

The Patent Damages Gap: An Economist’s Review of U.S. Statutory Patent Damages Apportionment Rules

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I. Introduction

As an economist, I must admit that I find the current state of the law regarding damages for patent infringement—most particularly that relating to apportionment—frustrating at best and woefully incomplete at worst. Namely, damages case law for utility patent infringement provides two very different, but insufficient, guidance frameworks for calculating damages: the Entire Market Value Rule (EMVR) versus the Smallest Salable Patent Practicing Unit (SSPPU) principle.

Apportionment is required for utility patent damages in litigation as a means of restricting damages to the footprint of the asserted technology and avoiding value from non-patented (or, as is often the case, “other-patented”) features. This requirement dates back to the early 1880s, with the *Garretson v. Clark* decision.¹ While that 1884 ruling was issued under a different damages regime (as explained below),² it remains applicable today. Specifically, the Supreme Court wrote in *Garretson* that:

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

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¹ *Garretson v. Clark*, 111 U.S. 120, 121 (1884).

² Disgorgement was the common rule in 1880s. Some authors argue that the reasonable royalties framework in place today works in a quasi-disgorgement fashion. See John Golden & Karen Sandrik, *A Restitution Perspective on Reasonable Royalties*, 36 REV. LITIG. 335 (2017).

speculative; or he must show, by equally reliable and satisfactory evidence, that the profits and damages are to be calculated on the whole machine, for the reason that the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature.³

Thus, the 1884 *Garretson* decision laid down the foundation for today's battle between damages based on the "entire value of the whole machine" (now known as the Entire Market Value Rule, or EMVR) and the Smallest Salable Patent Practicing Unit (SSPPU) principle.⁴ Note that the language of *Garretson* provides for two mutually exclusive but exhaustive options in calculating damages—the end-product value or an apportionment of that value—and does not call for pulling individual components out of end products.⁵ Nevertheless, the apportionment rule in *Garretson* set the stage for the SSPPU approach that emerged in case law over a century later. As I argue in this paper, the modern pair of EMVR and SSPPU options is far narrower than the approaches afforded by *Garretson*. I present the economic case for expanding the allowable damages frameworks beyond EMVR or SSPPU, to return to an apportionment regime more in line with *Garretson*.

In this paper, I explain the gap in reasonable damages calculations that I perceive the courts' EMVR/SSPPU dichotomy has created. I first survey utility patent damages under the EMVR approach in Section II. Then in Section III, I review the case law developing the SSPPU approach. Section IV compares and contrasts these two approaches. I find that utility patent damages case law is incomplete in that EMVR and SSPPU do not exhaust all reasonable valuation scenarios in litigation, and instead leave uncovered a class of highly likely infringement scenarios that do not fit either the EMVR or SSPPU confines. In Section V, I close out my analysis with a proposal for how we might seal the problematic gap in damages case law and issue a plea for the courts to step into the breach, providing guidance on how to apply reasonable and balanced apportionment principles in the circumstances that warrant damages between SSPPU and EMVR.

II. EMVR: Protecting Juries

The Federal Circuit has confirmed that the EMVR logic first expressed in *Garretson* (a case concerning mop heads) remains particularly relevant for damages today, when infringement suits can implicate products with far more non-patented features than those that were sold in the 1880s.⁶ It is important to understand that in the 1880s, patent damages did not include a "reasonable royalties" option as is available today. The reasonable royalties provision we are familiar with did not appear until 1915, and was not codified in U.S. code until 1922.⁷ Instead, in the 1880s,

³ *Garretson*, 111 U.S. at 121 (quoting *Garretson v. Clark*, 1878 U.S. App. LEXIS 2023 *1, *14 (C.C.N.D.N.Y. July 15, 1878)).

⁴ See generally 1-20 CHISUM ON PATENTS § 20.07(2)(g)(ii) (2017).

⁵ See generally 23 CHISUM ON PATENTS SCG-6213: Existing Licenses; Prevailing Industry Rates (2017).

⁶ See *Ericsson, Inc. v. D-Link Sys.*, 773 F.3d 1201, 1232 (Fed. Cir. 2014).

⁷ Caprice Roberts, *The Case For Restitution And Unjust Enrichment Remedies In Patent Law*, 14 LEWIS & CLARK L. REV. 653, 660 (2010) [hereinafter Roberts (2010)]; see also Michael Risch,

damages were limited to actual damages, such as lost profits or an established royalty payment.⁸ Thus, if patent holders were unable to prove that they had lost any profits and had no established royalty (having chosen not to license their patent), then disgorgement of the defendant's profits attributable to the patented technology was an allowable and common remedy in the 1880s, albeit one that was plagued with its own apportionment difficulties.⁹

In its 1995 *Rite-Hite* decision, the Federal Circuit reviewed the early case law prior to Congress passing the 1946 revision to the Patent Act,¹⁰ which removed infringer profit disgorgement for utility patents and replaced it with a narrower view of patent damages.¹¹ The Federal Circuit found that in pre-1946 rulings, “[w]hile patentees who commercialized the invention of the patent in suit might recover some amount of profits, the entire amount of profits would not be awarded where the invention was not of an entirely new device but amounted only to an improvement, unless the invention was the basis for demand for the entire device.”¹² The last portion of this quote, “the basis for demand,” has since formed a central guiding principle for allowing reliance on the EMVR. In short, the patent holder must show that its asserted technology drives demand for the product as a whole or else the entire market value of that product cannot be used as the base for damages calculations.

The Federal Circuit has explained the rationale behind its EMVR interpretation as being rooted in the potential for cognitive biases among jurors.¹³ For example, in its 2011 *Uniloc* decision, the court noted that “[t]he disclosure that a company has made \$19 billion dollars in revenue from an infringing product cannot help but skew the damages horizon for the jury, regardless of the contribution of the patented component to this revenue.”¹⁴ In other words, having seen a large number for total accused product revenues, a jury might “anchor” on that number when assessing the damages estimates presented by the two parties, even when the case evidence clearly establishes that the patents read on only a small part of the accused product.¹⁵ Expanding on this logic in its 2012 *LaserDynamics* opinion, the Federal Circuit wrote:

Admission of such overall revenues, which have no demonstrated correlation to the value

(Un)Reasonable Royalties 14, (Vanderbilt University, Working Paper No. 2016-1036, 2016) (available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2884387).

⁸ *Rude v. Westcott*, 130 U.S. 152 (1889) (explaining that only established royalty payments were acceptable: “In order to make the price received by a patentee from sales of licenses a measure of damages against infringers, the sales must be common—that is, of frequent occurrence—so as to establish such a market price for the article that it may be assumed to express, with reference to all similar articles, their salable value at the place designated.”).

