# Evidence-Based Patent Damages

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## Introduction

The past three decades have witnessed the spread of a movement toward "evidence-based" practices in which scholars and practitioners across a wide variety of disciplines have begun to use the best available evidence to test and improve pre-existing practices that lack the support of rigorous data.[2] This movement began in the field of medicine[3] then gradually extended to other fields, including psychology,[4] education,[5] business,[6] and public policy.[7]

This movement has also reached the field of law.[8] Legal scholars and practitioners have embraced the idea of taking an evidence-based approach to law — making improvements to law according to empirical findings.[9] Since 1990s, the quantity of empirical scholarship, which builds the evidence base for the reform of existing law, has increased continuously.[10] Based on existing evidence, some scholars proposed legal reform. For example, in civil procedural law, Jeanne Charn has advocated for improved access to legal services for indigent defendants in civil cases based on the

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[2] *See, e.g.*, David L. Sackett, *Evidence-Based Medicine*, 21 SEMINARS IN PERINATOLOGY 3, 3 (1997) (defining evidence-based medicine as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients"); DENISE M. ROUSSEAU, THE OXFORD HANDBOOK OF EVIDENCE-BASED MANAGEMENT 3 (2012) (defining evidence-based management as "the systematic, evidence-informed practice of management, incorporating scientific knowledge in the content and process of making decisions"); American Psychological Association Presidential Task Force on Evidence-Based Practice, *Evidence-Based Practice in Psychology*, 61 AM. PSYCHOLOGIST 271, 273 (2006) (defining evidence-based practice in psychology as "the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preference").

[3] *See* generally Izet Masic, Milan Miokovic & Belma Muhamedagic, *Evidence Based Medicine – New Approaches and Challenges*, 16 ACTA INFORM MED 219, 225 (2008) William Rosenberg & Anna Donald, *Evidence Based Medicine: An Approach to Clinical Problem-Solving*, 310 BMJ 1122 (1995) (explaining how the evidence-based approach works in clinical practices). *See also* Sackett, *supra* note 2 at 3 (noting that medical practitioners use evidence-based practice to produce "more powerful, more accurate, more efficacious, and safer" diagnostic tests and treatment).

[4] *See* generally American Psychological Association Presidential Task Force on Evidence-Based Practice, *supra* note 2.

[5] *See* generally Robert E. Slavin, *Evidence-Based Education Policies: Transforming Educational Practice and Research*, 31 EDUC. RESEARCHER 15 (2002).

[6] *See* generally Jeffrey Pfeffer & Robert I. Sutton, *Evidence-Based Management*, 84 HARV. BUS. REV. 62 (2006).

[7] *See* generally RAY PAWSON, EVIDENCE-BASED POLICY: A REALIST PERSPECTIVE (2006); Ross C. Brownson, Jamie F. Chriqui & Katherine A. Stamatakis, *Understanding Evidence-Based Public Health Policy*, 99 AM. J. PUB. HEALTH 1576 (2009) (summarizing approaches to the use of evidence for making public health policy); COMM'N ON EVIDENCE-BASED POLICYMAKING, THE PROMISE OF EVIDENCE-BASED POLICYMAKING-REPORT OF THE COMMISSION ON EVIDENCE-BASED POLICYMAKING 9-10 (2017) (illustrating the use of administrative data as the evidence base of government policies); OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, ANALYTICAL PERSPECTIVES: BUDGET OF THE UNITED STATES FOR FISCAL YEAR 2019, BUILDING AND USING EVIDENCE TO IMPROVE GOVERNMENT EFFECTIVENESS 59 (2018) (stating that "evidence-based policymaking is a cornerstone of effective and efficient government").

[8] *See generally* Jeffrey J. Rachlinski, *Evidence-Based Law*, 96 CORNELL L. REV. 901 (2011).

[9] *See Id.* at 905–07, 910–17.

[10] *See* Michael Heise, *An Empirical Analysis of Empirical Legal Scholarship Production, 1990-2009*, 2011 U. ILL. L. REV. 1739, 1739 (2011). *See also* Kathleen M. Sullivan, *Interdisciplinarity*, 100 MICH. L. REV. 1217, 1222 (2002) ("The rise of positive research and thus the increasingly empirical study of law is one of the most dramatic trends in recent legal scholarship."); John M. Golden, Robert P. Merges & Pamela Samuelson, *Foreword - The Path of IP Studies: Growth, Diversification, and Hope*, 92 TEX. L. REV. 1757, 1763 (2014) ("In the 1990s, serious empirical work by legal scholars began to pick up, and in the past decade, legal scholars' engagement in such work greatly accelerate . . . . ").

findings of a multi-year program of random controlled trials.[11] In constitutional law, Christine Jolls applied an "evidence-based assessment" to the effect of legally required communications, and then recommended an adjustment to the courts' analysis of the First Amendment with regard to these communications.[12] Sonja B. Starr examined both evidence that came from the real world, and evidence that she generated through a "randomized experiment using fictional cases."[13] Based on the findings, she proposed an adjustment to criminal sentencing.[14] The idea of using evidence to inform legal practice has also spread among legal institutions. As Cecelia Klingel noted, there has been a "surge in the popularity" of "evidence-based practices" in recent years among "courts, community supervision agencies, and correctional institutions" for reducing future crimes.[15] These practices are based on evidence from criminological research about what constitutes effective crime prevention.[16]

Although the efforts to generate evidence and use it to improve the law have produced many fruits, the attempt to make all law based on solid evidence is still far from complete.[17] As Jeffrey Rachlinski put it, "it is well short of creating an evidence-based legal system."[18] At least two problems impede the movement in this direction. The first is the law itself — "law has conflicting goals."[19] Legal reform is necessary in order to integrate existing evidence into law. However, if the goal of a given law is unclear, evidence will not be sufficient to change it. Because when a law's goal is contestable, the direction in which to reform it — and by extension, on which evidence to base the reform — is unclear as well.[20] But there are areas where the goal of a law is clear, while the factual basis of the law is unclear. In these areas, as the doctrinal areas that this Article will examine, an assessment of the evidence can clarify the factual basis, which will pave the path for the law's reform.

The high cost of collecting evidence is also an impediment for building an evidence-based legal system. For the legal community, to develop the research capacity for generating evidence can be a "challenge."[21] In certain areas of law, such as intellectual property, a "heavy investment" might be necessary.[22] This impediment is particularly

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[11] *See* Jeanne Charn, *Celebrating the Null Finding: Evidence-Based Strategies for Improving Access to Legal Services*, 122 YALE L. J. 2206, 2232–34 (2013).
[12] Christine Jolls, *Debiasing Through Law and the First Amendment*, 67 STAN. L. REV. 1411, 1413–14 (2015).
[13] Sonja B. Starr, *Evidence-Based Sentencing and the Scientific Rationalization of Discrimination*, 66 STAN. L. REV. 803, 803 (2014).
[14] *Id.* at 803.
[15] Cecelia Klingele, *The Promises and Perils of Evidence-Based Corrections*, 91 NOTRE DAME L. REV. 537, 537–39 (2015).
[16] *Id.* at 537.
[17] Rachlinski, *supra* note 8 at 910 ("Compared to other disciplines, evidence-based law lags.").
[18] *Id.* at 917.
[19] *Id.* at 901, 917.
[20] *Id.*
[21] *See* Charn, *supra* note 11 at 2233.
[22] *See* Golden, Merges, and Samuelson, *supra* note 10 at 1758 (noting that the sparseness of "good empirical evidence about IP regimes' operation and potential for reform" has indicated "the difficulty of assembling such information, but much has reflected a lack of heavy investment in serious IP empirical studies"); see also Elizabeth Warren, *The Market for Data: The Changing Role of Social Sciences in Shaping the Law Address*, 2002 WIS. L. REV. 1, 27 (2002) (noting that "an empiricist must become not only a hunter for data, but also a hunter for money").

relevant to the development of evidence-based judicial doctrines. Under the current legal system, litigation results, or case law, become the precedent for future determinations. While the factual basis for a law come from legislators, who can actively collect and analyze empirical evidence, judicial doctrines stem from judges who tend to base their decisions on the evidence that litigants present. However, litigants are likely not to invest heavily in production of empirical evidence when they can rely on anecdotal evidence to support their case.[23] They have no incentive to collect empirical evidence so for the purpose of informing future judicial doctrines.

Intellectual property is one of the fields where the law still lacks a solid evidence base. As John M. Golden, Robert P. Merges and Pamela Samuelson pointed out, in the foreword of a *Texas Law Review* symposium called "Steps Toward Evidence-Based IP," "[e]ven after decades of growth, IP studies have far to go before we can even hope for consensus about the proper bounds of evidence-based intellectual property."[24] In their view, evidence that reveals the operation of the intellectual property system and that supports potential reforms remains "frustratingly sparse."[25] They called for legal scholarship that would generate the empirical evidence that would serve as the base for future legal reform.[26]

This Article brings the field one step closer to an evidenced-based intellectual property law. It investigates one area — the law of patent damages. It tackles the unmet need to examine the factual basis behind the judicial doctrines for calculating patent damages. Under 35 U.S.C § 284, courts frequently use "reasonable royalty" patent damages to compensate patentees for patent infringements.[27] They calculate a reasonable royalty by trying to mimic the ways that patent licensing parties calculate royalties.[28] They imagine the infringed patentee as a willing licensor and the infringer as a willing licensee, and then envision "the terms of a licensing agreement reached as the result of a supposed meeting between the patentee and the infringer at the time infringement began."[29] Though such a meeting never happened, courts aim to determine the amount of royalties that the infringer would have paid the patentee had there been a negotiated agreement. This number becomes the award of patent damages that the infringer must pay the patentee. This approach is called the "hypothetical negotiation."[30]

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[23] *Cf*. Rachlinski, *supra* note 8 at 922 (noting that people "reject evidence that is inconsistent with their views about society and their role in it" and "embrace evidence that affirms their views").
[24] Golden, Merges, and Samuelson, *supra* note 10 at 1768.
[25] *Id.* at 1758.
[26] *Id.* at 1759.
[27] 35 U.S.C § 284 (2012). *See* CHRIS BARRY ET AL., PRICEWATERHOUSECOOPERS, 2013 PATENT LITIGATION STUDY: BIG CASES MAKE HEADLINES, WHILE PATENT CASES PROLIFERATE 5 (2013) (noting that reasonable royalty accounts for over 80% of awards from 2007 to 2013); Uniloc USA, Inc. v. Microsoft Corp. 632 F.3d 1292 ("A reasonable royalty is the predominant measure of damages in patent infringement cases.").
[28] Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1157-58 (6th Cir. 1978). *See* John C. Jarosz & Michael J. Chapman, *The Hypothetical Negotiation and Reasonable Royalty Damages: The Tail Wagging the Dog*, 16 STAN. TECH. L. REV. 769, 772 (2013) ("Its long-standing and widespread use has led many courts to go so far as to define a reasonable royalty as the outcome of a hypothetical negotiation").
[29] Rite-Hite Corp. v. Kelley Co., Inc., 56 F.3d 1538, 1554 (Fed. Cir. 1995) (en banc).
[30] *Id. See also* Minks v. Polaris Indus., Inc., 546 F.3d 1364, 1372 (Fed. Cir. 2008).

Though the hypothetical negotiation is designed to mimic the way that patent licensing parties use to calculate royalties, little attention has been devoted to test the doctrines of the hypothetical negotiation against the ways by which parties calculate royalties in actual patent licensing contracts. Legal scholars have conducted a number of conceptual or analytic assessments to the calculation of patent damages, but did not provided an empirical assessment in this regard.[31] Economists have conducted some empirical studies of royalty calculation in patent licensing, but they did not examine the contractual terms against doctrines of patent damages,[32] Without a study to compare actual licensing practices to the legal doctrines, we cannot know whether the doctrines of the hypothetical negotiation reflects actual patent licensing practices, as they are alleged to do.[33]

To fill this gap, this Article has carefully analyzed 400 patent licensing agreements that are the "material contracts" of publicly traded companies (meaning that their business substantially depends on them). These contracts reveal how patent licensing parties calculate royalties for the use of patents. This Article tests the doctrines of the hypothetical negotiation against them to see whether the doctrines reflect actual patent licensing practices. While this set of contracts might not represent the overall population of patent licensing contracts, many of which are contracts between small

[31] *See, e.g.*, William F. Lee & A. Douglas Melamed, *Breaking the Vicious Cycle of Patent Damages*, 101 CORNELL L. REV. 385 (2016); Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2006); Steven J. Shapiro, *Pitfalls in Determining the Reasonable Royalty in Patent Cases*, 17 J. LEGAL ECON. 75 (2010); David O. Taylor, *Using Reasonable Royalties to Value Patented Technology*, 49 GA. L. REV. 79 (2014) David Kappos & Paul R. Michel, *The Smallest Salable Patent-Practicing Unit: Observations on Its Origins, Development, and Future*, 32 BERKELEY TECH. L.J. 1433 (2017); Mark A. Lemley & Carl Shapiro, *A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents*, 28 BERKELEY TECH. L.J. 1135 (2013); Mark A. Lemley, *Distinguishing Lost Profits from Reasonable Royalties*, 51 WM. & MARY L. REV. 655 (2009); Christopher B. Seaman, *Reconsidering the Georgia-Pacific Standard for Reasonable Royalty Patent Damages*, 2010 BYU L. REV. 1661 (2010); Jarosz and Chapman, *supra* note 28; Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses Innovation & Competition Policy*, 34 J. CORP. L. 1151 (2009); John M. Golden, *Reasonable Certainty in Contract and Patent Damages*, 30 HARV. J. L. & TECH. 257 (2016); Brian J. Love, *Note, Patentee Overcompensation and the Entire Market Value Rule*, 60 STAN. L. REV. 263 (2007); Zelin Yang, *Note, Damaging Royalties: An Overview of Reasonable Royalty Damages Patent Law*, 29 BERKELEY TECH. L.J. 647 (2014); J. Gregory Sidak, *The Proper Royalty Base for Patent Damages*, 10 J. COMP. L. & ECON. 989 (2014); Daralyn J. Durie & Mark A. Lemley, *A Structured Approach to Calculating Reasonable Royalties*, 14 LEWIS & CLARK L. REV. 627 (2010); Thomas F. Cotter, *Four Principles for Calculating Reasonable Royalties in Patent Infringement Litigation*, 27 SANTA CLARA COMPUTER & HIGH TECH. L. J. 725 (2011); J. Gregory Sidak, *How Relevant Is Justice Cardozo's Book of Wisdom to Patent Damages*, 17 COLUM. SCI. & TECH. L. REV. 246 (2016); Ted Sichelman, *Innovation Factors for Reasonable Royalties*, 25 TEX. INTELL. PROP. L.J. 277 (2018); Elizabeth M. Bailey, Gregory K. Leonard & Mario A. Lopez, *Making Sense of "Apportionment" in Patent Damages*, 12 COLUM. SCI. & TECH. L. REV. 255 (2011); Roy J. Epstein & Alan J. Marcus, *Economic Analysis of the Reasonable Royalty: Simplification and Extension of the Georgia-Pacific Factors*, 85 J. PAT. & TRADEMARK OFF. SOC'Y 555 (2003).

[32] *See, e.g.,* Kemmerer, Jonathan E. and Lu, Jiaqing, *Profitability and Royalty Rates Across Industries: Some Preliminary Evidence*, https://ssrn.com/abstract=1141865; Becker, Stephen and Lu, Jiaqing, *Royalty Rate and Industry Structure: Some Cross-Industry Evidence*, https://ssrn.com/abstract=1447997 or http://dx.doi.org/10.2139/ssrn.1447997; Deepak Hegde, *Tacit Knowledge And The Structure of License Contracts: Evidence from The Biomedical Industry*, 23 J. ECON. & MGMT. STRATEGY 568 (2014).

[33] *See* Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151, 1187 (2009) ("It would be helpful to know, for example, whether firms typically calculate royalties based on the value of an end product, or only a portion of an end product, or if the choice of royalty base depends upon other subsidiary factors, what range of royalty rates they commonly use, and any other factors that go into real-world decision making. A mimic-the-market approach informed by facts rather than speculation might provide the best proxy for the bargain the parties would have reached, but for the infringement, and thus help to make reasonable royalty calculations more rational than under current standards.").

private companies and might not significant enough to be regarded as material contracts, it is the best evidence that is currently available to the public. These contracts reveal how parties calculate royalties for the use of high value patents that are important to their business.

