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VERIZON COMMUNICATIONS INC.

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HEARINGS ON THE  
EVOLVING IP MARKETPLACE

HEARING ON  
THE EVOLUTION OF REMEDIES

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EVOLVING IP MARKETPLACE – COMMENT, PROJECT NO. P093900

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b> .....	i
<b>I. THE PROBLEM: PATENT HOLDERS’ EXTRACTION OF SWITCHING COSTS</b> .....	1
<i>A. Economic Value and Switching Costs, Distinguished</i> .....	1
<i>B. Infeasibility of Clearing Rights in the Patent Thicket, and the Inevitability of Holdup</i> .....	3
<b>II. A SOLUTION: LIMIT PATENT HOLDERS’ ABILITY TO EXTRACT EXCESSIVE REASONABLE ROYALTY AWARDS AND UNDUE EXCLUSION ORDERS</b> .....	7
<i>A. Reasonable Royalty Awards</i> .....	7
1. <i>A Reasonable Royalty Should Be a Share of the Patent’s Economic Value</i> .....	9
2. <i>Reasonable Royalty Award Must Exclude Switching Costs</i> .....	11
<i>a. Use of the proper date</i> .....	12
<i>b. Presumption or inference of alternatives</i> .....	13
3. <i>Patent’s Economic Value Can Be Readily Ascertained</i> .....	13
<i>a. Alternatives</i> .....	14
<i>b. Price paid for the patent</i> .....	15
<i>c. Negotiated royalty rates</i> .....	16
4. <i>Entire-Market-Value Inquiries In The Royalty Setting Are Unnecessary And Confusing</i> .....	16
5. <i>Permitting Examination of Substitutes Does Not Grant a “Free Option”</i> .....	18
<i>B. ITC Exclusion Orders</i> .....	19
<b>CONCLUSION</b> .....	21

## EXECUTIVE SUMMARY

The Federal Trade Commission’s 2003 report on intellectual property and competition laid the groundwork for judicial decisions that improved patent law’s ability to stimulate competition and innovation.<sup>1</sup> The FTC urged a “more thoughtful application” of the suggestion test for obviousness,<sup>2</sup> presaging the Supreme Court’s decision in *KSR International v. Teleflex*.<sup>3</sup> Its observations about the economic function of patents in the modern economy formed the basis of Justice Kennedy’s concurrence in *eBay Inc. v. MercExchange, L.L.C.*<sup>4</sup> The learning that the FTC’s conference gathered about patent holdup in standard-setting organizations played an important role in a key standard-setting case before the Third Circuit, which repeatedly cited FTC and DOJ officials’ speeches on the issue.<sup>5</sup>

The FTC has an opportunity now to exercise the same intellectual leadership with respect to legal rules that allow patent holders to hold up commercializers, the companies that make the products and offer the services that patent holders challenge as infringing.<sup>6</sup> As four Justices in *eBay* noted, the ability to win a nearly automatic injunction for patent infringement allowed patent holders to hold up commercializers: patent holders could use “an injunction, and the potentially serious sanctions arising from its violation, . . . as a bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent.”<sup>7</sup> By putting a stop to the practice of nearly automatic injunctions for prevailing patent holders in district court, the *eBay* decision was an important step in the right direction.

Unfortunately, other legal rules can still be used to hold up commercializers in similar ways. Excessive damages awards, and the potential availability of exclusion orders from the International Trade Commission even where *eBay* would bar an injunction, let patent holders capture not just the economic value of their patents, but their holdup value – that is, the costs of after-the-fact switching to noninfringing alternatives – which is not properly a part of the patent reward.<sup>8</sup> Like the near-automatic injunction rule challenged in *eBay*, these rules can be used to hold up commercializers, injuring competition and innovation.

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<sup>1</sup> FED. TRADE COMM’N, TO PROMOTE COMPETITION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY (2003), available at <http://www.ftc.gov/os/2003/10/innovationrpt.pdf> (as visited Feb. 4, 2009) [hereinafter FTC 2003 IP REPORT].

<sup>2</sup> *Id.* at Exec. Summary, 11; see also *id.* at Ch. 4, 15.

<sup>3</sup> 550 U.S. 398 (2007).

<sup>4</sup> 547 U.S. 388, 396 (2006) (Kennedy, J., concurring) (citing FTC 2003 IP REPORT).

<sup>5</sup> See *Broadcom v. Qualcomm*, 501 F.3d 297, 308 (3d Cir. 2007).

<sup>6</sup> The FTC 2003 IP Report referred to these entities as “PPEs,” patent practicing entities. See, e.g., FTC 2003 IP REPORT, *supra* note 1 at Ch. 3, 38.

<sup>7</sup> *eBay*, 547 U.S. at 396 (Kennedy, J., concurring). See also Michael Abramowicz & John F. Duffy, *Intellectual Property for Market Experimentation*, 83 N.Y.U. L. Rv. 337, 400 (2008) (noting that *eBay* is consistent with “a market experimentation theory,” in that “the law should favor firms risking market entry over firms avoiding such a risk”).

<sup>8</sup> Other legal rules that similarly injure competition and innovation – such as the rule requiring defendant to prove validity by clear and convincing evidence – are beyond the scope of this paper. This paper is limited to the damages and permanent injunction issues that were addressed in the February 2009 sessions of the FTC’s IP hearings.

## *I. The Problem: Patent Holders' Extraction of Switching Costs*

A fundamental problem with the current patent system is that patents can be used to capture more than their economic value, *i.e.*, more than their contribution over the next-best alternative. Rather, patents – particularly in the high-tech industry – can be used to hold up commercializers, extracting their switching costs at sums that can far exceed the economic value of the patent.

### *A. Economic Value and Switching Costs, Distinguished*

The economic value of a patent is the value of the patent in the marketplace as against the next-best alternative. For example, the patented technology can increase the attractiveness of the product to consumers, leading to higher prices or more sales; or it might lower a producer's costs. Sometimes, evidence of this economic value will take the form of a base and a rate. "For example, if the patented feature enhances the value of the product to consumers by \$1 over the next best alternative, then [the economic value of the patent, per unit, is] \$1. Similarly, if it reduces the cost of manufacturing the good by \$1, then [the economic value of the patent, per unit, is] \$1."<sup>9</sup> In other situations, evidence of the economic value of the patent may take the form of lump-sum payments.<sup>10</sup> For example, past negotiations for lump-sum royalties, or the purchase price of the patent, can shed light on the economic value of the patent.<sup>11</sup> In short, regardless of whether the evidence of the patent's economic value takes a base-and-rate form or some other form, the royalty inquiry should be directed at measuring the incremental economic value over alternatives.

The power of a patent to hold up a defendant (or an industry) is distinct from the patent's economic value.<sup>12</sup> The holdup potential depends on the switching costs the patent holder can extract from the defendant. The switching costs are the expenses defendant must incur – in, say, redesigning its plant, or securing the redesign of complementary products made by others – in order to switch to a non-infringing technology.<sup>13</sup> Obtaining a license after switching costs have mounted, when the

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<sup>9</sup> Mark Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 1996 (2007) (defining this value as "V").

<sup>10</sup> Cf. Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (afternoon session; speaker not identified) (noting that in a hypothetical negotiation, the parties might have negotiated a lump sum royalty); *id.* (Philip S. Johnson) (noting that a defendant should be permitted to argue that in a hypothetical negotiation, it would have offered a lump sum payment, not a running royalty).

<sup>11</sup> See *infra* at Sections II(A)(3)(b), (c).

<sup>12</sup> The DOJ and FTC have noted the two different values in the standard-setting context: "It is useful to distinguish between the licensing terms a patent holder could obtain solely based on the merits of its technology and the terms that it could obtain because its technology was included in the standard. This distinction can be case as differentiating two sources of potential market power ..." U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION, 39 (2007), available at <http://www.usdoj.gov/atr/public/hearings/ip/222655.htm> (as visited Feb. 4, 2009) [hereinafter DOJ/FTC 2007 IP REPORT].

<sup>13</sup> See, e.g., Benjamin Klein, *Market Power in Franchise Chases in the Wake of Kodak: Applying Post-Contract Hold-Up Analysis to Vertical Relationships*, 67 ANTITRUST L.J. 283, III. A. (1999) (noting "what is meant economically by high switching costs in this [holdup] context is that the costs to the buyer of

alternative is having to stop the infringing activity, “will result in a higher royalty . . . than if a license were negotiated prior to the sinking of costs,” in part because commercializers “obtaining a license under threat of hold up typically do not have the option of designing around the patent . . . , because redesigning a product after significant costs have been sunk is usually not economically viable.”<sup>14</sup> Indeed, holdup can occur whenever “the cost of switching to the best alternative standard [is] greater than the benefits of switching to the best alternative standard.”<sup>15</sup> As the agencies have noted in the standard-setting context, “[g]enerally, the greater the cost of switching to an alternative standard, the more an IP holder can charge for the license.”<sup>16</sup>

The power of patent holders to exploit this holdup potential is well known, even outside the standard-setting context. Commissioner Rosch made the point in one context, noting that a patent holder that “does not itself make, use or sell any product or service but instead lies in wait until some other firm (or firms) does so and becomes locked into the technological process covered by the patent, and then sues that firm for infringement . . . extract[s] more than the patent is really worth from producers who can’t afford to stop producing the product or service.”<sup>17</sup> The former Chairman of the FTC explained more generally:

[i]f a manufacturer learns that it has infringed a patent only after it has committed substantial sunk costs to its innovation and production – and, to avoid the patent, the manufacturer would incur substantial switching costs, which effectively lock the manufacturer into the effort – the patent owner may be in a position to demand supra-competitive royalty rates that over-compensate it for the value of

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changing to a new supplier *in response to a hold-up* are high”) (emphasis in original). See also DOJ/FTC 2007 IP REPORT, *supra* note 12 at 38 n. 25 (“The most direct source of switching costs is the difference between the costs of acquiring new infrastructure to implement a new standard and the salvage value of current infrastructure that is supporting the existing standard but would not be used to support a new standard. In the absence of network effects, this switching cost can be viewed as an upper bound on the extent to which the underlying technology’s patent owner can hold up firms using the standard. A second source of switching costs can be network effects such as compatibility. It may be impractical to change the existing standard for one piece of infrastructure if that piece must be compatible with other pieces of infrastructure.”).