⁹ See Roberts (2010), *supra* note 7, at 656–61.

¹⁰ *Rite-Hite Corp. v. Kelley Co., Inc.*, 56 F.3d 1538, 1565–66 (1995).

¹¹ See Risch, *supra* note 7, at 19.

¹² *Rite-Hite*, 56 F.3d at 1565.

¹³ See *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1320 (Fed. Cir. 2011).

¹⁴ *Id.*

¹⁵ *Id.* at 1321.

of the patented feature alone, only serve to make a patentee's proffered damages amount appear modest by comparison, and to artificially inflate the jury's damages calculation beyond that which is "adequate to compensate for the infringement."¹⁶

The Federal Circuit's 2014 *Ericsson v. D-Link* ruling established a two-prong explanation of EMVR: 1) the "substantive legal rule" that dictates patent damages "must be based on the incremental value that the patented invention adds to the end products" and 2) an "evidentiary principle" meant to aid juries in assessing reasonable royalty damages in litigation.¹⁷ Then, in its 2015 *CSIRO v. Cisco* decision, the court expanded its explanation:

First, "[w]here small elements of multi-component products are accused of infringement, calculating a royalty on the entire product carries a considerable risk that the patentee will be improperly compensated for noninfringing components of that product." Second is the "important evidentiary principle" that "care must be taken to avoid misleading the jury by placing undue emphasis on the value of the entire product."¹⁸

As the quote above illustrates, a key feature of modern debates on apportionment is the "multi-component product." By their very nature, such products are unlikely to have a single feature that forms the one and only basis of demand, or is the sole driver of customer purchases. Hence, in the context of multi-component products, a successful argument for taking the EMVR approach is likely to be rare at best, which brings us to the case law's current alternative to EMVR: the SSPPU.

III. SSPPU: Protecting Infringers?

The SSPPU framework was first espoused in 2009 by Judge Rader in *Cornell University v. Hewlett-Packard Company*.¹⁹ That case involved a computer component: "the claimed invention is a small part of the IRB [instruction recorder buffer], which is a part of a processor, which is part of a CPU module, which is part of a 'brick,' which is itself only part of the larger server."²⁰ During pre-trial proceedings, Judge Rader warned Cornell not to claim damages beyond the reach of its asserted invention.²¹ Nevertheless, at trial Cornell's damages expert attempted to testify on damages based on Hewlett-Packard's (HP's) server and workstation revenues, but without presenting any evidence that would link consumer demand for servers and workstations to the asserted patents.²² The Judge interrupted the trial to prevent this testimony, but gave Cornell a chance to return the following day with a damages es-

¹⁶ *LaserDynamics Inc. v. Quanta Computs.*, 694 F.3d 51, 68 (Fed. Cir. 2012) (citing *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1319–20 (Fed. Cir. 2011)).

¹⁷ *Ericsson, Inc. v. D-Link Sys.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014). For a discussion of the Federal Circuit's ruling in this case, see The Essential Patent blog at <http://www.essentialpatentblog.com/2014/12/federal-circuit-gives-guidance-on-litigating-rand-obligation-ericsson-v-d-link/>.

¹⁸ *Commonwealth Sci. and Indus. Research Org. v. Cisco Systems, Inc.*, 809 F.3d 1295, 1302 (2015) (quoting *LaserDynamics Inc. v. Quanta Computs.*, 694 F.3d 51, 67 (Fed. Cir. 2012)).

¹⁹ *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 282 (N.D.N.Y. 2009).

²⁰ *Id.* at 283.

²¹ *Id.*

²² *Id.*

estimate more closely tied to the patented technology.²³ Cornell's damages expert chose to base his round-two damages estimate on HP's CPU "brick" revenues.²⁴ As clearly articulated in his Judgment as a Matter of Law ruling, Judge Rader found this approach equally problematic:

Notably, Cornell chose this hypothetical royalty base in favor of another alternative more clearly relevant to the value of the patented invention – the revenue Hewlett-Packard would have earned had it sold each infringing processor as just that, a processor, without any additional non-infringing components. Instead of linking its base amount to the processors (of which the infringing IRB is an important component), Cornell simply stepped one rung down the Hewlett-Packard revenue ladder from servers and workstations to the next most expensive processor incorporating product without offering any evidence to show a connection between consumer demand for that product and the patented invention.²⁵

Observing that at least some pricing data was available for the component in which the asserted patents were a meaningful and contributing part, Judge Rader argued that "[t]he logical and readily available alternative was the smallest salable infringing unit with close relation to the claimed invention – namely the processor itself."²⁶ Thus, the principle of the smallest salable patent practicing unit (SSPPU) was born.

Judge Rader's expressed frustration with Cornell's damages calculations is understandable. He had repeatedly ruled that Cornell had failed to establish that the asserted technology drove demand for anything beyond a processor, and as such, was not eligible for the EMVR approach as applied to HP's servers, workstations, CPUs, or "bricks."²⁷ Yet Cornell continued to argue (without producing any new evidence that its patented technology was important for the sale of HP's end products) that it was owed damages on the entire server product and continued to calculate damages based on relatively large elements of the server system that included numerous non-infringing features without presenting any rational apportionment of those sales to narrow the product revenues to the relevant asserted features.²⁸ However sensible the introduction of the SSPPU concept may have been in the *Cornell* case, though, that concept has subsequently led to significant mischief in other cases, with different fact patterns.

As the SSPPU principle gained in popularity, courts began to treat it with primacy, as if damages calculations must always use an SSPPU royalty base, unless the available evidence established that the EMVR was appropriate. For example, in the *In re Innovatio* case,²⁹ Judge Holderman concluded "that Innovatio's patent portfolio [of 23 standard essential patents, or SEPs] is of moderate to moderate-high

²³ *Id.* at 283–84.

²⁴ *Id.* at 284.

²⁵ *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 285 (N.D.N.Y. 2009).

²⁶ *Id.* at 288.

²⁷ *Id.* at 283–84.