After a systematic examination of these patent licensing contracts and the doctrines of the hypothetical negotiation, this Article found divergences between them in at least three areas. Yet, simply uncovering the discrepancies between a law and its underlying factual basis is not the ultimate goal of the evidence-based approach. The goal is "to create better law — law informed by reality."[34] To this end, the Article also illustrates how courts and litigants can import certain elements from patent licensing practices to improve the current judicial doctrines for calculating reasonable royalty damages. The divergences and the corresponding suggestions for potential reform are as the followings:

First, in actual patent licensing, parties can adjust the royalty payments based on information that develops after the date of the licensing contract. The licensing contract might incorporate a royalty adjustment clause that allows parties to adjust the royalties in response to specified later events. Or they might renegotiate to modify the royalties. In litigation, however, royalty adjustment is not available. Courts do not allow parties to adjust the reasonable royalty based on the information ex post the date of the hypothetical negotiation. This Article suggests that courts should recognize the possible need for adjustments to the reasonable royalty. In cases of patent infringement, the value of the patent might become clearer only after the date on which the infringement began. Allowing litigants to adjust reasonable royalty based on ex post information would make the assessment of patent damages more fair and complete.

Second, courts and patent licensing parties use different means by which determine the royalties on a patent incorporated into a multi-component product. Usually, a royalty equals a royalty base multiplied by a royalty rate.[35] But to calculate the royalty for a patent used in a product consisting of the patented component and other components, parties might multiply the royalty by a formula and retain the value of the multi-component product as the royalty base.[36] But in litigation, the use of formulas is not available. In this situation, courts tend to apportion the value of a multi-component product between the patented component and other components by reducing the royalty base to the value of the patented component and applying a royalty rate to it. This Article suggests that courts should allow litigants to use the formulas, while retaining the value of multi-component products as the royalty base, because doing so can keep economically irrelevant data from entering the calculation of reasonable royalties and can weight economically relevant criteria for apportionment.

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[34] Rachlinski, *supra* note 8 at 910.

[35] For example, royalties may be 1% of the net sales of the multi-component product. In this example, "1%" is the royalty rate while "the net sales of the multi-component product" is the royalty base.

[36] *See* Section II D Table 2 item 3-8 and the accompanying text.

Third, parties in patent licensing have a more sophisticated method for dealing with royalty stacking than courts do. Specifically, if the relevant products involve not only the patentee's patent but also third parties' patents, the licensee needs to pay royalties to both the patentee and the third parties. Parties want to avoid a situation in which the aggregate of the royalties is so excessive that the sale of the products becomes unprofitable and leads the licensee to stop implementing the patents. This situation is called royalty stacking. To avoid royalty stacking, patent licensing parties employ anti-royalty-stacking clauses, which allow third party royalties to offset the royalties payable to the patentee. Though courts acknowledge that royalty stacking might affect the calculation of the reasonable royalty, they have not developed a concrete method for dealing with the problem.[37] This Article suggests that courts and litigants can learn from ways to deal with royalty stacking in litigation from these anti-royalty-stacking clauses.

Section I describes the courts' primary approach for calculating reasonable royalties — the hypothetical negotiation. It focuses on the judicial doctrines that govern three aspects of the negotiation — the unavailability of royalty adjustments, the selection of a royalty base and the related issue of apportionment, and the method of dealing with royalty stacking. Section II examines royalties in patent licensing. It briefly introduces four types of royalties (percentage royalty, unit royalty, lump sum, and royalty-free). Then it analyzes the percentage royalty in detail, looking at its four key components — the royalty base, the royalty adjustment, the apportionment methods, and the arrangements for avoiding royalty stacking. Section III compares the judicial doctrines and the actual patent licensing contracts. It also provides suggestions for ways that courts and litigants can improve the doctrines of the hypothetical negotiation by importing certain elements from these contracts. This Article concludes with a call for courts and litigants to use a more evidence-based approach to the determination of patent damages, while acknowledging that there are impediments to implementing this approach to law.

## I. The Judicial Doctrines of the Hypothetical Negotiation for Calculating Reasonable Royalty Damages

Section 284 of the Patent Act requires courts to award infringed patentees damages adequate to compensate for patent infringements.[38] After a court determines that an infringer has infringed a patentee's patents, it needs to determine an amount that will

[37] Integra Lifesciences I, LTD. v. Merck KGaA, 331 F.3d 860, 871-72 (Fed. Cir. 2003) (acknowledging that the royalty stacking theory might "play a role" in the calculation of reasonable royalty); Lemley and Shapiro, *supra* note 31 at 1150 (suggesting that courts learn from the commercial arrangements that licensing entities adopt).
[38] 35 U.S.C. § 284 (2012). Courts also have the discretion to grant treble damages when they find that the infringement is willful. *See also*, In re Seagate Tech., 497 F.3d 1360 (Fed. Cir. 2007) (en banc).

recompense the patentee. Currently, there are two types of compensatory damages – lost profits and reasonable royalties. Lost profits recover for patentees the profits that they would have earned on the patents but for the infringement.[39] "Reasonable royalty" refers to the royalties that an infringer would have paid for a license but for the infringement.[40] There is a minimum for damages according to 35 U.S.C. § 284, which stipulates that the damages for infringements should not be "less than a reasonable royalty for the use made of the invention by the infringer."[41] Even if patent holders fail to prove lost profits, they can seek reasonable royalty damages.[42] Reasonable royalty is currently the kind of damages that courts use most frequently.[43]

Courts have various approaches for calculating reasonable royalties,[44] but the hypothetical negotiation is the predominant one.[45] Under this approach, courts "envision the terms of a licensing agreement reached as the result of a supposed meeting between the patentee and the infringer at the time infringement began."[46] When a court envisions these terms, it considers a list of factors[47] and follows certain rules. The rules affect the how it calculates reasonable royalties and therefore the amount of damages that patentees receive. This Article focuses on the judicial doctrines governing three aspects of the hypothetical negotiation.

### A. Date of the Hypothetical Negotiation and Royalty Adjustment

In patent licensing, parties might adjust royalties after they sign the licensing contract. The royalties might fail to reflect the actual value of the patent due to the occurrence of certain circumstances, such as an unexpected plunge in the sales volume of the patented products. In contrast, in the hypothetical negotiation, courts determine reasonable royalties based on information that predates the patent infringement, without

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[39] *See* Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1156 (6th Cir. 1978); Lemley, *supra* note 31 at 657.

[40] Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1157-58 (6th Cir. 1978); State Indus., Inc. v. Mor-Flo Indus., Inc., 883 F.2d 1573, 1580 (Fed. Cir. 1989).

[41] 35 U.S.C. § 284 (2012).

[42] *See* Panduit Corp. v. Stahlin Bros. Fibre Works, Inc., 575 F.2d 1152, 1157 (6th Cir. 1978) ("When actual damages, e.g., lost profits, cannot be proved, the patent owner is entitled to a reasonable royalty.").

[43] *See* CHRIS BARRY ET AL., PRICEWATERHOUSECOOPERS, 2013 PATENT LITIGATION STUDY: BIG CASES MAKE HEADLINES, WHILE PATENT CASES PROLIFERATE 5 (2013) (Reasonable royalty is the most frequently used theory. Reasonable royalty accounts for over 80% of awards from 2007 to 2013.); Uniloc USA, Inc. v. Microsoft Corp. 632 F.3d 1292 ("A reasonable royalty is the predominant measure of damages in patent infringement cases.").

[44] TWM Mfg. Co. v. Dura Corp., 789 F.2d 895, 899 (Fed. Cir. 1986) (holding that 35 U.S.C. § 284 "does not mandate how the district court must compute that figure, only that the figure compensate for the infringement"); Energy Transp. Grp., Inc. v. William Demant Holding A/S, 697 F.3d 1342, 1357 (Fed. Cir. 2012) ("Once again, this court does not endorse Georgia-Pacific as setting forth a test for royalty calculations, but only as a list of admissible factors informing a reliable economic analysis.").

[45] Jarosz and Chapman, *supra* note 28 at 772 ("Its long-standing and widespread use has led many courts to go so far as to define a reasonable royalty as the outcome of a hypothetical negotiation").

[46] Rite-Hite Corp. v. Kelley Co., Inc., 56 F.3d 1538, 1554 (Fed. Cir. 1995) (en banc). *See also* Minks v. Polaris Indus., Inc., 546 F.3d 1364, 1372 (Fed. Cir. 2008).

[47] Georgia-Pacific Corp. v. U.S. Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970) (setting out15 factors for courts to consider). However, scholars have criticized this list as being too malleable and difficult to implement. *See* Thomas F. Cotter, *Four Principles for Calculating Reasonable Royalties in Patent Infringement Litigation*, 27 SANTA CLARA COMPUTER & HIGH TECH. LJ 725, 730 (2011).

considering later developments. Specifically, courts place this negotiation on "the date when the infringement began."[48] This assumption allows no consideration of any information that develops later than that date since no one possesses future information during a negotiation. In *LaserDynamics, Inc. v. Quanta Comput.*, Inc., the Federal Circuit held that "[a] reasonable royalty determination for purposes of making a damages evaluation must relate to the time infringement occurred, and not be an after-the-fact assessment."[49]

Though no one has future information during a negotiation, parties in patent licensing can renegotiate the terms in their contract later, in light of new developments. In the renegotiation, they consider the information that was not available during their previous negotiation. Nevertheless, the hypothetical negotiation assumes away the possibility of renegotiation. In *LaserDynamics, Inc. v. Quanta Comput.*, the Federal Circuit also held that "there should be only a single hypothetical negotiation date" for each case, and that an infringer will "pay the same reasonable royalty based on a single hypothetical negotiation analysis."[50] The assumptions of a single negotiation date and a single analysis of reasonable royalties further exclude the use of information that postdates the start of the infringement. In court, neither the patentee nor the infringer may claim that it would have renegotiated the reasonable royalties because of unexpected circumstances that occurred after that date.

Despite this principle however, there are times when courts will consider information that developed after the date on which the infringement began because of a lack of evidence. The justification for doing so rest on a 1933 Supreme Court case, *Sinclair Refining Co. v. Jenkins Petroleum Co.* In this case, Justice Cardozo held that sometimes "years have gone by before the evidence is offered. Experience is then available to correct uncertain prophecy. Here is a book of wisdom that courts may not neglect."[51] In this case, a party may introduce ex post information concerning the actual use of the patent to aid the appraisal of its ex ante value.[52]

Based on this case, the Federal Circuit, will, in certain circumstances, regard ex post information as probative evidence.[53] In *Lucent Technologies, Inc. v. Gateway, Inc.*, the

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[48] Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1576 (Fed. Cir. 1995) (en banc); *see also* LaserDynamics, Inc. v. Quanta Computer, Inc., 694 F.3d 51 (Fed. Cir. 2012) ("In general, the date of the hypothetical negotiation is the date that the infringement began"); Panduit Corp. v. Stahlin Bros. Fibre Works, 575 F.2d 1152, 1158, 197 USPQ 726, 731 (6th Cir. 1978) ("The key element in setting a reasonable royalty after determination of validity and infringement is the necessity for return to the date when the infringement began.").

[49] LaserDynamics, Inc. v. Quanta Comput., Inc., 694 F.3d 51, 75 (Fed. Cir. 2012).

[50] *Id.* at 76 ("It also makes sense that in each case there should be only a single hypothetical negotiation date, not separate dates for separate acts of infringement, and that a direct infringer or someone who induced infringement should pay the same reasonable royalty based on a single hypothetical negotiation analysis.").

[51] Sinclair Refining Co. v. Jenkins Petroleum Co., 289 U.S. 689, 697-99 (1933).

[52] *Id.* at 697.

[53] *See* Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1333 (Fed. Cir. 2009) (holding that "case law affirms the availability of post-infringement evidence as probative in certain circumstances"); Fromson v. W. Litho Plate & Supply Co., 853 F.2d 1568, 1575 (Fed. Cir. 1988) (holding that the hypothetical negotiation is a methodology that "encompasses fantasy and flexibility," and that "speaks of negotiations as of the time infringement began, yet permits and often requires a court to look to events and facts that occurred thereafter and that could not have been known to or predicted by the hypothesized negotiators.").

Federal Circuit allowed the inclusion of information concerning the actual use of the patent to infer what "the parties would frequently have estimated during the negotiation."[54] In *Aqua Shield v. Inter Pool Cover Team*, the court used information concerning infringer's actual profits to infer its "anticipated profits" at the time of the hypothetical negotiation.[55] In both cases, the courts relied on the information only to infer what the *parties' expectations would have been* in the hypothetical negotiation. Neither case used ex post information to adjust the reasonable royalties in line with the actual implementation of the patents.[56]

Some commentators claim that courts should not take into account any information that develops after the date when the infringement began. They believe that once a court has set the date of a hypothetical negotiation, the royalties should reflect the parties' evaluation of the patented technology on that date.[57] They worry that if courts consider later information, the reasonable royalties that they determine might inadvertently include the value attributable to the infringer's investment to the patented technology, which could lead to overcompensation.[58] In terms of economic incentives, Gregory Sidak believes that the use of such information to calculate reasonable royalties "would provide the potential licensee with an incentive to infringe the patent, rather than to negotiate a license upfront" because it would allow licensees to avoid the risk of overpaying.[59]

But some commentators endorse the use of the ex post information to calculate reasonable royalties. They believe that doing so helps courts avoid both overcompensation and undercompensation because the information reveals the actual value that the infringer's use of the patent generated.[60] In this view, if courts use ex post information to match reasonable royalties with the actual value of the patent, their assessment of reasonable royalties is more likely to be "fair and complete."[61] In contrast, other commentators believe that courts should only recognize ex post

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[54] Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1334 (Fed. Cir. 2009).
[55] Aqua Shield v. Inter Pool Cover Team, 774 F.3d 766, 772 (Fed. Cir. 2014).
[56] In Aqua Shield v. Inter Pool Cover Team, the district court considered the infringer's actual profits as a royalty cap. On remand, the Federal Circuit held that this treatment "incorrectly replaces the hypothetical inquiry into what the parties would have anticipated, looking forward when negotiating, with a backward-looking inquiry into what turned out to have happened." *See* Aqua Shield v. Inter Pool Cover Team, 774 F.3d 766, 772 (Fed. Cir. 2014).
[57] Suzanne Michel, *Bargaining for RAND Royalties in the Shadow of Patent Remedies Law Symposium: Antitrust and Innovation*, 77 ANTITRUST L.J. 889, 898 (2011); *see also* Lee and Melamed, *supra* note 31 at 403 ("If the parties would not have known about those ex post matters at the time of the ex-ante bargain, introducing them into the analysis could lead to an erroneous determination of the royalty that the parties would have agreed to in that bargain.").
[58] Lee and Melamed, *supra* note 31 at 416 (noting that using information ex post the date of infringement to calculate reasonable royalties will make the royalties include "a premium based on ex post economic developments that increase the infringer's reliance on the patent," which leads to overcompensation); *see also* Michel, *supra* note 57 at 898 (claiming that damages based on a hypothetical negotiation should reflect "the ex ante value of the patented technology, and not the value of investments made by the infringer to manufacture a product incorporating the patented invention").
[59] Sidak, *supra* note 31 at 282–83.
[60] *See* Jarosz and Chapman, *supra* note 28 at 801 ("Similarly, if realized profits greatly exceed expected profits, a reasonable royalty determined using only ex ante information may substantially undercompensate the patent holder.").
[61] *See Id.* at 800–01.

information as evidence by which to infer parties' knowledge at the time of, but no later than, the hypothetical negotiation. They hold that courts can rely on such information to approximate what parties knew at the time of the hypothetical negotiation, but cannot use it to assess the size of the reasonable royalties that the infringer owes the patentee.[62] This perspective is consistent with the Federal Circuit's current use of the ex post information.

### B. The Entire Market Value Rule and the Smallest Salable Patent-Practicing Unit Rule

To determine a reasonable royalty, courts usually need to find a royalty base and then multiply it by a royalty rate.[63] An example of a reasonable royalty might be "5% of the sales price of the patented product," in which "the sales price of patented product" is the royalty base; and "5%" is the royalty rate. If an infringing product consists of a single component, the royalty base for calculating the reasonable royalty is usually the sales price of the product. But when an infringing product consists of both patented and unpatented components, courts have to choose a royalty base of either the entire market value of the product or the value of the patented component. There are two rules governing the selection of the royalty base.

One rule allows a court to use the entire market value of the multi-component product as the royalty base in situations where the patentee can prove that the patented component is the basis for customer demand. This rule is called the "entire market value rule."[64] In *Rite-Hite Corp. v. Kelley Co., Inc.*, the Federal Circuit held that courts can use the entire market value of a multi-component product as the royalty base, but only where the patentee proves that "the patent-related feature is the 'basis for customer demand.'"[65] If the patentee is unable to satisfy the burden of proof, courts can reduce the royalty base to the value of a patented component. In *Lucent Technologies, Inc. v. Gateway, Inc.* and *Uniloc USA, Inc. v. Microsoft Corp.*, the Federal Circuit declined to use the entire market value of the multi-component product as the royalty base because the patentees could not fulfill the burden of proof.[66]

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[62] *See, e.g.*, Gregory K. Leonard, Comment at the Federal Trade Commission Hearing on The Evolving IP Marketplace 14 (Feb. 11, 2009), available at: https://www.ftc.gov/sites/default/files/documents/public_comments/public-hearings-concerning-evolving-intellectual-property-marketplace-540872-00033/540872-00033.pdf.

