Fed. Cir. Jan. 4, 2011).

13. See RAYMOND T. NIMMER & JEFF C. DODD, *MODERN LICENSING LAW* (2005).

higher, even more than an integrated monopolist would price in order to maximize its profits.¹⁴ A more recently recognized application of the complementary input problem is royalty stacking.¹⁵ Similar to the traditional tangible goods that Cournot had in mind back in the 1800s, this newer theory holds that patent holders will set their royalty rates without regard to other strictly complementary patent holders, potentially leading to a cumulative royalty payment for the good's producer (the licensee) that is so high it no longer makes financial sense to produce the product.¹⁶

Concerns of these sorts have breathed new life into the long-standing apportionment/entire market value debate. If any given patent licensor can grab more than its reasonable share of the value commanded by the good in the marketplace, then the other relevant patent holders may be undercompensated, and more likely, licensees will face unfairly high licensing costs that eat into their profit margins or, in extreme cases, make production of the good unprofitable altogether.

These theoretical concerns are well vetted and well recognized. But are they really a problem in actual markets? Or, less restrictively, do they emerge with enough frequency and regularity that they call for preemptive solutions to be applied? Cross licensing, for instance, is prevalent in many industries and is acknowledged as a working solution to royalty stacking.¹⁷ True, this solution is applicable only for patent holders with downstream operations (e.g., vertically integrated

14. See AUGUSTIN COURNOT, RESEARCHES INTO THE MATHEMATICAL PRINCIPALS OF THE THEORY OF WEALTH 99-116 (Nathaniel T. Bacon trans., Augustus M. Kelley ed. 1960) (1838). See also Nicholas Economides & Steven C. Salop, *Competition and Integration Among Complements, and Network Market Structure*, 40 J. INDUS. ECON. 105, 106-09 (1992); Hugo Sonnenschein, *The Dual of Duopoly Is Complementary Monopoly: or, Two of Cournot's Theories Are One*, 76 J. POL. ECON. 316, 316-17 (1968).

15. See Shapiro, *supra* note 1, at 122-24, 127-28; Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, SCIENCE, May 1, 1998, at 698-700 (based on a more formal analysis by Michael Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1998)).

16. For a different perspective on royalty stacking, see Geradin et al., *supra* note 9; Richard A. Epstein & Bruce N. Kuhlik, *Is There a Biomedical Anticommons?*, REGULATION, Summer 2004, at 54, 55-56 (arguing that private parties often have strong incentives to avoid harmful outcomes like patent thickets. Private solutions include cross licensing, patent pools, and the strategic denial of property rights).

17. See Damien Geradin, *What's Wrong with Royalties in High Technology Industries?*, COMPETITION POLICY AND PATENT LAW UNDER UNCERTAINTY 12 (Geoffrey A. Manne & Joshua D Wright eds., Cambridge University Press, forthcoming 2011); Peter C. Grindley & David J. Teece, *Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics*, 39 CAL. MGMT. REV. 9, 9-10, 24-25 (1997).

firms), but nonetheless it is a valid market-based resolution. More broadly, patent holders have no interest in killing the market for their licenses and thus will not blithely set their licensing terms without any regard to other patent holders or general market conditions. The question of the frequency of Cournot complements problems is therefore essentially an empirical one, but due to the dearth of publicly available data on licensing, empirical studies are practically non-existent.¹⁸ As a result, we cannot ignore the risk of complements problems arising, given their sound theoretical basis and their potential to emerge in practice, but we also need to be careful not to assume that these problems will necessarily emerge every time more than one patent holder must be licensed. We do not take a stand here on the frequency question, but it is important to keep it in mind as we assess the apportionment debate.

Our focus here is an investigation of the issues that practitioners face in relation to licensing or litigating patents in complex product, multi-patent holder environments. These issues can be illustrated by two simple examples. In our first example, Product X is manufactured by Firm A and is made of 100 components (C1 to C100). We also assume that technology-heavy Component 2 (C2) potentially infringes 100 patents (P1 to P100), including Patent P5, held by Firm B. A few weeks after Product X was placed on the market, B sues A for infringement of P5. This patent is held valid and the product is determined to infringe it, which leads to the need for determination of a reasonable royalty rate. B argues that the royalty should be based on the sales of Product X as a whole (entire market value) whereas A considers that the royalty should be calculated on a much smaller basis, namely C2. In our second example, Product Y, which is manufactured by Firm C, is made of 5 components (C1 to C5), where C5 implements Standard S1, which involves 1000 potentially essential patents (P1 to P1000).¹⁹ Firm D holds 100 of these 1000 essential patents and enters into negotiation with Firm C. As part of the licensing agreement, D demands a royalty representing 5% of the net sales of Product Y to which C disagrees on the ground that this rate is unreasonable. Both of these scenarios involve complex questions regarding the determination of a royalty base and a royalty

18. See, e.g., Geradin et al., *supra* note 9, at 155.

19. We say “potentially” because participants in cooperative standard setting typically declare patents as potentially essential to the practice of the standard. To determine actual essentiality, detailed legal and technical reviews are needed, and these are often contested. For the above example, we assume that 1000 patents have been declared to the standard, but not evaluated.

rate, which we seek to highlight in this article.

In the remainder of this article, we present our evaluation of the above considerations. We begin with the royalty base. In Section II we offer a few illustrative scenarios that capture the pivotal issues at play in determining a viable royalty base and review the practical considerations that must necessarily drive the choice of a royalty base. We then turn to the appropriate royalty rate, given the chosen royalty base, in Section III. Section IV discusses some of the complications that can hinder efficient licensing, like the risk of willful infringement and concerns over injunctions. Section V presents our concluding remarks.

We find that the entire market value rule should be applied with some flexibility. There are reasons beyond the fact that the patented technology is the basis for demand that warrant setting the royalty base at the level of the product price, rather than a more narrow apportioned slice of that product price.²⁰ In setting reasonable royalty payments, we must keep in mind both licensees and patent holders, and do our best not to bias the licensing process to one or the other side. While licensees worry about over compensation for patent holders deriving from an improper use of the entire market value rule, if that rule is applied too rigidly, it will lead to under compensation for patent holders.

II. DETERMINING AN APPROPRIATE ROYALTY BASE

As we have seen, once the infringement of a patent has been established, the U.S. patent statute requires adequate compensation for use of the invention, and sets a reasonable royalty as the minimum of this adequate compensation.²¹ The reasonable royalty is calculated on a “base” of sales of a particular infringing product or uses of a particular infringing process.²²

The scope of the royalty base can be determined in two principal ways. The first is a method known as “apportionment.” The origin of the apportionment rule can be traced back to *Seymour v. McCormick*, where the Supreme Court held that it would be a “very grave error to instruct a jury ‘that as to the measure of damages the same rule is to govern, whether the patent covers an entire machine or an improvement on a machine’”.²³ Subsequently, in *Westinghouse*

20. See *infra* III.D. (Market Method).

21. 35 U.S.C. § 284 (2006).

22. See, e.g., Goldstein & Kearsy, *supra* note 4, at 151-53.

23. *Seymour v. McCormick*, 57 U.S. (16 How.) 480, 491 (1853).