<sup>14</sup> FTC 2003 IP REPORT, *supra* note 1 at ch. 3, 40-41 (discussing holdup in the context of non-practicing entities). This can create deadweight loss, retard innovation, and allow for the extraction of royalties on questionable patents, panelists told the FTC in its earlier hearings. *Id.*

<sup>15</sup> DOJ/FTC 2007 IP REPORT, *supra* note 12 at 35-36 n. 12, see also *id.* at 35 n. 11 (discussing standard setting as “a variant of the classical ‘hold-up problem.’ The hold-up problem pertains to problems of relationship-specific investment, whereas the hold up contemplated here pertains to standard-specific investment. The hold-up problem indicates the prospect of under-investment in collaborations in which parties must *sink investments* that are specific to the collaboration, *investments that may be costly to redeploy of have a significantly lower value if redeployed outside of the collaboration*. The potential for one party to hold up another party that has sunk investments specific to the relationship may discourage that other party from investing efficiently in the collaboration in the first place.”) (emphasis added).

<sup>16</sup> DOJ/FTC 2007 IP REPORT, *supra* note 12 at 38.

<sup>17</sup> J. Thomas Rosch, Commissioner, Fed. Trade Comm’n, Address at the Newport Summit on Antitrust & Economics, *Patent Trolls: Broad Brush Definitions and Law Enforcement Ideas*, 3 (May 31, 2008) (noting that “[t]his is sometimes referred to as patent ‘hold up’”); see also *id.* at 12 (“The patent holder enjoys some additional leverage because redesign of the product to avoid the patent would be expensive and time consuming.”).

its invention. If, before lock-in, the manufacturer had known about the patent and could have designed its product around it, then the firm might have used that alternative as leverage for seeking a competitive royalty rate. But after lock-in, redesigning the product may not be economically feasible, and the cost of being enjoined may be unacceptably high where, for example, it means shutting down a high-volume manufacturing facility.<sup>18</sup>

In short, high switching costs can drive high royalty demands, well in excess of the economic value of the patent.<sup>19</sup> Allowing the value of the patent to depend on the size of a defendant's switching costs does not promote innovation; it promotes gamesmanship. The value of the patent should not depend on whether the lawsuit was brought before or after the accused infringer sunk costs into the chosen technology. By contrast, allowing patent holders to capture rewards that hinge on the patent's economic value promotes one of the central goals of the patent system: to stimulate the invention of new technologies that are better than the available alternatives, promoting the progress of science and useful arts.

The risk of holdup is especially acute when the fear of countersuit does not deter the patent holder from suing for infringement. Where patent holders that do not practice the patent at issue (*i.e.*, non-practicing entities, or "NPEs") are "invulnerable to a countersuit for patent infringement," the awareness of mutually assured destruction does "little to constrain their willingness to seek high royalty rates from locked-in downstream actors."<sup>20</sup> As a result, "MAD strategies do nothing to mitigate NPE hold up."<sup>21</sup>

### *B. Infeasibility of Clearing Rights in the Patent Thicket, and the Inevitability of Holdup*

Patent holders can more readily exploit this holdup potential where it is not feasible for a commercializer to clear all relevant patent rights – whether by licensing the rights, contesting the patents, or avoiding the claimed technologies – before it starts investing in commercialization and its switching costs start rising. In such areas – as in many high-tech fields – infringement becomes nearly inevitable.<sup>22</sup>

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<sup>18</sup> Deborah Platt Majoras, Chairman, Fed. Trade Comm'n, Address at the American Antitrust Institute Conference: "The IP Grab: The Struggle Between Intellectual Property Rights & Antitrust," *A Government Perspective on IP and Antitrust Law*, 7 (June 21, 2006) (citations omitted)

<sup>19</sup> See, e.g., *In re N-Data*, No. 051-0094, Fed. Trade Comm'n, Analysis of Proposed Consent Order to Aid Public Comment, 7 (Jan. 23, 2008) (noting that when royalty demands are made "[a]fter the standard became successful, and it became difficult, if not impossible, for the industry to switch away from the standard ... [the patent holder can demand] value that ... was due to the opportunistic nature of its conduct rather than the value of its patents") (internal citation omitted).

<sup>20</sup> FTC 2003 IP REPORT, *supra* note 1 at Ch. 2, 31.

<sup>21</sup> *Id.*

<sup>22</sup> See Majoras, *supra* note 18 at 9 (stating that in evaluating the balance of hardships in deciding whether to grant an injunction, "courts may wish to consider the effect of any injunction on the infringer's business in the hold-up scenario, where infringement is inevitable, and practically unknowable in advance"); see also CARL SHAPIRO, INNOVATION POLICY AND THE ECONOMY *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, 120 (Adam B. Jaffe, *et al.* eds., 2001), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=273550#](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=273550#) (as visited Feb. 5, 2009)

A number of factors contribute to this problem. In many high-tech fields, particularly those involving electronics, communications, or information technology, individual products commonly contain a large number of components, and many patents read on a single product.<sup>23</sup> “For example, a single semiconductor product can be covered by hundreds, or even thousands, of patents. The overlapping patent rights covering complex products create a ‘patent thicket.’ With so many patents at issue, infringing another firm’s patent can be inevitable. Yet there is often no economically feasible way, prior to making sunk investments, to identify and obtain rights to all the relevant patented technologies.”<sup>24</sup> Profs. Bessen and Meurer quote the CEO of a patent risk management firm as saying: “‘If you’re selling online, at the most recent count there are 4,319 patents you could be violating. If you also planned to advertise, receive payments for, or plan shipments of your goods, you would need to be concerned with approximately 11,000.’”<sup>25</sup> The problem is a serious one in the telecommunications field. Wireless companies “must license thousands of patents to provide any one consumer product. Even in existing markets, if they miss a single high-tech horseshoe nail, a whole network may be threatened.”<sup>26</sup>

Moreover, the U.S. Patent and Trademark Office is granting growing volumes of patents, although the rate of increase in the PTO’s granting of patents is finally leveling off.<sup>27</sup> The number of patent cases filed has risen significantly since the early 1990s, and although these, too, have grown more slowly<sup>28</sup> (or according to one count, dropped<sup>29</sup>) in

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(describing the “dense web of overlapping intellectual property rights that a company must hack its way through in order to actually commercialize new technology.”); Doug Lichtman, *Patent Holdouts in the Standard-Setting Process*, Academic Advisory Council, Bulletin 1.3, 3-4 (2006) (stating that “[u]ndiscovered patents are inevitable”).

<sup>23</sup> See, e.g., S. Rep. No. 110-259, at 12 (2008) (“Long past is the day in which the typical invention is a sui generis creation; today’s patents are often combinations, and many products comprise dozens, if not hundreds or even thousands of patents, and the infringed patent may well be one smaller part of a much larger whole.”).

<sup>24</sup> Majoras, *supra* note 18 at 7 (citations omitted); see also Suzanne Michel, Dept’y Asst. Dir. of Pol’y & Coordination, Addressed to Committee on the Judiciary, U.S. House of Rep., *Prepared Statement of the Federal Trade Commission Before the Subcommittee on Courts, the Internet and Intellectual Property*, 7 (Feb. 15, 2007), available at <http://judiciary.house.gov/hearings/February2007/michel070215.pdf> (as visited Feb. 5, 2009) (noting that “[i]n some industries, such as computer hardware and software, firms can require access to dozens, hundreds, or even thousands of patents to produce just one commercial product.”).

<sup>25</sup> JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK, 8-9 (2008) (quoting David M. Martin as cited in David Streitfeld, *Note: This Headline is Patented*, Los Angeles Times, Feb. 8, 2003); see Lichtman, *supra* note 22, at 5 (noting that in practice, “a firm cannot hope to reliably identify all previously undiscovered patents relevant to a given technical standard, and identifying even a subset of such patents is likely an expensive and time-consuming task”).

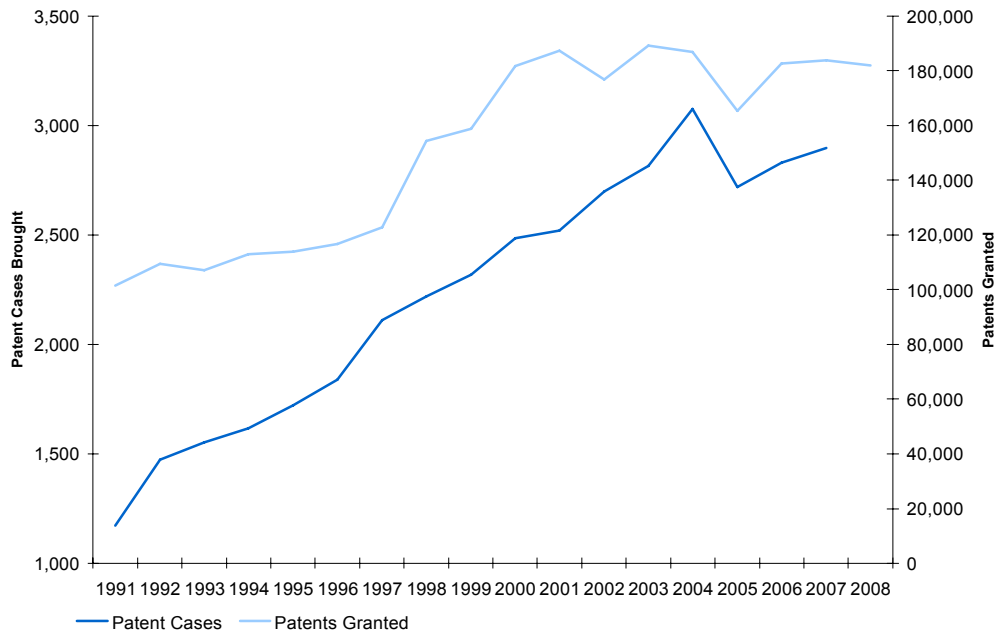
<sup>26</sup> MICHAEL HELLER, THE GRIDLOCK ECONOMY: HOW TOO MUCH OWNERSHIP WRECKS MARKETS, STOPS INNOVATION, AND COSTS LIVES, 100 (2008).

