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Economic Analysis of Market Licensing v. OEM Restricted Licensing for Standard and Essential Patents

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Contents

- 1. Executive Summary..... 3
- 2. Capturing the value of the SEP 5
- 3. The Meaning of Non-Discriminatory in FRAND:
 Is it really a license for everyone and anyone seeking a license?..... 11
- 4. Factors influencing licensing decisions 14
- 5. Discussion of economic models of licensing level 17
- 6. Insufficient Monitoring and Enforcement of FRAND Commitments .23
- 7. Conclusions and Policy Considerations 24

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1. Executive Summary

As part of the standard setting process, standard setting organizations (SSOs) require owners of declared standard and essential patents (SEPs) to agree to license these patents on fair, reasonable, and non-discriminatory (FRAND) terms. Unfortunately, fair, reasonable, and non-discriminatory mean different things to different parties.

Patents are routinely licensed all along the value chain.¹ There is no single optimal type of licensee for SEPs, but, in the case of several prominent industries, licensing to upstream entities like component manufacturers, whose products incorporating the SEP technology represent the smallest, saleable, patent-practicing unit (SSPPU), minimizes transaction costs and costs related to information asymmetries. Moreover, the component manufacturer producing at the SSPPU level is more knowledgeable about the component and the relative contribution of SEP technology than a downstream entity incorporating many distinct components into a final product. Consequently, in a related patent dispute, a component manufacturer, producing at the SSPPU level, is best able to provide relevant information in defense of a reasonable royalty, as opposed to a downstream original equipment manufacturer (“OEM”), often the primary target of litigation, that incorporates many components into a final product.

U.S. standard-essential patent litigation focuses on determining the value of SEP technology, including through use of the smallest, saleable, patent-practicing unit (SSPPU) as the proper royalty base. The standardized technology and its influence on consumer demand forms the basis for SEP value. SEP owners that limit licensing to only downstream entities like OEMs can potentially exploit their SEP position and could be overcompensated for technical contributions of the SEP, obtaining compensation that derives from aspects of the product that are not related to the SEP. SEP owners could obtain excess compensation if the SEP pertains to a part or a component that is not substantially connected to the commercial success of the final OEM product. In fact, the final market value of an OEM’s product is often tied to brand value, a function of past market success and the OEM’s market efforts. Furthermore, despite the courts focus on proper apportionment of patent benefits, there is the potential for anchoring bias to occur resulting in higher jury verdicts when supra-competitive royalties are demanded by SEP holders in litigation.

1 Patent infringement can occur when anyone, without authorization, “makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent....” 35 U.S.Code §271(a), <https://www.law.cornell.edu/uscode/text/35/271>.

Certain economists and others have adopted the premise that because royalties should be based on the actual contribution of the invention, it does not matter whether a license is negotiated at the component or end-product level, as long as a royalty reflects the contribution of the invention.² For example, a 10 percent royalty on an SSPPU valued at \$100 (\$10) would be equivalent to a royalty of 1 percent on the finished product valued at \$1,000 (also \$10). This can be referred to as “FRAND is FRAND.” While this is a useful economic assumption, it demonstrably does not always hold true in the real world. For example, SEP owners may restrict licensing to only downstream OEMs and not upstream supplier entities, like component manufacturers representing the SSPPU, if the SEP owners believe they can achieve higher royalties by restricting licensing to OEMs.

SEP licensees complain when SEP owners seek inflated royalty rates, often on the finished product, because the patents are part of a standard. This is best exemplified in situations where SEP licensors seek to obtain value contributed by the standard rather than their patented technology through the use of litigation and seeking injunctive relief or through market exclusion obtained by International Trade Commission (ITC) exclusion orders. SEP licensors complain of situations where licensors must force licensees to take a license to SEPs through threatened or actual litigation. Either form of gaming behavior would increase litigation risk and associated costs for both licensors and licensees.

Models of SEP licensing levels find no economic basis for restricting licenses to only OEMs or only suppliers. Transactions costs, private or imperfect information, and frictions that limit passthrough of the royalty burden along the production chain can reduce market efficiency, discourage innovation, and reduce the rewards to innovation. Further, these licensing models often produce results that are contradicted by real-world evidence. For example, these models suggest that total royalties should not be impacted by licensing level, despite the revealed preference of many major SEP licensors to license only the OEM level in order to maximize their licensing profits.

Licensing regimes restricting SEP licensing to OEMs without regard to the technical contributions of the SEP, market structure, or transaction costs can result in over-compensation to SEP owners for the value of their inventions. At the same time, restricting SEP owners to licensing to only suppliers without regard to the technical contributions of the SEP, market structure, or transactions costs could result in under-compensation to SEP owners. A more literal interpretation of “fair,” “reasonable,” and “non-discriminatory” terms and increased transparency of actual FRAND royalty rates would be expected to

² See, for example, Gregor Langus and Vilen Lipatov, *Efficient Level of SEPs Licensing*, February 9, 2022, pp. 3 and 7, <https://www.cesifo.org/en/publications/2022/working-paper/efficient-level-seps-licensing>.

reduce the licensees' perception of and the actual likelihood of SEP-owner over-compensation. In other words, any regime that selects a particular market level as the only level at which licenses may be obtained risks potential over- or under-compensation for use of an SEP.

SEP technology and its influence on consumer demand should form the basis of SEP value. However, SEP owners that limit licensing to only OEMs can potentially exploit their SEP position and could be overcompensated by receiving a royalty that includes the technical contributions of other parts or components that are also included in an OEM royalty base, potentially including OEM investments in the OEM brand that can drive consumer demand independently of the technical contributions of any SEPs.

2. Capturing the value of the SEP

Consistent with economic theory, the value of an SEP should be based on the value contributed by the patented technology over the next best non-infringing alternative and not on the market power derived from the standard itself. While the facilitation of a standard through its adoption is widely accepted as being economically beneficial, the adoption of a technology as part of a standard conveys a measure of market power to the SEP holder. Superior bargaining position accompanies the market power of being an SEP since the adoption of a standard would result in all other economic alternatives being foreclosed. In addition, economic incentives are created by the selection of a standard. These incentives, together with the particular market microstructure and decisions regarding the level of licensing, impact the bargaining strategies of SEP owners, component suppliers, and OEMs.

An SEP holder, whether operating as a non-practicing licensing entity, a supplier, or as an OEM, may derive market power from being part of a standard, and may also have market power in terms of its ability to compete as a monopolist at its particular level in the value chain. Both types of market power may impact the bargaining position of upstream and downstream implementers *vis a vis* the SEP holder. For example, an SEP holder who is also a supplier or an OEM may have economic incentives to use its licensing power to create market power, for example by refusing to license competitors. Judge Koh, in *FTC v. Qualcomm*, noted in her decision that “Qualcomm made it clear to Apple that Qualcomm’s practice of refusing to sell modem chips exhaustively was unique within Qualcomm, and is limited to the modem chip markets where Qualcomm has monopoly power.”³

3 *FTC v. Qualcomm Inc.*, 411 F. Supp. 3d 658, 726 (N.D. Cal. 2019), Court Opinion. As used in the quote, “exhaustively” refers to the patent exhaustion doctrine under U.S. law, where a patent holder is only able to license its patent once along the supply/use chain.