Electric & Mfg. Co. v. Wagner Electric Mfg. Co., the Supreme Court held that:

“[The patentee’s] invention may have been used in combination with valuable improvements made, or other patents appropriated by the infringer, and each may have jointly, but unequally, contributed to the profits. In such case, if plaintiff’s patent only created a part of the profits, he is only entitled to recover that part of the net gains.”²⁴

In practice, this means that when a patent reads on the entirety of an infringing product, the royalty base should be the total value of the sales (or use) of that product. By contrast, when the patent at issue covers only a component of the infringing product, the value of the sales or uses of that item must be apportioned between the patented invention and the remaining unpatented components. The apportionment principle seeks to ensure that the damages awarded to the patentee are proportionate to the contribution of its invention to the infringing product, and not based on any value attributable to the infringer’s or third parties’ inventions.²⁵

The second method for calculating the royalty base is the “entire market value rule,” which recognizes that the economic value added to a product by a patented component may be greater than the value of the component alone.²⁶ In the *Rite-Hite* case, the Federal Circuit confirmed that patent infringement damages should be based on the full value of the infringing product or process in those instances where the patented feature is the basis for customer demand for the entire product or process.²⁷ What matters for the entire market value

24. *Westinghouse Electric & Mfg. Co. v. Wagner Electric Mfg. Co.*, 225 U.S. 604, 615 (1912). In the *Georgia-Pacific* case, the district court identified a list of factors that may be relevant to determining a reasonable royalty for patent infringement damages, including factor 13, which provides that courts should consider “[t]he portion of the realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvements added by the infringer” when apportioning damages. *Georgia-Pacific Corp. v. United States Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), *modified and aff’d*, 446 F.2d 295 (2d Cir. 1971), *cert. denied*, 404 U.S. 870 (1971).

25. *See, e.g.*, Bensen, *supra* note 10, at 11.

26. *Id.* at 12.

27. *Rite-Hite Corp. v. Kelley Co., Inc.*, 56 F.3d 1538, 1549 (Fed. Cir.) (en banc), *cert. denied*, 116 S. Ct. 184 (1995). Besides the fact that the “infringing components must be the basis for customer demand for the entire machine including the parts beyond the claimed invention,” two additional conditions must be met: “the individual infringing and non-infringing components must be sold together so that they constitute a functional unit or are parts of a complete machine or single assembly of parts” and “the individual infringing and non-infringing components must be analogous to a single functioning unit.” *See* Cornell University v.

rule is whether the patented component drives demand for the entire product.²⁸ If that is the case, the entire market value rule permits the patentee to treat all revenue from the infringing product as an appropriate royalty base when calculating reasonable royalty damages.²⁹

That rule, and its extension by courts in the last two decades,³⁰ has been criticized for over-rewarding patentees, especially if applied to complex, multi-patent products.³¹ For example, Love writes that “[a]s a result of its expansion into a broad exception to the general rule of apportionment, the entire market value rule often overcompensates patentees through excessive awards of patent infringement damages.”³² He then develops an economic model to demonstrate that “the application of the entire market value rule overcompensates patentees unless the patent at issue accounts for the entire value of the accused product to the infringing firm.”³³

Taking Love’s model as representative of the general position, we find that strict arguments against the entire market value rule (e.g., those that claim that the rule should only be used in those instances where the patented component drives the full value of the product) have two important weaknesses. The first lies in the benchmark of what a reasonable royalty payment is. Some of those arguing that the entire market value rule overcompensates patent holders start from a benchmark biased in favor of infringers over patent holders.³⁴ For instance, Lemley and Shapiro’s analysis of royalty stacking, upon which Love bases his analysis, sets the benchmark reasonable royalty payment at $\beta * v$, where β is less than or equal to 1 and represents the relative bargaining power of the patent holder vis-à-vis the licensee and where v represents the value that the patented technology contributes to the manufacturer’s product.³⁵ Lemley and Shapiro (and Love) argue that any payment up to and equaling $\beta * v$ is reasonable, while any payment that exceeds $\beta * v$ is excessive, in that it over-rewards the patent holder.³⁶ But for any value of β less than 1, the

Hewlett-Packard Co., 609 F. Supp. 2d 279, 286-87 (N.D.N.Y. 2009).

28. See, e.g., Bensen, *supra* note 10, at 34-35.

29. *Id.* at 35.

30. Landers, *supra* note 7, at 309.

31. See Love, *supra* note 7, at 272.

32. *Id.*

33. *Id.*

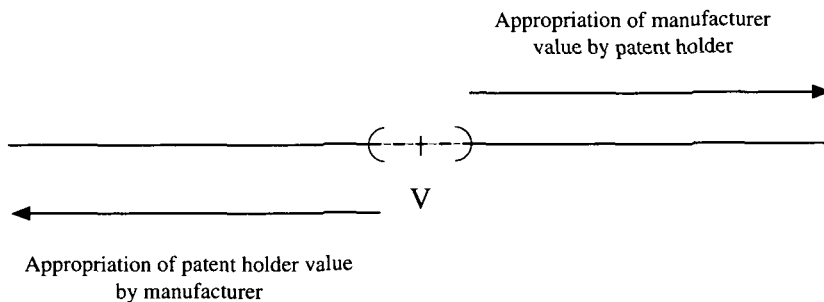
34. See, e.g., Lemley & Shapiro, *supra* note 5, at 1999; Love, *supra* note 7, at 273.

35. See Lemley & Shapiro, *supra* note 5, at 1999; Love, *supra* note 7, at 273.

36. See Lemley & Shapiro, *supra* note 5, at 1999; Love, *supra* note 7, at 273.

patent holder will not receive the full value contributed by the patented technology to the product. Advocates of this benchmark do not acknowledge that any payment less than v , the value that the patent holder alone is recognized as contributing to the product, represents an over reward for the licensee. In other words, this benchmark establishes that it is perfectly legitimate for licensees to appropriate patent holder value, but patent holders cannot appropriate any value contributed by the licensee without being accused of setting excessive royalties. The figure below illustrates the bias in this assumption.

Figure 1: Symmetric Appropriation of Patent Value



The dotted line area around v in Figure 1 represents the likely (and legitimate) disagreement over the precise value contributed by the patent to the product, as these issues are almost always subjective and thus hotly debated. The arrows on either side of the dotted line zone illustrate the symmetric nature of royalty setting. If the payment is too high (the area to the right of the dotted line zone), the patent holder will be overcompensated and the licensee will be harmed; if the payment is too low (the area to the left of the dotted line zone), the patent holder will be undercompensated, the licensee will appropriate value that it did not contribute, and the patent holder will be harmed. Given the uncertain nature of setting royalty payments, especially for forward royalty payments on new products, error in either direction is possible and should be kept in mind when deciding whether or not the entire market value rule is appropriate in a given case.