<sup>27</sup> See Chart 1.

<sup>28</sup> See Chart 1. See also Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (Aron Levko) (stating that recent decline in patent trials “means that maybe a lot of these disputes are being resolved outside of trials, in settlements or some sort of licensing with a little bit of a hammer.”), available at [http://htc-01.media.globix.net/COMP008760MOD1/ftc\\_web/transcripts/021109\\_sess1.pdf](http://htc-01.media.globix.net/COMP008760MOD1/ftc_web/transcripts/021109_sess1.pdf).

recent years, the number of defendants sued for infringement has increased. *See* Chart 2. One scholar has noted that this may be due to “a growing tendency to sue a number of unrelated and non-cooperating defendants in a single action.”<sup>30</sup>

**Chart 1.**



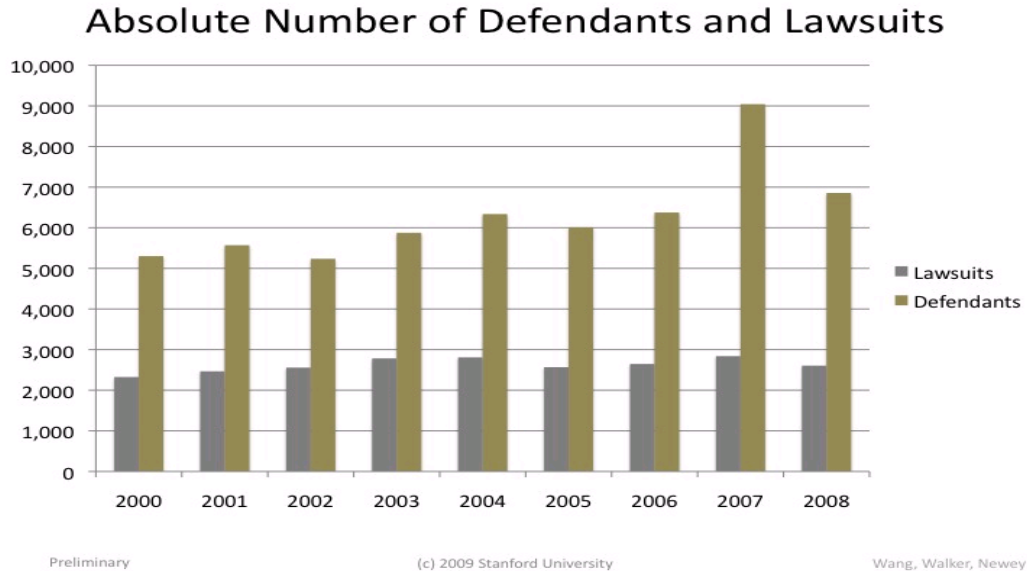
Source: Pricewaterhouse Coopers 2009 Patent Damages Study: Preliminary Results (presented to the FTC on February 11, 2009).

<sup>29</sup> See Paul M. Janicke, “Trends in Patent Litigation Filings” (Jan. 13, 2009) (reporting a drop in patent suit filings from 2007 to 2008), available at [www.patstats.org/Memo\\_1-13-09\\_on\\_Litigation\\_Filings\\_in\\_2008.doc](http://www.patstats.org/Memo_1-13-09_on_Litigation_Filings_in_2008.doc) (as visited Feb. 27, 2009).

<sup>30</sup> Janicke, *supra* note 29 (adding that “[a]lthough this is a joinder practice not allowed by Rule 20, Fed.R.Civ.P., which requires that the various claims arise ‘out of the same transaction, occurrence, or series of transactions or occurrences,’ it appears to be increasingly tolerated.”).



**Chart 2.**



Source: IP Litigation Clearinghouse, Stanford Law School

In addition, the boundaries of patents are sometimes fuzzy. “Not only are the words that lawyers use [in patents] sometimes vague, but the rules for interpreting the words are also sometimes unpredictable.”<sup>31</sup> Counsel’s opinion as to the boundaries of the patent is both expensive and often unavoidably “unreliable,” leaving commercializers with “no reliable way of determining patent boundaries short of litigation.”<sup>32</sup>

Exacerbating the problem, nascent patent rights are sometimes hidden. Patent owners can “hide the claim language that defines patent boundaries from public view for many years, a practice that is becoming increasingly frequent.”<sup>33</sup> Concerns such as these suggest the scale of the patent-thicket problem that the commercializer faces and explain why clearing rights in advance is often infeasible.

Without the ability to effectively clear rights in advance, commercializers in high-tech fields are particularly vulnerable to being held up.<sup>34</sup> The price of holdup can be quite high. As the Senate Judiciary Committee noted last year, “[p]atent litigations

<sup>31</sup> BESSEN & MEURER, *supra* note 25, at 10.

<sup>32</sup> BESSEN & MEURER, *supra* note 25, at 10; *see also* HELLER, *supra* note 26, at 100 (noting that in telecommunications, “[w]hether a new technology infringes any other patent is never clear”).

<sup>33</sup> BESSEN & MEURER, *supra* note 25 at 10, 26 (urging “strong limits on patent ‘continuations,’ a procedure used to keep patent claims hidden from the public for extended periods”). The FTC has recommended measures to “protect parties from infringement allegations that rely on certain patent claims first introduced in a continuing or other similar application.” FTC 2003 IP REPORT, *supra* note 1 at Executive Summary, 16. The PTO, recognizing the problem, adopted rules to address it – rules that were invalidated in a district court decision that is still under appellate review at the time of this paper. *Tafas v. Dudas*, 541 F.Supp. 2d 805 (E.D. Va. 2008).

<sup>34</sup> *See, e.g., Michel, supra* note 24 at 7 (noting “unjustified royalties and transaction costs” in the “patent thicket”).

typically take several years to complete, if appealed may be remanded more than once, and can cost several million dollars. In addition, litigation concerns can encourage unreasonable posturing during licensing negotiations, as well as premature settlements simply to avoid the high cost and uncertainty of patent litigation.<sup>35</sup>

That, in a nutshell, is the problem. The solution lies, in part, in ensuring that patent holders are not able to exploit this holdup potential. That solution, in turn, requires an examination of the way that federal district courts award reasonable royalties and the way that the International Trade Commission grants exclusion orders. Each of these points is considered in turn below.

## ***II. A Solution: Limit Patent Holders' Ability to Extract Excessive Reasonable Royalty Awards and Undue Exclusion Orders***

The potential for holdup depends on the threat a patent holder can make about the remedy it could obtain in an enforcement action. The Supreme Court's decision in *eBay* substantially reduced the threat of injunctions. Two remaining threats are the most prominent. One is the size of a damages award based on a reasonable royalty. The other is the potential for what amounts to an injunction – an ITC order excluding entry of products into the United States. Solving the holdup problem requires addressing both of those threats.<sup>36</sup>

### *A. Reasonable Royalty Awards*

As more infringement suits are brought by non-practicing owners, a larger proportion of plaintiffs seek reasonable royalties rather than lost profits.<sup>37</sup> Yet defining a reasonable royalty has proved more challenging than defining “lost profits.” Under the legal standards that trial courts have distilled from a less-than-systematic body of Federal Circuit precedents, factfinders commonly receive inadequate guidance on the calculation of royalties. Better standards, which address the holdup problem, are readily available and, in fact, supported in existing precedents.

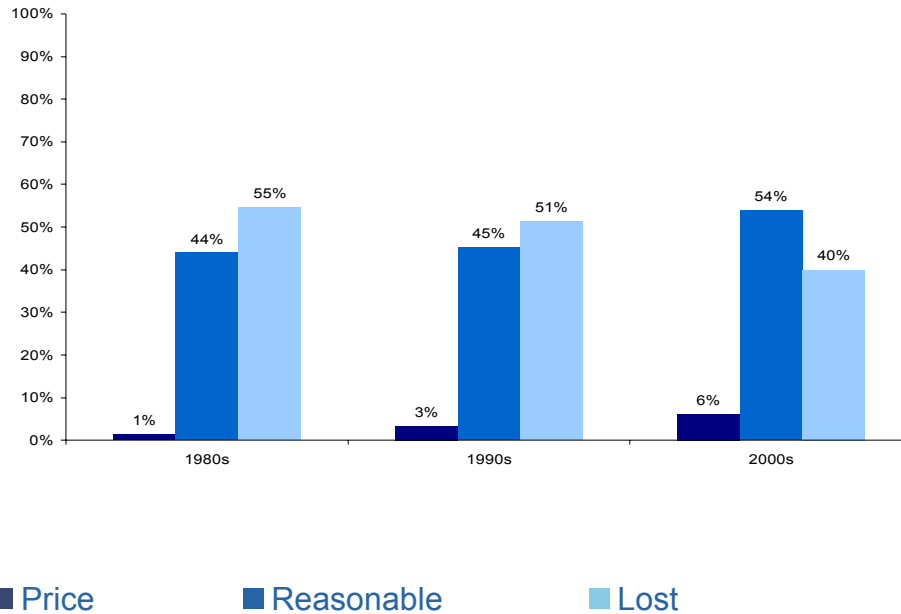
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<sup>35</sup> S. Rep. No. 110-259, at 3-4 (internal citations omitted). A 2005 survey found that the median cost of litigating a case with more than \$25 million at stake was \$4.5 million. See Am. Intell. Prop. Law Ass'n, *Report of the Economic Survey 2005*, at I-110 (Sept. 2005). A 2005 article similarly explained that “[p]ractitioners in the field of patent litigation will tell you it is some of the most expensive litigation to which a party can be exposed.” Mark H. Webbink, *A New Paradigm for Intellectual Property Rights in Software*, 2005 Duke L. & Tech. Rev. 12, ¶ 15 (2005), available at <http://www.law.duke.edu/journals/dltr/articles/2005dltr0012.html>. See also Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (Paul Janicke) (stating that AIPLA survey found that the litigation costs in getting to judgment are about \$5 million per side).