In addition, the market power derived from participation in and being adopted as part of a standard may allow holders of SEPs to charge royalty rates above the technical value of the SEP. Charging a royalty premium due to a patent being part of a standard underlies the licensee complaint of patent holdup. The theory of patent holdup is that the bargaining position of a patent owner may increase substantially after a patent is included as part of a standard and the patent owner may use their position as being part of a standard as leverage to force a licensee to pay a premium to license an SEP.⁴

Examples substantiating patent holdup can be observed on occasions where SEP owners tried to extract royalty rates that were exponentially higher than those arrived at through adjudication of SEPs. Former Federal Trade Commission (FTC) Commissioner Terrell McSweeney cited to several past reports by the FTC and Department of Justice (DOJ) that studied the problem of patent holdup and how it impacted SEP licensing. Former Commissioner McSweeney stated,

[t]here is also strong anecdotal support for the theory that patent holders are willing to seek considerably more than the FRAND value of their patents, consistent with the added power conferred by inclusion within a standard. When courts have been asked to rule on the reasonableness of purported “FRAND” offers by patent holders, they have found patent holders demanding far more than that to which they were entitled – a finding consistent with holdup.⁵

For example, in *Microsoft Corp. v. Motorola, Inc.* the court determined a FRAND royalty that was about 1/150th the royalty sought by Motorola.⁶ Along similar lines, in *Realtek Semiconductor Corp. v. LSI Corp.* the federal district court determined a FRAND royalty that was less than 1/500th of the amount sought by LSI.⁷ Additional examples of SEP owners attempting to charge royalties substantially higher than final, adjudicated rates include *Ericsson v. D-Link Corp.* and *In re Innovatio IP Ventures*, both concerning Wi-Fi technology.⁸ In the former, Ericsson sought a \$0.50 per product royalty and was awarded a royalty of only \$0.15 per device.⁹ In the latter, the adjudicated reduction was much more substantial. Innovatio IP Ventures sought a per device royalty ranging between \$3.39 to \$36.90 per device. The court award was only \$0.0956 per unit.¹⁰

4 Terrell McSweeney, “Holding the Line on Patent Holdup: Why Antitrust Enforcement Matters,” March 21, 2018, pp. 2-3, https://www.ftc.gov/system/files/documents/public_statements/1350033/mcsweeney_-_the_reality_of_patent_hold-up_3-21-18.pdf.

5 *Ibid.*, p. 4.

6 *Ibid.*, p. 4.

7 *Ibid.*, p. 4.

8 See *Ericsson Inc. v. D-Link Sys., Inc.*, 6:10-cv-473, U.S. Dist. E.D. Texas, LEXIS 110585 and *In re Innovatio IP Ventures, LLC Patent Litig.*, MDL Docket No. 2303 (N.D. Ill. Sep. 27, 2013).

9 *Ericsson Inc. v. D-Link Sys., Inc.*, 6:10-cv-473, U.S. Dist. E.D. Texas, LEXIS 110585, at *79 and *89.

10 *In re Innovatio IP Ventures, LLC Patent Litig.*, MDL Docket No. 2303; Case No. C 9308, 2013 U.S. Dist. Lexis 144061, at *74-75, and *184. For a detailed discussion of royalty demands for components and patent holders seeking disproportionate royalties, please

There are practical implications regarding over- or under-compensation dominating particular sectors if certain assumptions hold. For example, if reasonable assumptions regarding OEM marketing and other investments increasing brand value hold for some technology and telecommunications sectors, then SEP licensing only at the OEM level risks inflated non-FRAND royalties benefiting SEP owners, to the detriment of its licensees. For example, while the level of brand investment may vary, it is common in the technology and telecommunications sectors for OEMs to invest significant funds in building their brand value. To the extent brands' value are built by OEMs making costly investments in marketing, internal R&D, and overall firm reputation that are independent of the technical contribution of SEPs incorporated in final products,¹¹ then SEP licensing only at the OEM level allows the SEP owner efforts to extract value in excess of the technical contributions of the SEP from those OEMs.

If one also reasonably assumes that OEM compensation of upstream suppliers does not increase with an OEM's investment in its brand, SEP owners licensing at the supplier level would not expect to earn inflated non-FRAND royalties from suppliers. The expected outcome of licensing to suppliers would be to pass through SEP royalties to all purchasers, which could include both OEMs that invest large amounts in building brand value, as well as OEMs that do not.

Under these assumptions in a market licensing regime, OEMs would be expected to prefer paying their upstream suppliers for supplier products licensed upstream, in order to ensure FRAND licensing terms and SEP royalties consistent with the technical contributions of each patent and prevent a situation that could result in an OEM paying SEP owners a *de facto* "tax" on an OEM's own brand investments. From a social perspective, it should be noted that brand investments include not only marketing but also investments in R&D and in ensuring consistent and reliable final product quality, good customer service, and other final product features that may enhance consumer value.

Evidence of certain SEP owner's seeking a *de facto* tax on an OEM's brand investment is reinforced by situations where SEP owners show a willingness to forgo significant transaction cost savings that could be realized by licensing at the upstream component supplier level and, instead, insist on only negotiating and licensing to a much larger number of OEMs. For example, only a handful of manufacturers make Wi-Fi chips, while thousands of manufacturers make end products that incorporate these chips. If SEP owners prefer to pay for thousands of distinct negotiations and agreements with thousands of OEMs, rather than pocketing the savings from negotiating with just a handful of upstream component suppliers, this would suggest that SEP owners believe they can offset increased transaction costs with increased royalty revenue.

see Ann Armstrong, Joseph J. Mueller, and Timothy D. Syrett's working paper, "The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones," https://www.wilmerhale.com/-/media/files/shared_content/editorial/publications/documents/the-smartphone-royalty-stack-armstrong-mueller-syrett.pdf.

11. In other words, assuming it is possible for two OEMs to sell similar final products that differ based on each OEM's investment in the OEM brand.

In addition, it is also important to consider that just as not all innovation is from outside the licensing company or is patented. It is also possible that not all patents represent meaningful innovation. Assuming that such “low-value” patents exist, they would introduce another consideration. There is a possibility that licensing only at the OEM level, with its attendant potential to benefit from OEM brand investments independent of the technical contributions of a patent, could increase the incentive for holders of low-value patents to assert that they are required by a standard, which could lead to increased uncertainty, litigation, and potentially reduced SEP implementation with concomitant reduction in the selection of products available to consumers.

In order to minimize the potential for overcompensation, U.S. patent litigation requires apportionment and applies the entire market value rule to determining patent damages. Under this rule, damages are only assessed on the entire market value (EMV) of a product when the patented feature creates the “basis for customer demand” or “substantially create[s] the value of the component parts.”¹² Otherwise, determination of a reasonable royalty focuses on the value of patented technology through use of the SSPPU as the proper royalty base and the apportionment of the value of the patented feature to the SSPPU.¹³ The SSPPU was introduced by Judge Rader of the Federal Circuit, sitting by designation in the U.S. District Court for the Northern District of New York, in *Cornell University v. Hewlett-Packard Co.* In this matter, the patent was on a claimed method within a computer processor. These processors were incorporated into CPU modules, which were incorporated into CPU bricks. These bricks were ultimately assembled as servers. The initial royalty base used by Cornell’s expert was the EMV of servers and workstations sold by HP. Judge Rader excluded the expert’s testimony because the expert offered no reliable evidence linking the EMV of the servers to the patented invention.¹⁴ Importantly, the use of the SSPPU and EMV rule/criteria is not limited to SEPs, and its enforcement should, in theory, result in more appropriate patented technology-based royalty rates. Indeed, some standard setting organizations (SSOs), like IEEE, have proposed the use of “smallest saleable Compliant Implementation” (similar to SSPPU) as an appropriate value level in patent licensing negotiations over SEPs covered by FRAND commitments.¹⁵

12 *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F. 3d 1292, 1318 (Fed. Cir. 2011).