[63] Lucent Technologies, Inc. v. Gateway, Inc., 580 F.3d 1301, 1339 (Fed. Cir. 2009).

[64] Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1549 (Fed. Cir. 1995) ("When a patentee seeks damages on unpatented components sold with a patented apparatus, courts have applied a formulation known as the 'entire market value rule' to determine whether such components should be included in the damage computation, whether for reasonable royalty purposes or for lost profits purposes"). *See also* Yang, *supra* note 31 at 655; *see also* Seaman, *supra* note 31 at 1699 (noting that the entire market value rule is "often invoked by patentees to calculate the royalty base for a reasonable royalty award").

[65] Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1549 (Fed. Cir. 1995).

[66] Uniloc USA, Inc. v. Microsoft Corp., 632 F.3d 1292, 1320 (Fed. Cir. 2011) (denying the use of the entire market value of Microsoft Office software as the royalty base because the patentee failed to prove that the

The second rule is called the "smallest salable patent-practicing unit rule," because the value of such a unit is the value that a court should select as the royalty base. There is no standard definition of the smallest salable patent-practicing unit. The term first appeared in the district court case, *Cornell Univ. v. Hewlett-Packard Co*.[67] Here, the patent at issue applied to a component of an instruction reorder buffer, which was part of a computer processor, which itself worked in larger servers or workstations.[68] The court declined to use the sales price of the larger servers and workstations as a royalty base. It regarded the processor as the smallest salable patent-practicing unit, and used the sales price of the processor as the royalty base from which to calculate the reasonable royalty.[69]

In *LaserDynamics, Inc. v. Quanta Computer, Inc.,* the Federal Circuit calculated a reasonable royalty for the infringing use of a patented optical disc discrimination method in optical disc drives. The optical disc drives were part of one type of laptop computer.[70] The court held that if the infringed patent applied to a small component of a multi-component product, it is "generally required" that the reasonable royalty is based not on the entire multi-component product, but is "instead based on the 'smallest salable patent-practicing unit.'"[71] The court also held that the entire market value rule was a "narrow exception to this general rule."[72] The court was concerned that using the entire value of multi-component products might let patentees be "improperly compensated for non-infringing components of that product."[73]

The selection of the royalty base is relevant to a requirement called "apportionment" that was set by a Supreme Courts case in 1884, *Garretson v. Clark*.[74] Both the entire market value rule and the smallest salable patent-practicing unit rule derive from this case.[75] In the case, the court required the patentee to "give evidence tending to separate

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software's product aviation feature was the basis for the customer demand); Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1337–38 (Fed. Cir. 2009) (denying to use the entire market value rule because the patentee failed to prove that the patented date-picker tool was the basis of the consumer demand for the infringing software, Outlook).

67 LaserDynamics, Inc. v. Quanta Computer, Inc., 694 F.3d 51, 67 (Fed. Cir. 2012); *see also* Cornell Univ. v. Hewlett-Packard Co., 609 F. Supp. 2d 279, 283 (2009) (formulating the smallest salable patent-practicing unit rule). *See also* Kappos and Michel, *supra* note 31 at 1438–44 (describing the origin and development of the smallest salable patent-practicing unit rule).

68 Cornell Univ. v. Hewlett-Packard Co., 609 F. Supp. 2d 279, 283 (N.D.N.Y. 2009).

69 *Id.* at 288.Cornell Univ. v. Hewlett-Packard Co., 609 F. Supp. 2d 279, 288 (N.D.N.Y. 2009).

70 LaserDynamics, Inc. v. Quanta Computer, Inc., 694 F.3d 51, 68 (Fed. Cir. 2012).

71 *Id.* at 67.

72 *Id.*

73 *Id.*

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

75 Uniloc USA, Inc. v. Microsoft Corp., 632 F.3d 1292, 1318 (Fed. Cir. 2011) (holding that the entire market value rule is "derived from" the apportionment requirement of *Garretson v. Clark*); Virnetx, Inc. v. Cisco Sys., Inc., 767 F.3d 1308, 1327 (Fed. Cir. 2014) (holding that the use of smallest salable patent-practicing unit as royalty base is "simply a step toward meeting the requirement of apportionment"); Ericsson, Inc. v. D-Link Sys., Inc., 773 F.3d 1201, 1226-27 (Fed. Cir. 2014) (holding that to implement the requirement of apportionment, when the entire value of the product is not appropriately or legally attributable to the patented feature, the use of the smallest salable unit as royalty base is often "a more realistic starting point"). *See also* Yang, *supra* note 31 at 656 (noting that apportionment is a closely related concept to the entire market value rule); *see also* Kappos and Michel, *supra* note 31 at 1455 (concluding that the smallest salable patent-practicing unit rule is only a tool to fulfill the apportionment requirement in the situation where jury trials determine patent damages).

or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features . . . ; or he must show . . . 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."[76]

According to this holding, the patentee has two choices. Similar to the requirement of entire market value rule, the patentee may try to prove that the entire value of the multi-component product is attributable to the patented feature. This would allow it to use the value of the entire multi-component product as the royalty base. Alternatively, it can provide evidence of how to apportion "the defendant's profits and the patentee's damages between the patented feature and the unpatented features."[77] The Supreme Court did not regard a reduction of royalty base as the only way to determine apportionment when the patentee cannot prove that the entire value of the multi-component product is attributable to the patented feature. The court only required the patentee to "give evidence" relevant to this goal. Nor did the court specify what kind of evidence the patentee must give.

The Federal Circuit, however, tends to accomplish apportionment by reducing the royalty base. Under entire market value rule, courts reduce the royalty base from the value of the multi-component products to that of the patented components, unless the patentee proves that the patented feature is the basis for customer demand.[78] Under the smallest salable patent-practicing unit rule, courts directly reduce the royalty base to the value of the smallest salable component that relates to the patent.[79] But theoretically, it is possible that a patentee will find an appropriate way to accomplish apportionment while retaining the value of the entire multi-component product as the royalty base.[80]

Some commentators support the idea that courts should not use the value of the entire multi-component product as the royalty base. They believe that doing so risks giving the patentee a "value not in fact attributable to the patent," leading to overcompensation,[81] particularly when a jury, instead of a judge, calculates the reasonable royalty. These commentators believe that, due to cognitive bias, juries are less equipped to reach a sufficiently low rate.[82] The resulting overcompensation might

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[76] Garretson v. Clark, 111 U.S. 120, 121 (1884).
[77] *Id.*
[78] Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1336 (Fed. Cir. 2009).
[79] Ericsson, Inc. v. D-Link Sys., Inc., 773 F.3d 1201, 1226 (Fed. Cir. 2014).
[80] *See* Yang, *supra* note 31 at 652 ("In theory, the entire market value rule need not lead to substantial royalty awards, even if [as is sometimes the case] the entire market value is enormous, as long as the applicable royalty rate is correspondingly small.").
[81] *See* Lemley, *supra* note 31 at 664; *see also* Love, *supra* note 31 at 272–78 (constructing economic models to prove that the use of entire market value rule will lead to overcompensation unless the value of patented components drive the sales of the entire infringing product).
[82] FED. TRADE COMM'N, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 210 (2011) (noting that "a trier of fact, particularly a jury, may apply an insufficiently low royalty rate when the base is far larger than the inventive feature because an appropriate rate might be 'minuscule'"). Ericsson, Inc. v. D-Link Sys., Inc., 773 F.3d 1201, 1226-27 (Fed. Cir. 2014) (holding that jury might be "less

give patentees, especially non-practicing entities, the incentive to enforce their patents aggressively and make less effort to design, manufacture, and distribute products.[83] It might also increase the aggregate royalties for manufacturing new products to an excessively high level, discouraging companies from trying to innovate.[84]

Some commentators endorse the use of the value of the entire multi-component product as the royalty base. They believe that doing so is consistent with patent licensing practices, in which "firms often calculate royalties with reference to the retail price of the downstream product."[85] This would make using the entire multi-component product as the royalty base "the most authentic assumption," reflecting what patentees and infringers would have done but for the infringement.[86] Doing so also allows the patentee to capture the value of the "complementarity effects" that result from the interactions between the patented component and the unpatented components.[87] This value is positive, because the interaction of different components causes each component to add value to the others, thus increasing the value of the entire product.[88] In contrast, using the value of the patented component as the royalty base might prevent patentees from capturing that complementary value, which could lead to undercompensation.[89]

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equipped to understand the extent to which the royalty rate would need to do the work" in apportionment, and that "dramatically reducing the royalty rate to be applied in those cases—it is that reliance on the entire market value might mislead the jury, who may be less equipped to understand the extent to which the royalty rate would need to do the work in such instances"); Commonwealth Sci. & Indus. Research Org. v. Cisco Sys., Inc., 809 F.3d 1295, 1302 (Fed. Cir. 2015) (holding that "Our cases provide two justifications for this principle. …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.'"); *see also* Yang, *supra* note 31 at 655 (noting that "dramatically reducing the royalty rate to be applied in those cases—it is that reliance on the entire market value might mislead the jury, who may be less equipped to understand the extent to which the royalty rate would need to do the work in such instances"); *see also* Bailey, Leonard, and Lopez, *supra* note 31 at 259. But *cf.* Sidak, *supra* note 31 at 999; Kappos and Michel, *supra* note 31 at 1444–45 (claiming that the application of smallest salable patent-practicing unit rule should be limited to jury trials because there is no reason to believe that judges in the bench trials "would fail to understand the rule of apportionment and the "mathematical interactions between royalty base and royalty rate").

[83] *See* Lemley, *supra* note 31 at 668 (claiming that overcompensation will encourage non-practicing entities to file lawsuits, result in royalty stacking, and discourage sales of multi-component products); *see also* Love, *supra* note 31 at 278–83 (arguing that overcompensation diminishes the incentive to invest in innovation, causes patent infringement, and enhances the incentive for patentees to enforce patents aggressively rather than to participate in the design, manufacture, and distribution of products).

[84] *See* Yang, *supra* note 31 at 652 (claiming that the potentially over-compensatory effect of current law of patent damages might lead to a royalty stacking problem when a product involves multiple patented inventions); *see also* Love, *supra* note 31 at 280–81 (claiming that overcompensation caused by the application of entire market value rule can exacerbate the royalty stacking problem).

[85] Sidak, *supra* note 31 at 990; *See also* Cotter, *supra* note 47 at 748 (claiming that the calculation of reasonable royalties "should reflect the types of royalty rates and bases that the parties realistically would have chosen ex ante.").

[86] Sidak, *supra* note 31 at 990. *See also* Cotter, *supra* note 31 at 751 (noting that licensing parties sometimes choose the sales revenue of the end product as the royalty base for convenience and that there is no "particular reason" to avoid using sales revenue of the end product for this purpose, if the royalty rate is appropriate). *See also* Kappos and Michel, *supra* note 31 at 1449–50 (claiming that "market-based information in the form of actual licenses is very potent evidence of the value of patented technology" and that the rule of smallest salable practicing unit rule should not trump market evidence).

[87] Sidak, *supra* note 31 at 994; *see also* Bailey, Leonard, and Lopez, *supra* note 31 at 257 (claiming that "[w]hen there are complementarities between assets, such that the combined use of two or more assets is worth more than their individual use").

[88] *See* Sidak, *supra* note 31 at 994.

[89] *Id.* at 1019–20. *See also* Bailey, Leonard, and Lopez, *supra* note 31 at 260–62 (analyzing the value that synergies generate).

## C. Royalty Stacking

In some industries, such as electronics and biotechnology, one product can involve multiple patents.[90] A product infringing the patentee's patent might therefore also apply the patents of third parties. In this case, the infringer would need to pay reasonable royalties not only to the patentee but to the third parties as well. If the aggregation of the royalties becomes excessive, however, the infringer would be unable to profit from its sale of products. As a result, the infringer, who is also an innovator, might have to stop innovating. Scholars and practitioners call this situation royalty stacking; they believe that it will impose a drag on innovation.[91]

The Federal Circuit acknowledged that royalty stacking can be treated as a factor in the calculation of reasonable royalties. In *Integra Lifesciences I, LTD. v. Merck KGaA*, the patent at issue is applied in a research tool for drug development that also implemented the patents of third parties. On remand, the Federal Circuit suggested that the trial court should treat the need to pay royalties for third parties' licenses as a factor in determining reasonable royalties.[92] It held that "the presence or absence of stacking royalties for research tools may color the character of a hypothetical negotiation . . . . [S]tacking royalties may also play a role in crafting the hypothetical license between" the patentee and the infringer,[93] other technologies might affect the value of any technology invention used in the process of drug creation.[94]

The Federal Circuit also held that the infringer should present actual evidence to support any claim based on royalty stacking. In *Ericsson, Inc. v. D-Link Systems, Inc.*, the patentee sued the infringer as infringing its patents, which had become essential to the technology standard relating to Wi-Fi.[95] Though the Federal Circuit recognized that the stacking royalties paid to multiple patents relating to a technology standard might "become excessive in the aggregate," it held that courts "need not instruct the jury on hold-up or stacking unless the accused infringer presents actual evidence of hold-up or stacking."[96] Such "actual evidence" can be "any evidence of other licenses [the infringer] has taken on Wi–Fi essential patents or royalty demands on its Wi–Fi enabled products."[97] In a more recent case, *Commonwealth Scientific & Industrial Research Organisation v. Cisco Systems, Inc.*, the Federal Circuit reiterated the requirement of evidence, especially quantitative evidence. It held that "abstract recitations of royalty

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[90] *See* Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, 1 INNOVATION POL'Y & ECON. 119, 119 (2000).
[91] *See, e.g.*, Lemley and Shapiro, *supra* note 31 at 1993, 2011–12. B. G. BRUNSVOLD, D. P. O'REILLEY & D. B. KACEDON, DRAFTING PATENT LICENSE AGREEMENTS 172–73 (2008).
[92] Integra Lifesciences I, Ltd. v. Merck KGaA, 331 F.3d 860, 871 (Fed. Cir. 2003) (vacated on other grounds).
[93] *Id.* at 871-72.
[94] *Id.* at 871.
[95] Ericsson, Inc. v. D-Link Sys., Inc., 773 F.3d 1201, 1208 (Fed. Cir. 2014).
[96] *Id.* at 1209, 1234.
[97] *Id.* at 1234.

stacking theory, and qualitative testimony that an invention is valuable — without being anchored to a quantitative market valuation — are insufficiently reliable."[98]

Some commentators support that the idea that the hypothetical negotiation needs to "reflect the presence of patents held by others that read on the same product."[99] If the negotiation fails to take third parties' licenses into account properly, it might "obscure the value of other technologies in the accused product."[100] To deal with third parties' licenses and prevent royalty stacking, Lemley and Shapiro suggest that when tribunals determine a royalty rate, they should consider evidence concerning whether the licensees also need to pay for other licenses.[101] They also recommend that the tribunals learn from the "commercial arrangements" that parties use in licensing to deal with royalty stacking.[102]

## II. Royalties in Patent Licensing Contracts

This section first provides an overview of four types of royalties that parties use in patent licensing contracts. The section then examines one type of royalty — percentage royalty — in detail because it is the kind of royalty that the contracts use most frequently. It has the most intricate structure and contains the key components that make up all other royalties. It gives us the most comprehensive understanding of how parties calculate royalties in patent licensing.

### A. An Overview of Royalties in Patent Licensing Contracts

In patent licensing, licensees can pay royalties as considerations for the patent licenses. These royalties are monetary. In some instances, non-monetary considerations, such as equities, can also serve as considerations for the use of patents.[103] Though royalties can take many forms, in general, they can be classified into four categories — percentage royalty, unit royalty, lump sum, and royalty-free.

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[98] Commonwealth Scientific & Industrial Research Organisation v. Cisco Systems, Inc., 809 F.3d 1295, 1302 (Fed. Cir. 2015) (citing Ericsson, Inc. v. D-Link Sys., 773 F.3d 1201, 1234 (Fed. Cir. 2014)).