<sup>36</sup> These are not the only threats. For example, there may be a need to address the standards for damages awards based on lost profits. In part because only commercializers can seek lost profits, and commercializers typically have marketplace incentives to act reasonably, the standards for lost profits have not provoked substantial commentary as a source of practical problems. This paper does not address lost profits.

<sup>37</sup> See S. Rep. No. 110-259, at 10-11. See also Chart 3.

**Chart 3.**



Source: Pricewaterhouse Coopers 2009 Patent Damages Study: Preliminary Results (presented to the FTC on February 11, 2009).

Most fundamentally, juries today lack adequate guidance. They are often presented simply with the fifteen factors articulated in *Georgia-Pacific Corp. v. United States Plywood Corp.*<sup>38</sup> and left to their own devices as to what to do with those factors.<sup>39</sup> That approach has led to excessive and unpredictable awards that appellate courts cannot readily review,<sup>40</sup> threatening competition and innovation.<sup>41</sup> The focus should be placed firmly on the economic value over alternatives, with “factors” relevant only insofar as they bear on that inquiry. In addition, instructions framed in terms of an “entire market value rule” for a reasonable royalty are confusing and unnecessary and have turned factfinders away from the properly governing inquiry into the economic value over

<sup>38</sup> 318 F. Supp. 1116 (S.D.N.Y. 1970), *modified by* 446 F.2d 295 (1971).

<sup>39</sup> S. Rep. No. 110-259 at 11-12 (2008) (noting that “[j]uries are given little useful guidance in calculating that reasonable royalty ... often, the jurors are presented with the fifteen ‘Georgia-Pacific’ factors and some version of the ‘entire market value’ rule, and then left to divine an appropriate award”) (internal citation omitted).

<sup>40</sup> See, e.g., Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Response*, Minn. Legal Research Paper No. 08-39, 39 n. 154 (2008) (collecting recent cases that demonstrate that “reasonable royalty awards may exceed the amount the parties would have agreed to; indeed, may exceed the defendant’s entire expected profit from the use of the patent” and which “make[s] no economic sense.”); Lemley & Shapiro, *supra* note 9 at 2044 (concluding that “the way reasonable royalties are calculated, particularly for component inventions, has made them into a tool for patentees to capture more than their fair share of a defendant’s profit margins.”).

<sup>41</sup> See, e.g., Brian J. Love, *Patentee Overcompensation and the Entire Market Value Rule*, 60 STAN. L. REV. 263, 278-82 (2007) (noting that patentee overcompensation reduces incentives for beneficial commercial activities, exacerbates the royalty stacking problem, and increases incentives for “patent trolling”); see also FTC 2003 IP REPORT, *supra* note 1 at Exec. Summary 5 (noting the harms to competition and innovation that stem from the enforcement of poor quality or questionable patents).

alternatives.<sup>42</sup> The “entire market value” formulation should be dropped from the royalty context, as the principle it serves is fully and better served by a direct inquiry into economic value over alternatives.<sup>43</sup>

1. *A Reasonable Royalty Should Be a Share of the Patent’s Economic Value*

The central point of any such clear standard is a simple one: A reasonable royalty should not exceed the economic value of the patent over alternatives that the infringer could have used, whether the alternatives were using a substitute technology or simply dropping the product or service feature made possible by the patented technology.<sup>44</sup> As the Federal Circuit’s Chief Judge Michel has recently stated, “[w]here the value added can be established, it should be used. Look to the market value of the product with the next best, non-infringing substitute for the component causing infringement.”<sup>45</sup>

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<sup>42</sup> See *infra* at Section II(A)(4).

<sup>43</sup> A model reasonable royalty jury instruction is offered as Attachment A.

<sup>44</sup> See, e.g., Cotter, *supra* note 40 at 36-37 (“Logically, [the value of the patent to the user] should equate to the *marginal* value of the technology, that is, to the user’s expected increase in profit (or decrease in cost) from the use of that technology in comparison with the next-best alternative.”) (emphasis in original); see also *id.* at 37 n.149 (offering illustration); Lemley & Shapiro, *supra* note 9 at 2039 (demonstrating that “the existence of such a noninfringing alternative should absolutely constrain a reasonable royalty for a patented component” in a reasonable royalties case, “just as it does in a lost profits award. . . . We strongly encourage the courts to consider the noninfringing design-around alternatives available when the product was initially designed when valuing patented features or components for the purpose of establishing reasonable royalties.”); Paul M. Janicke, Slide Presentation for FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) at 11 (stating that rule for calculation of reasonable royalties “should be simply: portion of the value added; as compared to next-best alternative; the judge should supervise the award”), available at <http://www.ftc.gov/bc/workshops/ipmarketplace/feb11/docs/pjanicke.pdf>; Prepared Statement of Philip S. Johnson, Chief Intellectual Property Counsel, Johnson & Johnson, before the U.S. Senate Committee on the Judiciary (March 10, 2009) at 16 (noting that “a promising approach to this reasonable royalty problem, at least for circumstances involving non-practicing entities with no competitive interests in the field, may be to focus on ascertaining the incremental value to the infringer, at the time just before the infringement began, of using the invention compared to not using it, or to using its closest reasonably available non-infringing substitute, and then determining the fair proportion of that value that should be paid to the patent owner for that use.”).

The patent holder should not necessarily be awarded that entire incremental value. As a threshold matter, contracts with the infringer, commitments made in standard setting, or other legal restrictions might limit what the patent holder can demand (and thus what any reasonable royalty award may grant). More generally, if the patent holder plans to license others to practice the patent as one way of putting the patent to use, those others may have to be compensated for adopting the patented technology by the patent holder’s sharing some of the incremental value over alternatives, in order to be made more than indifferent between the patented technology and alternatives. In a world of firm differentiation and less-than-perfect competition among potential users of technology, this would generally call for some sharing of the economic value of the patent between the licensor and licensees, with the degree of sharing dependent on market circumstances. See, e.g., Lemley & Shapiro, *supra* note 9 at 1997-98; Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (Philip S. Johnson) (“as with all invention[s], the inventor who prices his invention to try to garner 100% of the value if it’s \$1 billion and keep it all for himself has an invention that’s never adopted. He must share it down the road.”).

<sup>45</sup> Paul R. Michel, Chief Judge, U.S. Court of Appeals for the Federal Circuit, “A Strong Patent System,” Address before the Association of Corporate Patent Counsel (Jan. 28, 2009), at 2. The idea is also reflected in the Supreme Court’s recent exhaustion decision, *Quanta Computer, Inc. v. LG Electronics, Inc.*, 128 S. Ct. 2109 (2008). There, the Supreme Court reiterated the earlier conclusion of *United States v. Univis Lens Co.*, 316 U.S. 241 (1942), that a patent holder (or its authorized licensee) gains all the reward

The Federal Circuit has recognized the key point in a major case principally involving lost profits: “only by comparing the patented invention to its next-best available alternative(s) – regardless of whether the alternative(s) were actually produced and sold during the infringement – can the court discern the market value of the patent owner’s exclusive right.”<sup>46</sup> The Federal Circuit has subsequently made clear that where the defendant could have turned to non-infringing alternatives to the plaintiff’s technology, the market could not have provided plaintiff a royalty “divorced of all relation to a potential non-infringing alternative method. The economic relationship between the patented method and non-infringing alternative methods, of necessity, would limit the hypothetical negotiations” – and the reasonable royalty award.<sup>47</sup>

This standard is reflected in the enumeration of facts that *Georgia-Pacific* – the 1970 district court decision often used by district courts today for their jury instructions – identified as having been used by earlier decisions to determine a reasonable royalty. *Georgia-Pacific* lists “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” and “[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.”<sup>48</sup> Indeed, the economic-value standard helps ensure that any royalty is no greater than the role played by the patented technology in the overall economic activity (producing and selling a product or service, for example) of which it is a part. Apportionment in that way is a long-established requirement of governing law.<sup>49</sup> And it is particularly important when, as is one common option, a claim is written to define an overall product (*e.g.*, a computer) containing a smaller inventive contribution (*e.g.*, a small component inside the computer). In such circumstances, the value of the infringing computer should be only the starting point. By subtracting from that figure the value of an alternative product (one that either uses an alternative technology for the inventive component, or simply drops the feature in question altogether), the factfinder can arrive at the economic value of the patent. This subtraction

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the patent is supposed to provide upon sale of an article embodying the “essential, or inventive, feature” – that which contributes “novelty” over prior art. 128 S. Ct. at 2119-20.

<sup>46</sup> *Grain Processing Corp. v. American Maize-Products Co.*, 185 F.3d 1341, 1351 (Fed. Cir. 1999). See also *In re Rambus* No. 9302, 18 (FTC 2007), Opinion of the Commission on Remedy (FTC 2007) at 18 (noting that “[a]lternative technologies were available” and that design-around solutions were likely possible, “albeit possibly with some higher cost”).

<sup>47</sup> *Riles v. Shell Exploration & Prod. Co.*, 298 F.3d 1302, 1312 (Fed. Cir. 2002). Limiting the royalty to a share of the incremental value over the next-best alternative, based not only on saved costs but on enhanced value manifested in higher prices or revenues, does not mean limiting the royalty to the “cost of implementing the cheapest available, acceptable, noninfringing alternative” – a limit rejected (in dicta) in *Mars, Inc. v. Coin Acceptors, Inc.*, 527 F.3d 1359, 1372, 1373 (Fed. Cir. 2008), *cert. denied*, 129 S. Ct. 653. Nor is the inquiry limited to the value to the *particular* alleged infringer, see, *e.g.*, *Monsanto Co. v. Ralph*, 382 F.3d 1374, 1384 (Fed. Cir. 2004) (opportunity for particular infringer to make a profit not required in setting royalty), for a particularly inefficient infringer may well be eating into the sales of more efficient users (to whom the value is higher).

<sup>48</sup> 318 F. Supp. at 1120.