The second weakness that we see in strict arguments against the entire market value rule lies in the characterization of the royalty payment. Love, for instance, treats the royalty payment as an indivisible whole, set through the $\beta \cdot v$ determination described

above.³⁷ But as we note in the introduction, any royalty payment is comprised of two variables: the royalty rate and the royalty base.³⁸ The entire market value rule determines the base, but not the rate. In fact, the Court of Appeals for the Federal Circuit (CAFC) recognized this flexibility inherent in royalty payment determinations in its *Lucent v. Gateway* decision:

Although our law states certain mandatory conditions for applying the entire market value rule, courts must nevertheless be cognizant of a fundamental relationship between the entire market value rule and the calculation of a running royalty damages award. Simply put, the base used in a running royalty calculation can always be the value of the entire commercial embodiment, as long as the magnitude of the rate is within an acceptable range (as determined by the evidence). . . . Microsoft surely would have little reason to complain about the supposed application of the entire market value rule had the jury applied a royalty rate of 0.1% (instead of 8%) to the market price of the infringing programs. . . . Thus, even when the patented invention is a small component of a much larger commercial product, awarding a reasonable royalty based on either sale price or number of units sold can be economically justified. . . . There is nothing inherently wrong with using the market value of the entire product, especially when there is no established market value for the infringing component or feature, so long as the multiplier accounts for the proportion of the base represented by the infringing component or feature.³⁹

It is precisely this sort of reasonable approach that we are attempting to support in this article. It might be that the component upon which the patent reads is difficult to value separately, making the entire market value a reasonable starting point. Apportionment can be a difficult and subjective task;⁴⁰ calculating the royalty rate implied for the entire market value base so that the payment equals the value determined by an apportionment exercise offers a valid reasonableness check.⁴¹ For ongoing royalty payments, practical

37. Love, *supra* note 7, at 273.

38. See Goldstein & Kearsley, *supra* note 4, at 158.

39. *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1338-39 (Fed. Cir. 2009).

40. “The apportionment problem—how to determine how much of the ‘value added’ is due to the intellectual property at issue in the case, and how much is due to the other complementary assets (including other intellectual property), skills or risk-taking—is typically one of the most significant practical problems in doing intellectual property damages analysis.” Edward F. Sherry & David J. Teece, *Some Economic Aspects of Intellectual Property Damages*, 573 PLI/PAT 399, 403 (1999).

41. The CAFC has been quick to penalize those that attempt to use such “checks” for misleading purposes. See, e.g., *Uniloc USA Inc. v. Microsoft Corp.*, No. 03-CV-0440, 2011 WL

issues like sales verification and reporting enter the calculus as well. In the remainder of this section, we discuss these rationales for a flexible view of the entire market value rule. While a royalty base equal to the value of an individual component can be both the best and the most practical approach, that conclusion may not always be warranted. Rigid thinking about the royalty base can lead to undesirable effects. Relying on the entire market value rule need not lead to excessive royalties, as acknowledged by the CAFC in the quote above, and can instead be the most reasonable approach even when the patented component does not drive the entire market value of the product.

A. Can the Product Be Separated into Distinct Components?

In many instances, products can be separated into different parts. For instance, a personal computer (PC) will typically comprise a monitor, a keyboard, a central processing unit (CPU), a mouse, and possibly, some speakers or a webcam. But each of these parts will be made of many components. The CPU will certainly contain a chip (or several), a hard-drive, CD or DVD ROM drives, and a multitude of smaller, but sometimes equally important elements. Yet, in some cases, the product in question may not be so easily unbundled. Think, for instance, of smart phones. While they include chip(s) that may be used in other products, and thus can be unbundled relatively easily, a great deal of the customer-perceived value in these phones comes from the bundling of a number of features, including calendar functions, email, a camera, etc. In this case, the sum is greater than its parts. Moreover, the screen size and quality, the total size and weight of the phone, the life of the battery, and the phone's physical design will all have value as well, but will not always be separable from the phone itself.

Assuming that the product in question can be separated into distinct components and that the patent in question reads on one particular component, the next step in the analysis is determining the "value" of that component. When the particular component is sold in separate wholesale markets, the royalty base could amount to the average selling price of that component. Thus, assuming that a CD-ROM drive sells for \$25 and that the patent in question reads only on the CD-ROM, the obvious choice for the royalty base would amount to \$25. We might need to adjust this figure slightly, say taking an average selling price (ASP) over the relevant geographic region, or

9738, at *21 (Fed. Cir. Jan 4, 2011).

using a wholesale price instead of a retail price, but the general approach is clear.

Components may not always sell on wholesale markets, though, and this may be one of the reasons why they are developed in house rather than bought from third parties. This practical reality limits the usefulness of the component pricing approach.⁴² For example, suppose that a firm holds a patent on a technology that extends a particular smart phone battery for an additional hour of use before the phone needs to be recharged. Consumers would clearly value such an improvement, and the length of use between charging is an important one in choosing a phone. Typically, the battery is not sold separately from the phone. Moreover, battery life makes a significant contribution to the overall phone value, but cannot be said to be the basis of the entire value of the phone. How, then, should the royalty base be set? To take an even more complicated scenario, how should the base be set for a patent that reads not on any single component, but rather on the interface between components or on the way in which the components are assembled and work together? Clearly, there will be many instances where component based pricing is not attainable, even if it is theoretically desirable.

B. Does the Component in Question "Enable" Other Components?

As we have seen, the entire market value rule "permits recovery of damages based on the value of the entire apparatus contained several features, where the patent related feature is the basis for customer demand."⁴³ This language suggests a stringent threshold, where the component is *the* driving force for demand. The justification here is clear: when the patented feature is what drives customers to purchase the product, then the entire market value rule is most obviously the best approach⁴⁴ for the royalty base. For example, a patent on the active ingredient in a pharmaceutical drug would clearly qualify for the entire market value rule. When the relationship

42. *Lucent Techs., Inc.*, 580 F.3d at 1339 ("The license agreements admitted into evidence . . . highlight how sophisticated parties routinely enter into license agreements that base the value of the patented inventions as a percentage of the commercial products' sales prices. There is nothing inherently wrong with using the market value of the entire product, especially when there is no established market value for the infringing component or feature, so long as the multiplier accounts for the proportion of the base represented by the infringing component or feature.").

43. *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1580 (Fed. Cir. 1989).

44. *See, e.g., Bensen, supra* note 10, at 34-35.

is not so clear cut, critics argue that relying on the entire market value rule will lead to overcompensation for patent holders. But what about when the patented component is pivotal to the overall product value, but not the only feature driving demand?

In some circumstances, an argument can be made that a strict application of the component pricing rule may actually under-reward the patentee. For instance, if the component in question “enables” other components but does not rise to the level of driving demand. For instance, high-resolution screens allow a wide range of functionalities in PCs, such as video/movie watching, game playing, etc, but it would be questionable to assume that customers bought PCs primarily because of the screen. Similarly, the high data transmission rate that is allowed by 3G mobile telecommunications standards is what enables many of the more advanced applications that can be found in smart phones today, particularly those involving data transmissions and Internet access, but again, smart phones include a great deal of other valuable technology in addition to the high speed radio transmission.

While a particular patented component may not provide “the basis for customer demand,” if the component at issue enables other components, then limiting the royalty base to the individual component it reads directly upon is too restrictive. In this case, we may instead include multiple components in the royalty base. Or, if that were difficult to do, because valuing a group of components separately was too subjective, the entire market value approach might be the most appropriate, with the understanding that the royalty rate would be set accordingly.