13 *Cornell University v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279 (N.D.N.Y. 2009). Note that in *Finjan v. Blue Coat Systems, Inc.*, the Federal Circuit stated that “[a]s we noted in *VirnetX*, if the smallest salable unit— or smallest identifiable technical component— contains non-infringing features, *additional apportionment is still required.*” *Finjan, Inc. v. Blue Coat Systems, Inc.*, 879 F.3d 1299, 1311 (2018), emphasis added.

14 *Cornell University v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279 (N.D.N.Y. 2009). See also, *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014), *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308 (Fed. Cir. 2014), and *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 68 (Fed. Cir. 2012).

15 See “IEEE Announces Decision on Its Standards-related Patent Policy,” businesswire, September 30, 2022, <https://www.businesswire.com/news/home/20220930005084/en/IEEE-Announces-Decision-on-Its-Standards-related-Patent-Policy>, see links to “The IEEE SA BOG approved proposed updates to the IEEE SA Standards Board Bylaws, effective 01 January 2023” and “The IEEE SA BOG approved proposed updates to the IEEE SA Letter of Assurance (LOA) form, effective 01 January 2023.” Note that IEEE recently revised its considerations to determine reasonable royalties to “the smallest saleable Compliant Implementation that practices the Essential Patent Claim or to another appropriate value level of the Compliant

However, not all world courts have adopted the use of the SSPPU in establishing a reasonable royalty. In *Nokia Solutions v. Daimler AG*, the Mannheim Regional Court underscored “that the patent holder must, in principle, ‘be given a share’ in the ‘economic benefits of the technology to the saleable end product at the final stage of the value chain.’”¹⁶ The rationale provided was that the use of the patented invention “creates the chance” for an “economic profit” tied to the end-product which is based on the invention.¹⁷ The Court rejected the argument that considering the value of the patented technology in the end-product allowed SEP holders to benefit from other innovations taking place at other stages of the value chain.¹⁸ It is important to note that the Nokia principles may contradict U.S. patent laws’ emphasis on the patent’s value over the nearest alternative(s). This could result in overcompensation of the patent holder by appropriating value from other features of the final product. OEM-restricted licensing exacerbates this by potentially inflating the royalty base.

Certain academic papers support some of the conclusions reached in the *Nokia Solution v. Daimler AG* case. Heiden *et al.* (2021) argue that the value of an SEP should be “determined independently of the licensing level but dependent on the value derived by end-users....”¹⁹ They endeavor to rebut the notion that incorporating the total value of the standard over-inflates market values for SEPs because standards can define entire markets and the value of the technology cannot be independently separated from the value of the standard.²⁰ The authors contend that this is not inconsistent with evaluating whether the SEP forms the basis of consumer demand under the entire market value rule.

Along similar lines, Galetovic and Haber (2019) note that a key concept of price theory in economics holds that distribution of gains derived from the value of the SEP “is not independent of, and not separable from, the value produced across the entire production chain.”²¹ They suggest that the pricing of royalties should begin with a framework that looks at observed royalties as the market rental price of assets. SEPs, or the value of SEP licenses, can then be derived from value created by the entire production chain. The revenues, if classical price theory applies, should be the sum of marginal value of the inputs and this implies

Implementation.” See also Axel Gautier and Nicolas Petit, “Smallest Salable Patent Practicing Unit and Component Licensing: Why 1\$ Is Not 1\$,” pp. 3-4, <https://ssrn.com/abstract=2954592> and Angela Morris, “Wi-Fi standards body releases new patent policy to replace highly controversial 2015 version,” IAM, September 30, 2022, <https://www.iam-media.com/article/wi-fi-standards-body-releases-new-patent-policy-replace-highly-controversial-2015-version>.

16 *Nokia v Daimler*, 2 O 34/19 (Regional Court (Landgericht) of Mannheim 2020), <https://caselaw.4ipcouncil.com/german-court-decisions/lg-mannheim/nokia-v-daimler>.

17 *Ibid.*

18 *Ibid.*

19 Bowman Heiden, Jorge Padilla, and Ruud Peters, *The Value of Standard Essential Patents and the Level of Licensing*, 4iP Council, January 18, 2021, p. 14, <https://www.4ipcouncil.com/research/value-standard-essential-patents-and-level-licensing>.

20 *Ibid.*, pp. 13-14.

21 Alexander Galetovic and Stephen Haber, *SEP Royalties: What Theory of Value and Distribution Should Courts Apply?* November 26, 2019, p. 4, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3447641.

that the total value can be distributed among the input suppliers. The total value is bounded by consumers' willingness to pay, which is essentially the demand curve for that product.²²

Properly compensating for both technical contributions of SEPs, as well as for what forms the basis for consumer demand, may be necessary to promote innovation. Unsurprisingly, Henkel's (2021) qualitative study based on interviews found that SEP licensors favor device-level licensing and view it as the best way to generate a fair return on their investments.²³ This view is evidenced by Qualcomm executives in findings from *FTC v. Qualcomm Inc.* in the District Court of Northern California. Eric Reifschneider, then Senior Vice President and General Manager of QTL, told the IRS that Qualcomm decided to "concentrate our licensing program and our licensing negotiations on the guys who make the cell phones and the base stations and the test equipment, *because that's where the real money is.*"²⁴ This was the consensus among other executives as well – Qualcomm decided to license OEMs rather than rivals because it was "humongously more"²⁵ lucrative for them to do so.

Conversely, while failure to properly compensate innovators by undervaluing SEPs can harm innovation, Henkel also notes that the cost burden of requiring device-level licensing of small and medium scale enterprises (SMEs) can obstruct innovators from entering the market.²⁶ One of Henkel's important observations is that the optimal licensing level should incorporate and minimize transaction costs to promote downstream innovation and entrepreneurship.²⁷ It is especially important to consider the implications of device-level licensing in industries where SMEs are significant drivers of innovation, particularly in the internet of things (IoT) marketplace.

Other academic papers suggest that concerns about reduced investment in R&D and contributions to standards development due to licensing component suppliers as opposed to end-use devices may be overblown. This is especially true if the value of the SEP is determined by the value derived by end-users as mentioned above. For example, one study looked at two changes in IPR policies to better understand the impact on upstream innovation: the World Wide Web Consortium's (W3C) 2003 shift from a FRAND to royalty free licensing policy, and the IEEE Standards Association's revision to their then FRAND policy that placed

22 *Ibid.*, p. 6.

23 Joachim Henkel, *How to License SEPs to Promote Innovation and Entrepreneurship in the IoT*, March 23, 2021, p. 13, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3808987.