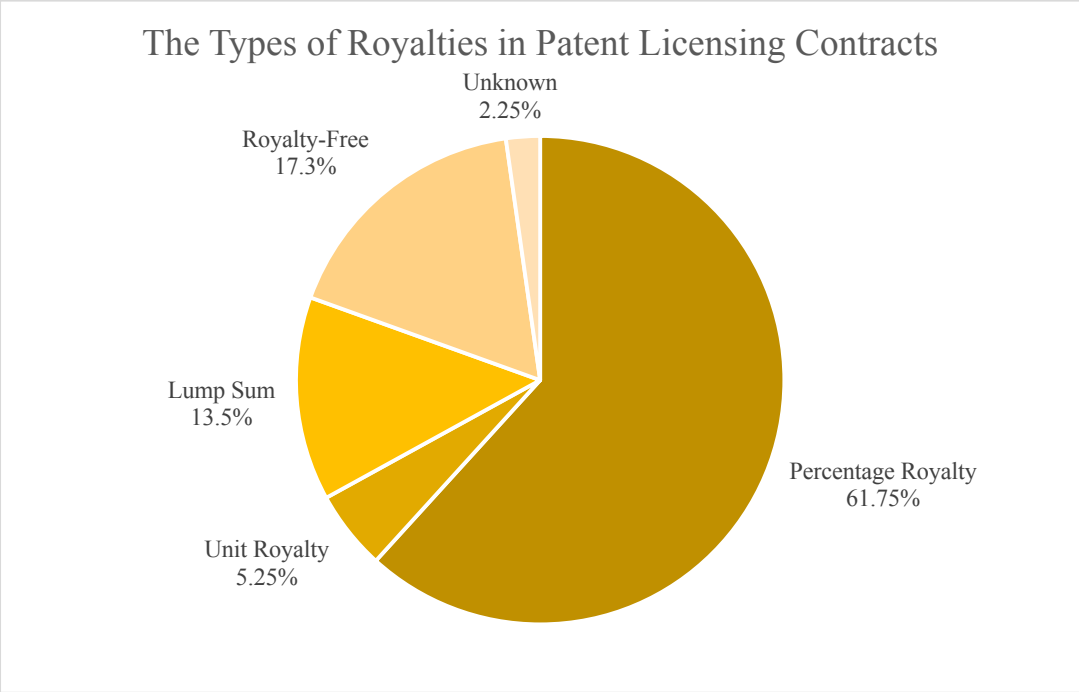
[99] Lemley and Shapiro, *supra* note 31 at 1149.

[100] *See* Seaman, *supra* note 31 at 1689, 1693 (claiming that the current hypothetical negotiation does not handle the problem of royalty stacking effectively and it might "obscure the value of other technologies in the accused product").

[101] Lemley and Shapiro, *supra* note 31 at 1151.

[102] *Id.* at 1150.

[103] *See, e.g.*, Ali Manesh & Meridian Innovations, LLC, Exclusive Commercial Patent License Agreement § 4.1, 2017 WL 05182776 (stock); Dr. Malireddy S. Reddy & Greenhouse Solutions, Inc., Patent and Technology License Agreement § 4.1 (b), 2015 WL 8588070 (The licensee paid 7,000,000 shares of common stocks to the licensor).Another common non-monetary consideration is reciprocal patent licenses. *See* Data Domain, Inc. & Quantum Corp., Patent Cross-License Agreement § 2, 2007 WL 9558480 (Reciprocal patent licenses). 35 U.S.C. § 284 does not currently regard non-monetary considerations as compensatory patent remedies. This Article focuses mainly on reasonable royalty damages, which we can view as one type of monetary compensation to patent licenses.




(Figure 1)

| The Types of Royalties | Percentage | Quantity |
|---|---|---|
| Percentage Royalty: Royalty Base × Royalty Rate | 61.75% | 247 |
| Unit Royalty: License Fee Per Unit × Number of Units | 5.25% | 21 |
| Lump Sum | 13.5% | 54 |
| Royalty-Free | 17.25% | 69 |
| Unknown[104] | 2.25% | 9 |

(Table 1)

The first type of royalty is the percentage royalty, which is the most common. The percentage royalty has two parts — a royalty base and a royalty rate. Sales of the patented product can serve as the royalty base, but profits and costs can serve this purpose as well. The royalty rate represents the share of the royalty base that the licensee will pay the patentee. For example, in the statement, "1% of the net sales of the patented product," "the net sales of the patented product" is the royalty base, and "1%" is the royalty rate. Unlike the royalty rate in the reasonable royalty, which is usually a single fixed rate, the royalty rate in patent licensing contracts is often adjustable. This Article will discuss the royalty base and adjustments to the royalty rate in detail in Section II B and C.

The second category of royalty is the unit royalty. Like percentage royalty, it consists of two parts — a license fee for each unit sold and the quantity of units sold. Usually, parties only specify the former of these and imply the latter. For example, "$2 per unit sold" refers to the former part of a unit royalty, which requires the licensee to pay $2 to the patentee for each unit of the patented product it sells. The latter part, referring to

[104] The consideration clause in nine of the licensing contracts was redacted, making it impossible for me to determine the types of royalties involved.

the quantity of units sold, is not explicitly stated but is implied in the contract. The final number of units sold is only available after the fact. Suppose the licensee sells 500 units. Then the unit royalty it owes the patentee is \$2 × 500=\$1,000. Sometimes, licensing parties may use other quantifiers to count the number of units. For example, the patentee might impose a license fee per pound of the patented products sold,[105] per use of the products,[106] or per month of usage.[107] In addition, parties occasionally count units after they are manufactured rather than when they are sold.[108]

An upfront fee sometimes accompanies the percentage royalty or the unit royalty. An upfront fee is usually a one-time, non-refundable payment that the licensee makes to the patentee.[109] For example, a patentee might require a licensee to pay "a one-time, non-refundable, non-creditable license issue fee of Three Hundred Fifty Thousand Dollars (\$350,000)" plus 3% of the net sale of the licensed products.[110] The \$350,000 license issue fee is the upfront fee. Sometimes, the licensee pays an upfront fee, which the patentee will then credit against the percentage royalty or the unit royalty.[111] Licensing experts note that patentees might charge this fee in order to give licensees an incentive to exploit the licensed patent or get compensation for other benefits that they have received.[112] In the event that litigating parties employ a patent license to settle a patent dispute, they might use the upfront fee as the consideration for the previous infringing use of the patent.[113] Among the 268 contracts that used percentage royalty or unit royalty, 172 of them included an upfront fee, accounting for 64.2%.

Licensing parties may impose a cap or set a floor for a percentage royalty or a unit

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[105] *See* Honeywell Federal Manufacturing & Technologies, LLC. & Itec Environmental Group., Patent License Agreement § B.2, 2006 WL 8362304.
[106] *See* eSpeed, Inc. & Intercontinental-Exchange, Inc., Patent License Agreement §§ 3.1 (d), 1.2, 1.5, 1.6, 2005 WL 8037959.
[107] *See* OptionTech, LLC & NCM Financial, LLC, Patent License Agreement §§ 1.2, 3.1, 2014 WL 10591887.
[108] *See* Max Sound Corporation & Santok Ltd., License Agreement § 4, Table D § 2, 2016 WL 11255757 ("LICENSEE will pay LICENSOR a Royalty Fee of \$1.50 USO for each LICENSED PRODUCT manufactured with the MAX-D API installed.").
[109] In most circumstances, the up-front fee is non-refundable. *See, e.g.*, Anterios, Inc. & The Board of Supervisors of Louisiana State University and Agricultural and Mechanical College, Patent License Agreement § 3.1.1, 2015 WL 6605268 ("Such License Issue Fee shall be nonrefundable."); Hoffmann-La Roche Inc.& F. Hoffmann-La Roche Ltd & MDRNA, Inc., Non-Exclusive Patent License Agreement § 4.2, 2009 WL 10600461 ("a one-time non-refundable execution fee in U.S. currency of five million dollars (US\$5,000,000)"); and Ethicon Endo-Surgery, Inc. & Cyberonics, Inc., Exclusive Patent License Agreement § 4.a., 2008 WL 11019169 ("EES shall pay Licensor the non-refundable sum of \$9.5 Million").
[110] Glycomed, Inc. & ParinGenix, Inc., Exclusive Patent License Agreement §§ 6.1, 6.2, 2009 WL 10598720.
[111] *See, e.g.*, Document Security Systems, Inc. & Ergonomic Group, Inc., Limited Exclusive Patent License Agreement §6.1 (a), 2007 WL 9540382 ("These second \$500,000 payment shall be deemed as a royalty advance, to be credited against royalty fees due for sales"). In some instance, a upfront fee is not creditable. *See, e.g.*, The National Institutes of Health & KineMed Inc., Patent License Agreement Appendix C, 2014 WL 10610049 ("Licensee agrees to pay to PHS a noncreditable, nonrefundable license issue royalty in the amount of Two Hundred and Fifty U.S. dollars (\$250,000)").
[112] *See* M. S. HOLMES, PATENT LICENSING AND SELLING: STRATEGY, NEGOTIATION, FORMS §4:2 (2014).
[113] *See, e.g.*, MyMedicalRecords, Inc.& Surgery Center Management, LLC., Settlement and Patent License Agreement § 3, 2012 WL 12421182 ("Licensee shall pay Licensor a license fee (including royalty for the total past use of any Licensed Patents from January 1, 2010 to the Effective Date) in the amount of Thirty Million U.S. Dollars (\$30,000,000 USD) ("Initial License Fee")."); Intergraph Hardware Technologies Company & Gateway, Inc., Settlement Agreement, Release and Patent License § 2.a., 2004 WL 7232119 ("For the release, license, covenant not to sue, and other rights granted herein, GATEWAY shall pay to IHTC ten million dollars (\$10,000,000.00).").

royalty. A cap refers to the maximum royalties that the licensee needs to pay to the patentee within a certain period of time, such as a quarter, a year, or several years.[114] Sometimes parties impose a cap on the total royalty that the licensee must pay for the license.[115] A floor refers to the minimum royalties that the licensee must pay within certain period of time. If after calculating the relevant payment, the sum of the royalties comes to less than the floor, the licensee must make up the difference.[116] Among the contracts using the percentage royalty or unit royalty, this Article found that 13 contracts had a cap and 101 set a floor, accounting for 4.8% and 37.7% respectively.

The third type of royalty is the lump sum. In this category, the licensee pays a fixed amount of money to the patentee, such as "the sum of twelve million U.S. dollars ($12,000,000)."[117] A patentee can demand that the licensee pay the lump sum in a single payment. Or it can break the lump sum up into several installments. For example, one contract required the licensee to pay "the sum of USD $10,900,000 in cash," but allowed it to pay this in three installments of $4,300,000, $3,300,000 and $3,300,000, due on three specified dates respectively.[118] Second, a patentee can charge a fixed sum of cash. Sometimes, patentees do not specify this sum but instead, require licensees to pay a fixed amount of money on a periodic basis. For example, one contract required the licensee to pay "RMB50,000 as the licensee fee for each patent licensed to the Licensee by the Licensor per year."[119]

In the fourth category, we see contracts that are royalty-free, so do not require the licensee to pay any money. However, a royalty-free agreement does not mean that the patentee has surrendered its entitlement for compensation; it might mean that the licensee needs to pay something other than money. For example, a patentee might require a licensee to issue equities and/or grant it a reciprocal patent license as consideration.[120] Sometimes, a patentee will grant a license to a licensee for purposes

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[114] *See, e.g.*, Broadcom Corporation & Verizon Wireless, Patent License Agreement § 3.1, 2007 WL 9454680 (a quarter); Total SA & La Compagnie Generale de Geophysique & Mr. Jean Laurent Mallet & Earth Decision Sciences, License Agreement for The Utilization of DSI Patents § 4.1.2, 2006 WL 8329066 (a year); Advanced Micro Devices, Inc. & Intergraph Hardware Technologies Company, Patent License and Settlement Agreement § 4.2.4, 2004 WL 7232118 ("over the three-year period").

[115] *See, e.g.*, OPTi Inc. & NVIDIA Corporation, PRE-SNOOP Patent License Agreement § 5.1, 2006 WL 8384683 ("Under no circumstances shall NVIDIA be obligated to pay more than a total of nine million U.S. dollars (U.S. $9,000,000) in aggregated Installment Payments."); Notify Technology Corporation, Inc. & NCR Corporation, Patent License Agreement § 3.1, 2004 WL 7299727 (requiring the licensee to pay royalties "until the total payment equals five hundred thousand dollars ($500,000)."); DOV Pharmaceutical, Inc. & Biovail Laboratories Incorporated, Confidential Patent License, Settlement, and Special Mutual Release Agreement §2.3 (b) (iii), 2003 WL 27319236 ("DOV shall pay to Biovail a total royalty of up to $7,500,000, payable at the rate of 3% of the Net Sales of DOV Royalty Product until the total royalty is paid by DOV").

[116] *See, e.g.*, Lifestream Technologies, Inc. & LifeNexus, Inc., Patent License Agreement § 2.2, 2005 WL 8085195.

[117] Avistar Communications Corporation & Tandberg ASA, Patent License Agreement § 4.1, 2007 WL 9518810.

[118] *See* Finjan, Inc. & Proofpoint, Inc. & Armorize Technologies, Inc., Confidential Patent License, Settlement and Release Agreement § 2.1, 2016 WL 04180473. *See also e.g.*, Quantum Corporation & Storage Technology Corporation, Patent Cross License Agreement § 4.1, 2006 WL 8280647.

[119] AutoNavi Information Technology Co., Ltd. & AutoNavi Software Co., Ltd., Patent License Agreement Appendix 2, 2010 WL 11372376.

[120] *See, e.g.*, Data Domain, Inc & Quantum Corporation, Patent Cross-License Agreement §§ 2.1, 5.1, 2007 WL 9558480 (common stock and reciprocal patent license). A patentee might grant license to a licensee in exchange for partnership interests. *See* Bell Atlantic Cellular Holdings, L.P. & Cellco Partnership, Patent License Agreement §2, 2009 WL 10596895. For the transaction background of this patent license, see Cellco Partnership, Registration

other than collecting royalties.[121] Take one of the royalty-free agreements for example. The patentee of the agreement outsourced its production of patented products to a supplier to whom it granted a royalty-free patent license.[122] It purchased the products from the supplier, and then sold them to one of its customers.[123] The purpose of the license was to enable the supplier to manufacture the products, rather than to earn royalties from it.[124]

### B. Royalty Base

As noted earlier, a percentage royalty consists of two parts, a royalty base and a royalty rate. For example, "1% of the net sales of the patented product" is one type of percentage royalty, in which "the net sales of the patented product" is the royalty base, and "1%" is the royalty rate. The product of the royalty base and the royalty rate is the royalties payable to the patentee.

In the relevant contracts, this Article found three types of royalty bases — sales, profits, and costs. Sales are the revenues that derive from the sale of patented products. They are the most frequent kind of royalty base. Among the contracts calling for percentage royalty (N=247), 242 of them, or 98%, employ sales as the royalty base, accounting for 98%. There are two types of sales — gross and net. Twenty-eight contracts (11.34%) use gross sales, while 214 (86.64%) use net sales. "Gross sales" refers to the total amount of the revenues that the licensee earned by selling the patented products.[125] "Net sales" refers to the amount that "is paid by the customer for the product alone."[126]

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Statement (Form S-4) 124 (Jul. 6, 2009), https://www.sec.gov/Archives/edgar/data/1175215/000119312509144450/ds4.htm. *See also e.g.*, GolfView Investors, LLC & GPS Industries, Inc., Patent License Agreement § 2, 2009 WL 10611986 (A royalty-free license); GPS Industries, Inc., Annual Report (Form 10-K) F-22 (Apr. 15, 2009), https://www.sec.gov/Archives/edgar/data/29233/000121465909000928/c499010k.htm ("In January 2009, the Company issued a perpetual, non-terminal, royalty-free limited license in one of the Company's patents to Golfview Investors, LLC (Golfview) in exchange for a fifty percent interest in Golfview.").

[121] The purposes of royalty-free patent licenses vary. An owner of a company might grant a royalty-free patent license to the company as a way to facilitate the development of the company. *See, e.g.*, Headwaters Technology Innovation Group, Inc. & FT Solutions LLC, Patent and Trademark License Agreement § 3, 2004 WL 7293100. A debtor might grant a royalty-free patent license to a creditor in order to secure a debt. *See, e.g.*, Inventergy Global, Inc & Inventergy, Inc. & DBD Credit Funding LLC, Patent License Agreement 2014 WL 10843429, § 2. There are many other purposes as well.

[122] *See* Accuray Incorporated & Forte Automation Systems, Inc., Patent and Trademark License Agreement § 2.1, 2007 WL 9502032. Along with the patent license, the patentee and licensee signed an "exclusive manufacturing agreement," which makes the licensee a supplier to the patentee. *See* Accuray Incorporated, Exclusive Manufacturing Agreement (Form S-1/A, Exhibit 10.46) (Jan. 16, 2007), https://www.sec.gov/Archives/edgar/data/1138723/000104746907000223/a2175548zex-10_46.htm.