²⁸ *Id.*

²⁹ *In re Innovatio IP Ventures, LLC Patent Litig.*, 2013 WL 5593609, at *1 (N.D. Ill. Oct. 3, 2013).

importance to the 802.11 [Wi-Fi] standard.”³⁰ Despite this finding, Judge Holderman reported that he felt compelled to follow the SSPPU approach because he found that the patent holder had failed to introduce sufficient evidence in support of an EMVR revenue base:

Beyond the court’s resolution of the parties’ dispute about the application of the “smallest salable patent-practicing unit” test to Innovatio’s asserted claims here, Innovatio’s application of its approach did not credibly apportion the value of the end-products down to the patented features. In light of that failure of proof, the court has no choice based on the record but to calculate a royalty based on the Wi-Fi chip.³¹

Thus, Judge Holderman set the royalty base for damages as “a small silicon device about the size of a dime that is inserted during manufacturing into an electronics device, such as a laptop computer or wireless access point, to provide the device with 802.11 wireless functionality.”³² The chips were found to have an average price, over the relevant time period, of \$3.99 per unit, which was then further reduced to reflect the chipmaker’s established profit margin.³³ In the end, the royalty base employed in the *Innovatio* case was below \$2.00 per unit.³⁴ This is in contrast to the average price of Wi-Fi access points (around \$60 per unit) or Wi-Fi enabled laptops (around \$785 per unit), which Innovatio argued should form the royalty base (with apportionment they argued reflected the footprint of the asserted patents).³⁵ Clearly, when the numbers differ by magnitudes of this size, decisions on which royalty base to allow are likely have a profound effect on the resulting damages calculations.³⁶

IV. The Patent Damages Disconnect

One of my primary concerns with the SSPPU approach as the de facto royalty base when the EMVR criteria (at least as currently defined) cannot be met, is that it is often at odds with the statutory requirement for damages calculations that damages should be “in no event less than a reasonable royalty for the *use* made of the invention by the infringer.”³⁷ As further evidence of its importance in damages calculations, the use a specific infringer makes of the asserted patented technology is woven throughout the fifteen *Georgia Pacific* factors commonly referenced in pa-

³⁰ *Id.* at *36.

³¹ *Id.* at *14.

³² *Id.* at *12.

³³ *Id.* at *40–41.

³⁴ *Id.* at *43.

³⁵ See *In re Innovatio IP Ventures, LLC Patent Litig.*, 2013 WL 5593609, at *12 (N.D. Ill. Oct. 3, 2013). The average price per chip is reported in the opinion; the average prices of the end products are backed out from other data reported in the opinion.

³⁶ It is of course true that a \$1 royalty can be reached either by applying a 1% royalty rate on a \$100 end product or by applying a 10% royalty rate on a \$10 component. In my experience, however, such close matching of rates and bases is difficult to achieve in practice, where each element of a royalty calculation needs to be supported with documents or other evidence. The most likely outcome in a jury trial is for the court to reduce the allowable base while holding the rate constant or adjusting it upward only modestly, such that calculated damages are meaningfully affected by the reduction of the royalty base.

³⁷ 35 U.S.C. § 284 (2017) (emphasis added).

tent infringement litigation.³⁸ Thus far, however, the choice of SSPPU is largely an exercise of where the patented technology physically resides, without serious consideration of its value footprint. For example, the SEP portfolio in the *Innovatio* case included patents on wireless adapters for “controlling high level communication protocols” and a “radio frequency data communication system” involving numerous pieces of base station equipment.³⁹ Nonetheless, since the functionality of these SEPs was technically implemented in so-called Wi-Fi chips, that component was chosen for the royalty base.⁴⁰

I am not the first to recognize a potential disconnect between the SSPPU standard and the value-of-use calculation. Judge Davis provided a nice analogy highlighting this problem:

It is simply illogical to attempt to value the contributions of the [CSIRO patent] based on wireless chip prices that were artificially deflated because of pervasive infringement. Basing a royalty solely on chip price is like valuing a copyrighted book based only on the costs of the binding, paper, and ink needed to actually produce the physical product. While such a calculation captures the cost of the physical product, it provides no indication of its actual value.⁴¹

That the choice of an SSPPU may be divorced from the value the asserted patented technology brings to users leads directly to a problem with treating the damages framework as an either/or choice between EMVR and SSPPU. That dichotomy creates an incomplete set of economic options for damages experts. On the one hand, when the patented technology drives or forms the basis for demand, the case law establishes that revenues from the end product are the correct royalty base, with appropriate apportionment applied to reflect non-infringing features.⁴² On the other hand, when the patented technology does not form the basis of demand for the product as a whole, and instead contributes to a relatively small portion of the accused product, then revenues associated with the smallest salable component within the end product that infringes the patented technology should be the royalty base.⁴³ But there is a third possibility not captured by either of these damages estimation frameworks: the patented technology is not the sole driver of demand, but is important enough to affect features and functionality—and hence user value—beyond its smallest salable component implementation.

To see the gap in the coverage of the SSPU and EMVR frameworks more clearly, we return to the language in the Federal Circuit’s *LaserDynamics* decision, where the court observed that:

³⁸ *Georgia-Pac. Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1119–20 (S.D.N.Y. 1970) (explicitly relating Factor 11 to the value conveyed by the infringer’s use and applying aspects of the value-in-use concept in factors 6, 8, 9, 10, and 13).

³⁹ *In re Innovatio IP Ventures, LLC Patent Litig.*, 2013 WL 5593609, at *13 (N.D. Ill. Oct. 3, 2013).

⁴⁰ *Id.* at *14.

⁴¹ *Commonwealth Sci. and Indus. Research Org. v. Cisco Systems, Inc.*, 2014 WL 3805817, at *11 (E.D. Tex. 2014).

⁴² *LaserDynamics Inc. v. Quanta Computs.*, 694 F.3d 51, 67–68 (Fed. Cir. 2012).

⁴³ *Id.*

We reaffirm that in any case involving multi-component products, patentees may not calculate damages based on sales of the entire product, as opposed to the smallest salable patent-practicing unit, without showing that the demand for the entire product is attributable to the patented feature Admission of such overall revenues, which have no demonstrated correlation to the value of the patented feature alone, only serve to make a patentee's proffered damages amount appear modest by comparison, and to artificially inflate the jury's damages calculation beyond that which is "adequate to compensate for the infringement."⁴⁴

The first sentence of the above quote matches the language discussed above in the context of the EMVR case law: "demand for the entire product" must be "attributable to the patented features." But the latter sentence of the quote uses different language that is not equivalent to the "basis of demand" point. Specifically, the court argues that when overall revenues "have no demonstrated correlation to the value of the patented features" then reference to overall product revenues can "artificially inflate" a jury's view of damages.⁴⁵ I agree, but "correlation" is a very different metric than "the basis of demand." Patented technology may not be the sole driver of customer demand, but may nonetheless affect the end product beyond its physical implementation in a component, such that there can be a "demonstrated correlation" between the value of the patented features and overall revenues.