24 *FTC v. Qualcomm Inc.*, 411 F. Supp. 3d 658, 754 (N.D. Cal. 2019), Court Opinion, emphasis added.

25 *Ibid.*, at *754.

26 Joachim Henkel, *How to License SEPs to Promote Innovation and Entrepreneurship in the IoT*, p. 27.

27 *Ibid.*

limits on SEP holders' ability to seek injunctive relief.²⁸ Using a difference-in-differences analysis, the authors find that there is not a statistically significant decline in SEP participation or reduced innovation due to the changes made to the patent licensing policies.²⁹ In some cases, like with the 802.11 standard, there was an increase in contributions to the standard after the IEEE revised its IPR Policy.³⁰ This is evidence that more defined terms for FRAND licensing agreements may not be as detrimental to innovation as originally thought.

3. The Meaning of Non-Discriminatory in FRAND: Is it really a license for everyone and anyone seeking a license?

FRAND licensing is the commitment by SEP holders to grant licenses to those seeking to use their patents on Fair, Reasonable and Non-Discriminatory terms. Such a requirement by SSOs incentivizes participation in the development of a standard by providing SEP holders proper compensation for their innovations, while also limiting their ability to exploit the market power of being an essential part of a standard and protecting competition. "FRAND is FRAND," or the premise that patent royalties should be equal regardless of whether the license is negotiated at the component or end-product level,³¹ is a useful economic assumption that, demonstrably, may not hold true in the real world. If it were true, then licensors would be indifferent as to which level of production licensing occurred, assuming equal transactions costs. Accordingly, there is much debate in the world of SEP licensing over whether the commitment to license on FRAND terms necessitates that an SEP holder provide a license to anyone who seeks one (license-to-all), or if SEP owners are simply required to make licenses available to each supply chain, meaning they can choose where in the supply chain to license, provided it is on FRAND terms.³²

Emerging from the debate over the intent of FRAND and certain case law is the assertion by some that a broad "license-to-all" regime is generally not required by the commitment to grant licenses on FRAND terms, and that the FRAND terms of individual SSOs are important in determining what constitutes complying with FRAND.

28 See note 9, *supra*, for IEEE's subsequently revised FRAND policy.

29 Timothy Simcoe and Qing Zhang, *Does Patent Monetization Promote SSO Participation?*, November 29, 2021, p. 2, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3973585.

30 *Ibid.*, p. 21.

31 Gregor Langus and Vilen Lipatov, *Efficient Level of SEPs Licensing*, February 9, 2022, pp. 3 and 7, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4036991.

32 Damien Geradin, *SEP Licensing After Two Decades of Legal Wrangling: Some Issues Solved, Many Still to Address*, March 3, 2020, pp. 16-17.

Layne-Farrar and Stark (2020) argue that from both a legal and an economic standpoint, a license-to-all interpretation of FRAND agreements is not valid.³³ The authors argue that a lack of licensing at the component level and the tendency of components to price as commodities would lead to under-compensation of SEP holders. This, in turn, would impact economic incentives of the SEP holder to engage in innovation and forms the basis for their conclusion that the economics do not support access to all licensing. Their analysis does not consider the impact of licensing level on incentives to suppliers to innovate and how changes to the licensing level would impact suppliers' bargaining power and relatedly, the royalty rate.

In Layne-Farrar, Llobet, and Padilla's (2014) model of royalty allocation (the "Layne-Farrar model"), bargaining ability affects both the royalty rate and the price of the components.³⁴ Variables that could theoretically impact economic incentives to innovate, including the cost of and gains to furthering innovation, not just those of the SEP holder, come into play in their specification. In their model, there is an optimal allocation of royalty burden across the value chain that is the outcome of bargaining over the distribution of joint profits net of royalties and innovation effort. They derive what they refer to as "the royalty allocation neutrality principle," in which they demonstrate that under general conditions with efficient negotiations, only the sum of the royalties matters to the SEP holder, regardless of the level of licensing.

Langus and Lipatov (2022) adopt the bargaining framework of Layne-Farrar, *et al.*, but add a number of additional assumptions that act as constraints on the allocation of royalties consistent with stylized facts that are discussed in the SEP licensing literature. Taking the commitment of an SEP holder to license at FRAND terms, the authors assume that FRAND is FRAND in order to investigate whether the SEP holders' choice of licensing level would be consistent with that of a hypothetical benevolent social planner. They find under these assumptions, there is no basis for restricting licensing level to upstream component manufacturers or final goods manufacturers. In the case of heterogeneous goods using a common component, the ability of a component manufacturer to pass-on royalty payments affects which regime it and the downstream manufacturer prefer. Under different demand formulations, different regimes may be preferred. Since the SEP holder's incentives are more closely aligned with that of the social planner to maximize industry output, Langus and Lipatov conclude that the SEP holder is best positioned to choose the licensing level. We consider the Langus and Lipatov model, as well as the Layne-Farrar model, in more detail in Section 5.

33 Anne Layne-Farrar and Richard Stark, License to All or Access to All? A Law and Economics Assessment of Standard Development Organizations' Licensing Rules, November 2020, at 1311, <https://www.gwlr.org/license-to-all-or-access-to-all/>.

34 Anne Layne-Farrar, Gerard Llobet, and Jorge Padilla, "Patent Licensing in Vertically Disaggregated Industries: The Royalty Allocation Neutrality Principle," *Digiworld Economic Journal*, no. 95, 3rd Q. 2014, pp. 61-84.

Padilla and Wong-Ervin (2017) look at whether a refusal to license individual component suppliers in favor of licensing end-use devices constitutes an antitrust and competition law violation. They find that failing to comply with FRAND licensing agreements is not necessarily an antitrust violation, and that refusing to grant a license at the component level is not anti-competitive if an SEP holder licenses to OEMs on FRAND terms.³⁵ Moreover, in *Continental Auto Sys., Inc. v Avanci, L.L.C.*, the Fifth Circuit ruled that Avanci’s refusal to grant an SEP license to Continental, an auto-parts supplier, due to their policy of only licensing OEMs did not constitute an antitrust violation.³⁶ While the court in *Continental* held that licensing downstream OEMs but not suppliers does not constitute an antitrust injury, they did not address the question of whether it violates other obligations of an SEP holder.

These papers and the *Continental Auto Systems* decision focus on the antitrust issues and show that the non-discrimination component of FRAND is not necessarily and uniformly enforced in the litigation context. From the perspective of the models of SEP licensing, the assumptions of FRAND and its ability to deliver optimal licensing results can be a convenient simplification that fails to deliver on the non-discrimination component of FRAND.

It is important to note that complying with FRAND obligations is dependent on which SSO developed and adopted the standard to which the SEP relates. Since SEP owners are almost always a part of the relevant SSO, SEP holders can have significant influence on SSOs’ Intellectual Property Rights (IPR) policies. Different SSOs may have different IPR policies and different FRAND terms. Most prominently contrasted are ETSI (a big player in the cellular standards space) and IEEE (a big player in the Wi-Fi standards space). The ETSI IPR Policy does not explicitly assert that licensing must be available to every entity along the entire supply chain, though that is a plausible interpretation of its licensing requirements, and “contemporaneous documents from ETSI participants confirm their understanding that the ETSI IPR Policy would require licenses to be available ‘to all that wish to be licensed.’”³⁷ On the other hand, the IEEE Patent Policy does specify that licenses need to be made available to components, sub-assemblies, and end-products,³⁸ or (beginning in 2023) “to another appropriate value level of the Compliant Implementation.”³⁹ Therefore, the individual policies of SSOs can impact an SEP holder’s ability to choose or restrict the level where licensing occurs.