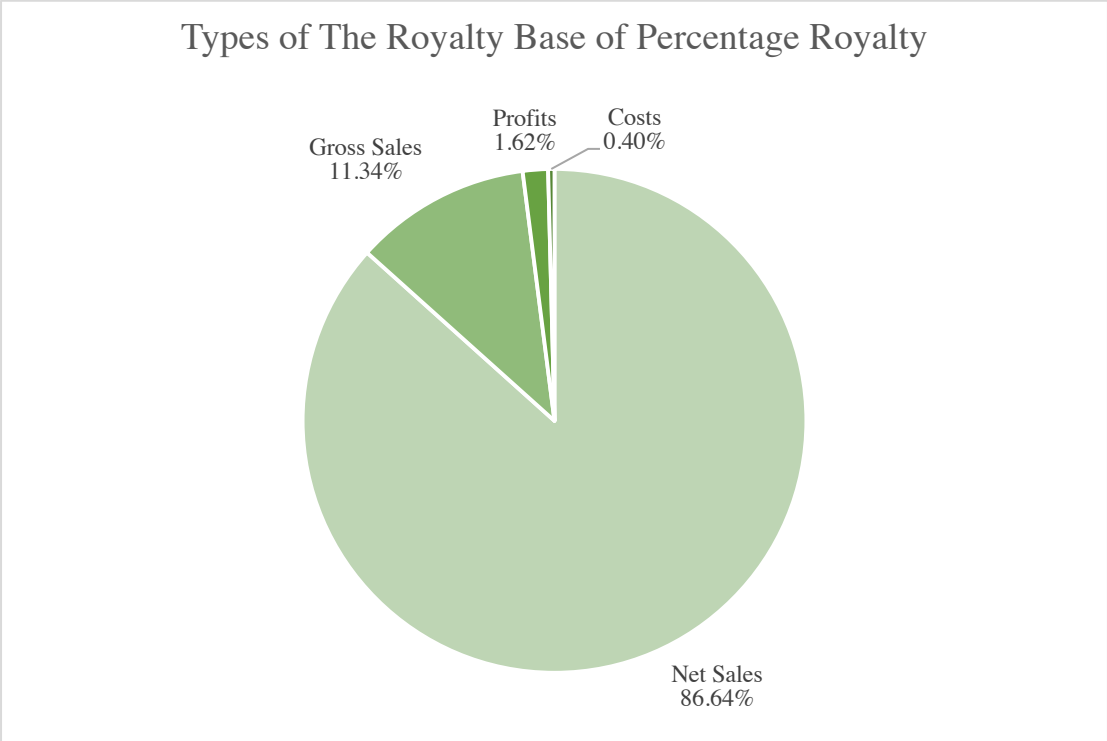
[123] *See* Accuray Incorporated & Forte Automation Systems, Inc., Patent and Trademark License Agreement § 1, 2007 WL 9502032; Accuray Incorporated, Amendment No. 5 to Registration Statement (Form S-1/A) 27 (Feb. 7, 2007), https://www.sec.gov/Archives/edgar/data/1138723/000104746907000723/a2175815zs-1a.htm ("On November 29, 2006, we entered into a Patent and Trademark License Agreement with Forte Automation Systems, Inc., or Forte, under which we granted Forte a license, exclusive with respect to one customer for patent rights and trademark rights related to our patient positioning system.").

[124] *See* Accuray Incorporated, Exclusive Manufacturing Agreement (Form S-1/A, Exhibit 10.46) § Recitals (Jan. 16, 2007), https://www.sec.gov/Archives/edgar/data/1138723/000104746907000223/a2175548zex-10_46.htm.

[125] Here, "patented products" also refers to patented services.

[126] BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 166.

Gross sales minus deductible items become net sales. Deductible items include promotion costs, operation costs, refunds, and government charges. Only a few of the contracts used profits as the royalty base (N=4, 1.62%). Profits equal the revenues that come from the sale of patented products minus the costs of manufacturing and selling them. Only one contract used the costs of manufacturing patented components as the royalty base, accounting for 0.4% of contracts using the percentage royalty.




(Figure 2)

There are different definitions of gross sales in patent licensing. The parties might use the term to refer to the gross revenues that the licensee invoices[127] or to the gross revenues that it receives.[128] The scope of the gross revenue invoiced in general is larger than the gross revenue received because the buyers of the patented products sometimes default on payments. Specifically, gross revenues are invoiced when the licensee-seller sends the buyer a bill requesting payment. In this situation, the buyer has not yet made a payment to the licensee-seller. If the buyer defaults on the payment, (for, say, insolvency), the licensee-seller might never receive the payment. If the licensing contract uses gross revenues invoiced as the royalty base, the licensee-seller bears the risk of the buyer's default. Even it cannot receive the payment, the amount of the payment still goes into the royalty base to calculate the royalties that the licensee owes

[127] *See, e.g.*, AutoGenomics, Inc. & Mayo Foundation for Medical Education and Research, Nonexclusive Patent License Agreement § 1.7, 2012 WL 12473859 ("total of the gross invoice amounts"); Document Security Systems, Inc. & Ergonomic Group, Inc., Limited Exclusive Patent License Agreement § 1.14, 2007 WL 9540382 ("invoiced amount of a product or service"); Cardion Pharmaceuticals, Inc. & Diacrin, Inc., Patent License Agreement § 1.7, 2007 WL 9505297 ("gross invoice prices from the sale").

[128] *See, e.g.*, Cerebain Biotech Corp. & Dr. Surinder Singh Saini, Patent License Agreement § 2.5, 2012 WL 12408443 ("the revenue acquired from the gross sales"); John C. Bedini & Bedini Technology, Inc., Exclusive Technology License Agreement and Right to Purchase Patents § 2.11, 2005 WL 8071582 ("gross amount received"); Celltech Therapeutics Limited & Medimmune Inc., Patent License Agreement § 1.6, 2005 WL 8079147 ("monies received").

payable the patentee.

On the other hand, if the licensing contract uses gross revenues received as the royalty base, the amount of payment on which the buyer defaults will never be a part of the royalty base calculations. In this situation, the patentee shares part of the risks of default with the buyer, because the default will reduce the royalty amount. Some contracts specify a hybrid combination of gross revenues invoiced and gross revenues received.[129] They require gross revenues either "invoiced or received, whichever occurs sooner"[130] or whichever is greater[131] as the royalty base.

Net sales are gross sales less deductible items. The definition of net sales differs among the licensing contracts partly because they customarily determine deductible items on a case to case basis.[132] In general, this Article has found five types of deductible items — operating costs, promotion costs, refunds, government charges, and bad debts.[133] Most of the contracts using net sales make the first four of these deductible. Bad debts are deductible in only a small number of the contracts.

Operating costs are expenses associated with business operations, including the expenses of transportation or freight, the expenses of insurance in transit, and the expenses of packaging and handling.[134] 147 of the 214 contracts using net sales as the royalty base (or 68.7%) subtract these expenses from the gross sales. But the scope of deductible operating costs varies. In some contracts, deductible expenses for transportation or freight exclude the expenses for inbound transportation (that is, the transport of goods coming into a business); they make only the expenses for outbound transportation (the transport of goods out of a business) deductible.[135] Similarly, some contracts treat expenses for insurance in transit and the expenses for packaging and

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[129] *See* Genocea Biosciences, Inc. & University of Washington, Patent License Agreement § 1.10, 2014 WL 10825227 ("gross amount invoiced or otherwise received"); LDN Research Group LLC & Dr. Jill P. Smith, Patent License Agreement § 1.2 ,2014 WL 10875746 ("consideration received or expected from, or the fair market value attributable to, each Sale").

[130] Samsung SDI Co., Ltd & Universal Display Corporation, OLED Patent License Agreement § 1.3.1, 2005 WL 8036678.

[131] *See, e.g.*, ProQR Therapeutics B.V. & The General Hospital Corporation, Exclusive Patent License Agreement §1.7, 2014 WL 10866678.

[132] *See* HOLMES, *supra* note 112 at § 4:6.2. *See also* BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 166.

[133] But these do exhaust all deductible items. Some licenses make deductible the costs for applying market approvals. *See, e.g.*, SweeGen, Inc. & Conagen Inc., Inter-Company Patent License Agreement § 1.7, 2017 WL 00583070 ("'Net Sales' shall mean . . . the gross sales price for Licensed Products invoiced by and paid to Licensee . . . for consideration of Licensed Products , less Licensee 's . . . (iii) costs (inclusive of third parties professional service charges) to apply and register Licensed Products with government authorities as required by relevant laws and regulations.").

[134] *See, e.g.*, Massachusetts Institute of Technology & Sontra Medical, Inc., Patent License Agreement § 1.10, 2002 WL 35608498 ("insurance costs and outbound transportation charges prepaid or allowed"); Valipharma Limited & HyperGenomics Pte. Limited, Patent License Agreement § Definitions, 2012 WL 12408411 ("costs of packaging, insurance, carriage and freight"); Michael D. Farkas & Balance Holdings, LLC & Car Charging Group, Inc. Patent License Agreement § 3.3, 2013 WL 11206461("shipping costs, handling costs, transportation insurance costs").

[135] *See, e.g.*, The University of North Texas Health Science Center & SignPath Pharmaceuticals, Inc., Patent and Technology License Agreement § 2.8, 2015 WL 6611745 ("outbound transportation actually prepaid or allowed"); ProQR Therapeutics B.V. & The General Hospital Corporation, Exclusive Patent License Agreement § 1.7 , 2014 WL 10866678 ("amounts for outbound transportation, insurance, handling and shipping").

handling as deductible items, while others do not.[136]

Promotion costs are the expenses of promoting the sales of the patented products, including trade and quantity discounts, early payment cash discounts, and normal and customary rebates.[137] 167 of the 214 contracts using net sales (78%) deduct promotion costs from the gross sales numbers. Here too we see variations in the scope of deductible promotion costs. Take, for example, sales commission. Sales commission is an additional compensation that the licensee pays employees or independent agents to reward their achievements in obtaining sales opportunities. Only 20 contracts treat sales commission as deductible promotion costs.[138] The rest of the contracts do not do so. In fact, 32 of them explicitly exclude it as a deductible promotion costs.[139]

Refunds are amounts that sellers repay to customers, including sales returns, chargeback, and retroactive price reduction.[140] 173 of the 214 contracts using net sales (or 80.8%) treat refunds as deductible. Sales returns are credits or allowances to the customers when they reject a patented product due to dissatisfaction. The "customers" can include not only end users, but also wholesalers and retailers.[141] A "chargeback" is a forced transaction reversal that the credit card holder's bank initiates in response fraudulent or disputed transactions.[142] "Retroactive price reduction" refers to the discount covering all preceding sales during the measurement period; the amount reduced is never collected. 26 licenses explicitly regard retroactive price reduction as

[136] *See, e.g.*, ProQR Therapeutics B.V. & The General Hospital Corporation, Exclusive Patent License Agreement § 1.7, 2014 WL 10866678 (including insurance and handling costs); AnnaMed, Inc. & DERMIN Sp. zo.o., Patent and Technology Development and License Agreement § 3, 2016 WL 01469341 (not including insurance and handling costs).

[137] *See, e.g.*, Can-Fite BioPharma, Ltd. & The National Institutes of Health, Patent License Agreement § 2.10, 2013 WL 11160921 ("cash discounts in amounts customary in the trade to the extent actually granted."); The University of Texas at Austin & AEMase Inc., Patent License Agreement Exhibit A, 2015 WL 6654817 ("discounts in amounts reasonable or customary in the trade"); BioMimetic Pharmaceuticals & ZymoGenetics, Inc., Exclusive Patent License Agreement § 1.11, 2006 WL 8310939 ("normal and customary rebates, and cash and trade discounts, actually taken").

[138] *See, e.g.*, LightLab Imaging, LLC & Lantis Laser, Inc., Non-Exclusive License Agreement § 2, 2007 WL 9541615; Science Applications International Corporation &VirnetX Inc., Patent License and Assignment Agreement § 1.29, 2010 WL 11366671; Stephen Key Design, LLC & AquaBlue International, Inc., Patent License Agreement § 2.05, 2009 WL 10564050.

[139] *See, e.g.*, American Power Group, Inc. & GreenMan Technologies, Inc., Exclusive Patent License Agreement §§ Recital, 1.6, 2009 WL 10579493 ("No deductions shall be made for any commissions paid to any individuals or for any costs or expenses of collections."); Can-Fite BioPharma, Ltd. & The National Institutes of Health, Patent License Agreement § 2.10, 2013 WL 11160921 ("No deductions shall be made for commissions paid to individuals").

[140] *See, e.g.*, PDL BioPharma, Inc. & Alexion Pharmaceuticals, Inc. Patent License Agreement § 1.17, 2009 WL 10585004 ("discounts, credits or allowances, if any, actually granted on account of price adjustments, recalls, rejection or return of items previously sold"); Purdue Pharma L.P. & The P.F. Laboratories, Inc., Patent License Agreement § 1, 2009 WL 10521234 ("(c) credits to customers for purchaser returns, returned goods allowances . . . ; (d) price adjustments . . . (e) allowances or credits to customers on account of withdrawal, recall or return; and (f) rebates").

[141] GlaxoSmithKline LLC & NPS Pharmaceuticals, Inc., Exclusive Patent License Agreement § 1.39, 2011 WL 12975350.

[142] *See, e.g.*, DOV Pharmaceutical, Inc. & Biovail Laboratories Incorporated, Confidential Patent License, Settlement, and Special Mutual Release Agreement § 1.1 (x) (i) 2003 WL 27319236; Essex Chemie AG & Cerecor Inc., Exclusive Patent and Know-How License Agreement § 1.35 (b), 2014 WL 10817805.

deductible.[143]

Government charges are the fees that the government collects in the course of sales, including taxes and duties.[144] 176 of the 214 contracts using net sales (82.2%) subtract these expenses from the gross sales. There are variations here as well. The contracts usually allow sellers to deduct customs duties. In contrast, not all kinds of taxes are deductible. Sales taxes and use taxes generally are, but not value-added taxes, which are a form of sales taxes assessed on income derived from sales.[145] Income taxes are generally not deductible.[146]

Only 24 of the 214 contracts using net sales (or 11.2%) treat bad debts as deductible.[147] Bad debts are the amount that the buyer owes the licensee but that are not collectable for various reasons such as liquidation or the insolvency of the buyer. In other words, a licensee might sell a patented product to a third party but get nothing in return. By allowing bad debt to be a deductible item, the patentee shares the risk of loss with the licensee. To limit the risk, some patentees put a cap on the deductible bad debt. For example, one contract only allowed the subtraction of bad debts that do not "exceed Five Percent (5%) of NET SALES per calendar year."[148]

Patent licensing contracts in the pharmaceutical industry may have a special deductible item as a part of the net sales royalty base.[149] That special deductible item is the rebates that drug manufacturers pay to the government. This is relevant with regard Medicare, which the U.S. government launched to provide health coverage to its low-income

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[143] *See, e.g.*, The University of Washington & Solid GT, LLC, Exclusive Patent License Agreement § 1.8, 2017 WL 06627723; Cue Biopharma, Inc. & Merck Sharp and Dohme Corp., Exclusive Patent License and Research Collaboration Agreement §1.62.3, 2017 WL 06347621.

[144] *See, e.g.*, Cerebain Biotech Corp. & Dr. Surinder Singh Saini, Patent License Agreement § 2.5, 2012 WL 12408443 ("Sales taxes, tariffs, duties, and/or other taxes directly imposed and with reference to particular sales"); The University of Texas M. D. Anderson Cancer Center & Arrowhead Research Corporation, Patent and Technology License Agreement §2.10, 2011 WL 12997286 ("sales and/or use taxes actually paid, import and/or export duties actually paid").

[145] *See, e.g.*, Cardion Pharmaceuticals, Inc.& Diacrin, Inc, Patent License Agreement § 1.7, 2007 WL 9505297; Document Security Systems, Inc. & Ergonomic Group, Inc., Limited Exclusive Patent License Agreement § 1.14, 2007 WL 9540382; Lawrence Livermore National Security, LLC & RainDance Technologies, Inc., Coexclusive Patent License Agreement § 2.11.4, 2015 WL 8546486.

[146] *See, e.g.*, ASDERA & QBioMed Inc. & Q BioMed (Cayman) SEZC, License Agreement on Patent & Know-How/Technology at 3, 2017 WL 01454932; AutoGenomics, Inc. & Mayo Foundation for Medical Education and Research, Nonexclusive Patent License Agreement § 1.7, 2012 WL 12473859; Bracco International BV & Acusphere Inc., Patent License Agreement § 3.07, 2006 WL 8344255.

[147] *See, e.g.*, MERCK and CO. & Regeneron Pharmaceuticals, Inc., Non-Exclusive Patent License Agreement § 1.6, 2003 WL 27322915; Roche Molecular Systems, Inc. & Expression Diagnostics, Patent License Agreement § 1.8 b), 2014 WL 10625116; Moleculin, LLC & The Board of Regents of The University of Texas System, Patent And Technology License Agreement § 2.10, 2016 WL 1090185.