The problem with determining whether one component “enables” additional components or is “the basis for customer demand” is that it is likely to involve subjective considerations. For example, Intel clearly attempted to influence consumer demand for computers with its “Intel inside” stickers and marketing,⁴⁵ but the extent to which the average consumer was fully aware of any differences in chips is debatable. As another example, in its day the sleek RAZR phone caught a lot of consumer attention,⁴⁶ but that slim design was only possible given a small sized battery and low profile

45. See Donald G. Norris, *'Intel Inside' Branding a Component in a Business Market*, 8 J. BUS. & INDUS. MKTG. 14 (1993).

46. Adam Lashinsky, *RAZR's Edge*, FORTUNE MAGAZINE (June 8, 2006, 9:44 AM), http://money.cnn.com/magazines/fortune/fortune_archive/2006/06/12/8379239/index.htm; Kent German, *Razr Refresh: Motorola's Fashion Cell Phone*, CNET (November 9, 2005), http://reviews.cnet.com/4520-3504_7-5670915-1.html.

chipsets inside the phone. More generally, it is only natural that firms have a rosy view of the contribution their technology makes to a particular product, which means patent holders will tend to argue for multiple components or entire market value while manufacturers will see their contributions as the most important such that third party patent holders should be limited to a narrow slice of product value.

When a patented feature enables other features, it may, however, be possible for the patentee to demonstrate that these other features would simply not work without the enabling feature, hence negatively affecting the entire value of the product. Patent holder evidence might be of a technical nature, showing that certain other features will fail if the component at issue is removed. More commonly, the evidence will be softer, considering quantities sold and prices charged in the marketplace. If, for example, the product is sold both with and without the feature at issue, the valuation process will be relatively easy, involving a simple price and demand comparison. In other instances, the feature may have been added relatively recently, so that demand can be assessed before and after the introduction. In yet other cases, customer surveys might be used to establish the features that consumers value most highly. For these reasons, plus all of the other reasons discussed in this subsection, we argue that product complexity and “enabling” components are important considerations in determining whether or not to apply the entire market value rule.

C. Taking into Account Reporting Needs

While the question of attributed value is crucial, we need to keep in mind more prosaic matters as well. Namely, reporting needs can dictate, or at least influence, the most appropriate choice of a royalty base.

Much of the debate over apportionment arises in the context of litigation. But the determination of the royalty base is also of much relevance in non-litigation contexts, such as when firms negotiate licensing agreements. In that context, or when litigation dictates that a forward running royalty rate be set, we posit that one factor to take into consideration in the determination of the royalty base concerns the practicability of the base selected with respect to reporting and monitoring issues. A patentee’s ability to generate revenues through licensing in great part depends on its ability to collect the fees that are owed to it by its licensees. That is the reason why licensees are typically subject to reporting obligations.

For reporting to work efficiently, the base on which royalties are

calculated must be objective and workable. Indeed, troubles with observing and verifying sales made in order to determine that licensees have reported the correct sales base is a significant real world problem, one that has even led to modifications in the licensing process and not just the choice of a royalty base.⁴⁷ For instance, in an attempt to reduce underreporting by its global licensees, Philips introduced per-batch licensing, a program it dubbed “VEEZA”, in place of its previous CD-R Disc Patent License Agreements.⁴⁸ With VEEZA, a separate license is obtained for each shipment.⁴⁹ The shipments are marked with a unique code that signals to the traders and retailers that the merchandise is licensed.⁵⁰

In regards to the underreporting problem, the average selling price of the product containing the patented feature offers the greatest clarity, as those prices often will be observable in public documents. These prices might be net of discounts, such as volume rebates, if price concessions are common in the industry involved. Even when product prices are not public, they will at least be consistently recorded in the licensee’s company documents, although in this case audits will likely be needed to verify the relevant sales quantities. Analogously, if an individual component is sold separately (as computer chips typically are), then the component price can be appropriate both from a theoretical and a practical point of view.

The point we are making here is not that reporting needs dictate one particular structure for the royalty base, but rather that practical concerns such as proper reporting do matter and must be considered in the apportionment debate. Just as licensees are entitled to pay no more than fair and reasonable royalty payments, patent holders are entitled to actually receive the royalty payments properly dictated by the parameters of an agreed upon license.

III. SETTING REASONABLE ROYALTY RATES

The second variable in the royalty payment calculation is the royalty rate.⁵¹ It is typically a percentage rate and thus reflects the proportion of the base value that the patented technology

47. See Philips Intellectual Property & Standards, Licensing Programs, <https://www.ip.philips.com/services/?module=IpsLicenseProgram&command=View&id=20&part=7> (last visited Mar. 15, 2011).

48. *Id.*

49. *Id.*

50. *Id.*

51. See GOLDSTEIN & KEARSEY, *supra* note 4, at 158.

contributes.⁵² As noted in the introduction, setting reasonable royalty rates (given a royalty base to which they will apply) involves a good degree of art.⁵³ There is little public data on arms-length patent licenses to guide us. Moreover, each patent is (at least in theory) unique, representing a novel contribution to the state of the art, else the patent office should not have granted the patent. As a result, pricing a patent royalty rate is much like pricing a work of art: beauty is in the eye of the beholder.

Licensing situations involving multiple complementary patents held by separate entities frequently adds another layer of subjectivity to royalty rate determination. If the two parties know (at least roughly) how many and which patents read on the product or service to be produced, then they can assess each patent and apportion royalty payments accordingly. More commonly, however, a licensee has only a loose understanding of how many patents are likely to read on its product/service. For instance, the typical semiconductor chip likely involves hundreds, perhaps more, patents. In turn, that chip may be intended for use in a laptop computer, the other components of which involve hundreds, or more, patents. Without knowing how many patents actually read on a product, and how many have holders who will actively seek licensing fees, it can be exceedingly difficult to assign the contributed value to those that are known. While the parties may have a working agreement on what the licensee contributes to the product—through its own know-how, processes, and marketing, for instance—and what is contributed as a whole by third parties (although this step will also be negotiated), the number of relevant third parties will clearly affect what any one of them should receive.⁵⁴

While setting “reasonable” royalty rates is clearly subjective, a number of approaches have emerged in practice to provide a framework for determining what a reasonable rate is. We summarize and critique those approaches in this next section.

A. *Rule of Thumb*

The surprisingly common rule of thumb, which suggests that a patent be licensed at 5% of the sales revenue or 25% of the operating profit margin for the good it reads upon,⁵⁵ implicitly assumes that

52. See *id.* at 156.

53. See *supra* p. 2.

54. Observe that it is not so much the number of patents that likely read on a given product, but rather the number of distinct patent holders, as patents can be treated as a bundle.

55. See Robert Goldscheider, John Jarosz & Carla Mulhern, *Use Of The 25 Per Cent Rule*

only one patent holder will emerge for any given product. Not only does this method fail to even attempt to value the patented technology and its contribution to a given product,⁵⁶ but clearly if four or more patent holders are present and each applies this rule, there would be no operating profit left for the licensee. In contrast, if a single patent (or portfolio of patents) contributes the lion share of the entire product value, 25% of the operating profit margin will be too low. So, although this method lowers transaction costs (since no analysis is required at all, by either party), it is wholly unsuited to the complex cases we have in mind.