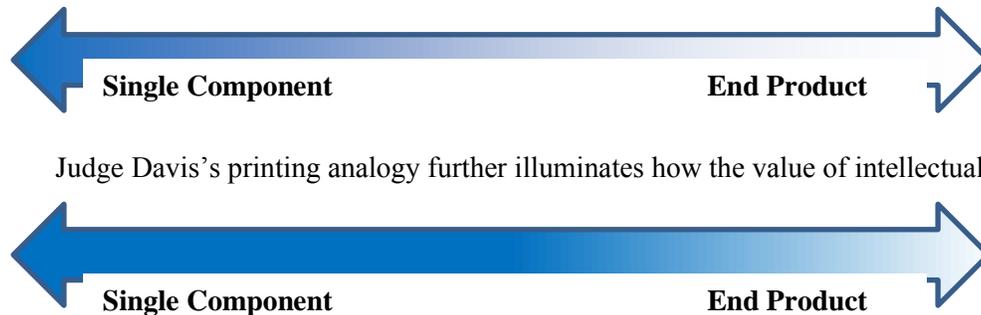
If we place damages frameworks on a spectrum ranking the magnitude of patented contributions to the value of their end products, where EMVR lies at the far right (the patented technology is the key reason for the end-product value) and SSPPU at the far left (the patented technology is just one of many reasons for end-product value), this third option would occupy the middle of the spectrum.⁴⁶ For this middle group, the relevant question then becomes how much "correlation" can be "demonstrated," with SSPPU becoming less suitable as a damages approach as demonstrable correlation between the patented technology and end-product value increases. The figure below presents three paradigms of demonstrated correlation. The top line fits an SSPPU approach reasonably well, but the bottom two do not, with the third line showing a meaningful disconnect between the SSPPU physical implementation and the value contributed by the use of the patented technology to the overall product.



⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ That is, product value that "results as a natural, direct, uninterrupted consequence" from use of the patented technology, "without which the [value] would not have [been realized]" should be included in the selection of a damages approach and should counsel for moving beyond SSPPU when that value exceeds the limits of the smallest salable unit. This is an economic analog to the legal concept of proximate cause; *see* West's Encyclopedia of American Law (2nd ed., 2008), available at <http://legal-dictionary.thefreedictionary.com/proximate+cause> (defining "proximate cause").



Judge Davis's printing analogy further illuminates how the value of intellectual

property can extend beyond the costs of its physical implementation.⁴⁷ Suppose a printer will publish two books, each 100-page-long hardcopies: one is a textbook by a well-respected legal scholar, such as Herbert Hovenkamp; the other a case analy-

Single Component

End Product

sis written by an unknown first-year law student. The cost of the paper, ink, and printing will be the same for the two books, but the value to users of the IP embedded in each book is likely to be vastly different. The Hovenkamp textbook will likely have far higher value than the law student case analysis, with the former enjoying greater distribution and a longer shelf life. Thus, even though both works are physically implemented in the same format, and have identical production costs, the value of the works to users will be very different. The same can be true for other forms of IP with respect to their physical implementations.

Some examples may clarify the various points that are likely to exist along the spectrum of damages between the endpoints of EMVR and SSPPU. First, think about certain pivotal radio frequency (RF) technology within a smartphone: RF functionality is physically implemented on a semiconductor chip within a smartphone, but technically unrelated features within that phone can have enhanced value because of innovations in radio-enabled connectivity, and radio-enabled connectivity can enjoy enhanced value resulting from the presence of those features. As Teece and Sherry (2016) explain:

[A]dding a camera to a cellphone increases the range of ways that the owner can make use of the cellphone; the owner can now take photos and share them with others over cellular connections in a way that the owner of a camera-less cellphone cannot. This increases the value to the owner of having cellular connectivity. Similarly, the ability to share photos with others over a cellular network enhances the value of the camera functionality, as compared to the value of a stand-alone camera without cellular connectivity that is not capable of such sharing. In other words, even though the two features are technologically unrelated, adding the camera functionality enhances the value of cellular connectivity, and vice versa.⁴⁸

⁴⁷ Commonwealth Sci. and Indus. Research Org. v. Cisco Systems, Inc., 2014 WL 3805817, at *11 (E.D. Tex. 2014).

⁴⁸ David J. Teece & Edward F. Sherry, *On the 'Smallest Saleable Patent Practicing Unit': An Eco-*

Putnam and Williams (2016) corroborate the prevalence of system-level technologies within the mobile telecom sector, which makes that sector ill-suited to an SSPPU approach.⁴⁹ These authors conducted a case study of patents declared as potentially essential for the 3G WCDMA standard, identifying the “practicing unit” most relevant for the patented technology defined as the aspect of the product in which the benefits of the technology were most clearly apparent. In many instances, components, product features, and user equipment were specifically described in the patent claims, along with how the technology affected functionality for those components, features, and equipment. Among the practicing unit options of baseband chip, network, or user equipment, the authors find that none of the 362 patents reviewed could be limited to baseband chip functionality alone.

As another example, Petit (2016) presents a case study on the Wireless Avionics Intra-Communications (WAIC) standard.⁵⁰ This standard is “primarily about safety-related applications: release of oxygen masks, trigger of oxygen flow, emergency lighting, cabin pressure, etc.”⁵¹ The WAIC standard is implemented via the installation of RF equipment (antennae, transmitters, and receivers) on commercial airplanes.⁵² This RF equipment represents identifiable, salable components of the much larger end product—the plane.⁵³ While oxygen mask operations and other safety features improved through the use of the WAIC standard are important, these elements are not the sole basis for demand of a plane.⁵⁴ Thus, damages calculations for infringement cases involving WAIC-related patents fall squarely within the current SSPPU regime, with the RF component prices as the relevant royalty base, to which further apportionment would be applied to reflect the particular footprint of the patents in suit.⁵⁵

Petit, however, calculates that adopting the WAIC standard can lead to significant operational cost savings for commercial airlines.⁵⁶ In particular, “a standard Airbus A-380 embarks approximately 5700 kilograms of electrical wires. With wireless technology, approximately 30% of the entire aircraft electrical wire (i.e., 1710 kilograms) can be stripped.”⁵⁷ In turn, that reduction in weight translates into both jet fuel cost savings (the most significant operational cost that airlines face)

nomics and Public Policy Analysis 17 (Tusher Center, Univ. of Cali. at Berkeley Working Paper, January 2016), <http://innovation-archives.berkeley.edu/businessinnovation/documents/Tusher-Center-Working-Paper-11.pdf>.

⁴⁹ Jonathan Putnam & Tim Williams, *The Smallest Salable Patent-Practicing Unit (SSPPU): Theory and Evidence* 35–45 (Sept. 6, 2016) (unpublished manuscript), <https://papers.ssrn.com/abstract=2835617>.

⁵⁰ See generally Nicolas Petit, *The Smallest Saleable Patent Practicing Unit (“SSPPU”) Experiment, General Purpose Technologies, and the Coase Theorem* (Feb. 20, 2016) (unpublished manuscript), <https://papers.ssrn.com/abstract=2734245>.

⁵¹ *Id.* at 2.