[148] Massachusetts Institute of Technology & Cheung Laboratories, Inc,, Patent License Agreement § 1.16 a) v., 2014 WL 10629913. *See also e.g.,* TNI BioTech, Inc. & The Penn State Research Foundation, Patent License Agreement § 1.2, 2013 WL 11212660; Strategic Science and Technologies-D LLC & Strategic Science and Technologies, LLC & Daré Bioscience, Inc., License and Collaboration Agreement § 1.66 (v), 2018 WL 01516513.

[149] *See, e.g.*, Myriad Genetics, Inc. & Genetic Technologies Limited, Patent License Agreement § 2.8, 2005 WL 8067334; Derma Sciences, Inc & Quick-Med Technologies, Inc., Patent and Technology License Agreement § 1.19, 2012 WL 12408968; Roche Molecular Systems, Inc. & Expression Diagnostics, Patent License Agreement § 1.8 a), 2014 WL 10625116.

population.[150] The program now is one of the largest payers of health care in the U.S.[151] A drug-manufacturer-licensee might make most of its drugs under the coverage of the program, as long as it agrees to pay a rebate on the drugs for which the government paid.[152] The licensee pays the rebate to the government "to offset the overall cost of prescription drugs under the Medicaid Program."[153] In other words, though the drug manufacture earns revenues by selling its drug, it then must use part of these revenues to pay the rebates to the government. When calculating the royalties that it owes to the patentee, the drug-manufacturer-licensee subtracts, as a deduction, the money that it never actually earned.

In some of the contracts, the parties use profits as the royalty base. Profits are gross sales less costs, which include not only the deductible items but other costs, such as manufacturing costs and the costs of acquiring raw materials.[154] Sometimes, the patentee will license its patents to the licensees for management purposes. In this case, the licensee will manage the licensed patent rights to generate revenues.[155] The revenues might derive from sublicensing and enforcing the licensed patents.[156] The profits in this situation are the revenues minus the costs of generating the revenues.[157] These costs may include for example, the costs of litigating and maintaining the licensed patents.[158]

Parties may use the costs of patented components as the royalty base. Only one license of the 247 contracts that employ the percentage royalty uses costs as the royalty base. In this contract, the patentee requires the licensee to pay 10% of the costs the patented technologies, "multiplied by 1.1."[159] To be clear, the royalty base of this contract is

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[150] Program History, MEDICAID.GOV, https://www.medicaid.gov/about-us/program-history/index.html (last visited Jan 18, 2020).
[151] *Id.*
[152] Medicaid Drug Rebate Program, MEDICAID.GOV, https://www.medicaid.gov/medicaid/prescription-drugs/medicaid-drug-rebate-program/index.html (last visited Jan 18, 2020).
[153] *Id.*
[154] *See* Michael D. Farkas & Balance Holdings, LLC & Car Charging Group, Inc. Patent License Agreement § 3, 2013 WL 11206461 (defining profits as "total gross revenues less any discounts, manufacturing costs, rebates, shipping costs, handling costs, transportation insurance costs, installation costs, marketing and sales costs, applicable taxes, importation fees, and duties on" licensed products and/or processes disposed); Q BioMed Inc. & Bio-Nucleonics Inc., Patent and Technology License and Purchase Option Agreement § 1.12, 2016 WL 06066675 (defining profits as gross revenues derived from the patented product minus the "the costs directly associated with (1) the acquisition of raw materials, (2) direct manufacturing cost, (3) logistics and delivery, and (4) contract sales and marketing organizations but which shall not exceed 50% of the net profits" to the licensee from the sales of the licensed products).
[155] The subject matters of the agreement are a series of patents possessed by the licensor, such as Method for monitoring internet dissemination of image, video and/or audio files, Paper-based control of computer systems, Security documents with hidden digital data, etc. (the licensor) Digimarc Corporation is a provider of technological solutions that create digital watermarking and content identification. *See* Digimarc Corporation & IV Digital Multimedia Inventions, LLC, Patent License Agreement § Recitals, 2016 WL 04136497. *See also* Digimarc Corporation, Annual Report (Form 10-K) 1-5, 24 (Mar. 3, 2011), https://www.sec.gov/Archives/edgar/data/1438231/000119312511054776/d10k.htm.
[156] Digimarc Corporation & IV Digital Multimedia Inventions, LLC, Patent License Agreement §§ 2, 10, 2016 WL 04136497.
[157] *Id*.
[158] *Id*.
[159] Oryon Technologies, Inc. & Oryon Technologies, LLC & Oryon Technologies Development, LLC & Oryon Technologies Licensing, LLC & Myant Capital Partners Inc., Patent License Agreement § 4, Exhibit A, Exhibit B., 2014 WL 10613895.

only the direct costs attributable to the patented technology in the final product, not the direct costs of the entire final product.[160] Experts note that in patent licensing, parties sometimes use the costs of the final products' raw materials as the royalty base.[161]

### C. Royalty Adjustment

Parties may adjust royalties according to information that develops after the date on which they sign their patent licensing contract.[162] They make this adjustment by one of two methods. Either they incorporate into the patent licensing contract royalty adjustment clauses, which specify the conditions and the degree of adjustment. Or, they renegotiate and amend the contract, regardless of the existence of any royalty adjustment clauses.

Among the patent licensing contracts, this Article found that licensing parties adjusted royalties according to different kinds of ex post information, such as sales volume, sales revenues, and profit margins.[163] The contracts specify the conditions that trigger the adjustment and the degree of adjustment. The conditions and the ways of adjustment vary among contracts. For example, in some contracts, when the cumulative sales revenues of a patented product reach a benchmark, the adjustment clauses require the licensee to pay extra royalties to the patentee.[164] In some contracts, this situation triggers a rise or a reduction of the royalty rate.[165]

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[160] *Id*. § 1 (6).

[161] *See* BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 159 (noting that the costs of raw materials may serve as royalty bases).

[162] *See* Keith J. Crocker & Scott E. Masten, *Pretia ex Machina—Prices and Process in Long-Term Contracts*, 34 J.L. & ECON. 69–100, 75–76 (1991).

[163] A high gross margin may lead to a higher royalty rate. *See, e.g.*,. Massachusetts Institute of Technology & The ExOne Company, LLC, Amended & Restated Exclusive Patent License Agreement § 4.1, 2013 WL 11168668 (the licensor charge 5% of net sale when the sales have a gross margin greater than 65% and reduce the royalty rate to 2.5% when the gross margin less than 50%); The Anthon Leon Smith and Rosalie Joyce Johnson Smith Revocable Living Trust & EnShale, Inc., License Agreement for Use of Patent §§ 1.4, 1.5, 1.6, 5, 2007 WL 9498539 (charging 6% for "Net Gross Margin" ranging from $0-$50, 7% for $51 - $60, 8% for $61 - $70, 9% for $71 - $80, 10% for $81 - $90, 11% for $91 - $100 and 12% for $101 – above. the term "Net Gross Margin" is defined as gross revenue of the licensed product minus all costs except interest, tax, depreciation, and amortization). Adjustment based on sales volume: eSpeed, Inc. &Intercontinental-Exchange, Inc., Patent License Agreement § 3.1 (c), 2005 WL 8037959 (the licensee shall pay the licensor $2,000,000 when the unit sold exceeds 25,000,000 and shall make additional payment of $2,000,000 for each additional 25,000,000 units sold in a given year); iCurie Lab Holdings Limited & Asia Vital Components Co., Ltd., Patent License and Sales Exclusivity Agreement § 4.1, 2006 WL 8356838 (The licensor charges a royalty of 10% of average sale price when the sales volume is between 1 to 2,000,000. The percentage raise by 1% for each additional 2,000,000 units of the sale of the licensed product until reaching 6%. 6% percent is the maximum royalty rate, which is when the sale volume exceeds 8,000,000 units).

[164] The University of Texas System & Trinity Biotech, Incorporated, Patent License Agreement § 5.1 d, 2015 WL 6644267 (the licensee should pay $30,000 when the gross, aggregate income from the sale of the licensed products has reach each of the following sales benchmarks: $5,000,000 in the United States, $5,000,000 in European Patent Office member countries, $10,000,000 in the United States and $10,000,000 in European Patent Office member countries).

[165] Commonwealth Biotechnologies, Inc.& Prism Pharmaceuticals, Inc., Patent License And Development Agreement § 10.2, 2006 WL 8367942 (raising the royalty rate); The National Institutes of Health & NeoPharm, Inc., Patent License Agreement Appendix C, 2006 WL 8341343 (same); The University of North Texas Health Science Center & SignPath Pharmaceuticals, Inc., Patent and Technology License Agreement § 4.2 (a), 2015 WL 6611745 (same); Unither Pharma, Inc. & Real Health Laboratories, Inc., Patent License Agreement § 3.1, 2005 WL 8119756 (Same); The National Institutes of Health & KineMed Inc. Patent License Agreement Appendix C,

Parties might adjust royalties upon the occurrence of specified events. For example, in a pharmaceutical patent licensing contract, a patentee might require a licensee to pay extra royalties or might raise the royalty rate when the licensed drug passes certain regulatory hurdles of the marketing approval procedure.[166] In the field of pharmaceutical and medical devices, a drug or device needs to overcome several regulatory hurdles in order to obtain marketing approvals. The progress in the process of obtaining the approvals significantly affects the value of the licensed patent. Parties might re-evaluate the royalties payable to the patentee according to the amount of money they have spent on this process.[167]

Parties might reduce royalties due to the intensification of market competition, because that can reduce the licensee's profits. The intensification might be attributable to a grant of the license to third parties, especially on more favorable terms. The third parties can then compete with the licensee by selling products with the licensed technology. In this situation, the licensee might request a reduction in the royalty rate.[168] Even without obtaining a license from the patentee, third parties might sell products with similar functionality that compete with the licensee. For example, in the pharmaceutical industry, parties can often reduce royalties when "generic products" appear on the market.[169] Generic products work in the same way that brand-name drugs do but did

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2014 WL 10610049 (same); UCL Business PLC & Coronado Biosciences, Inc, License Agreement § 4.3, 2011 WL 13017955 (same). Ecoenergy Patent GmbH & Aqua Society GmbH, Patent License Agreement § 9, 2006 WL 8331651 (reducing the royalty rate); The Eye Microsurgery Intersectoral Research and Technology Complex & STAAR Surgical AG, Patent License Agreement § 17, 2001 WL 37100872, (same); Panther Biotechnology Inc. & The University of Rochester, Exclusive Patent License Agreement §8.3, 2015 WL 6667526 (same).

166 *See, e.g.*, The Board of Regents of the University of Texas System & DOR Vaccines, Inc., Patent and Technology License Agreement § 5.1 e, 2004 WL 7252866 (charging extra specified fees); Massachusetts Institute of Technology & Arch Therapeutics, Inc., Amended and Restated Exclusive Patent License Agreement § 4.1 (e), 2013 WL 11057569 (charging an extra specified fee); The Trustees of The University of Pennsylvania & PolyMedix, Inc., Patent License Agreement § 3.1, 2013 WL 11059119 (raising royalty rate).

167 The Regents of The University of California & TomoTherapy Incorporated, Limited Exclusive Patent License Agreement §§ C.2.3.1, C.2.3.2, 2008 WL 11049468.

168 Interdigital Technology Corporation & Samsung Electronics Co., Ltd., TDMA Patent License Agreement § 8.4.4, 2006 WL 8391398 (Reducing the royalty rate when a third party obtains a right under the licensed patent to manufacture, use or sell the patented products). When the patentee grants a license to third party, the third party is able to compete with the licensee in relevant market. The licensee might require the patentee to reduce the royalty when this happens. A patentee might grant a license to a third party due to compulsory license. So compulsory license may lead to a reduction on royalties. *See, e.g.*, GlaxoSmithKline LLC & NPS Pharmaceuticals, Inc., Exclusive Patent License Agreement § 6.1, 2011 WL 12975350 (When the royalty rate for a compulsory license is lower than the royalty rate of the patent license agreement, the licensee is entitled to reduce the royalty rate to the compulsory license royalty rate). Among the 400 patent licensing contracts, this Article found 14 contracts containing a "most favored licensee" clause. *See, e.g.*, AutoGenomics, Inc. & Mayo Foundation for Medical Education and Research, Nonexclusive Patent License Agreement § 3.4(d), 2012 WL 12473859. A licensee might require a licensor to disclose the terms in other licensing agreements. This enables the licensee to determine whether these terms are more favored than its terms are. *See, e.g.*, Virus Research Institute & The National Institutes of Health, Patent License Agreement § 5.09, 2003 WL 27343652. Parties might make amendment to reduce royalties because the licensee is enforcing the most favorable licensee clause. *See* InterDigital Technology Corporation & NEC Corporation, Amendment to Patent License Agreement, 2007 WL 9570115. For the transaction background of this amendment, see InterDigital, Inc., Annual Report (Form 10-K) 8 (Feb. 29, 2008), https://www.sec.gov/Archives/edgar/data/1405495/000119312508043723/d10k.htm.

169 *See, e.g.*, Moleculin, LLC & The Board of Regents of The University of Texas System, Patent And Technology License Agreement § 4.1 (d), 2016 WL 1090185 (reducing royalties by 25% due to the presence of generic products); Strategic Science and Technologies-D LLC & Strategic Science and Technologies, LLC & Daré Bioscience, Inc. License and Collaboration Agreement § 8.2.6, 2018 WL 01516513 (stating that upon the presence of generic drugs, the royalty rate applicable to net sale of licensed product "will be reduced by [***] percent

not have to repeat the costly clinical studies that brand-name drugs did.[170] The price of generic products is always substantially lower than that of brand-name drugs.[171] Sometimes, the presence of generic products entirely discharges the licensee's obligation to pay royalties.[172]

Even without a royalty adjustment clause, parties can renegotiate and adjust the royalties after signing the contract by making amendments to it. When they renegotiate the royalties, they will consider the ex post information.[173] Renegotiation allows more freedom for adjusting the payment according to changing market conditions.[174] In the process of data collection, this Article also found 61 amendments to the 400 licenses examined. Twenty of them adjust the royalties of a previous patent licensing contract. Parties might specify that they are making the amendment "in light of unforeseen circumstances."[175]

For example, on November 28, 2016, Conagen Inc. (the patentee) licensed to SweeGen, Inc. (the licensee) its patents used in the field of flavoring for food and beverages. In their original licensing contract, the patentee charged a percentage royalty of 10% of net sales. The royalty rate would step down by 1% annually until it reached a flat rate of 5%.[176] The contract required the licensee to pay a minimum royalty of $2,000,000 per calendar year.[177] On August 16, 2017, the parties amended their contract. They removed the minimum royalty requirement and added a cap of $15,000,000 for the annual royalty. They also replaced the step-down royalty rate of 10% to 5% with a flat rate of 5% of the net sales of the patented products.[178] In other words, the amendment

([***] %)"). But *cf.* Essex Chemie AG & Cerecor Inc., Exclusive Patent and Know-How License Agreement § 7.03 (b), 2014 WL 10817805 ("There shall be no reduction in the royalty due to Merck in the event of generic product commercialization.").

[170] The definitions of generic product in patent licenses may be different from the FDA's suggested definition, but these definitions are similar. The generic products in patent license usually meet three conditions: (1) generic products have the same chemical composition or active ingredients as the licensed product, (2) the sales of generic products will not infringe a valid claim in pending or issued patents in a specific country, and (3) the generic products have obtained regulatory approval to be marketed or sold in that country. *See, e.g.*, UCL Business PLC & Coronado Biosciences, Inc, License Agreement § 1, 2011 WL 13017955; Moleculin, LLC & The Board of Regents of The University of Texas System, Patent And Technology License Agreement § 2.2, 2016 WL 1090185; Strategic Science and Technologies-D LLC & Strategic Science and Technologies, LLC & Daré Bioscience, Inc. License and Collaboration Agreement § 1.41, 2018 WL 01516513.

[171] Generic Drug Facts, FDA.GOV, https://www.fda.gov/drugs/generic-drugs/generic-drug-facts (last visited Jan 18, 2020).

[172] *See, e.g.*, UCL Business PLC & Coronado Biosciences, Inc, License Agreement § 1, 2011 WL 13017955 (stating that the royalty term of a licensed product in a country "shall terminate immediately three (3) months after the first commercial sale of a Generic Equivalent of such Licensed Product in such country"); Massachusetts Institute of Technology & Visterra, Inc., Exclusive Patent License Agreement § 4.1 (d), 2016 WL 45409 (stating that royalty should not be due as the patented products are sold in developing countries at a price equivalent to the price of a generic pharmaceutical product); Inserm Transfert SA & Assistance-Publique-Hôpitaux de Paris, License Agreement § 4.4, 2018 WL 01536851 (To terminate the obligation to pay royalty, the licensee need prove that the significant reduction of net sale is "only attributable to the presence of a generic product" marketed by a third party.).