It is not surprising, then, that in its January 2011 decision in *Uniloc USA Inc.*, the CAFC found that such rules of thumb are not acceptable by the Court.⁵⁷ In the decision, the Court wrote:

This court now holds as a matter of Federal Circuit law that the 25 percent rule of thumb is a fundamentally flawed tool for determining a baseline royalty rate in a hypothetical negotiation. Evidence relying on the 25 percent rule of thumb is thus inadmissible under *Daubert* and the Federal Rules of Evidence, because it fails to tie a reasonable royalty base to the facts of the case at issue.⁵⁸

B. Numerical Proportionality

One method that does explicitly address the multiplicity problem is numerical proportionality.⁵⁹ According to that method, which has been proposed in the standardization context but could also be applied outside that context,⁶⁰ the royalty entitlement of the holder of patents

in *Valuing IP*, 37 LES NOUVELLES 123, 123 (2002).

56. Rules of thumb also suffer from a number of well known shortcomings. See, e.g., HARVARD BUS. SCH., INTELLECTUAL ASSET VALUATION, CASE NO. 9-801-192 1, 5 (Dec. 8, 2000) (the case study was based on a paper originally written by Gavin Clarkson, Olin Fellow for Law, Economics, and Business at Harvard Law School).

57. See *Uniloc USA Inc. v. Microsoft Corp.*, No. 03-CV-0440, 2011 WL 9738 (Fed. Cir. Jan 4, 2011), at *21.

58. *Id.* at *19.

59. See Damien Geradin, *Standardization and Technological Innovation: Some Reflections on Ex-ante Licensing, FRAND, and the Proper Means to Reward Innovators*, 29 WORLD COMPETITION 511, 527-28 (2006) (provides a discussion and critique of papers taking this position).

60. That approach can be illustrated by the proposal made by some ETSI members (Nokia, Ericsson, and Motorola) that ETSI's current IPR policy can be revised in order to introduce the principles of "aggregated reasonable terms" and "proportionality" into the definition of FRAND. Pursuant to this proposal, called "Minimum Change, Optimal Impact", Aggregated Reasonable Terms would mean that "in the aggregate the terms are objectively commercially reasonable taking into account the generally prevailing business conditions relevant for the standard and applicable product, patents owned by others for the specific

essential to a standard should be calculated in the light of the proportional contribution of that patent owner's essential patents compared to the total contribution of all other essential patents reading on the standard. For example, if one patent owner declared 10 out of 100 essential patents, and another patent owner declared 20 out of 100 essential patents, the value of the second patent owner's essential patent portfolio would be twice as much as the first patent owner's essential patent portfolio (20% versus 10%).

While on its surface numerical proportionality offers a royalty rate calculation method that accounts for multiple patent holders, this approach amounts, in essence, to a simplistic formula that counts patents and is, therefore, seriously flawed and simply unfit to value patents.⁶¹ First, numerical proportionality unavoidably requires the determination of a "cumulative royalty cap", or rate ceiling applicable to all patent holders.⁶² The proponents of that method, however, cannot explain the basis and legitimacy for determining such a cumulative royalty cap, which would necessarily limit, pursuant to some unclear basis, the rewards available to innovators.⁶³

Second, numerical proportionality rests on the proposition that every patent is of equal value⁶⁴—a proposition that the Competition Committee of the OECD Directorate for Financial and Enterprise Affairs has flatly stated to be "meritless."⁶⁵ Specifically, numerical proportionality ignores the fact that the economic value of a particular patent or patent portfolio depends on the benefits it provides to the industry and ultimately consumers, which is far from a function solely of the number of patents. Clearly, (essential) patents are not equal and that simple fact makes numerical proportionality meaningless.

Finally, numerical proportionality would inevitably stifle innovation as it would incentivize firms to seek to generate as many patents as they could, hence favoring large corporations with

technology, and the estimated value of the specific technology in relation to the necessary technologies of the product." In turn, proportionality would mean that "compensation under FRAND must reflect the patent owner's proportion of all essential patents." See "Vendors Seek Compromise on LTE", Informa Telecoms and Media, 20 March 2006. For a criticism of that proposal; Geradin, *supra* note 59, at 527.

61. See Organization for Economic Co-operation and Development [OECD], Directorate For Financial and Enterprise Affairs, Competition Committee, *Policy Roundtables: Competition, Patents and Innovation II*, DAF/COMP (2009) 22, p. 28 (May 25, 2009).

62. See Geradin, *supra* note 59, at 529.

63. See *id.*

64. See *id.* at 530.

65. Organisation for Economic Co-operation and Development [OECD], *supra* note 61, at 28.

extensive IP departments able to file large numbers of marginally varying patents. If a smaller, innovative entity develops the next new breakthrough or “core” patent with a value far surpassing all prior patented technologies, the numerical proportionality formula would prevent it from being properly rewarded for its investment. With numerical proportionality, patent attorneys would suddenly become more important to companies’ licensing revenues than its true innovators.

C. *Cost-Based Rate Setting*

Added to the list of inappropriate methods is cost-based rate setting.⁶⁶ The notion here is that the patent holder’s cost of obtaining the invention and its patent forms the basis of the royalty rate.⁶⁷ A profit margin is simply tacked onto the innovation cost.⁶⁸ This method would be very hard to implement for at least a couple of reasons.

First, a major difficulty lies in the determination of the firms’ costs that need to be taken into consideration. Courts and regulators typically rely on one of the following cost methodologies when asked to assess whether the price of a product or service is “reasonable”: marginal cost (“MC”), average variable cost per unit (“AVC”), average total costs (“ATC”) or long run average incremental costs (“LRAIC”). The cost methodology selected would obviously have to take into account the fact that while innovation generates very high fixed costs, the (variable) cost of granting a license is close to zero. The relevant cost measure should therefore factor in the R&D expenditures of the patent holder. But this again would raise considerable difficulties.

There is also the question of which R&D costs should be taken into account. Considering only the R&D costs directly linked to the development of a given technology would be under-inclusive as innovative firms usually have to engage in dozens of research projects to develop one successful technology.⁶⁹ The costs of failed projects

66. Josh Lerner & Anne Layne-Farrar, *Valuing Patents for Licensing: A Practical Survey of the Literature* 8, (unpublished manuscript), available at <http://ssrn.com/abstract=1440292>.

67. *Id.*

68. *Id.*

69. Even if an innovator manages to obtain the necessary capital to pursue a given R&D project, this gives it no guarantee that its investments will bear fruit. Its research may not lead to any concrete results or may lead to results that may not be subject to commercial exploitation. While there is obviously no precise data with respect to the success (or failure) rate of R&D projects, the conventional wisdom is that the vast majority of such projects fail. An additional

would thus have to be taken into account. Another difficulty arises from the fact that R&D expenditures are typically “common costs” when the dominant firm is also active in downstream manufacturing markets.⁷⁰ Hence, while only part of the R&D costs should be allocated to the licensing activities, finding the adequate allocation key between manufacturing and licensing activities may prove insuperable.⁷¹ Finally, on technology markets where “incremental innovations” (minor evolutions of existing technologies) are protected by intellectual property rights, the question arises whether the R&D expenditures incurred for the existing technology should be factored in to the analysis.