<sup>49</sup> *Seymour v. McCormick*, 57 U.S. (16 How.) 480, 491 (1854); *Dowagiac Mfg. Co. v. Minn. Moline Plow Co.*, 235 U.S. 641, 646 (1915).

in essence eliminates the “non-inventive” components and other costs that would be needed to create, produce, and market the product or service even if it did not contain the patented technology. The end result may well be that the economic value of the patented technology is, even if not zero, a very small share of the product or service price.

Distilling these principles from the *Georgia-Pacific* factors helps direct the factfinder to the proper inquiry. By contrast, when jury instructions simply borrow the *Georgia-Pacific* listing and direct juries to consider them as “factors,” however, the economic principle that should guide reasonable royalty awards – the value of the patented technology over alternatives – is lost.<sup>50</sup>

## 2. Reasonable Royalty Award Must Exclude Switching Costs

One of the most important implications of this governing principle is that a reasonable royalty award must exclude switching costs. If a defendant had a choice about using technology A (infringing) or technology B (noninfringing), the difference in value must reflect only the *difference* in benefits and costs. Accordingly, if, after the defendant has built plants or otherwise incurred costs to offer technology A, and would have to retool to switch to technology B, the total costs of retooling do not measure the improvement over A, for those total retooling costs can and typically do include amounts that the defendant would have had to incur regardless of which technology it chose from the start. In short, the required comparison excludes all switching costs: what is required is a comparison of the net value (considering costs and benefits) of infringing versus non-infringing choices that could have been made, with eyes-open knowledge of all costs, before the investments were made that depended on either choice.

In *Rambus*, the FTC recognized that a reasonable royalty award should strip out switching costs: “A reasonable royalty ‘is or approximates the outcome of an auction-like process appropriately designed to take lawful advantage of the state of competition existing ex ante ... between and among available IP options.’”<sup>51</sup> This approach properly

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<sup>50</sup> The entire-market-value and apportionment doctrines also suggest this principle, albeit sometimes inartfully. See *infra* at Section II(A)(4). As Prof. Duffy has noted in another context, clarity in patent law doctrine is essential. See John F. Duffy, *Inventing Innovation: A Case Study of Legal Innovation* 86 Tex.L.Rev. 1, 72 (2007) (“The hope for the future has to be that in fashioning and explaining doctrine, courts and commentators can provide better justifications and discussions of the principles animating the doctrine.”).

<sup>51</sup> *Rambus*, Docket No. 9302, Opinion of the Commission on Remedy (FTC 2007) at 17 & n.106 (quoting Daniel G. Swanson & William J. Baumol, *Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power*, 73 ANTITRUST L.J. 1, 57 (2005)). See also *Rambus v. FTC*, 522 F.3d 456, 462 (D.C. Cir. 2008), *cert. denied*, 2009 U.S. LEXIS 1318, 77 U.S.L.W. 3467 (2009) (noting that in the remedy order in *Rambus* the FTC awarded “‘reasonable royalty rates,’ which it calculated based on what it believed would have resulted from negotiations between Rambus and manufacturers before JEDEC committed to the standards”) (emphasis added); *Rambus*, No. 9302, *Remedy Statement of Commissioner Pamela Jones Harbour*, 3 (Comm’r Harbour concurring in part and dissenting in part) (noting that “as the Commission’s unanimous liability opinion explains in detail, the Commission assumes a ‘but for’ world where lock-in had not yet occurred and where viable, cost-effective alternative technologies were available” to the standard-setting organization); *Grain Processing*, 185 F.3d at 1347 (“The [district] court concluded that if [patentee] had insisted on a rate greater than 3% in the hypothetical

recognizes that the accused infringer’s willingness to pay the patent holder to avoid the costs of switching to a non-infringing alternative is *not* an indication of the economic value of the patented technology over the alternative. That is an indication only of the size of the switching costs. The focus should thus be on examining the alternatives the defendant could have adopted before making investments and commitments that add costs of change to the costs of non-infringing alternatives.<sup>52</sup> The reasonable royalty should hinge on the price that the defendant would have paid then – before switching costs mounted – to use plaintiff’s technology rather than another. Thus, any evidence of switching costs should be excluded. This has two significant implications for court-awarded royalties.

a. *Use of the proper date.* First, where factfinders aim to determine the value of the patented technology over alternatives by trying to reconstruct the rate that the parties would have negotiated themselves, they should hypothesize those negotiations occurring not “at the time when the infringing sales first began” as is sometimes done today,<sup>53</sup> but *before defendant’s switching costs began mounting*. Switching costs can rise well before the first infringing sale. As two federal courts of appeals have noted in the standard-setting context, once “[i]ndustry participants ... have invested significant resources developing products and technologies that conform to the standard[, they] will find it prohibitively expensive to abandon their investment and switch to another standard.”<sup>54</sup> The same is true outside the standard-setting context. Companies often sink considerable resources into developing products and services well before the first sale, manufacture, or use. Before such switching costs begin to rise, the would-be infringer should be willing to switch to the next-best non-infringing alternative for a sum that corresponds to the most a reasonable royalty should award – making that earlier date the proper one for factfinders to use.<sup>55</sup>

This inquiry cannot be avoided by simple reference to an industry standard. In the common setting of standard-setting organizations that are open to information from any source and pay attention to patents in choosing what technology to standardize, if the defendant must use the plaintiff’s technology because it was included in an industry standard to which the defendant must conform, the proper date for factfinders to use is still the same: the period before defendant’s switching costs began mounting, “prior to the incorporation of the technology into a standard.”<sup>56</sup> The existence of alternative

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negotiations, [the defendant] instead would have chosen to invest in producing noninfringing Lo-Dex with Process IV [the noninfringing process].”).

<sup>52</sup> See, e.g., Shapiro, *supra* note 22 at 125.

<sup>53</sup> See, e.g., Model Patent Jury Instructions for the Northern District of California, § 5.7 (Nov. 2007).

<sup>54</sup> Qualcomm Inc. v. Broadcom Corp., 548 F.3d 1004, 1010 (Fed. Cir. 2008) (quoting Broadcom Corp. v. Qualcomm, Inc., 501 F.3d 297, 310 (3d Cir. 2007)).

<sup>55</sup> See, e.g., Lemley & Shapiro, *supra* note 9 at 2040 (encouraging courts “to consider the noninfringing design-around alternatives available *when the product was initially designed* when valuing patented features or components for the purpose of establishing reasonable royalties.”) (emphasis added).

<sup>56</sup> *Rambus*, No. 9302 at 17 (“The parties agree that the ‘*ex ante*’ value of a technology is the amount that the industry participants would have been willing to pay to sue a technology over its next best alternative prior to the incorporation of the technology into a standard.”). *State Contracting & Eng’g Corp. v. Condotte Am., Inc.*, 346 F.3d 1057, 1072 (Fed. Cir. 2003), did not involve a standard-setting organization, as discussed in text. In that case, there is no recited evidence to suggest that any information about patents,

technologies must be ascertained as of that date.<sup>57</sup> The value of the plaintiff's technology over the next-best alternative at that point – when the standard-setting organization members, if informed of a patent, could have swapped it for an alternative, free of switching costs – is the relevant time frame for the factfinder's reasonable royalty inquiry.

b. *Presumption or inference of alternatives.* There also may be good grounds for a presumption of available alternatives, or justification for inferring such alternatives even without identifying such alternatives, in certain circumstances. For example, if a patent holder (1) knew or should have known that an entity was sinking costs into the use of technology owned by the patent holder, and yet (2) did not sue for infringement or otherwise place the entity on meaningful notice, it may be reasonable to conclude that the patent holder recognized that the would-be infringer would have simply – and cheaply – used an alternative had it gotten such notice. In circumstances that suggest a careful waiting game, factfinders may be able justifiably to presume or infer the availability of alternatives and may thus award a correspondingly small reasonable royalty.

### 3. *Patent's Economic Value Can Be Readily Ascertained*

Some have argued that it will be hard to discern the value of the patented technology over alternatives that the infringer could have used.<sup>58</sup> Even if true, the response is insufficient: the alternative of unfocused determinations is worse. In any event, the inquiry is not unduly difficult, particularly because getting an answer does not mean proving with mathematical certainty a quantitatively precise answer. The inquiry should be no more difficult than the issues of substitutability and market definition that the antitrust authorities – and reviewing courts – routinely address. In both cases, the goal is to discern whether there are substitutes for a given product, and if the substitutes are imperfect, how their use would affect price or quantity. Moreover, there are a number of practical tools that factfinders may use to discern the value of the patented technology over alternatives that the infringer could have used:<sup>59</sup>

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or information from the accused infringer, was or would have been considered by the Florida department of transportation in setting specifications for highway-wall construction contracts. In that circumstance, the Federal Circuit permitted the patent holder's damages expert to take the government contract specification as a given in his royalty calculation.

<sup>57</sup> Alternative technologies that arise after that date may play a role, as well. *See infra* at p. 14.

<sup>58</sup> *See, e.g.,* John M. Golden, "Patent Trolls" and Patent Remedies, 85 TEX. L. REV. 2111, 2138 (2007) ("[t]he marginal value V of an invention is notoriously difficult to determine"); Cotter, *supra* note 40 at 37, 40 (noting difficulties of ascertaining the marginal value of an invention, but acknowledging it to be "the theoretically correct premise"). *See also* Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (Gregory K. Leonard) (noting that economists can readily model the changes in price, quantity and demand that would occur "if the infringer had to change the attributes of its product in order not to infringe.").