[173] Crocker and Masten, *supra* note 162 at 75–77.

[174] *Id.* at 77.

[175] Rambus Inc. & SK hynix Inc., Amendment 1 to Semiconductor Patent License Agreement § Recital, 2015 WL 6595433.

[176] SweeGen, Inc. & Conagen Inc., Inter-Company Patent License Agreement § 3.1 (b), 2017 WL 00583070.

[177] *Id.* at § 3.1 (a).

[178] SweeGen, Inc. & Conagen Inc., First Amendment to Inter-Company Patent License Agreement § 3, 2017 WL 03536377. *See also* SweeGen, Inc., Current Report (Form 8-K) 3 (Aug. 16, 2017),

reduced the royalties that the contract mandated the licensee pay to the patentee.

In another example, on June 17, 2009, American Power Group, Inc. (the patentee) licensed to GreenMan Technologies, Inc. (the licensee) a patent relating to duel fuel conversion.[179] The patentee required the licensee to pay percentage royalties, including 10% of the net sales of product and product installment.[180] On June 30, 2011, the parties made an amendment to their licensing contract.[181] The amendment reduced the 10% of the net sales of product installment to 6% after the date when the cumulative sum of all payments reached $15,000,000.[182] The amendment also completely eliminated the licensee's obligation to pay royalties once the cumulative sum of all payments reached $36,000,000.[183] The patentee agreed to assign to the licensee all of its rights to the patent thereafter.[184]

Both amendments adjust the royalties of the previous contracts. They both reduce the royalty rate to some extent, which means that the parties realized that the previous royalties overstated the actual value of the patents. And both amendments added royalty caps to the percentage royalty. Royalty caps are based on the specific amount of money that a patent is worth, so they often offer an accurate reflection of actual value of a patent. The facts that caps disappeared and that the royalty rates were higher in the original contracts indicates that the parties did not have sufficient information to determine the actual value of the patent in an ex ante negotiation. They acquired sufficient information thereafter and were able to adjust the royalties to a more appropriate level.

### D. Apportionment Methods

A patented technology might only apply to one component of a multi-component product. However, the overall value of a multi-component product consists of the value of the patented component plus the value of the other components. Parties may employ certain methods to calculate the royalties for use of the patent in a multi-component product. This Article calls these "apportionment methods," because they apportion the value of the multi-component product between its patented component and other components; this Article has classified these into 11 types. Among the 242 licensing contracts that charge percentage royalty, this Article found 55 contracts containing one

https://www.sec.gov/Archives/edgar/data/1580883/000107878217001171/f8k081717_8k.htm.

[179] American Power Group, Inc. & GreenMan Technologies, Inc., Exclusive Patent License Agreement §§ Recital, 1.7, 2009 WL 10579493. *See also* GreenMan Technologies, Inc., Annual Report (Form 10-K) 5 (Sept. 30, 2011), https://www.sec.gov/Archives/edgar/data/932699/000117152012000024/eps4497.htm.

[180] American Power Group, Inc. & GreenMan Technologies, Inc., Exclusive Patent License Agreement § 3.2., 2009 WL 10579493.

[181] American Power Group, Inc. & GreenMan Technologies, Inc., Amendment No 2 To Exclusive Patent License Agreement § Recital, 2011 WL 12991193.

[182] *Id.* at §§ 1, 3A.2. *See also* GreenMan Technologies, Inc., Current Report (Form 8-K) 2 (Jun. 30, 2011), https://www.sec.gov/Archives/edgar/data/932699/000117152011000497/eps4278.htm.

[183] *Id.*

[184] *Id.*

or more of these 11 types. If a contract contains more than one apportionment method, the parties set a priority list. When the first agreed method does not fit the situation, they try the second, and so forth.

Apportionment Methods

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|---|
| 1.Using the value of a patented component × a royalty rate |
| 2.Using the value of the multi-component product × a reduced royalty rate |
| 3.Using the value of the multi-component product × a royalty rate ×A/(A+B) |
| 4.Using the value of the multi-component × a royalty rate × A/C |
| 5.Using the value of the multi-component product × a royalty rate × (1- B/C) |
| 6.Using the value of the multi-component product × a royalty rate × D/(D+E) |
| 7.Using the value of the multi-component product × a royalty rate × D/F |
| 8.Using the value of the multi-component product × a royalty rate × 1/(1+N) |
| 9.Letting one party determine how to do the apportionment |
| 10.Letting both parties determine how to do the apportionment |
| 11.Letting a third party determine how to do the apportionment |
| "A" = the sales price of the patented component, if sold separately<br>"B" = the total sales price of other components, if sold separately<br>"C" = the sales price of the multi-component product<br>"D" = the cost of the patented component<br>"E" = the total cost of other components<br>"F" = the cost of the multi-component product<br>"N" = the number of other components |

(Table 2)

1. Using the value of a patented component × a royalty rate

If the licensee also sells the patented component as a standalone product in the market, the parties may treat the sale of one unit of the multi-component product as equal to the sale of one unit of the patented component.[185] In this way, parties remove the value of the unpatented components from the calculation of royalties. So, if each unit of the multi-component product is sold at $1,200, and the patented component, at $1,000, according to this method, the parties will use $1,000 instead of $1,200 to calculate the royalties for the sale of the multi-component product. If the royalty rate is 1%, then the royalties for the sale of a multi-component product is $1,000 × 1%=$10.

2.Using the value of the multi-component product × a reduced royalty rate

Parties may retain the value of the multi-component product as the royalty base, but reduce the royalty rate. For example, in a pharmaceutical patent license, the patentee charges 9% of the sales of single agent patented product (one that achieves the desired

[185] *See, e.g.*, Ethicon Endo-Surgery, Inc. & Cyberonics, Inc. Exclusive Patent License Agreement § 4f, 2008 WL 11019169; BioTrove, Inc. & Massachusetts Institute of Technology, Exclusive Patent License Agreement § 4.1(h), 2008 WL 11046253; The Regents of The University of California & Lantis Laser, Inc., Limited Exclusive Patent License Agreement § C.2.3, 2007 WL 9541613; Cue Biopharma, Inc. & Merck Sharp and Dohme Corp., Exclusive Patent License and Research Collaboration Agreement § 1.62.6, 2017 WL 06347621.

therapeutic response without using any other components).[186] The patentee charges 5% of the sale of the multi-component product, which relies on one or more additional components to achieve the desired therapeutic response.[187]

3.Using the value of the multi-component product × a royalty rate ×A/(A+B)
Parties may retain the value of the multi-component product as the royalty base, but multiply it by a fraction. The fraction here is A/(A+B), in which "A" is the sales price of the patented component when sold separately and "B" is the total sales price of other components.[188] To illustrate, say the licensee sells a multi-component product consisting of one patented component and other components, at the price of $1,200. The sales price of the patented component would be $1,000 and the total sales price of the other components would be $500, if they were sold separately. Suppose the royalty rate is 1%. The parties multiply $1,200 × 1% by the fraction 1,000/(1,000+500), which comes to $8.

4.Using the value of the multi-component × a royalty rate × A/C
Likewise, the parties can retain that as the royalty base but multiply it by another fraction, A/C, in which "A" is the sales price of the patented component sold separately and "C" is the sales price of the entire multi-component product.[189] Here, suppose the sales price of the entire multi-component product is $1,200 and the sales price of the patented component is $1,000. If the royalty rate is 1%, the faction A/C would equal 1,000/1,200. Multiplying the royalty base by the royalty rate then by the fraction, parties will get $10.[190]

5.Using the value of the multi-component product × a royalty rate × (1- B/C)
Similarly, parties may retain the value of the multi-component product as the royalty base and multiply it by a fraction (1- B/C), in which "B" is total sales price of other

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[186] *See* BioMimetic Pharmaceuticals & ZymoGenetics, Inc., Exclusive Patent License Agreement §§ 1.2, 1.4, 1.12, 4.2., 2006 WL 8310939.
[187] *See Id. See also* The George Washington University &Protea Biosciences, Inc., Patent License Agreement §3.3, 2013 WL 11056988 (charging the licensee 7% of the net sales of the patented component sold alone and charging 5% of the net sales of the multi-component product).
[188] *See, e.g.*, CyberHeart, Inc. & Accuray Incorporated, Patent License Agreement § 3.1.1, 2014 WL 10830787.
[189] *See, e.g.*, Samsung SDI Co., Ltd. & Universal Display Corporation, OLED Patent License Agreement § 1.3.3, 2005 WL 8036678; Imperial College Innovations Limited & Imperial College of Science, Technology and Medicine & CytRx Corporation, Patent License Agreement § 1.1, 2008 WL 11045458; Dharmacon, Inc. & Quark Pharmaceuticals, Inc., Patent License Agreement § 1.28, 2010 WL 11351382; Regents of the University of Minnesota & Synageva BioPharma, Exclusive Patent License Agreement § 1.4, 2011 WL 13023543; The University of Texas System & Miragen Therapeutics, Inc., Exclusive Patent License Agreement § 2.10, 2016 WL 07030678.
[190] At first glance, this apportionment method looks like the first method, which replaces the value of multi-component product with the value of patent component as the royalty base. But sometimes, they reach different results when "A" represents the average sales price of the patent component and "C" represents the average sales price of the multi-component product. To illustrate, suppose the current sales price of a patent component is $1,000 and its average sales price of is $800. The current sales price of a multi-component product is $1200; the average sales price is $1,400. If we use the first method, we use $10,00 as the royalty base to calculate the royalties for each unit of multi-component product sold. But if we use the fourth method, we multiply $1,200 with a fraction 800/1,400 to get the royalty, which is $685.71. In this situation, the first method and the third method render different results.

products and "C" is sales price of the multi-component product.[191] In this example, we assume that the total sales price of other component is still $500 and the sales price of the multi-component product is still $1,200. So if the royalty rate is 1%, then the royalties after apportionment will be $12 multiplied by (1-500/1200), which equals $7.

6.Using the value of the multi-component product × a royalty rate × D/(D+E)
Alternatively, the parties may determine the royalty of a multi-component product by data relating to costs. One way to do this is to multiply the value of the multi-component product by a fraction D/(D+E), in which "D" is manufacturing cost of the patented component, and "E" is the total manufacturing cost of other components.[192] Suppose the value of the multi-component product remains at $1,200, the manufacturing cost of the patented component is $800, and the total manufacturing costs of other components are $200. Again, if the royalty rate is 1%, then royalties after apportionment would be $1,200 × 1% × 800/ (800+200)= $9.6.

7.Using the value of the multi-component product × a royalty rate × D/F
Parties may retain the value of the multi-component product as the royalty base and multiply it by a fraction D/F, in which "D" is manufacturing cost of the patented component and "F" is manufacturing cost of the multi-component product.[193] Suppose the sales price of the multi-component product remains at $1,200, the manufacturing cost of the patented component remains at $800, and the manufacturing cost of the multi-component product is $900. With a the royalty rate of 1%, royalties after apportionment will be $1,200 × 1% × 800/900 = $10.67.

8.Using the value of the multi-component product × a royalty rate × 1/(1+N)
Instead of relying on cost and price, licenses can allocate the revenue of a multi-component product by the number of components. The parties may multiply the proceeds of the multi-component product by a fraction, 1/(1+N), where "N" is the number components other than the patented component in the multi-component product.[194] This method limits the consideration of apportionment based on the number of components that the product has, regardless of the relative value of each component.[195] Here too, the royalty base is the $1,200 value of the multi-component

[191] *See, e.g.*, Imperial College Innovations Limited & Imperial College of Science and Technology & Cytrx Corporation, Patent License Agreement § 1.1, 2008 WL 11045458; The University of Texas at Austin & AEMase Inc., Patent License Agreement § 1 & Exhibit A, 2015 WL 6654817.
[192] *See, e.g.*, LightLab Imaging, LLC & Lantis Laser, Inc., Non-Exclusive License Agreement § 2, 2007 WL 9541615; Peregrine Pharmaceuticals, Inc. & The University of Texas System Exclusive Patent License Agreement §2.7, 2010 WL 11321026; Cue BioPharma, Inc. & Merck Sharp and Dohme Corp., Exclusive Patent License and Research Collaboration Agreement §1.62.6, 2017 WL 06347621; Evelo Biosciences, Inc. & Mayo Foundation for Medical Education and Research, Patent License Agreement §1.08, 2018 WL 01771872.
[193] *See, e.g.,* Imperial College Innovations Limited & Cronos Therapeutics Limited, Patent License Agreement § 4.6, 2012 WL 12408465; Ethicon Endo-Surgery, Inc. & Cyberonics, Inc. Exclusive Patent License Agreement § 4f, 2008 WL 11019169; Regents of the University of Minnesota & Synageva BioPharma, Exclusive Patent License Agreement § 1.4, 2011 WL 13023543; Samsung SDI Co., Ltd & Universal Display Corporation, OLED Patent License Agreement § 1.3.3, 2005 WL 8036678.
[194] *See, e.g.,* Cerecor Inc. & Essex Chemie AG, Exclusive Patent and Know-How License Agreement § 1.34, 2015 WL 6606686; Entegris, Inc., & Entegris Cayman Ltd. & Asyst Technologies, Inc., Patent Assignment and Cross-License And Trademark License Agreement § 1.35, 2003 WL 27348850.
[195] HOLMES, *supra* note 112 at §4:6.4.

product. The product contains three unpatented components and one patented component. Suppose the royalty rate is 1%. Applying this apportionment method, the licensee needs to pay $1,200 ×1% × 1/(1+3), which equals $3.

9, 10, 11. Letting one party, both parties, or a third party determine how to do the apportionment

Because parties can anticipate that they will exhaust the agreed apportionment methods that they set beforehand, they often incorporate a clause in the contract in which they agree to delegate the power to determine the apportionment method, if necessary. They might delegate the power to either of sides[196] or to a third party.[197] Or they might choose to renegotiate the method of apportionment and determine it together.[198] They might set the relevant criteria for determining an apportionment method in the original contract. For example, they might require that the apportionment method be based on the components' contribution to the price of the multi-component product,[199] on the proprietary protection of the components,[200] or on the relative importance of the component to the efficacy of using the multi-component product.[201]

## E. Anti-royalty-stacking Clauses

Sometimes a licensee might sell products that involve not only the patentee's patent but third parties' patents as well. When this happens, the licensee might find itself in a situation where it must pay royalties to both the patentee and the third parties. If the aggregate royalties become excessive, they might keep the licensee from profiting from

[196] Accuray Incorporated & CyberHeart, Inc., Patent License Agreement § 3.1.1, 2014 WL 10830787 (licensor); GlaxoSmithKline LLC & NPS Pharmaceuticals, Inc., Exclusive Patent License Agreement § 1.39, 2011 WL 12975350 (licensor); Aquamer, Inc. & Partners in Biomaterials , Inc., Patent License Agreement § 3.2, 2006 WL 8365901 (licensee); The University of Texas M.D. Anderson Cancer Center & Intron Therapeutics, Inc., Patent and Technology License Agreement § 5.2 (b), 2015 WL 8052069 (licensee).

[197] Imperial College Innovations Limited & Imperial College of Science, Technology and Medicine & CytRx Corporation, Patent License Agreement § 1.1, 2008 WL 11045458 (If both parties fail to agree on a calculation method, they will employ third party experts to make the final decision); AutoGenomics, Inc. & Mayo Foundation for Medical Education and Research, Nonexclusive Patent License Agreement § 3.4(c), 2012 WL 12473859 (same); Valipharma Limited & HyperGenomics Pte. Limited, Patent License Agreement § 3.4, 2012 WL 12408411 (same).

[198] *See, e.g.*, Dharmacon, Inc. & Quark Pharmaceuticals, Inc., Patent License Agreement § 1.28, 2010 WL 11351382 (determining the way of apportionment by both parties in good faith); Cerecor Inc. & Essex Chemie AG, Exclusive Patent and Know-How License Agreement § 1.34, 2015 WL 6606686 (same); PDL BioPharma, Inc. & Alexion Pharmaceuticals, Inc. Patent License Agreement § 3.4, 2009 WL 10585004 (same).

[199] *See, e.g.*, AutoGenomics, Inc. & Mayo Foundation for Medical Education and Research, Nonexclusive Patent License Agreement § 3.4(c), 2012 WL 12473859 ("The values described above shall be determined by mutual agreement of Mayo and Licensor based upon the then-available facts and circumstances, particularly, for example, . . . the increased sales prices of a Combination Offering when it has the particular component").