Moreover, reliance on a cost-based method would require the determination of an appropriate “margin” or “rate of return” on investment. But that margin would have to be much higher than the low rate of returns allowed to regulated utilities. The innovation process is indeed risky as it is akin to a painful “trial and error” process. Firms generally experience a number of setbacks prior to obtaining a successful patent which can be licensed. Worse, innovators often incur huge R&D investments which never lead to the award of a patent and even when a patent is granted there is no guarantee that it will be commercially significant.⁷² The upshot of this is that when firms hold successful patents, setting royalties well in excess of R&D costs is a perfectly rational and efficient pricing

problem is that, although frequent, failure is very hard to predict and prevent as its causes can be numerous (e.g., insufficient resources, unrealistic completion timeframe, loss of key personnel, failure to obtain authorizations from regulators, etc.) and complex (e.g., technological shifts, unpredictable changes in the commercial landscape, etc.). Although an innovator can learn from experience, there is nothing like a failure-proof research project.

70. See STEVEN ANDERMAN & JOHN KALLAUGHER, *TECHNOLOGY TRANSFER AND THE NEW EU COMPETITION RULES – INTELLECTUAL PROPERTY LICENSING AFTER MODERNISATION* (2006).

71. See Michal Gal, *Monopoly Pricing as an Antitrust Offense in the U.S. and the EC: Two Systems of Belief About Monopoly?*, 49 *ANTITRUST BULL.* 343, (2004) (Some authors have alluded to that difficulty). See also Shigeki Kamiyamam, Jerry Sheehan, & Catalina Martinez, *Valuation and Exploitation of Intellectual Property (Statistical Analysis of Science, Technology and Industry, STI Working Paper, 2006)*, available at <http://www.oecd.org/dataoecd/62/52/37031481.pdf> (the practical difficulty underlined in OECD).

72. J. Gregory Sidak, *Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent Infringement: A Reply to Lemley and Shapiro*, 92 *MINN. L. REV.* 714, 738 (2008) (This ties in to the difference between rents and quasi-rents: the latter is the risk-adjusted return to sunk investment made in risky activities; it may look excessive ex post, but only because one already has turned the cards over and knows with certainty what was unknown at the time that bets had to be laid. For further discussion about the difference between rent and quasi rent see also, J. Gregory Sidak, *An Economic Theory of Censorship*, 11 *Sup. Ct. Econ. Rev.* 81, 87-88 (2003).).

policy, one which compensates the failed R&D investments and provides in turn incentives for further risky investment.⁷³

In addition to the implementation difficulties, there are also theoretical objections to cost-based royalty rates. Most importantly, a highly valuable invention that was arrived at through a “stroke of genius” should command a higher royalty than a minor incremental improvement, but if the latter cost more, this method could turn the royalty payments on their ear. As a result, the cost-based approach is clearly financially naïve.⁷⁴ When multiple patents and patent holders are involved, it could lead to a much distorted distribution of royalty payments: the least efficient/knowledgeable patent holders, those with the highest costs, would receive the highest royalty payments, while those contributing the “stroke of genius” patents would receive next to nothing. In addition, this method does not acknowledge the presence of other complementary patents and so runs the risk of creating a royalty stack.

D. Market Method

One approach with promise for complex, multi-patent holder contexts is the market method, where the worth of a patent is determined by examining the range of prices garnered in the sale of similar technologies.⁷⁵ This is often referred to as the comparables method.⁷⁶ The problem, however, lies in finding meaningful comparable licenses, which can be quite difficult. As already noted,⁷⁷ patents are supposed to be unique, so in practice this method is really about finding benchmarks to bookend the value of the patents at issue.

Because under this method the prices are grounded in commercial market value, which will vary depending on the perceived contribution of the various patents, it can (in theory) accommodate complex multi-component settings.

73. ANDERMAN & KALLAUGHER, *supra* note 70, at 273 (for a similar argument).

74. For a discussion, see F. Russell Denton and Paul Heald, *Random Walks, Non-Cooperative Games, and the Complex Mathematics of Patent Pricing*, 55 RUTGERS L. REV. 1175, 1183-84 (2003). See also Mohammad S. Rahman, *Patent Valuation: Impacts on Damages*, 6 U. BALT. INTELL. PROP. L.J. 145 (1998).

75. See, e.g., Morton I. Kamien, *Patent Licensing*, in HANDBOOK OF GAME THEORY 346-47 (R.J. Aumann and S. Hart eds) (1st ed. 1992); Gordon V. Smith and Russell L. Parr, VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS 202-06 (1989).

76. Gordon V. Smith and Russell L. Parr, VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS 204-06 (1989).

77. See *supra* p. 14.

E. Discounted Cash Flow

Another well regarded method for valuing patents relies on discounted cash flow (DCF) analysis.⁷⁸ The method assumes that patent price can be expressed as the present value of the future stream of economic benefits derived from ownership, which includes projected sales of products (or components) based on the patent over its expected life or any increased share of sales as compared to competitors, net of any capital requirements of production.⁷⁹

While DCF is a well known and respected financial analysis tool, in the context of patent valuation, in some ways it merely moves the source of debate from the royalty rate itself to the stream of projected sales attributable to the patent. That being said, licensees often have strategic plans projecting sales, or other commonly produced company documents, and these can provide a tangible starting point or anchor for negotiations, as the absolute maximum that the patent holder could command from the licensee.

F. Georgia Pacific

Finally, and in litigation contexts most importantly, the *Georgia Pacific* factors play a key role in royalty rate determination.⁸⁰ The fifteen factors enumerated in the case, several of which repeat approaches discussed above, are as follows:⁸¹

1. The royalties received by the patentee for the licensing of the patent in suit, proving or tending to prove an established royalty.
2. The rates paid by the licensee for the use of other patents comparable to the patent in suit.
3. The nature and scope of the license, as exclusive or non-exclusive; or as restricted or non-restricted in terms of territory or with respect to whom the manufactured product may be sold.
4. The licensor's established policy and marketing program to

78. Russell L. Parr and Gordon V. Smith, *Quantitative Methods of Valuing Intellectual Property*, in THE NEW ROLE OF INTELLECTUAL PROPERTY IN COMMERCIAL TRANSACTIONS, 58, 58 (1994). Another, far more complex, method for valuing patents is based on options valuation methods, such as Black-Scholes. The data intensity required for this approach often precludes its use in common litigation contexts. However, see Ariel Pakes, *Patents as Options: Some Estimates of the Value of Holding European Patent Stocks*, 54 ECONOMETRICA, 780 (July 1986).

79. Ariel Pakes, *Patents as Options: Some Estimates of the Value of Holding European Patent Stocks*, 54 ECONOMETRICA, 780 (July 1986).

80. *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

81. *Id.*

maintain its patent monopoly by not licensing others to use the invention or by granting licenses under special conditions designed to preserve that monopoly.

5. The commercial relationship between the licensor and licensee, such as, whether they are competitors in the same territory in the same line of business; or whether they are inventor and promoter.

6. The effect of selling the patented specialty in promoting sales of other products of the licensee; the existing value of the invention to the licensor as a generator of sales of its non-patented items; and the extent of such derivative or convoyed sales.