35 Jorge Padilla and Koren W. Wong-Ervin, “Portfolio Licensing to Makers of Downstream End-User Devices: Analyzing Refusals to License FRAND-Assured Standard-Essential Patents at the Component Level,” *The Antitrust Bulletin* 2017, Vol. 62(3), p. 497.

36 “No Harm, No Foul, and No Standing for Would-be SEP Implementer: 5th Circuit Changes Narrative on Patent ‘Hold Up,’” *The National Law Review*, March 3, 2022, <https://www.natlawreview.com/article/no-harm-no-foul-and-no-standing-would-be-sep-implementer-5th-circuit-changes>. Note that the *Continental Auto Systems* matter is still under appeal.

37 Pocknell and Djavaherian, “The History of ETSI IPR Policy,” 2022, p. 25, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4231645.

38 Layne-Farrar and Stark, *License to All or Access to All?* 2020, p. 1330.

39 Angela Morris, “Wi-Fi standards body releases new patent policy to replace highly controversial 2015 version,” *IAM*, September 30, 2022, <https://www.iam-media.com/article/wi-fi-standards-body-releases-new-patent-policy-replace-highly-controversial-2015-version>.

4. Factors influencing licensing decisions

If an SSO does not require licensing to all or at specific levels in the production stream, then SEP holders remain free to determine the optimal licensing level at which to enforce their patents. From an efficiency perspective, the optimal licensing level depends on how the SEP licensed technology will be implemented.⁴⁰ Licensing at either the OEM or the Supplier level may make sense depending on the market structure. Transactions costs, efficient differentiation of licensing terms, the optimal mix of implementation effort, entry incentives, and pricing distortions are all factors that determine the optimal level of licensing.⁴¹ The weight of influence for each of these factors, in turn, depends on the market structure.

In terms of transaction costs, SEP owners should license where transaction costs are the least. This is especially true given the magnitude of transaction costs. The American Intellectual Property Law Association's (AIPLA) 2021 Economic Survey provides an estimate for transaction costs for negotiating a patent license. The survey provides an estimate of the typical charges for “[p]reparing licenses, including negotiations” in addition to the cost for “[d]ue diligence” related to transactional IP work. Based on the survey, the average charge for the preparation and negotiation of a license is \$10,273, and the average charge for due diligence related to IP work is \$16,866.⁴² While these are average charges, the legal costs related to SEPs are likely to be exponentially higher.

The same transactional cost consideration exists for SEP licensees. Their preference would be to license from as few SEP owners as possible. It may not be possible to satisfy this licensing preference for both SEP owners and licensees across a particular product or technology.

There are many important factors to consider when an SEP holder is determining where transaction costs are the least. For one, the number of potential licensees matters. Licensing for many products has historically occurred at the end-product level since there is a presumed savings in transaction costs from only having to negotiate licenses with one group of licensees.⁴³ However, this argument may overstate the potential to reduce transaction costs when the number of licensees is prolific and varied. In cases where the standardized innovation is centered on the components and components are required to deliver on the innovation, licensing to a lower number of component manufacturers compared to a higher number of end-product manufacturers could result in lower transaction costs. Again, the industry characteristics are

40 Layne-Farrar and Stark, *License to All or Access to All?* 2020, p. 1346.

41 Gregor Langus and Vilen Lipatov, *Efficient Level of SEPs Licensing*, CESifo Working Papers, February 9, 2022, pp. 2-3, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4036991.

42 American Intellectual Property Law Association, *2021 Report of the Economic Survey*, p. 256.

43 Jean-Sébastien Borghetti, Igor Nikolic, and Nicolas Petit, *FRAND Licensing Levels under EU Law*, February 5, 2020, p. 3, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3532469.

important and downstream savings on transaction costs should not be presumed without investigating the sources of transaction costs.

Second, the opportunity for cross-licensing agreements and participation in patent pools can help reduce transaction costs.⁴⁴ Cross-licensing agreements can reduce transactional costs for both SEP owning parties when the parties both hold SEPs at the same level of the material value (i.e., supply) chain.⁴⁵ Cross-licensing is often seen taking place between two, highly integrated firms. For highly integrated firms that hold SEPs throughout the material value chain, it makes sense that end-product level licensing would be the industry norm. The same operational freedom from cross licensing is less likely when the parties own SEP rights at different levels of the material value chain. For instance, one party may have SEPs related to components while the other party has SEPs related to more downstream features. At the same time, the increasing presence of SEP holders whose business is solely licensing, with no product business, can limit the availability of cross-licensing.

While transaction costs are given prominent consideration by SEP holders, they are not the only factor that influences SEP owners' decision of where to license. This is evidenced by SEP holders passing up substantial transactional cost efficiencies from licensing relatively few component manufacturers in favor of licensing at the final product level. This suggests that SEP holders think they have more to gain from licensing many manufacturers at the end-product level and maximizing the royalty base and revenues rather than minimizing transaction costs by negotiating with fewer suppliers.⁴⁶ For example, only a handful of manufacturers make Wi-Fi chips, while thousands of manufacturers make end products that incorporate Wi-Fi chips.⁴⁷ In the case *Ericsson Inc. v. D-Link Systems, Inc.* that was heard on appeal at the Federal Circuit, it was revealed that Ericsson chose to license at the end-manufacturer level,⁴⁸ despite the reduced transaction costs they could have enjoyed by choosing to license the relatively few chipmakers.

Nevertheless, this revealed preference of licensing at the end-product level without regard to transaction costs may not be sustainable in the IoT world. Henkel (2021) finds that transaction costs of device-level licensing in the IoT space are much higher due to the expected large number of IoT device manufacturers compared to relatively few baseband processor manufacturers.⁴⁹

44 Bowman Heiden and Jens Andreasson, *Re-Evaluating Patent Damages in the Knowledge Economy: The Determination of Royalty Base for Standard Essential Patents from an Intellectual Value Chain Perspective*, 2016, p. 30, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3708856.

45 *Ibid.*, pp. 30-31.

46 See note 18, *supra*, for Qualcomm's statement on why it chooses to license handset manufacturers rather than its direct competitors.

47 Joseph Kattan, *The Next FRAND Battle: Why the Royalty Base Matters*, March 16, 2015, pp. 9-10, <https://www.competitionpolicyinternational.com/the-next-frand-battle-why-the-royalty-base-matters/>.

48 *Ibid.*, p. 9.

49 Joachim Henkel, *How to License SEPs to Promote Innovation and Entrepreneurship in the IoT*, 202, p. 13.

Therefore, the optimal level of licensing would be expected to shift to the supplier level for IoT devices.