⁵² *Id.* at 3.

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ Petit, *supra* note 50, at 3.

⁵⁷ *Id.* at 2.

and reduced CO₂ emissions.⁵⁸ Taking the fuel cost savings for a standard Airbus A-380, Petit estimates a cost savings of \$3.02 million per plane, far in excess of the \$1,000 price of a typical RF transmitter.⁵⁹ Even if the key patent holders in the aggregate only sought half of the cost savings realized by users as compensation for their patented technology, the necessary royalty rate would need to be 1510 times the SSPPU price—a figure an accused infringer would surely decry as “unreasonable.”⁶⁰ Indeed, should the aggregate royalty for WAIC technology reach even a fraction of 1500% of RF transmitter revenues, it is likely that the patents would be held up as the poster children for “royalty stacking” abuse.⁶¹

The WAIC example highlights yet another important point for damages apportionment and the appropriate choice of a royalty base: a jury’s cognitive biases can run in either direction.⁶² Just as the Federal Circuit in *LaserDynamics* rightly worried about the disclosure of total revenues “artificially inflat[ing] the jury’s damages calculation” when the patented technology contributes to no more than a small component of the overall product, we also need to worry about an SSPPU revenue (and even more so, an SSPPU profit margin) figure artificially deflating a jury’s damages calculations when the patented technology is not the sole driver of demand but nonetheless contributes more value to its users than is captured in the component in which it is physically or technically implemented. Presenting a jury with the \$1,000 RF transmitter price tag as the royalty base would likely artificially deflate the jury’s damages calculations in a WAIC patent infringement case, when the value contributed by the patents to users will measure some portion of \$3.02 million.

Yet another example drawn from discussions with David Long further emphasizes the importance of basing valuation on a technology’s use, rather than its physical location in some component. Consider an innovative wireless technology that reduces the power requirements for mobile devices, increasing the time a device holds a charge by 30%. As is common for information and communications technology (ICT) inventions, this battery improvement technology is physically implemented in a semiconductor chip. Suppose that the same chip can be deployed to provide wireless capabilities in a mobile phone, a tablet, a laptop, or a desktop computer. The last device is kept plugged into the wall socket whereas the other three devices are mobile and hence only plugged in when a new charge is needed.

This patented power-saving invention will be more valuable to a mobile user than to a desktop user: longer battery life is one (though not the only) key feature on which consumers choose mobile devices. Thus, using the patented technology would either increase a mobile device maker’s quantity of sales, enable it to in-

⁵⁸ *Id.*

⁵⁹ *Id.* at 3.

⁶⁰ *Id.*

⁶¹ *Id.*

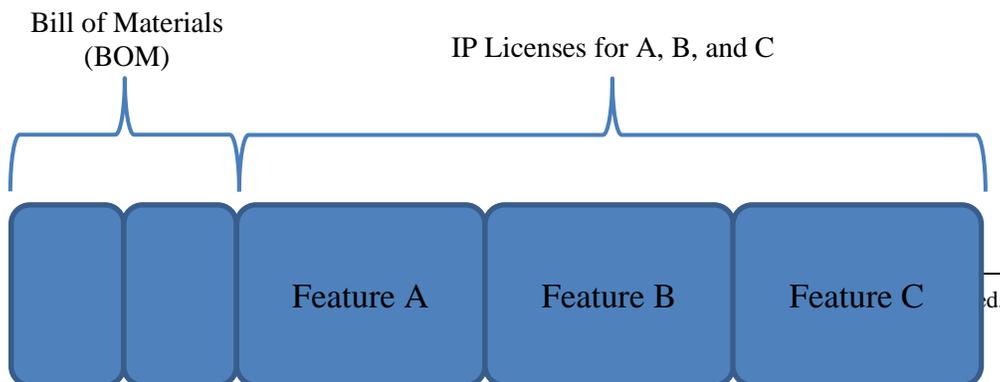
⁶² See Anne Layne-Farrar, *The Practicalities and Pitfalls of The Smallest Saleable Patent Practicing Unit Doctrine: A Review of Teece and Sherry*, 51.4 LES NOUVELLES 234, 235 (2016) (reviewing Teece & Sherry, *supra* note 48).

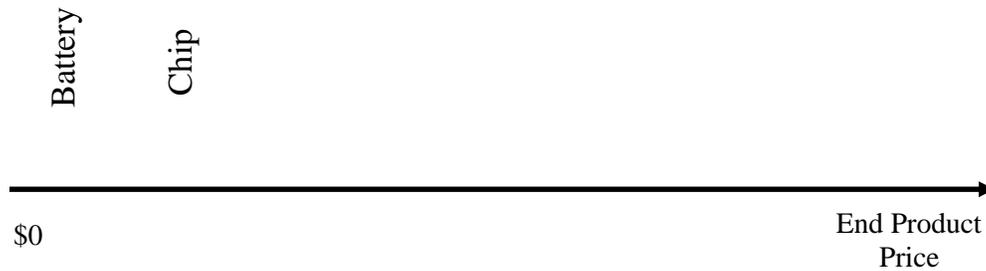
crease its retail prices, or both. By contrast, desktop computer users will find less value in patented technology that provides power savings, as desktop computers must be plugged in to function. While the patented technology may improve the desktop's energy consumption, users are unlikely to consider this a key feature, and hence is unlikely to translate into meaningfully higher market shares or revenues for the desktop maker. With this fact pattern, is the chip a reasonable SSPPU for the patented technology? Does the answer depend on whether the chip is used in a mobile device or a desktop? If a particular manufacturer used the same chips in both mobile devices and desktops, how should damages for that multi-product manufacturer be calculated?

The disconnect between the physical implementation of the patented technology and the value of the technology's use is particularly problematic if the component in which the technology is implemented reflects a component market that has rarely taken patent licenses at the component level of the production chain. Industry practice in many ICT sectors is to license all IP at the end-production level: thus, some component makers will not have patent licenses, will not have paid for the user value of the IP physically implemented in their components, and thus will have component pricing structures that do not reflect the value of using the technically implemented IP. Judge Davis referred to this problem in his *CSIRO* ruling, noting that the wireless chip prices relevant in his case "were artificially deflated because of pervasive infringement."⁶³

To alter such a market structure *ex post*, taking a component maker's prices or profit margins as the royalty base without considering whether that component maker has ever paid for the use of the technology implemented in its components, ignores important market dynamics. Consider a hypothetical Product X, an end product with three key features (A, B, and C) that together drive demand. Under industry norms, most manufacturers of Product X currently pay all IP royalties to the patent holders. Suppose the product incorporates two smaller components, a battery and a chip, both purchased from third-party suppliers and hence with observable prices. Figure 1 illustrates this product, broken down into its components, reflecting the status quo costs a manufacturer of Product X faces (the bill of materials for the components and the license fees covering features A, B, and C).