7. The duration of the patent and the term of the license.

8. The established profitability of the product made under the patent; its commercial success; and its current popularity.

9. The utility and advantages of the patent property over the old modes or devices, if any, that had been used for working out similar results.

10. The nature of the patented invention; the character of the commercial embodiment of it as owned and produced by the licensor; and the benefits to those who have used the invention.

11. The extent to which the infringer has made use of the invention; and any evidence probative of the value of that use.

12. The portion of the profit or of the selling price that may be customary in the particular business or in comparable businesses to allow for the use of the invention or analogous inventions.

13. The portion of the realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvements added by the infringer.

14. The opinion testimony of qualified experts.

15. The amount that a licensor (such as the patentee) and a licensee (such as the infringer) would have agreed upon (at the time the infringement began) if both had been reasonably and voluntarily trying to reach an agreement; that is, the amount which a prudent licensee—which desired, as a business proposition, to obtain a license to manufacture and sell a particular article embodying the patented invention—would have been willing to pay as a royalty and yet be able to make a reasonable profit and which amount would have been acceptable by a prudent patentee who was willing to grant a license.

The last of these factors, the so-called hypothetical negotiation,⁸² is the umbrella under which all of the other factors are considered. The key points here are picking an appropriate *ex ante* time at which to set the negotiation, so that the relevant uncertainties are acknowledged. While the hypothetical negotiation is presumed to have occurred prior to any infringement taking place, courts still allow recognition of *ex post* realities, like the sales that actually took place.⁸³

Despite their length and apparent detail, it is important to understand that the *Georgia Pacific* factors do not, in fact, prescribe an exact method for calculating reasonable royalties. Rather, they offer guidelines against which specific reasonable royalty approaches, like those listed above, can be evaluated. Judges have considerable discretion over the particulars involved in royalty rate assessments, including the choice of an accounting method.⁸⁴

IV. A REVIEW OF SOME COMPLEX QUESTIONS

Thus far, we have reviewed the theoretical underpinnings and some practical limitations that must be kept in mind in comparing the entire market value rule versus the component rule for determining an appropriate royalty base. We have also reviewed the more common frameworks for determining a reasonable royalty rate in the context of licensing for use in complex products. In this section, we turn to some institutional features that have a bearing on the apportionment debate. Specifically, we consider the behavior incentives created by the willful damages rule, the influence that the availability of injunctive relief can have on license negotiations, and the general incentives that licensees face.

A. Treble Damages and the "Catch 22" it Creates for Infringers

Without a doubt, the willful infringement laws in the U.S. play a role in how patents are licensed.⁸⁵ Consider infringement litigation

82. *Id.* at 1120-21.

83. *Id.*

84. *See, e.g.,* *Smithkline Diagnostics, Inc. v. Helena Labs. Corp.*, 926 F.2d 1161, 1164-65 n.2 (Fed. Cir. 1991).

85. Early U.S. patent law allowed manufacturers to be found to be "willful" infringers liable for treble damages and attorneys' fees, even if they were unaware of the patent or even of the patent owner at the time they began commercializing the product. *See, e.g.,* *Underwater Devices Inc. v. Morrison-Knudsen Co.*, 717 F.2d 1380 (Fed. Cir. 1983), *overruled en banc* by *In re Seagate Tech., LLC*, 497 F.3d 1360 (Fed. Cir. 2007). On willfulness and its problems, *see*

over a patent that allegedly reads on a complex product for which the manufacturer suspects that around 100 patents are relevant. The manufacturer holds five of those patents and has to date licensed another five. Let us assume that the manufacturer does not know exactly which 90 other patents actually read on the product, it simply believes that many may be relevant but not yet surfaced or discovered. To put the one patent in perspective for the judge or jury trying the case, the defendant will certainly point to its own five patents, along with any unpatented know-how, processes, and distribution value that it will be contributing, but it also would like be able to point to the 90 additional third party patents that it believes exist.

In many ways this defendant faces a “catch 22” situation. Option 1 is for the manufacturer to admit to the court that it should actually be licensing 90 more third party patents that read on its product, but it has not yet reached license agreements. The court would thus be able to put the one patent at issue in the trial into perspective, but the downside would be huge: this option is tantamount to admitting to willful infringement of 90 patents, with the attendant treble damages once the patents are specifically identified. The holders of the 90 patents (or more realistically, holders of another 200 or so patents that potentially read on the product, 90 of which are expected to be found to be actually infringed) would emerge the next day, with infringement suits in hand. Option 2 is to ignore all other third party patents, arguing instead that the full value of the product can be apportioned between the licensee and the licensor. In this case, the one third party patent holder will appear to have made a disproportionate contribution to the value of the product, which will likely sway the fact finder into awarding large damages and/or a relatively high ongoing royalty payment. In this latter case, the manufacturer still faces the risk that other patent holders will approach it, as they will be attracted by the relatively high royalty awarded by the court, but there will be no admission of willful infringement. Choosing among these two unattractive alternatives poses a thorny problem for licensees.

Ironically, the potential penalty of treble damages exacerbates

generally Mark A. Lemley & Ragesh K. Tangri, *Ending Patent Law's Willfulness Game*, 18 BERKELEY TECH. L.J. 1085 (2003). See also Jon E. Wright, Comment, *Willful Patent Infringement and Enhanced Damages—Evolution and Analysis*, 10 GEO. MASON L. REV. 97, 97 (2001); Stephanie Pall, *Willful Patent Infringement: Theoretically Sound? A Proposal to Restore Willful Infringement to its Proper Place Within Patent Law*, 2006 U. ILL. L. REV. 659, 659 (2006).

the problem of willful infringement.⁸⁶ Legal counsel often advises clients not to search for patents that might read on a product,⁸⁷ because if a patent is mistakenly discarded as irrelevant, the manufacturer may open itself up to treble damages because it knew of the patent and chose not to license it. The rule thus discourages proper due diligence on the part of licensees and contributes to the problem of unlicensed contributors to complex products.

It can be relatively harder to go the other direction, from the patent holder to the manufacturer. This follows because the patent holder may not be in the same industry, may not have insight into the exact product specifications the manufacturer is using, and so forth. As a result, many patents likely go unlicensed. One might think this is not a problem, as it keeps manufacturer costs down and may therefore contribute to lower consumer prices. The other side of that story, however, is that the expectation of not being able to successfully license a patent will tend to prevent innovations from emerging in the first instance, particularly for individual inventors and small start up firms. The more common unwitting infringement is, the lower the expected value of achieving and licensing an innovation, and thus the lower the likelihood of investing resources in obtaining that innovation.

It is important, therefore, for fair rules to govern both sides of the licensing transaction. Manufacturers should not be at the mercy of a royalty stack, but patent holders should have meaningful opportunities to reach reasonable licensing terms when their patents are indeed infringed.