<sup>59</sup> Just as patent holders generally bear the burden of proving damages – particularly regarding apportionment, *see, e.g.,* *Garretson v. Clark*, 111 U.S. 120, 121 (1884) (the patentee "must in every case give evidence tending to separate or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features, and such evidence must be reliable and tangible, and not conjectural or speculative," or else show that the entire value in the market of the infringing machine is attributable to the patented features) – the patent holder bears the burden of proving the value of its patented technology over available alternatives.



a. *Alternatives.* Strong evidence of the patented technology’s market value can be found by “comparing the patented invention to its next-best available alternative(s) – regardless of whether the alternative(s) were actually produced and sold during the infringement.”<sup>60</sup> Thus, if the defendant could have implemented an alternative to the patented invention to achieve the same result (before making investments and commitments that later increased the costs of switching to the alternative), then the reasonable royalty would be limited to any difference in the costs of implementation. Since courts are already experienced in determining whether there are non-infringing substitutes for the accused invention in lost-profits cases, the inquiry here should not pose any undue administrative burden on the factfinder.<sup>61</sup>

If the defendant could have used a more expensive or lower quality alternative, or could have invested in a design-around solution, the plaintiff is entitled to no more than the difference between its patented technology and the inferior substitute. Thus, in *Grain Processing v. American Maize Products*, Judge Easterbrook (sitting as a district judge) found that the defendant could have used a “more expensive” substitute for the infringing technology it had been using. He found that the cost savings that the patented technology provided over the non-infringing alternative “effectively capped the reasonable royalty award.”<sup>62</sup>

In determining whether there are such alternatives to the patented technology, the factfinder may consider potential competition, as well. For example, in *Grain Processing*, an acceptable noninfringing substitute was “available, though not on the market or for sale, during the period of infringement,” limiting the patent holder’s reasonable royalty damages.<sup>63</sup> In that case, the district court found that the defendant “had all of the necessary equipment, know-how, and experience to implement” a non-infringing process that would substitute for the process covered by the patent; the only reason it did not use the substitute was that it was more expensive.<sup>64</sup> Likewise, the factfinder can consider new alternatives as they arise. For example, if a new alternative technology became available midway through the period of infringement, the factfinder can consider whether the defendant’s ability to use that new alternative would mitigate the reasonable royalty award for the second half of the infringement period.

The inquiry about alternatives should not be cut short by any misplaced presumption that simply because the defendant used the patented technology and not alternatives to it, other technologies are not substitutable alternatives. Often, there are many technologies that an accused infringer could have used to accomplish its end. As the United States (including the FTC) has explained, “[a] patented product, no matter how novel, unique, or distinct for purposes of patent law, may well face competition from

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<sup>60</sup> *Grain Processing*, 185 F.3d at 1351.

<sup>61</sup> *See, e.g., id.* at 1353; *Love, supra* note 41 at 290.

<sup>62</sup> *Grain Processing*, 185 F.3d at 1347. Note that switching costs cannot be included in what makes the alternative more expensive. *See supra* at Section II(A)(2).

<sup>63</sup> *Id.* at 1343.

<sup>64</sup> *Id.* at 1348.

other products that consumers would substitute for the patented invention.”<sup>65</sup> The PTO has issued “scores of patents for items such as bottle openers, toothbrushes, and paper clips. It would be implausible to presume that the owner of such a patent possesses market power merely by virtue of the patent.”<sup>66</sup> The fact that the accused infringer happened to choose the patent holder’s technology may mean that that technology is superior, to be sure, but it could also mean that the patented technology is simply one of many other substitutable alternatives the accused infringer could have just have easily chosen, or that the defendant thought – incorrectly, according to the later jury verdict – that the technology it used was not covered by a valid patent and therefore would be cheaper than the other options.

Similarly, a defendant’s decision not to implement a design-around solution should not be overread. A defendant’s decision not to design around a patent could mean that the patented technology is better, of course, but it could also mean that the defendant thought it was not infringing or that the patent was not valid, or that high switching costs now make it very expensive to adopt any alternative solution (including the design-around). In short, factfinders should be very careful about interpreting a decision not to design around a patent as evidence of the patent’s value over alternatives.

b. *Price paid for the patent.* If the patent was purchased – whether by the plaintiff or by another entity, and whether alone or as part of a larger purchase of assets or businesses<sup>67</sup> – that purchase price can be strong market-based evidence of the value of that patented technology over its alternatives, especially when the patent has rarely been licensed and its sale is one of the few available pieces of evidence of its market value.<sup>68</sup> It may not always be dispositive evidence, to be sure, but it can play an important role in shedding light on the market value of the patent.<sup>69</sup>

The reasonable royalty may well be a fraction of that purchase price because the total of all possible royalties, for all users of the technology, presumptively should not exceed that purchase price.<sup>70</sup> A reasonable royalty in a particular case should correspond

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<sup>65</sup> Brief of Amicus Curiae, United States, Supporting Petitioners, *Illinois Tool Works, Inc. v. Independent Ink, Inc.*, No. 04-1329, 12 (U.S. 2005), available at <http://www.usdoj.gov/atr/cases/f210500/210544.htm> (as visited Feb. 6, 2009).

<sup>66</sup> *Id.* (citation omitted).

<sup>67</sup> If the patent was purchased as part of a larger purchase of assets or businesses, the price paid for the patent alone – as distinct from the price paid for the other assets or businesses – is the relevant price here.

<sup>68</sup> See *Integra Lifesciences I, Ltd. v. Merck KGaA*, 331 F.3d 860, 871 (Fed. Cir. 2003) (royalty for particular patent “unbalanced in view of the overall acquisition price” of entire company owning patent), vacated and remanded on other grounds, 545 U.S. 193 (2005). See also Allan L. Shampine, *A Note on Reasonable Royalties and the Sale of Patent Rights* (unpublished working paper) (on file with the author).

<sup>69</sup> The parties may seek to introduce evidence relating to how accurately the purchase price reflects the value of the patent over alternatives. For example, a plaintiff may argue that the patent has become more valuable with respect to the defendant’s activity since the date of its sale, but that argument will carry less weight if the defendant’s infringement began before the sale.

<sup>70</sup> See, e.g., Amy Landers, *Liquid Patents*, 84 DENV.U.L.REV. 199, 244 (2006) (“[T]he right to recover for patent infringement measures the rights of the patent holder to recover as against one particular party, the infringer, as that patent is being used in their infringer’s products. By contrast, market prices represent an amount paid for an entire patent right separate and apart from the context of actual use.”).

to the defendant's share of the total potential base of users of the patented technology. For example, if the patent was sold for \$1 million, and in a particular case, the defendant's activities represent about 25% of the potential user base, then a royalty in that case for the lifetime use of the patent should not exceed a total of \$250,000.

c. *Negotiated royalty rates.* Considerable care should be taken in using past negotiated rates in trying to derive the value of the patented technology over alternatives. Today, "courts rely heavily on evidence pertaining to the rates at which the patent owner previously licensed the patented invention,"<sup>71</sup> but this tends to overcompensate the patent holder. Academic commentators have explained that "reliance on private license deals involves a degree of circularity," in part because "private parties negotiate those royalties in the shadow of litigation."<sup>72</sup> Excessive court-awarded royalties in turn lead to even more excessive negotiated royalties, and vice versa. Moreover, expert testimony about royalty rates tends to overstate actual rates because *reported* royalties (the typical basis for expert testimony) tend to be higher than average.<sup>73</sup>

On the other hand, if the patent holder has licensed the patent to others in arm's length negotiations under circumstances that suggest that the negotiated rates reflect market value – and exclude switching costs or undue fear of injunction – then those negotiated rates should set an upper bound on the reasonable royalty.<sup>74</sup>

#### 4. *Entire-Market-Value Inquiries In The Royalty Setting Are Unnecessary And Confusing*

Directly pursuing the inquiry into the value of the patent over alternatives, and using that standard to cap reasonable royalties, serves the goal of "apportionment" and "entire market value" inquiries, but without some of the uncertainty and confusion that attends those doctrines in the royalty setting.

In particular, courts deciding whether to establish a royalty base amounting to the entire market value of the product or to apportion ask questions that, in essence, search for the value of the technology over its alternatives. They ask, for example, whether the patented feature is "the basis for consumer demand," whether the patented and unpatented components are normally sold together, and whether they form "a single assembly or parts of a complete machine, or ... functional unit."<sup>75</sup> All these questions are best understood as aiming, sometimes in a roundabout way, to ascertain the market value of the invention. If the invention is so valuable that the product would not sell

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<sup>71</sup> Love, *supra* note 41 at 267.

<sup>72</sup> Lemley & Shapiro, *supra* note 9 at 2021-22.

<sup>73</sup> See Lemley & Shapiro, *supra* note 9 at 2022.

<sup>74</sup> See *Dowagiac Mfg. Co. v. Minn. Moline Plow, Co.*, 235 U.S. 641, 648; *Seymour v. McCormick*, 57 U.S. 480, 490 ("Where an inventor finds it profitable to exercise his monopoly by selling licenses to make or use his improvement, he has himself fixed the average of his actual damage, when his invention has been used without his license. If he claims any thing above that amount, he is bound to substantiate his claim by clear and distinct evidence.").

<sup>75</sup> *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1549-50 (Fed. Cir. 1995) (*en banc*); see also *Imonex Servs, Inc. v. W.H. Munzprufer Dietmar Trenner GMBH*, 408 F.3d 1374, 1379 (Fed. Cir. 2005) (same).

without it, then the technology's value over any substitutes is likely high, and the reasonable royalty rates should be, too (prompting courts to use the entire market value as a base). If the invention is less valuable and contributes little to the market demand for the product, then its value over alternatives is low and the reasonable royalty should be, too (prompting courts to use apportionment to find a smaller base). In this way, the size-of-the-base inquiry is a means, albeit sometimes indirect, of getting at the value of the technology over its alternatives.