Preparing, negotiating, and performing licensing due diligence are not the only transaction costs considered by SEP owners (and licensees). Litigation risk and potential associated litigation costs are also important to take into consideration when determining the optimal licensing level. Patent litigation can be cost-intensive. The AIPLA 2021 Economic Survey provides an estimate of the median litigation costs associated with patent infringement cases of all varieties. While not specific to SEP litigation, they estimate that to get to the claim construction phase, the median cost is \$300,000 for a case with less than \$1 million at risk, \$650,000 for \$1-10 million at risk, \$1 million for \$10-25 million at risk, and \$2.125 million for more than \$25 million at risk.⁵⁰ The median cost through trial (including pre and post-trial, and appeal when applicable) is \$675,000 for a case with less than \$1 million at risk, \$1 million for \$1-10 million at risk, \$3 million for \$10-25 million at risk, and \$4 million for more than \$25 million at risk.⁵¹ These estimates were based on survey respondents providing cost estimates on the types of litigation they had personal knowledge of. These cost estimates were based on a single IP asset and are inclusive of total costs associated with the case.⁵²

With respect to the likelihood of litigation, one study found that SEPs are five times as likely to be litigated compared to non-SEPs.⁵³ In addition, an overwhelming majority of patent assertions come from non-practicing entities (NPEs). In one study that looked at lawsuit data for patents declared essential from SSOs that have publicly available SEP disclosures, only 27.2 percent of assertions came from practicing entities, i.e., 72.8 percent of assertions come from NPEs.⁵⁴ The share of claims asserted by NPEs drops significantly to 37.6 percent when looking at unique patents asserted.⁵⁵ The same study found that SEP cases were more complex than non-SEP cases, with greater docket entries for SEP cases than non-SEP cases.⁵⁶ Greater complexity could imply greater costs for SEP-related litigation.

Importantly, the terms of SSOs can help reduce patent litigation. According to a recent IPLytics study, cellular standards are responsible for roughly 75 percent of all SEP litigation and are governed by more ambiguous FRAND rules such as those of ETSI. On the other hand, IEEE standards, whose FRAND rules were far less ambiguous, are responsible for approximately only 2 percent of SEP litigation.⁵⁷

50 American Intellectual Property Law Association, *2021 Report of the Economic Survey*, p. 60.

51 *Ibid.*, p. 60.

52 *Ibid.*, p. 60.

53 Mark A. Lemley and Timothy Simcoe, "How Essential are Standard-Essential Patents?" *Cornell Law Review*, March 3, 2019, p. 612.

54 *Ibid.*, p. 620.

55 *Ibid.*, p. 621.

56 *Ibid.*, p. 623.

57 Michael Carrier and Brian Scarpelli, "How Standard-Setting Orgs Can Curb Patent Litigation," *Law360*, June 15, 2021, <https://www.law360.com/articles/1392222/how-standard-setting-orgs-can-curb-patent-litigation>.

5. Discussion of economic models of licensing level

Due to a paucity of data and the complexity and opacity of SEP valuation, negotiation, and royalties, very few papers have tackled the question of the costs and benefits of a particular licensing level, the apportionment of royalty burden across licensing levels, or the optimal level that would encourage innovation across the entire value chain. As noted above, there have been various papers that have discussed the challenges of SEP licensing, but few have taken on the question of the level of license directly. In those that have, the assumptions of the papers on the subject beg for economic scrutiny, either through investigation by data analyses or by interrogation of the underlying microstructure.

As discussed in Section 3, a working paper by Langus and Lipatov (2022) endeavors to model the choice of the licensing level in a sequential choice bargaining model that includes an SEP holder, an upstream component manufacturer, and a downstream final product manufacturer.⁵⁸ Since each final product requires one unit of the component, the downstream producer of the end-product and the component supplier bargain over the surplus which depends on the value of the technology, royalties, and the respective efforts of the upstream and downstream implementors. Given a number of assumptions, including equal royalties regardless of the licensing level (e.g., FRAND is FRAND), the licensing level is determined as the one most in alignment with a benevolent social planner seeking to maximize consumer welfare.

The Langus and Lipatov model is ambitious, technically sophisticated, and full of insight regarding the choice of the licensing level. Its most valuable insights come in the form of propositions, which emerge from different specifications of how the component is priced (fixed vs. ad valorem), different competitive conditions (monopoly, free entry), and over different demand functions for the final product. In the base specification, the market is characterized by a particular demand for end products and an environment wherein the component manufacturers bargains over the surplus with the end-product manufacturer. The model then considers how different demand functions and assumptions about the pricing of the components affect the choice of licensing level.

Because of the particular bargaining framework, upstream and downstream firms each chose an effort level that enters as a cost in the consumer welfare equation. The optimal level of licensing in this idealized setting depends on two factors, the royalty base effect and the double distortion effect. In their model, the royalty base effect weighs in favor of licensing the downstream end-product manufacturer, since the royalty base at the component manufacture is smaller and therefore the SEP holder can extract greater royalties if it licenses downstream. If the upstream were charged the FRAND level dictated by the

58 Gregor Langus and Vilen Lipatov, *Efficient Level of SEPs Licensing*, CESifo Working Papers, February 9, 2022, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4036991, pp. 20-21 and 30-44.

royalty base at the downstream level, lacking a means to fully pass-on the same royalty, levying the same royalty on the upstream level would distort his effort.⁵⁹

The double distortion effect, on the other hand, can distort both upstream and downstream effort depending on where royalties are collected. Double distortion occurs because at whatever level the royalties are levied, distortion of implementation effort occurs because the upstream and the downstream manufacturers must negotiate over the available industry revenue under the FRAND assumption (we discuss the assumptions below). If the upstream royalty is per unit and the downstream royalty is ad valorem, the upstream and downstream manufacturers are indifferent to the level the royalty is collected at, and the social planner prefers upstream since it minimizes the distortion effect.

While different demand structures, constraints on effort, and market structure affect the optimal level in the cases considered by Langus and Lipatov, the assumptions underlying the cases considered are critical to the market microstructure of what determines licensing level in practice. In order to overcome the issue of valuation of the SEP royalty rate, their model assumes that a FRAND royalty reflects the value of the licensed technology that is in some way proportionate to the value of the technology. In its basic formulation, both the upstream and downstream choice functions are trained on maximizing value at the end-product level, which depends on each's level of effort in implementing the technology. The end-product is the relevant focus of value because, the authors reason, no value is generated in a component if a technology is not incorporated in the final technology.

Another crucial assumption that underlies their model is that, in all cases considered, FRAND is FRAND, and by this they mean FRAND royalties are equal whether they are paid at the component or manufacturer level.⁶⁰ While the authors suggest the justification for this assumption is based on case law, it is ironic that most of case law centers around disputes regarding FRAND royalties. The FRAND is FRAND assumption allows the model to abstract from having the SEP holder optimize on royalty rates subject to specific transactions costs, including, importantly, those very search, bargaining, enforcement, and monitoring costs that are discussed in the paper as the fulcrum of a FRAND royalty determination.

Absent the need to negotiate on the value of the technology or the FRAND royalty, the SEP holder can be indifferent to the licensing level and shift its focus to maximizing the quantity of the final good produced in the face of whatever demand curve is specified. Specifically, assuming the negotiators all operate

⁵⁹ *Ibid.*, 19-20.