B. The Role of Injunctive Relief in Negotiations

The other institutional feature that looms over patent licensing negotiations is the possibility for an injunction. Patent holders can wield the threat of an injunction to obtain a license.⁸⁸ This threat is often cited as a reason for licensees “paying too much”.⁸⁹ For instance, Mark Lemley and Carl Shapiro claim that:

The threat that a patent holder will obtain an injunction that will force the downstream producer to pull its product from the market

86. See, e.g., Lemley & Tangri, *supra* note 85, at 1087.

87. See Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21 (“Companies and lawyers tell engineers not to read patents in starting their research, lest their knowledge of the patent disadvantage the company by making it a willful infringer.”).

88. Lemley & Shapiro, *supra* note 5, at 1993.

89. *Id.*

can be very powerful. . . . Injunction threats often involve a strong element of *holdup* in the common circumstance in which the defendant has already invested heavily to design, manufacture, market, and sell the product with the allegedly infringing feature. The threat of an injunction can enable a patent holder to negotiate royalties far in excess of the patent holder's true economic contribution.⁹⁰

Lemley and Shapiro thus plead for narrowing the circumstances in which injunctive relief should be granted to the patentee.⁹¹ Specifically, they argue that injunctive relief should be: (i) stayed (until the infringer has an opportunity to design around the patented feature) when the value of the patented feature is only a small part of the value of the final product and (ii) denied when the patent holder is a non-practicing entity (i.e., a firm that does not practice its patents by, for instance, manufacturing products).⁹²

Lemley and Shapiro's proposals are, however, based on the questionable premise that a patent holder's ability to seek injunctive relief against downstream producers allows it to negotiate excessively high royalties.⁹³ But that is not necessarily true. As pointed out by John Golden, one should not lose sight of the fact that the patent holder negotiates with knowledge that it will be burdened with significant costs if negotiations fail and that such costs "could drive the patent holder to settle for substantially less than the patented invention's more intrinsic economic worth."⁹⁴ For instance, the patent holder will face significant litigation costs if negotiations fail and its patents have to be enforced through the courts, which may not even be an option if the patent holder is a small company. In addition, when a patent holder wants to license non-exclusively, its failure to successfully conclude negotiations with a "first mover" licensee will significantly undermine its ability to negotiate licenses with other potential licensees.⁹⁵ Thus, although the patent holder may be able to *threaten* a potential licensee that it would seek a court injunction if negotiations broke down, "years of time and a million dollars or so

90. *Id.*

91. *Id.* at 2044-45.

92. *Id.* See also Vincenzo DeNicolo et al., *Revisiting Injunctive Relief: Interpreting eBay in High-Tech Industries with Non-Practicing Patent Holders*, 4 J. OF COMPETITION L. AND ECON. 571 (2008) (containing a rebuttal of Lemley and Shapiro's proposals).

93. Lemley & Shapiro, *supra* note 5, at 2044-45.

94. Golden, *supra* note 5, at 2133.

95. *Id.* at 2134.

likely stand down between such a threat and its realization.”⁹⁶

The fact that injunctive relief can only be achieved through costly litigation means that the potential to seek injunctive relief is important even for non-practicing patent holders, for whom licensing revenues represent the only remuneration for a valuable patented invention. For these entities, the ability to seek an injunction is an important negotiation tool, and may be the only tool that a small non-practicing patent holder (particularly an individual inventor) has to balance the often far stronger bargaining position of an established manufacturer licensee.

Moreover, the ability to seek an injunction does not imply that an injunction will actually be granted. Particularly in the wake of the Supreme Court’s 2006 decision in *eBay v. MercExchange L.L.C.*, in which it rejected a “general rule that courts will issue permanent injunctions against patent infringement absent exceptional circumstances,”⁹⁷ courts can and often do deny injunctive relief. Justice Thomas, writing for the *eBay* majority, called for the lower courts to adhere to the four-part equity test already established in the case-law.⁹⁸ Under that balancing test, before a plaintiff may receive injunctive relief it is required to demonstrate that: (i) it has suffered an irreparable injury; (ii) remedies available at law are inadequate to compensate for that injury; (iii) considering the balance of hardships between the plaintiff and a defendant, a remedy in equity is warranted; and (iv) the public interest would not be disserved by an injunction.⁹⁹ Lower courts thus have the flexibility to stay or deny an injunction when appropriate, and indeed have been exercising that flexibility for the last several years.

The situation would be much worse if the threat of injunction disappeared from the patent holder’s legal arsenal and its only available relief were an ex post award of damages. In that scenario, any firm wishing to use another firm’s invention would be invited to begin immediately using the invention without even trying to obtain a license from the patent owner and take its chances in court later.¹⁰⁰ This would be a patent infringers’ charter and would provide an

96. *Id.*

97. *eBay Inc. v. MercExchange L.L.C.*, 126 S. Ct. 1837, 1839-41 (2006) (quoting *MercExchange, L.L.C. v. eBay, Inc.*, 401 F.3d 1323, 1339 (Fed. Cir. 2005), *vacated* 126 S. Ct. 1837 (2006)).

98. *Id.* at 1839.

99. *Id.*

100. For those infringing implementers, the worst case scenario would merely be a requirement to pay damages once a court had established the infringement.

incentive for manufacturers to refuse beforehand to enter into license agreements on reasonable terms, limiting patent owners to enforcing their rights through what could be patent-by-patent, country-by-country damages claims. In those circumstances, patent owners, especially if they are small firms, would arguably prefer to settle even for a license on terms that would not provide a fair return on their investment, rather than face lengthy, onerous and uncertain court proceedings for the award of damages.¹⁰¹ Faced with the prospect of spending millions of dollars and several years in the courts, patent holders (particularly smaller ones) would be forced to settle for royalties that would be lower than the true value of their inventions.

V. CONCLUDING REMARKS

In this article we have attempted to offer some thoughts on the economic principles that can be applied to address the determination of the royalty base and rate in the presence of complex products and multiple relevant patent holders. The appropriate choice of a royalty base has been the subject of heated debate for some years now. On the one hand, the royalty rate base, in isolation, is irrelevant since the royalty rate applied to that base can always be adjusted upwards or downwards to match the selected base. This mathematical indeterminacy suggests that a reasonable royalty payment can be achieved either through the use of apportionment or reliance on the entire market value rule. On the other hand, critics note that the theoretical equivalence of the two approaches ignores the reality of court procedure, in which juries can be improperly swayed by consideration of the entire market value when only a narrow component of the product is at issue.

We sympathize with the critics' concerns and agree that theory cannot take complete precedence over practical realities. It is for this very reason that we find that the entire market value rule should be applied with some flexibility. Practical reasons call for the use of the entire market value rule, beyond those situations in which the patented component is the basis for the entire product demand. In particular, component value is not always separable from full product value, some components may enable others even though they do not form the full basis of demand, and reporting and verifiability must be

101. In his reply to Lemley and Shapiro, Greg Sidak concludes that those authors' recommendations for patent reform, including in particular the denial of injunctive relief, are not supported by conjecture, would result in bias in favor of the infringing party, and would create more problems than they would solve. *See Sidak, supra* note 72.

accounted for as well in choosing the best royalty base.

In setting reasonable royalty payments, we must keep in mind both licensees and patent holders, and do our best not to bias the licensing process to one or the other side. While licensees worry about over compensation for patent holders deriving from an improper use of the entire market value rule, if that rule is applied too rigidly, it will lead to under compensation for patent holders.