Nevertheless, the entire-market-value/apportionment inquiry has introduced confusion, for at least two reasons. First, establishing a large base encompassing the entire market value does not guarantee a large royalty damages award, and vice versa. The royalty award depends on the rate, too. Indeed, it is unclear how a factfinder can logically assess the propriety of the "base" of a royalty calculation independent of the rate applied to that base. Moreover, by suggesting that factfinders can divide consideration of the proper rate from a determination of the base to which the rate should be applied, this approach can easily obscure the real inquiry, which can be made only by examining *the combination* of base and rate: that is, what is the invention worth as an improvement over alternatives? By dividing the question, then stopping short of proceeding to the necessary analysis, litigants and trial courts have drawn too rigid an approach from appellate opinions and framed their arguments in ways that misdirect the inquiry and that are widely perceived to have opened up the possibility of excessive damages, thereby raising settlement values and licensing rates.<sup>76</sup>

In practice, perhaps this point is taken into account. In *Lucent v. Gateway*, for example, the plaintiff's expert testified that "[t]he idea is to achieve a fair and reasonable royalty for the use of the patent. So you can take a high base, a big base and a small rate or you can take a smaller base and a bigger rate, so long as the multiplication gives you a reasonable royalty."<sup>77</sup> But it should be made clear that, as a matter of law, the goal is to achieve a reasonable royalty no greater than the value of the patented technology over alternatives, free of switching costs. If the reasonable royalty is to be awarded as a running rate, it should be at a rate and base that in combination match that reasonable royalty.<sup>78</sup>

Second, the questions that the apportionment and entire-market-value inquiry place at center stage sometimes lead factfinders and litigants away from the proper measure of damages: the value of the technology over alternatives. For example, is it

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<sup>76</sup> See, e.g., Love, *supra* note 41 at 277 (collecting cases); Lemley & Shapiro, *supra* note 9 at 2030-35 (empirical analysis of reasonable royalty verdicts found that fact-finders granted an average royalty of 10% for components compared with 13.1% for all inventions and 14.7% for integrated products, a modest reduction equivalent to a senseless conclusion that the average multicomponent invention has less than 1.5 components).

<sup>77</sup> See Brief of Appellant Microsoft Corporation, *Lucent Tech. Inc. v. Gateway Inc.*, Nos. 2008-1485, -1486, -1487, -1495, 18 (filed November 21, 2008) (quoting Lucent expert Roger Smith).

<sup>78</sup> Cf. Love, *supra* note 41 at 273 n. 42 ("While, in practice, courts typically announce reasonable royalty awards as a percentage royalty on the total price of the accused product, the most logical way to calculate a reasonable royalty award is to first consider the value added by the patented component and then divide that value between the patentee and the infringer.").

relevant that the patented feature has a “functional relationship” to the whole product? Perhaps tangentially. The better question to ask is how much the whole product would have been worth if the defendant had used an alternative technology in its product. It is not just whether the patented feature has a “functional relationship” to the whole product; the question is how essential (or fungible) the patented feature is to the function – and more to the point, to the cost and sales – of the whole product. This refined understanding of the “functional relationship” test points the factfinder towards a better measure of damages: the value of the patented technology over alternatives

##### 5. *Permitting Examination of Substitutes Does Not Grant a “Free Option”*

Some have argued that allowing defendants to demonstrate that they could have turned to substitutes for the patented technology will confer a “free option on the infringer,” decreasing incentives to innovate.<sup>79</sup> A firm, it is claimed, can opt to use potentially infringing technology, and if the patent is later found to be valid and infringed, “effectively mak[e] the switch retroactively.”<sup>80</sup>

Yet this “free option” is hardly free. The costs of litigation that an accused infringer must bear are considerable,<sup>81</sup> not to mention the costs that could flow from any injunction imposed. Nor is the option always (or even typically) affirmatively chosen, despite what the free “option” label suggests. Infringement commonly is inadvertent. Indeed, a new empirical study suggests that “[w]ith very few exceptions, defendants are not making a calculated decision whether to infringe a patent. The overwhelming majority of defendants are independent developers who were unaware of the existence of the patent when they made their product design decisions.”<sup>82</sup> Calls to increase damages awards in order to deter infringement<sup>83</sup> thus miss the mark. Heaping on penalties is unlikely to deter *unintentional* infringement, and since “overwhelmingly, infringers are not choosing to infringe, but are designing products in ignorance of the patent in ways that are later found to infringe,”<sup>84</sup> enhanced damages are perhaps best limited to appropriate cases of willful infringement.

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<sup>79</sup> Jerry A. Hausman, Gregory K. Leonard & J. Gregory Sidak, *Patent Damages and Real Options: How Judicial Characterization of Noninfringing Alternatives Reduces Incentives to Innovate*, 22 BERKELEY TECH. L.J. 825, 852 (2007).

<sup>80</sup> *Id.*

<sup>81</sup> See *supra* at n. 35.

<sup>82</sup> Christopher A. Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 N.C. L. REV. (forthcoming 2009) (manuscript at 53-54), available [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1270160](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1270160) (as visited March 6, 2009) (noting further that “those who were aware of the patent and made a decision to infringe are mostly generic pharmaceutical companies subject to a special set of rules that make the application of reasonable royalty law implausible in the extreme.”).

<sup>83</sup> See, e.g., Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 11, 2009) (Anne Layne-Farrar) (stating that because “not all infringements are detected,” awards that grant only “what a license would have achieved” will induce more infringement by firms that hope to have their infringement go undetected).

<sup>84</sup> Cotropia & Lemley, *supra* note 82 at 54 (stating that “deterrence and unjust enrichment are concepts designed to punish and therefore discourage infringement; they have no place in a patent regime where virtually all infringement is unintentional.”).

Finally, and in any event, the patent statute itself makes clear that requiring the patent holder, in general, to shoulder the burden of suit to enforce its rights is exactly what Congress has contemplated. Only in “exceptional cases” are parties entitled to recover their attorney fees;<sup>85</sup> the general rule is that it is proper to have the parties bear the costs of litigation. That clear choice may reflect a number of sensible congressional determinations: *e.g.*, that both sides must bear considerable costs; and that the level of enforcement costs may be a function of how much care the patent applicant took in drafting and prosecuting the application (in framing claims to enhance clarity and to avoid prior art, in writing the specification to meet Section 112 requirements, etc.), so that forcing the patent holder generally to bear the burden of its own enforcement costs is an important discipline on the *ex parte* process of shaping the patents issued from the PTO.

### B. ITC Exclusion Orders

As Justice Kennedy noted in *eBay*, automatic injunctions can be used as a “bargaining tool to charge exorbitant fees to companies that seek to buy licenses to practice the patent.”<sup>86</sup> Limiting injunctions to cases that warrant them makes it harder for patent holders to extract switching costs from defendants. It instead offers them reasonable royalty awards that, properly calculated, tie their award to the economic value of their patents, and not the switching costs.

Yet the International Trade Commission, which often serves as a parallel forum for trying many patent cases, appears to award prevailing patent holders exclusion orders almost automatically. Indeed, a recent study of Section 337 patent cases initiated between January 1995 and June 2007 found that prevailing patent holders won exclusion orders 100% of the time at the ITC; they were awarded injunctions only 79% of the time in district court.<sup>87</sup>

Responding to the argument that *eBay* governs the ITC, the ITC has stated that its organic statute, “the Tariff Act of 1930, as amended, represents a legislative modification of the traditional test in equity,” a modification justified by the “long-standing principle that importation is treated differently than domestic activity.”<sup>88</sup> From an economic perspective, however, it is hard to see why that justification matters. The ITC often hears the same kinds of disputes – indeed, often the very same disputes – that district courts hear. The recent Section 337 study mentioned above found that at least 65% of the ITC cases studied “involved patents that were also the subject of district court litigation between the same parties.”<sup>89</sup> An additional 23% of the cases involved patents that were

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<sup>85</sup> 35 U.S.C. § 285.

<sup>86</sup> *eBay*, 547 U.S. at 396 (Kennedy, J., concurring).

<sup>87</sup> See Colleen V. Chien, *Patently Protectionist? An Empirical Analysis of Patent Cases at the International Trade Commission*, 50 WM. & MARY L. REV. 63, 99 (2008); see also *id.* at 78 (noting that under 19 U.S.C. § 1337(d), the ITC can grant “exclusion orders” which “typically prohibit respondents from importing or selling for importation into the United States covered products.”).

<sup>88</sup> In the Matter of Certain Baseband Processor Chips and Chipsets, 2007 ITC LEXIS 621, \*102 n. 230.

<sup>89</sup> Chien, *supra* note 87 at 92.

at issue in district court actions involving different parties.<sup>90</sup> As a result, there was a nearly 90% chance that one of the patents in a given ITC dispute was also at issue in a district court action.<sup>91</sup> Indeed, the study found that “[m]ore often than not, ITC complainants are also initiating suit in district court, although the cases may involve different sets of defendants. Furthermore, in most cases the same plaintiff initiated both the ITC and the district court suits (usually with the district court suit filed prior to the ITC case), and litigated both simultaneously.”<sup>92</sup> As Prof. Christopher Sprigman noted at the FTC’s IP hearings, “[t]his gives the plaintiff two bites at the injunction apple and in a sense [may] represent[] an ... early attempt ... to circumvent the Supreme Court’s rule restoring traditional equitable standards in patent cases.”<sup>93</sup>

If the ITC were not subject to *eBay*, *eBay*’s power to reduce the threat of holdup would be diminished, at least for cases that fall within the ITC’s parallel jurisdiction. The ITC’s practice of granting exclusion orders almost automatically to prevailing patent holders may “attract patent trolls” looking for an injunction that *eBay* makes it harder to win in district court.<sup>94</sup> The ITC could “become a haven for such patent holders, undermining the policy objectives served by the [*eBay*] decision.”<sup>95</sup> Recently, the *Wall Street Journal* noted that the ITC has become an attractive forum for litigants, in part because it “regularly imposes import bans that create big pressure on defendants to settle cases.”<sup>96</sup>

Nothing in Section 1337 of Title 19 compels this unfortunate result. Indeed, principles of equity have always been intended to govern ITC remedy decisions, even before the Supreme Court’s *eBay* decision. The statute expressly provides that “[a]ll legal and equitable defenses may be presented in all cases.”<sup>97</sup> As the ITC has stated, an

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<sup>90</sup> *Id.* at 92 n. 161.

<sup>91</sup> *Id.* at 92 n. 161.

<sup>92</sup> *Id.* at 93.

<sup>93</sup> Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 12, 2009) (Christopher J. Sprigman) (adding that “we should start looking at this more closely and begin to consider whether we want to stop this kind of two-bite-of-the-apple strategy”).

<sup>94</sup> Chien, *supra* note 87 at 110.