⁶⁰ *Ibid.*, pp. 7 and 19.

under FRAND prices, the SEP holder, consistent with the aims of the hypothetical social planner, can focus on maximizing output. In their model, due to the FRAND assumption, the royalty rate is given, set by the social planner in the first stage of the bargaining model.

Langus and Lipatov discuss the Coase (1960) transactions costs at length, but do not incorporate them as variables into their model of optimal licensing.⁶¹ In their discussion, they argue that SEP holder efforts to minimize transactions costs are largely consistent with those of the benevolent social planner. Further, the authors argue that FRAND commitments help alleviate or reduce many of the transactions costs that implementers face. For example, assuming the SEP holder has made a FRAND commitment, the authors posit that neither the supplier nor the end-product manufacturer needs to engage in search of the standard they may be infringing. An implication of this assumption is that since their royalty burden will be FRAND in equilibrium in any case, manufacturers, whether upstream or downstream, cannot be over or undercharged.

In this idealized model and setting, a component manufacturer or OEM does not face sunk or unrecoverable costs should they lack a license since they are guaranteed to pay a FRAND royalty should the SEP holder choose to search for and litigate an infringement. In the description of costs under FRAND, SEP holders would solely bear the brunt of the monitoring and enforcement costs. In their model, having the benevolent social planner set the royalty rate enables the SEP holder to choose the level of licensing that would presumably minimize these unmodeled costs. However, the model provides no mechanism for litigation or other risks, or their inevitable impact on innovation and the potential appropriation of royalties from each level.⁶²

Another key assumption is that royalties will be levied on one level only, either at the upstream or the downstream firm.⁶³ There is support for this assumption in case law and it is grounded in both the first sale and the patent exhaustion doctrines, which keep the SEP holder from double dipping, extracting rents from both component and OEM without any additional effort or innovation related to the standard. While the restriction on licensing to the first sale may reduce the likelihood of overcompensation, it is not the only source of overcompensation.

While Langus and Lipatov argue that their stylized model of single-level licensing derives from the economic principles of transactions costs, some caution is necessary. First, the argument that single-level licensing can reduce transactions costs is not wrong, but the full thrust of the FRAND assumption in the model is

61 *Ibid.*, pp. 2-3, and 13-18.

62 Langus and Lipatov discuss how transactions cost might impact incentives of the SEP holder to *advocate* (emphasis added) for a licensing level that reduces its costs, p. 8.

63 *Ibid.*, p. 7

problematic. There is virtually no example in the real world of fixed transactions costs and transactions costs are certainly not equal or even necessarily comparable across component manufacturers versus downstream OEMs.

Second, and more fundamental, in the real world of SEP licensing, both component manufacturer and end-product manufacturer face transactions costs, including search, bargaining, and litigation costs. That implementers both upstream and downstream must incur substantial costs often before they undertake production is not nullified by an assumption of FRAND or patent exhaustion. These costs are significant and impact both innovation and welfare.

Transactions costs are expended *ex ante*, i.e., before the production of value begins, and *ex post*, after the end-product enjoys adoption in the marketplace, and can be amplified by litigation, private or asymmetric information, opacity, and economic inconsistency arising from comparability problems, bias, and conflicting standards. The potential for disputes in the bargaining process over the value of the technology and the FRAND royalty are subject to substantial litigation risk and the inevitable impact such risks have on outcomes warrants more detailed consideration.

Layne-Farrar, Llobet, and Padilla also investigate the welfare implications of restricting a patent holder's ability to choose where to license along the production chain in a sequential bargaining model.⁶⁴ Like Langus and Lipatov, Layne-Farrar *et.al.* also find that leaving the choice to the patent holder is the most efficient regime and different assignments of the royalty burden across the vertical supply chain do not affect social welfare. Both treatments conclude that there is no economic justification to restrict licensing to one level in every instance or to require one licensing regime over the other.

The Layne-Farrar model does not hardwire the equivalence of royalties that emanates from the FRAND assumption or the single-level licensing constraint into their model. In their model, an upstream manufacturer incorporates the patented technology into a component which it sells to the downstream manufacturer who incorporates it into an end-product sold to consumers. The intermediate price of the component is the product of bargaining over the intermediate price that would maximize their respective profits. In their basic model, they assume *ex ante* licensing negotiations in a frictionless environment before any investments are made by licensees.⁶⁵ Implicit is the assumption that licensees have full information about the existence of the SEP and its validity.

64 Anne Layne-Farrar, Gerard Llobet, and Jorge Padilla, "Patent Licensing in Vertically Disaggregated Industries: The Royalty Allocation Neutrality Principle," *Digiworld Economic Journal*, no. 95, 3rd Q. 2014, p. pp. 61-84.

65 *Ibid.*, p. 63.

In the Layne-Farrar model, if the patent holder levies royalties on the upstream manufacturer, the price of the component can adjust to reflect the additional royalty burden it bears. Indeed, any increase in costs is fully passed through to the downstream manufacturer as long as there are no frictions in the form of intermediate pricing constraints or private information.⁶⁶ The authors devote significant discussion to how these frictions can impact prices, profits, and consumer welfare.

Like the Langus and Lipatov model, the Layne-Farrar formulation answers many key questions regarding the licensing level, also finding the licensing level should not be restricted and negotiations can result in pareto optimal royalty rates at either the component or the manufacturer level.

Despite these important conclusions, the Layne-Farrar formulation is based on *ex ante* negotiations before the product using the technology is produced, and therefore eliminates the possibility of associated litigation risks and costs that are of concern and can lead to the holdup problems raised by the industry. As in Langus and Lipatov, Layne-Farrar *et.al.* discuss the possibility that there is more information at the downstream level and the value of the standard is determined at the end-product level, where the price and the output is determined at the point of demand based on the shape of a given demand curve. At the downstream end-product level, Layne-Farrar *et. al.* reason there is more information on the scope of the technology and the number of goods actually sold that utilize the licensed standard and derive value from the patented technology.⁶⁷

The conclusion that licensing downstream at the end-product level is more likely to be optimal based on the presumption that there is more information on the scope of the technology and the output is arguable in the broader context. A television manufacturer and a car manufacturer that utilize the same standard technology should not be assumed to have greater information on the scope and value of the technology than the component maker that produces the underlying technology. If the standard is incorporated in the component, the assumption that its value is only realized or known at the downstream level is a simplification that could inflate the technology's value. While this allows both papers to argue that the downstream or end-product is more likely to be optimal under asymmetric information, this focus on quantity produced overlooks potential information asymmetry and incentives of the SEP holder in possession of private information.

Other sources of information asymmetry and imperfect information are discussed in the literature and in litigation, and these can obscure the optimal licensing level and lead to overcompensation of the SEP holder. Critically, not only is there imperfect information about the applicability of the SEP, but information

⁶⁶ *Ibid.*, p. 64.

⁶⁷ Layne-Farrar, *et.al.*, p. 64.

on royalty rates paid by other users of the standard technology is not generally known to the would-be implementers. In short, there is little information that allows SEP licensees to evaluate whether they are being offered fair or reasonable rates compared to other licensees with whom they directly compete. Royalty rates and information on the quality of the technology, its innovation over existing technology can only be inferred, except during the discovery process of bargaining and litigation.