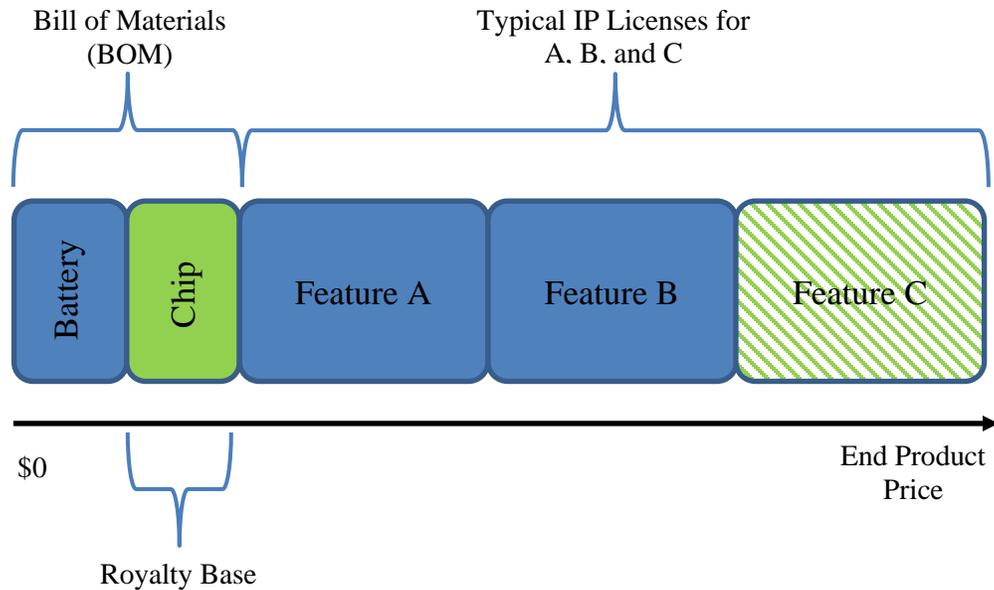
Figure 1: Licensing under industry norm





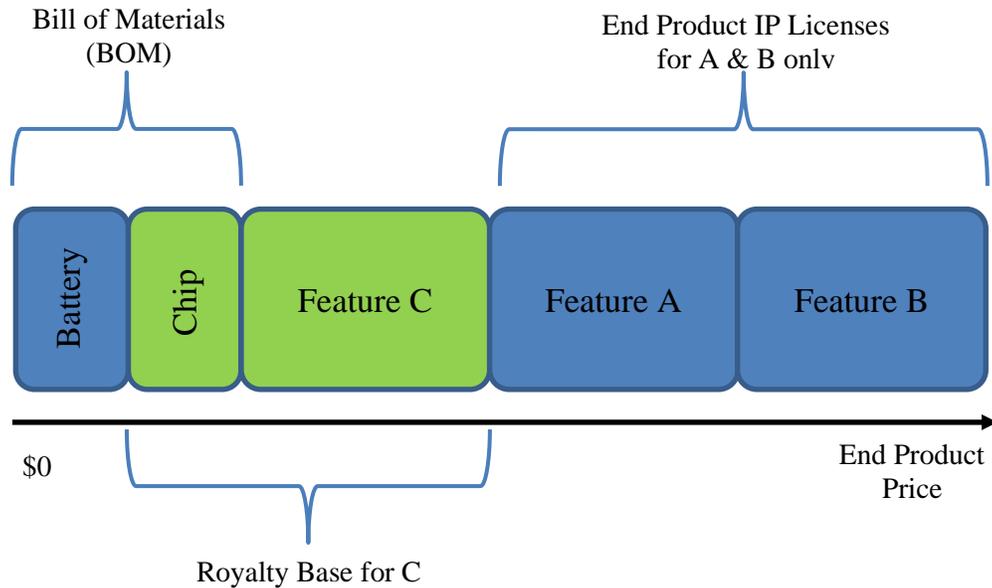
Suppose that the patents asserted in litigation read on feature C, but are physically implemented in the chip. Feature C, alone, does not drive demand, so EMVR cannot be used to determine damages. The chip also implements feature sets A and B, so under an SSPPU approach, the defendant will argue that the chip implements far more than feature set C and thus requires further apportionment. Assuming that each of the three features are of equal value to users of Product X (and hence to its seller), the defendant will argue for taking around 33% of the chip price (or even more likely, 33% of the chip's profit margin) as the royalty base, reflecting the "cost" of the patented technology implemented on the chip to the maker of Product X. The basis for this argument is that 1) the chip "captures" all of the patented technology because this is where the asserted patents are technically implemented; 2) the "value" of the IP on the chip must be some fraction of the chipmaker's profits, which reflect all of the chipmaker's costs of producing the chip, so the chipmaker's profit margin is the relevant damages base; and 3) the chip's price is set by the market and cannot be raised without substantial loss of sales and/or profits, so the chip's profits must cap the royalty. While highly stylized, this is a realistic example of SSPPU arguments in my experience. Figure 2 below represents this scenario graphically, with the solid green box for the chip highlighted out of the rest of the product components representing the royalty base for damages and the green shaded box for feature C illustrating the value contributed to the product from the asserted patents.

Figure 2: Licensing under narrow SSPPU approach



SSPPU arguments under this set of circumstances offer an incomplete view of the market, how the market values the use of the asserted patented technology, and what the relevant royalty base should be for setting reasonable damages for the asserted patented technology. First, under industry norms, end-product makers are currently paying both the price of the chip *and* the license fee for patents enabling feature C that are implemented on that chip. As a result, the apportioned chip profits do not reflect the full value of the asserted patented technology to users of the end product or its seller. Second, the argument that the price of the chip cannot be increased due to market pressures ignores the fact that the value of using the IP was separate from the price of the chip to begin with. If Product X manufacturers were willing to pay for both the chip and the IP license under the industry norm of end-product makers licensing all IP, then the chip's price should increase to reflect the value of using the IP if that chip now captures the full value of using the IP. This approach merely shifts payments across production levels, and as such does not increase aggregate payments for the asserted technology at the overall product level. Figure 3 below illustrates this point, with both the chip and feature C combined to form the royalty base for damages, shifting the cost of using feature C from an end-user license regime to a component license regime.