<sup>95</sup> *Id.*; see also Sapna Kumar, *The Other Patent Agency: Congressional Regulation of the ITC*, Duke Law School Legal Studies Paper No. 181, at 31 (“The eBay decision consequently gives trolls a greater incentive to pursue dual litigation, allowing them to use the threat of an exclusion order as leverage for a settlement.”); Transcript, FTC Hearing on the Evolving IP Marketplace: Remedies (Feb. 12, 2009) (stating that “in the ITC, if you establish infringement in a domestic industry, you are entitled to the exclusion order. The domestic industry [requirement] can be established by licensing. So the same licensing that negatively impacts your ability to ... get an injunction in a district court can be used as a plus in the ITC to establish a domestic industry.”).

<sup>96</sup> Don Clark, *Spanion Seeks Import Ban to Pressure Samsung*, Wall Street Journal, Nov. 18, 2008 (reporting that Spanion sued in the District of Delaware and in the ITC to block U.S. imports of products containing certain Samsung technologies used in flash memory). See also Kumar, *supra* note 95 at 31 (stating that “the law firm Bingham McCutchen issued an alert declaring that “[i]n contrast to the uncertain availability of permanent injunctions in district court, in Section 337 investigations exclusion orders are and will continue to be the standard remedy for a violation of the statute. This is likely to make Section 337 an even more attractive alternative to district court litigation, either in itself or in conjunction with a parallel district court action.”).

<sup>97</sup> 19 U.S.C. § 1337(c) (2004).

exclusion order is “in the nature of an injunction,” and equitable principles apply in fashioning relief.<sup>98</sup> Indeed, Section 337(d) permits the ITC to deny an exclusion order in circumstances similar to the public interest factor specified in *eBay*.<sup>99</sup> Yet as the ITC recently noted, it “has found that public health and welfare considerations outweigh the public interest in the protection of intellectual property rights in only three investigations,” the most recent of which was in 1984.<sup>100</sup>

More thoughtful consideration of equity in ITC cases – or, if necessary, legislative change – could ameliorate this problem and help prevent patent holders from extracting switching costs through this alternative forum.<sup>101</sup>

## CONCLUSION

Exercising its intellectual leadership in competition and innovation policy, the FTC has the opportunity to help courts and policy makers understand how current legal rules still allow patent holders to hold up commercializers, even after *eBay*. In its report on these hearings, in amicus briefs, in speeches, and through other means, the agency can continue the foundational work that led to the Supreme Court’s decision in *eBay*. As in *eBay*, legal rules that allow for the grant of excessive damages awards in federal district court, or undue exclusion orders in the ITC, let patent holders capture more than the economic value of their patents; they let them hold up commercializers, undermining competition and innovation.

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<sup>98</sup> In re Certain Processes for the Manufacture of Skinless Sausage Casings and Resulting Product, Inv. No. 337-TA-148/169, USITC Pub. No. 2812, Comm’n Op. at 6 (Sept. 1994); *see also id.* at 7 n.27.

<sup>99</sup> 19 U.S.C. § 1337(d) (“the effect of such exclusion upon the public health and welfare, competitive conditions in the United States economy, the production of like or directly competitive articles in the United States, and United States consumers . . .”).

<sup>100</sup> *See* In re Certain Baseband Processor Chips and Chipsets, *Additional and Dissenting Views of Chairman Pearson and Commissioner Pinkert*, Inv. No. 337-TA-543 at 9; *see also* In re Certain Tadalafil or any Salt or Solvate Thereof and Products Containing Same, Inv. No. 337-TA-539, USITC Pub. No. 3992, at n. 31 (May 2008).

<sup>101</sup> Prof. Chien considers a number of reforms, some of which could be implemented by the ITC through its case law and some of which would require legislative or executive action. *See* Chien, *supra* note 87 at 106-07 (discussing legislative proposals to limit the ITC’s jurisdiction or remedies); *id.* at 110 (discussing proposal to exclude pure licensing activities from ITC’s domestic industry requirement); *id.* (noting that President reviewing an ITC decision could consider the *eBay* factors in deciding whether to deny an injunction).



## ATTACHMENT A

### MODEL JURY INSTRUCTION ON REASONABLE ROYALTIES

A reasonable royalty is an amount that reflects a share of the value of the claimed invention over the next-best alternative that [the alleged infringer] could have used, which may be a substitute for this invention or may be simply dropping whatever product or service feature [the alleged infringer] uses the patented technology to offer.

You must first consider what alternatives to using the invention a potential user of the claimed invention at issue here would have had. You must then determine what increased value, if any, the invention had over the next-best alternative. That is the upper limit on any royalty. Such an incremental economic value may be manifested in a number of ways, e.g., increasing the attractiveness of [the product/service] to consumers, leading to higher prices or more sales; or lowering the costs to a producer using the patented technology. Many patented technologies offer no such increased economic value at all. You must make the determination here, based on whatever evidence the parties have presented that you find to be relevant and reliable in making this inherently comparative inquiry.

If you find that the patented technology does have an economic value over the next-best alternative, then you must determine what portion of it should be awarded to [the patent holder]. The idea is that, where the patent holder plans to license others to practice the patent as one way of putting the patent to use, a patent holder may well have to offer some part of the value over alternatives to induce others to use it – so

that they have some reason not just to use alternatives. The parties have offered testimony on how, if at all, any value over alternatives should be shared in this case. You must resolve that dispute.

Now, let me clarify some important aspects of the threshold inquiry into the value over alternatives. It does not include costs, e.g., of design, development, and commercialization, that a user of the patented technology would incur whether it chose an alternative or the patented technology; those costs do not represent any difference in value over alternatives. And you are not to ask what [the alleged infringer] would pay now to avoid having to switch to a non-infringing alternative, which may include replacing or duplicating already incurred costs. Instead, the required comparison is between the value (considering costs and benefits) of infringing versus non-infringing choices when the choice could have been made, with eyes-open knowledge of all costs, before the investments were made that depended on either choice.

You must ensure that any royalty is tied to the role played by the patented technology in the economic activity (production and selling of a product or service, for example) of which it is a part. This point is particularly important where, as here, the patent claim is written to define [an overall product] in which only a component contains the inventive contribution. Looking at the value of [the overall product] is only the starting point. From that figure, you must subtract the value of [the overall product] if it had either used an alternative technology or had simply dropped the feature in question altogether. This subtraction in essence eliminates all of the “non-inventive” components and other costs that would be needed to create, produce, and

market the product or service even if it did not contain the patented technology, while also taking account of the difference in overall revenues and profits. You may be subtracting two large numbers, but the difference, even if not zero, might be a very small part of the product or service price.

One potential indicator of the value of the claimed invention may come directly from certain kinds of sale of the patent in the market. In this case, the patent at issue was sold after the invention was made. If you find that that the sale was made at arm's length – that is, not by related parties – then you should consider the price paid for the patent. If the patent was sold as part of a larger deal, you should consider what amount was fairly attributable to the patent. The price paid for that patent is evidence tending to reflect the overall market-wide value of the technology over alternatives. If the overall market-wide value of the patent can be determined in that way, an appropriate share of that value attributable to the particular infringer's activities (as a proportion of the overall market-wide eventual use of the patented technology) is a useful indicator of a reasonable royalty for the particular infringer.

In applying these principles, it is important that you resist any thought or argument from counsel that a large royalty is justified simply because [the alleged infringer] has what you may consider to be large revenues from a product or service that uses the patented technology. The proper royalty depends on the value over alternatives, and the other necessary costs of the product or service, as I have explained. Even for a company with high revenues, the resulting royalty can be tiny, or even zero, depending on the alternatives and other costs.

Those principles govern the determination of what royalty is reasonable. As long as you adhere to those principles, you may find it useful to approach your task by asking what a hypothetical owner of the patent at issue and a hypothetical person interested in using the claimed invention would have agreed on as a voluntary royalty if they had sat down and negotiated before [the alleged infringer] had made the decision to use the invention and had assumed the validity of the patent. You may find this approach helpful to your thinking. Whether or not you do, remember that the governing principle is that a reasonable royalty is an amount that reflects a share of the value of the claimed invention over the next-best alternative that [the alleged infringer] could have used.

In addition, as long as you follow the principles I have laid out, you may find a number of considerations relevant, either in using the hypothetical-negotiation approach or in directly considering the question of the value of the claimed invention over alternatives. I stress to you, however, that this is not a check-list or grab-bag of factors. Any given consideration is relevant only to the extent that, given the other facts that you find, it actually indicates what the value of the claimed invention over available alternatives was, under the principles I have give you. Any given consideration on this list may not be relevant at all, because other facts that would be needed to connect the given consideration to the inquiry into the value over available alternatives are missing:

- Licenses or offers to license the patent at issue in this case, if they reflect an assessment of value over alternatives rather than other considerations

- Licenses involving comparable patents, if they help indicate the value of the patents now at issue over the alternatives to these patents.
- The licensing history of the parties
- Licensing practices in the relevant industry
- Whether the patent owner had an established policy of refusing to license the patent at issue
- The relationship between the patent owner and alleged infringer, including whether or not they were competitors
- The significance of the patented technology in promoting sales of the alleged infringer's products and earning it profit
- Alternatives to the patented technology and advantages provided by the patented technology relative to the alternatives
- The portion of the alleged infringer's profit that should be credited to the invention as distinguished from other elements, or significant features, improvements, or contributions added by the alleged infringer or others
- Any other economic factor that a normally prudent businessperson would, under similar circumstances, take into consideration in negotiating the hypothetical license.

**Note:** *This language is not intended to supply a ready-for-use instruction to be given in every case but, instead, to provide a model that can be adapted to the particulars of a given case. As part of the important effort to focus the jury only on genuine disputes on the record in the particular case, the jury should be given only those items in the foregoing bullet-point list that the Court determines are*

*supported by adequate evidence to make an item actually relevant to the central economic inquiry in the particular case. The Court may also find it advisable to elaborate for the jury on what facts have to exist to make a particular item relevant (e.g., truly comparable circumstances of other licenses), especially if expert or lawyer presentations fail to focus with discipline on explaining the concrete connection of each relied-on basis to the economic inquiry. More generally, even aside from the bullet-point list, the evidence in the particular case should determine whether any given component of the instructions warrants further elaboration to take account of important context or to be clear about those points which are specifically in dispute in the case, remembering that length itself can end up reducing the likelihood of clear jury understanding.*