In their discussion of the uses of the technology, alternatives to the patent portfolio, and the scope of the license, Langus and Lipatov assume bargaining costs are symmetric in the presence of opacity in royalty rates. However, they focus on primarily one source of asymmetric information, specifically the implementers' knowledge of and incentives to under-report sales, in a manner that is unsupported in practice.⁶⁸ While misreporting financial information is likely to violate contract, antitrust, and securities laws, obscuring royalty rates and a SEP holders' incentives to do so are taken as a cost of bargaining that either does not exist in the economics context or one that the assumption of FRAND can resolve. Thus, the FRAND assumption, while a convenient modeling concession, eliminates the possibility of a key source of private information well known in litigation and practice, while highlighting a source that is institutionally less likely because of the law and one that is actively monitored by contracting parties, government authorities, and the courts. Only through litigation can this source of asymmetric information theoretically be resolved, and the costs of doing so are significant, but in their model, completely unspecified.

Interestingly, even though the discussion in the Layne-Farrar, *et.al.* article does not elaborate on potential asymmetric information about royalty rates paid by competitors, suppliers, or manufacturers, they advance a special case in their model appendix that does.⁶⁹ In that case, the upstream suppliers and downstream seller do not observe royalty rates paid by others when they undertake negotiations. The upstream producer forms a belief about the royalty paid and this influences the intermediate price charged to the downstream firm. As in the base case, the SEP holder maximizes aggregate royalties, but in the case of asymmetric information regarding royalties paid by others, SEP profits are greater if royalties to upstream producers are increased.⁷⁰ In short, since the locus of information asymmetry impacts both SEP profitability and the SEP's choice of licensing level, more information on royalty rates could lead to substantially different and more efficient outcomes.

While Galetovic and Haber (2019) observe that in some markets royalty rates can be taken from financial statements, no practical requirements, outside of a court proceeding, exist that would compel publication or disclosure of rate

68 Langus and Lipatov, p. 17.

69 *Ibid.*, p. 83.

70 *Ibid.*, pp. 64 and 83.

information. Therefore, any potential inferences from royalty rates are dependent on extricating relevant information from whatever incomplete information is available. All this is to say that, despite the utility of the models of licensing level, licensing at a level further downstream does not solve the asymmetric information problem and cannot do so as long as the private information resides with the SEP holder. As long as the practical locus of private information on SEPs and royalties exist, claims of patent holdup and royalty stacking will persist.

In litigation, implementers and SEP holders often disagree on the appropriate FRAND royalty. Implementers sue because they claim they are not getting FRAND rates and, in particular, that the rates are discriminatory, yet different courts will get different answers. Anchoring bias, which occurs when juries and judiciaries award greater damages for infringement based on a higher royalty base at one level or another, also causes FRAND not to be FRAND. In assessing litigation risk and the potential for sunk costs and switching costs, implementers will seek to avoid litigation. In practice, implementer efforts to avoid these costs may increase the royalty rates that prospective users of the standard will accept. Due to these factors, models that enable parties to minimize these transactions costs may yield different predictions on the optimal level of licensing.

6. Insufficient Monitoring and Enforcement of FRAND Commitments

Despite SEP owners' agreements to license on FRAND terms, there is no public or private sector mechanism to monitor or evaluate whether royalty rates are FRAND. In short, there is no way to "enforce" FRAND commitments. Regulatory bodies are not empowered to and not expressly charged with monitoring and enforcing FRAND obligations. In the U.S., there are no specific laws or regulations governing FRAND commitments or the monitoring of FRAND royalty rates. SSOs perform a quasi-governmental function in terms of setting standards and setting (or not setting) FRAND terms. SSOs are generally private-sector funded, trade or membership organizations and institutes. Their powers are largely driven by the acquiescence of market participants. SSOs can be "jaw-boned" into action by governmental agencies, e.g., the DOJ and FTC have pushed for changes in SSOs leading to greater clarity and reduced disputes.⁷¹

There may also be differences as to what constitutes FRAND terms in different political economies, which can be impacted by domestic considerations, such as importance of local industries and whether a country is a net importer or exporter of innovations. FRAND royalty determinations made in other countries that set international FRAND rates can have a negative impact on U.S. competitiveness, directly impacting profitability through higher royalty or component costs, pricing to end users, and future innovation.

71 Michael Carrier and Brian Scarpelli, *How Standard Setting Orgs Can Curb Patent Litigation*, Law360, June 15, 2021.

While an SEP owner may rationally care about getting the highest royalty rate, minimizing costs, and maximizing revenues and ensuring the widest dissemination of the technology, it may not care about the impact of its FRAND licensing policies on international competitiveness of domestic vs. foreign suppliers. With an inability to monitor and without a common understanding of what is fair, reasonable, and nondiscriminatory, FRAND royalty rates could impact the competitive market environment for the production of components or OEM products. This will potentially affect both market efficiencies and prices to consumers.

7. Conclusions and Policy Considerations

Patents are routinely licensed all along the value chain.⁷² There is no single optimal type of licensee for standard essential patents (SEPs). Optimal licensing level varies across situations and is dependent upon factors such as market structure and the use of technology.

Certain economists have adopted the premise that because royalties should be based on the actual contribution of the invention, it does not matter whether a license is negotiated at the component or end-product level, as long as a royalty reflects the contribution of the invention. This is expressed as FRAND is FRAND. While this is a useful economic assumption, it, demonstrably, does not hold true in the real world. Despite there being limited data, in instances where SEP patents have been adjudicated, we are able to see evidence of SEP owners seeking royalties that would result in overcompensation (based on final, adjudicated rates). This attempt at overcompensation is evidence disproving the assumption that FRAND is FRAND. Moreover, the existence of circumstances in which there are consistent SEP owner preferences for licensing exclusively at a level that does not minimize transaction costs provides further evidence that “FRAND IS FRAND” does not hold true in the real world.

SEP licensors complain of situations where licensors must force licensees to take a license to SEPs through threatened or actual litigation. Unfortunately, lack of agreement on what constitutes FRAND terms and asymmetric information regarding existing SEP licenses and rates reinforces licensees’ reluctance to accept licenses and rates based on downstream product prices. Without a plain meaning understanding of what constitutes FRAND and without greater transparency, certain SEP licensees view litigation as a reasonable, but expensive approach to negotiating FRAND license terms.

⁷² Patent infringement can occur when anyone, without authorization, “makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefore, infringes the patent.” 35 U.S.Code §271(a), <https://www.law.cornell.edu/uscode/text/35/271#:~:text=Except%20as%20otherwise%20provided%20in,patent%20therefor%2C%20infringes%20the%20patent.>

In many industries, data on royalty rates are either incomplete or non-existent but for discovery in connection with litigation. Indeed, a lack of data on royalty rates is often most pervasive in those industries where asymmetric or incomplete information are of greatest concern and concomitant transactions costs, including those associated with litigation, are believed to be the greatest. If transparency were improved due to government intervention or activism by standard setting organizations, an increase in informational efficiency could lead to a reduction in transactions costs. A more literal interpretation of “fair,” “reasonable,” and “non-discriminatory” terms and more transparency of actual FRAND royalty rates could reduce transactional costs, increase market efficiencies, and encourage innovation by providing more predictability and consistency in FRAND royalty rates.