Figure 3: SSPPU Licensing reflecting value, not location, of IP



While modifying the SSPPU cost base to include the full value of using the patented technology enabling feature C might seem the most straightforward way to fill in the damages gap, allowing for EMVR and SSPPU to define the full set of damages framework options, I am skeptical that this would work in practice (at least without some serious transition pains for all of the companies involved). The problem with this sort of adjustment to SSPPU is that it too runs the risk of taxing juries' evaluation skills during the industry shift to the new licensing regime and therefore is likely to fall afoul of anchoring problems analogous to those that drove the creation of the SSPPU in the first place. In order to achieve an SSPPU with value-of-use based damages when the value footprint of the patented technology exceeds its physical implementation footprint, the royalty rate would need to exceed the current price of the component until the industry adjusted to the new paradigm. With chips, the current market structure for many ICT industries would need to be adjusted to include the value of using IP to the end product, where it historically has been paid, shifting it down to the component level, where heretofore it has generally not been paid. Component prices would then increase to reflect the value of using the IP implemented within the component, shifting costs from end-product makers down to component makers. Through patent exhaustion and pass-through rights, component makers would then indemnify their customers to justify their newly higher prices, meaning end-product prices would be unaffected (except by any transaction costs that affect rights pass through).

The Product X hypothetical is simply a generic illustration of the more specific WAIC example from above, where an SSPPU approach reflecting the value of using the patented technology would require a royalty rate over 1500 times the price

of the component in which the technology is implemented. Nevertheless, before component prices adjust to such a new industry order, I suspect that juries will struggle with the SSPPU-plus approach just as much, if not more, than they did with \$19 billion end-product revenue for a component of a processor. That is, juries seeing a royalty base that starts with a low-priced component and a royalty rate 10 times 100% are likely to be biased in the other direction, toward awarding damages that are too low to compensate the patent holder for the value its patents contribute to the product.

Understanding why a chip maker that has not paid for the use of IP embedded on its chips before could indeed handle an initial 150,000% royalty rate (in a dynamic sense, before the industry adjusted) requires a fairly sophisticated understanding of path dependency and market pricing, as well as an understanding of how market pricing would realign over time with chip makers taking on costs from and providing indemnity to producers further downstream.⁶⁴ As Figure 3 makes clear, increasing the royalty base to incorporate the value of using the patented technology would reflect a rejiggering of where costs are incurred within the production chain, but would not impact the final product price or the license fee that the holder of Patent C received for the use of its patented technology. It would require component makers to raise prices to reflect the value of using the IP embedded within the component and to begin offering indemnity to their customers. Against this nuanced, though economically sound argument, we would likely have defendants making simple, fairness-based responses during patent infringement litigation: how can it be reasonable to charge many multiples of the total profit the licensee earns from sale of the component?⁶⁵ In other words, the pain associated with the necessary market changes to move IP licensing from the end-product level to the component level make it highly unlikely that the move will ever occur.

Given the above issues, I conclude that the currently allowed damages approaches for utility patent infringement are incomplete. Patent holders with asserted technology whose value exceeds the baseline valuation of “one feature out of many” that fits the SSPPU principle, but which also falls short of the “sole basis of demand for the end product” as required by the EMVR, face an exceedingly difficult task in presenting “reliable and tangible” evidence on apportionment and in calculating damages that still enables compensation that is “in no event less than a reasonable royalty” and that thereby reflects the value of using the patented technology within the infringing product.⁶⁶

⁶⁴ For such an understanding, see, for example, Anne Layne-Farrar, Gerard Llobet & Jorge Padilla, *Patent Licensing in Vertically Disaggregated Industries: The Royalty Allocation Neutrality Principle*, 95 COMM. & STRATEGIES 61, 65–67 (2014).

⁶⁵ Moreover, in jurisdictions with “excessive pricing” laws, like the European Union, defendants are likely to raise antitrust arguments as well. Given the global nature of many patent portfolios, this concern is a real one even for U.S.-based patent holders.

⁶⁶ 35 U.S.C. § 284 (2017).

V. How to Fill the Gap

The choice between EMVR and SSPPU is not quite as stark as presented above: the courts have allowed some non-SSPPU, non-EMVR damages methodologies. However, these options appear insufficient to unequivocally fill the gap identified here. For instance, in *CSIRO v. Cisco*, the Federal Circuit held that taking a cents- or dollars-per-unit royalty approach does not fall under either EMVR or SSPPU, which both require a revenue base as opposed to a units base for damages calculations.⁶⁷ The fee-per-unit option could work in cases like the WAIC example above, where cost savings stemming from the patented technology are relatively easy to estimate on a per-unit basis. But this approach is unlikely to be workable in other instances, such as for the RF smartphone example given above, where the additional value for technically unrelated features is not a simple cost reduction. In many instances, it is quite difficult to translate technology value into per-unit cost savings or per-unit price increases that can be cleanly isolated and attributed to specific asserted patented technology.

A second option that avoids the EMVR/SSPPU split relies on comparable licenses covering the same patents. Recognizing that industry practice in many sectors of the economy, particularly for multi-component ICT products, sets royalty rates as a fraction of average selling prices for the end product, the Federal Circuit explained in its *CSIRO* ruling that:

The rule Cisco advances—which would require all damages models to begin with the smallest salable patent-practicing unit—is untenable. . . . [A]dopting Cisco’s position would necessitate exclusion of comparable license valuations that—at least in some cases—may be the most effective method of estimating the asserted patent’s value. Such a holding “would often make it impossible for a patentee to resort to license-based evidence.”⁶⁸

“License-based evidence” is typically one of the best indicators of an asserted patent’s value, because arm’s-length licenses tend to reflect the fair market value of using the patented technology within products and services.⁶⁹ When the case record contains sufficiently comparable licenses that value the asserted patents, but do so without resort to an SSPPU estimation exercise, the damages expert can rely on those licenses as establishing a reasonable royalty. These comparable licenses might

⁶⁷ *Commonwealth Sci. and Indus. Research Org. v. Cisco Systems, Inc.*, 809 F.3d 1295, 1303 n.1 (Fed. Cir. 2015) (“The choice of royalty base—which is often the focus of the apportionment analysis—is irrelevant to the district court’s analysis. The particular rates relied on by the district court were contemplated as cents per end unit sold by Cisco, but they could equally have represented cents per wireless chip without affecting the damages calculation.”).

⁶⁸ *Id.* at 1307.

⁶⁹ While secrecy is certainly a common issue, in my experience patent holders do not avoid license deals on the “bottom segment” for fear of setting precedents, particularly when they can rely on arguments that such deals are not comparable for other licensees. *But see* Erik Hovenkamp & Jonathan Masur, *How Patent Damages Skew Licensing Markets*, 36 REV. LITIG. 379, 381 (2017) (stating that patent holders are discouraged “from licensing at anything less than a high royalty rate—even if additional mutually beneficial agreements could be reached at lower rates—due to the fear that anything less would weaken its patent by limiting its future recovery.”).

entail running royalties (percentages of revenues, percentages of selling prices, or per-unit amounts), lump sums, or some combination thereof. But sufficiently comparable licenses will not always be available, especially for newer products or newly licensed patent portfolios, and thus this alternative is also insufficient for filling the damages gap.

As a third alternative to the EMVR/SSPPU dichotomy, damages can take the form of a lump-sum payment. This also avoids the need for an explicit revenue base multiplied by a royalty rate, and thus avoids the need for an SSPPU. That being said, in my experience, willing parties often arrive at lump-sum license payments through negotiations over the basic math of a revenue base times a royalty rate. In other words, in arm's-length bargaining the parties frequently forecast revenues for the covered products over the life of the license, apply some mutually acceptable royalty rate to that amount, and then factor in appropriate discounts (for example, to reflect the fact that the patent holder is receiving the entire license payment upfront rather than over time) to arrive at the ultimate lump-sum amount to be paid by the licensee. Recall from the quote above that *Garretson* requires evidence that is "reliable and tangible, and not conjectural or speculative," so damages experts must explain how they reach their lump-sum amounts. As a result, this third option will likely be limited to either truly comparable license agreements establishing an appropriate lump sum that could translate without adjustment to the current litigation or cases with clean evidence of cost savings or price increases (e.g., like the WAIC example). Thus, this option is also limited and insufficient for overcoming the patent damages gap.

We therefore need to add a new option to the current choices of EMVR, SSPPU, per-unit royalties, comparable licenses, and lump-sum payments. As discussed above in relation to Figure 3, one solution might be to expand the SSPPU approach to allow for royalty rates in excess of 100% of the chosen component royalty base. This would trigger price increases for components that had not before paid for IP licenses, with a shift of patent licensing from the end-product level to the component level over time. However, as a matter of economics, it is not clear that moving to such an SSPPU-plus world would be more efficient or bestow greater societal welfare than the current regime where many arm's-length, multi-component ICT licenses are set on the basis of end products.⁷⁰ This approach would require significant changes to industry practices, and thus would incur considerable transition costs. Moreover, firms in these industries have voluntarily chosen to handle patent licensing at the end-product level, where market prices are easy to observe and much harder to game than many component prices would be. It therefore seems far easier (and less disruptive to otherwise uninvolved industry members) to simply add a new utility patent damages approach that covers the middle ground cases where

⁷⁰ See Gerard Llobet & Jorge Padilla, *The Optimal Scope of the Royalty Base in Patent Licensing*, 59 J.L. & ECON. 45 (2016) (presenting theoretical analysis establishing that royalty percentages applied to EMVR or "ad valorem" royalties are generally welfare enhancing and preferable to SSPPU prices).

the value of using the asserted patent exceeds the price or profit of the component in which it is physically located but does not rise to the level of being the sole driver of demand for the entire end product.

I do not believe that introducing such an additional damages option would require much effort from the courts or the litigating parties. In fact, I think some incremental changes to the current regime could be all that is required. To see this, return to the hypothetical Product X example. Again, consider that the asserted patents cover feature C and the technologies are physically implemented in the chips. Consumers choose Product X suppliers on the basis of all three features, A, B, and C. In addition, assume that the chip makers are not licensed to use the asserted patent. The situation falls short of the current requirements for EMVR, since feature C is not the sole basis of demand, but clearly exceeds the confines of the current applications of SSPPU since the value of feature C to the end product exceeds the price that the Product X maker pays for the chip implementing feature C. If the chip were used as the royalty base, it would run the risk of biasing the jury towards a too-low damages figure not reflective of the value footprint of using the asserted technology.

In this situation, the damages expert could rely on the end-product price as the royalty base, on a per-unit basis so as not to unfairly bias the jury with aggregate revenue figures. To this royalty base, the damages expert could either apply an appropriate apportionment percentage (say 33%, reflecting that feature C is one of three features in the product driving consumer demand) in conjunction with an established end-product royalty rate, or she could devise a smaller royalty rate that appropriately reflects the value of using the patented technology within the product (and no more) to apply directly to the product price (that is, the rate itself would incorporate apportionment). In recognition of the issues driving the EMVR rule, the jury could be shown either the apportioned revenue base only (33% of end-product revenues in our hypothetical) or the per-unit product price but not any aggregate revenues, which could solve both the upward and downward bias problems.

This additional damages approach proposal is consistent with recent case law on injunctions for patent infringement. In particular, in its late 2015 review of the irreparable harm prong of injunction evaluations under *eBay*⁷¹ for the *Apple v. Samsung* case,⁷² the Federal Circuit “issued an Order that withdrew their original opinion and issued a revised opinion that focuses on the patented feature being ‘one of several [features] that cause consumers to make their purchasing decision,’ rather than the patented feature having to be ‘the exclusive or significant driver of customer demand’ as prior decisions had intimated.”⁷³ A similar softening of the sole driv-

⁷¹ *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 395–96 (2006).

⁷² *Apple Inc. v. Samsung Electronics Co., Ltd.*, 786 F.3d 983, 1005 (Fed. Cir. 2015).

⁷³ David Long, *Federal Circuit revised injunction decision to emphasize patented feature being one of several that drive purchasing decision (Apple v. Samsung)*, ESSENTIAL PATENT BLOG (Dec. 23, 2015), <http://www.essentialpatentblog.com/2015/12/federal-circuit-revised-injunction-decision-to-emphasize-patented-feature-being-one-of-several-that-drive-purchasing-decision-apple-v-samsung>.

er of demand requirement for EMVR could be allowed for patent damages, as one means of filling in the current gap that appears when asserted patents add more value to an end product than is captured in the price or profits of the physical component housing the patented technology.

The above proposal also appears to be consistent with the spirit of *Garretson*: the patent holder would present “evidence tending to separate or apportion the defendant’s profits and the patentee’s damages between the patented feature and the unpatented features.”⁷⁴ That is, using the end product as the royalty base, but applying a reasonable apportionment factor and limiting what is shown to the jury could close the patent damages gap in a sensible fashion, balancing the needs of both patent holders and licensees and balancing the risks of both downward and upward biases for juries.

The goal in relation to the litigation rules framing utility patent damages should be the creation of rubrics that ensure compensation for patent holders that is not “less than a reasonable royalty” and that reflects the value of using the asserted patented technologies within the accused infringing products, without risking over-compensation that could harm product manufacturers or follow-on inventors hoping to move those products forward. The case law currently in place does not reach that goal. While I believe the proposals above are worth considering, even those who disagree with the proposals made here should be open to finding other means of filling out the damages approaches to avoid leaving entire categories of cases without a reasonable damages framework.

⁷⁴ *Garretson v. Clark*, 111 U.S. 120, 121 (1884).