[200] *See, e.g.*, The University of Texas M.D. Anderson Cancer Center & Intron Therapeutics, Inc., Patent and Technology License Agreement § 5.2 (b), 2017 WL 03574264 ("NET SALES from such combination sales for purposes of calculating the amounts . . . shall be as reasonably allocated by LICENSEE between such LICENSED PRODUCT and such other product or components, based upon their relative importance and proprietary protection as commercially reasonable.").

[201] *See, e.g.*, The National Institutes of Health & Gen Vec, Inc., Patent License Agreement § 6.14, 2004 WL 7243301 (stating that the licensee should reasonably allocate the net sales receipts of the combination product between licensee product and other components based on their contribution to the proprietary position of the combination product and relative importance to the efficacy of using the combination product).

the sale of its products,[202] which might, in turn, lead it to give up innovation. The phenomenon of excessive royalty payments to several parties is called royalty stacking.

In patent licensing, when parties anticipate that the licensee might obtain licenses from third parties in the future, they can incorporate clauses to prevent the aggregate royalties from stacking to an unreasonably high level. The clauses allow the licensee to offset third party royalties against the royalties payable to the patentee. They are sometimes called anti-royalty-stacking clauses. Among the 242 licensing contracts that charge percentage royalty, this Article found that 40 contracts (or 16.5%) contain anti-royalty-stacking clauses.

One example of the use of these clauses appears in the patent licensing contract between the University of Texas System (the patentee) and Bio-Path, Inc. (the licensee). Here, the licensee agrees to pay 3% of net sales of its patented products to the patentee as royalties. In the event that the licensee determines that "it is necessary to pay royalties or other fees to any third party to obtain a license to practice any third party's rights in order to practice" the patentee's patent, "then fifty percent (50%) of the royalties payable to such third party may be deducted from royalties otherwise payable to" the patentee.[203] However, the royalties that the license owes the patentee shall not be less than 2% of the net sales of the patented products.[204]

This clause is a typical anti-royalty-stacking clause. It has four features. First, it only allows a portion, 50%, of the third party royalties to offset the royalties otherwise payable to the patentee. Among the 40 contracts containing anti-royalty-stacking clauses, 30 limit the deductible portion of the third party royalties. The rest do not have such a limitation, allowing the licensee to credit all the royalties payable to third parties against the royalties payable to the patentee.[205]

Second, the anti-royalty-stacking clause also sets a floor for the royalty rate of the royalties payable to the patentee. In this example, the original royalty rate is 3%, while 2% is the minimum royalty rate after the offset. In other words, the licensee can at the most deduct one-third of the royalties that it owes to the patentee. Thirty-nine of the 40 contracts containing anti-royalty stacking clauses set a floor for the royalty rate.[206] The

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[202] BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 172–73.
[203] The Board of Regents of The University of Texas System & Bio-Path Inc., Patent and Technology License Agreement § 4.7, 2013 WL 11158697.
[204] *Id.*
[205] *See, e.g.*, Cardion Pharmaceuticals, Inc. & Diacrin, Inc., Patent License Agreement § 3(b), 2007 WL 9505297; Imperial College Innovations Limited & Imperial College of Science, Technology and Medicine & CytRx Corporation, Patent License Agreement § 4.12, 2008 WL 11045458; RXi Pharmaceuticals Corporation & Invitrogen IP Holdings, Inc., Patent License Agreement § 5.1.2, 2008 WL 11045564; Massachusetts Institute of Technology & Sontra Medical, Inc., Patent License Agreement § 4.6, 2002 WL 35608498; Trinity Biotech Manufacturing Limited & The National Institutes of Health, Patent License Agreement Appendix C, 2015 WL 6644266; The Arizona Board of Regents on Behalf of The University of Arizona & Wildcap Energy, Inc., Exclusive Patent License Agreement § 5.12, 2011 WL 13039236.
[206] For the exception, see Pierre Fabre Medicament S.A & Novacea, Inc., Patent and Know-How License Agreement § 11.3.6, 2006 WL 8377440.

minimum such royalty rate this 50% of the original royalty rate.[207] The floor is important because the patentee has no control over the licensee concerning how many third party licenses the licensee might take and how much it will pay in royalties for these licenses.[208] Setting a floor keeps the royalties from dropping to an unreasonably low level after the offset.[209]

Third, the clause also requires the third party licenses to meet certain standards before their royalties become deductible. In this example, the third party licenses need to be "necessary" to the implementation of the patentee' patent. Many of the 40 contracts employ a similar standard, requiring that the third party licenses be "necessary" to prevent the product to from infringing third parties' patents[210] or be "legally required."[211] Some of the contracts employ less restrictive standards, which require the third party licenses to be "necessary or desirable"[212] or simply require that the third party licenses are made to "make, use, or sell" the product that the patentee's patent covers.[213] Some contracts employ a reciprocal standard, which requires that the third party licenses also contain anti-royalty-stacking clauses that are "at least as deductive as" the patentee's.[214] And a few contracts only allow the offset when the licensee's profits drop below a certain threshold;[215] or when the aggregate royalties exceed a determined threshold.[216]

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[207] *See, e.g.*, The Regents of The University of Colorado & V-Clip Pharmaceuticals, Inc., Exclusive License Agreement § 6.06, 2007 WL 9582375 ("However, in no event shall the Earned Royalty paid to University be less one half the specified royalty."); Imperial College Innovations Limited & Cronos Therapeutics Limited, Patent License Agreement § 4.7, 2012 WL 12408465 ("royalties paid under the Third Party Licence shall be treated as a deductible item when calculating Net Sales Value provided that the amount of royalty payable by the Licensee . . . shall not be reduced by more than 50% of the amount which would have been payable in the absence of this Clause").

[208]. BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 173.

[209] *Id.* at 173.

[210] Imperial College Innovations Limited & Cronos Therapeutics Limited, Patent License Agreement § 4.7, 2012 WL 12408465. *See also* Massachusetts Institute of Technology & Synlogic, Inc., Exclusive Patent License Agreement § 4.1 (e), 2017 WL 03688461 ("to exploit, or avoid or settle claims of infringement of such rights by the practice of," the licensed patent).

[211] BioHaven Pharmaceutical Holding Company & The General Hospital Corporation, Exclusive Patent License Agreement § 4.5(a)(ii), 2017 WL 01289105.

[212] Genencor International, Inc. & The National Institutes of Health, Patent License Agreement § 6.11, 2005 WL 8057067.

[213] The Regents of The University of Colorado & V-Clip Pharmaceuticals, Inc., Exclusive License Agreement § 6.06, 2007 WL 9582375. *See also* Koninklijke Philips Electronics N.V. & Hansen Medical, Inc., Patent and Technology License and Purchase Agreement § 3.4, 2011 WL 13022426 ("to exploit the licenses granted" under the agreement); Miragen Therapeutics, Inc.& The Brigham and Women's Hospital, Inc., Exclusive Patent License Agreement § 4.5(b), 2016 WL 07030675 (third party license in order to "develop, manufacture, use, or sell" a licensed product); Massachusetts Institute of Technology & Sontra Medical, Inc., Patent License Agreement § 4.6, 2002 WL 35608498 ("to manufacture, use or sell such LICENSED PRODUCTS or practice of any method, process or procedure within the PATENT RIGHTS").

[214] Massachusetts Institute of Technology & Synlogic, Inc., Exclusive Patent License Agreement § 4.1 (e), 2017 WL 03688461 ("For clarity, royalty payments may constitute Third Party Royalties if and only if the third party agrees to and accepts a provision at least as deductive as this Section 4.1(e)").

[215] GlaxoSmithKline LLC & NPS Pharmaceuticals, Inc., Exclusive Patent License Agreement § 6.1, 2011 WL 12975350 ("Third Party Licenses. If, during the Term, GSK's Average Gross Margin on Net Sales of the Product during a particular calendar year falls below [*] in a particular country as a result of royalty payments made by GSK to Third Parties . . . , then GSK's royalty obligations under Section 5.2(a) shall be reduced by the amount required to raise GSK's Average Gross Margin to [*]").

[216] Miragen Therapeutics, Inc.& The Brigham and Women's Hospital, Inc., Exclusive Patent License Agreement § 4.5(b), 2016 WL 07030675 ("the total royalty payment (i.e., royalty payment due for Licensed Product under such license(s) plus the royalty payment due to Hospital under Section 4.5(a) of this Agreement) exceeds [*] of the

Fourth, the parties include the clause in anticipation of future third party licenses. We can assume that the number of third party licenses and the royalties that the licensee will pay for them is unknown to the patentee and licensee at the time they sign the contract. Otherwise, they would not need an anti-royalty-stacking clause and could adjust the relevant royalties directly. For example, they could impose a cap on annual royalties to prevent them from exceeding a determined threshold.[217] So the presence of anti-royalty-stacking clauses indicates that parties anticipate possible royalty stacking scenarios. The absence of them does not indicate the opposite, however; in these situations, parties might cope with royalty stacking through other methods.

## III. Implications

The predominant approach that courts use to calculate the reasonable royalty is the hypothetical negotiation. In such negotiations, courts envision the terms of the actual licensing agreement that the patentee and the infringer would have reached had they been a willing licensor and a willing licensee.[218] This section tests the judicial doctrines of the hypothetical negotiation against the licensing contracts that this Article carefully assembled. It reveals divergences between actual licensing practices and the judicial doctrines in three areas. This section also recommends that courts and litigants should use a more evidence-based approach to determine patent damages by incorporating certain elements of the contracts into the judicial doctrines.

### A. Adjustments to Reasonable Royalty

Courts generally determine reasonable royalties by imagining how the patentee and the licensee would have negotiated the terms of a patent licensing contract. They date this hypothetical negotiation to the time when the infringement began.[219] Attempting to recreate the status quo of that date, courts do not take into account the information that developed after the hypothetical negotiation. That ensures that the determination will not be an "after-the-fact assessment."[220] We have seen, however, that there are circumstances in which courts do allow parties to introduce ex post information as probative evidence.[221] This is for the purpose of determining what the parties would

Net Sales of such Licensed Product, then the royalty payment due to Hospital under this Agreement shall be reduced by [*] of the total royalty payment that exceeds such [*] threshold").

[217] Lemley and Shapiro, *supra* note 31 at 2042. For the arrangements that set a cap on royalties, see also Section II B, notes 115 and 114.

[218] Rite-Hite Corp. v. Kelley Co., Inc., 56 F.3d 1538, 1576 (Fed. Cir. 1995) (en banc).

[219] *Id.*

[220] LaserDynamics, Inc. v. Quanta Comput., Inc., 694 F.3d 51, 75 (Fed. Cir. 2012).

[221] Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1333 (Fed. Cir. 2009); Fromson v. W. Litho Plate & Supply Co., 853 F.2d 1568, 1575 (Fed. Cir. 1988).

have known at the date of the hypothetical negotiation.[222] Courts will not employ this evidence to determine the amount of reasonable royalties. So even in these cases, courts do not allow parties to adjust reasonable royalties, because the adjustments would rely on ex post information.

This disregard of ex post information that might affect a hypothetical negotiation is inconsistent with actual patent licensing practices. At the time of an actual patent license negotiation, no one has ex post information; the parties can only set the terms of their contract based on the information at hand. But recognizing that future circumstances can affect the use of patent and the value generated from that use, it is standard for parties to incorporate royalty adjustment clauses into the contract. These clauses raise or reduce the royalties payable to the patentee according to ex post information, such as sales volume, sales revenues, profit margins, and so forth.[223] These economic factors are not fully in the control of either party and no one can completely predict them.[224] Parties are willing to adjust royalties based on ex post information because the economic factors alter their perception of the value of the patent or the patent license.[225]

To illustrate, a royalty adjustment clause might increase the royalty rate when the sales revenues of the patented product reach a benchmark.[226] Merely relying on ex ante information, parties cannot know whether the sales revenue will reach that benchmark or not. Therefore, they also cannot know whether there will be an increase in the royalty rate. They know it only after the fact, when the sales revenues come out. In this situation, ex post information affects the way that the parties calculate royalties by triggering an adjustment in the royalty rate. To know which royalty rate will apply, it is inevitable that the parties will examine the ex post information.

In litigation, however, courts do not consider which royalty adjustment clauses the infringer and the patentee would have used in their hypothetical license. Courts usually determine a percentage royalty with a flat rate, a unit royalty with a fixed per unit license fee, or a lump sum based on the ex ante information.[227] Once they make this determination, they do not take ex post information into account to modify any of these. For example, in *Aqua Shield v. Inter Pool Cover Team*, the district court considered ex post information — the infringer's actual profits — when determining a reasonable royalty. On remand, the Federal Circuit held that this treatment was incorrect because it "replaces the hypothetical inquiry into what the parties would have anticipated, looking forward when negotiating, with a backward-looking inquiry into what turned out to have happened."[228] What the Federal Circuit did not consider was the possibility that parties might have incorporated into the contract a royalty adjustment clause based

[222] Aqua Shield v. Inter Pool Cover Team, 774 F.3d 766, 772 (Fed. Cir. 2014).
[223] *See* Section II C.
[224] Eric. E. Benson, Bensen on Patent Licensing Transactions § 3.04 (2019).
[225] *Id.*
[226] *See supra* note 165.
[227] For a summary of adjudicated royalties see the case table in 1 Chisum on Patents § 20.07 (2019).
[228] Aqua Shield v. Inter Pool Cover Team, 774 F.3d 766, 772 (Fed. Cir. 2014).

on profit margins.

The cases show that the Federal Circuit assumes away the possibility of renegotiation. In *LaserDynamics, Inc. v. Quanta Comput.,* the court held that "there should be only a single hypothetical negotiation date" for each case, and that an infringer must "pay the same reasonable royalty based on a single hypothetical negotiation analysis."[229] Therefore, even if extraordinary events that occurred after the date when the infringement began affect the value of the patent, courts still assume that the infringer and the patentee would not have renegotiated the royalties.

This assumption, however, runs contrary to actual licensing practices. In actual patent licensing, parties renegotiate royalties and make amendments to their licensing contracts.[230] There is no reason for them to agree that their negotiations should only occur once. As the analysis in this Article shows, parties amend their contracts to reduce the royalty rate, add a royalty cap, remove a pre-determined royalty floor, and so forth.[231] When they amend a contract, it is inevitable that them will take the facts that have arisen since the signature date of their previous contract into account. There is no reason for the parties to limit themselves to the previously existing information. After all, it is precisely the ex post information that necessitates the renegotiation.

Parties use royalty adjustment clauses and make amendments to adjust royalties for various reasons. Market conditions are complex and uncertain. Neither party has exact information about the future beforehand. But patent licensing contracts usually create a long-term relationship. Some events that affect the value of the patent or the patent license are unpredictable. When unpredictable events make the original royalty no longer a fair compensation, the parties need to renegotiate the contract to adjust the terms.[232] The parties might expect other ones, but not know their timing. The parties might expect other ones, but not know their timing. In this situation, the parties will include in their agreement a royalty adjustment clause that will allow them to adjust the royalties as these events occur.[233]

A patent licensing agreement is, in essence, a contract governed by the principles of contract law. Under contract law, obligors are usually liable for the breach the terms even if the ex post events make the obligation harder or less desirable than they expected.[234] Nevertheless, courts might grant a party relief if the occurrence of extraordinary events makes "performance so vitally different from what was reasonably to be expected as to alter the essential nature of that performance."[235] Such relief is an

[229] LaserDynamics, Inc. v. Quanta Comput., Inc., 694 F.3d 51, 76 (Fed. Cir. 2012) ("It also makes sense that in each case there should be only a single hypothetical negotiation date, not separate dates for separate acts of infringement, and that a direct infringer or someone who induced infringement should pay the same reasonable royalty based on a single hypothetical negotiation analysis.").
[230] *See* Section II C.
[231] *See Id.*
[232] *See* Crocker and Masten, *supra* note 162 at 70.
[233] Eric. E. Benson, Bensen on Patent Licensing Transactions § 3.04 (2019).
[234] RESTATEMENT (SECOND) OF CONTRACTS ch. 11 Intro. note (AM. LAW INST. 1981).
[235] *Id.*

adjustment to the obligation in the original contract. In the context of patent licensing, the obligation to pay royalties is within scope of the contractual obligation. In this sense, a court-mandated adjustment to royalties is justifiable under the principles of contract law. To determine whether to grant such an adjustment (the relief), courts must take ex post information into account.[236]

Likewise, when they envision the terms of a hypothetical license in patent infringement litigation, courts also encounter the complexity and uncertainty of the market. Information from after the date when the infringement began can reveal the actual use of the patent and the actual value that this has generated.[237] This is especially the case when extraordinary events happen during the course of the infringing use, which significantly affect the value that the infringement generates. In litigation, if courts the use ex post information to adjust the reasonable royalties, the award that they assess is more likely to be "fair and complete."[238] It is also the case that, as we have ssen, taking the ex post information into account is not inconsistent with actual licensing practices, as we have seen.

The need for the possibility of a royalty adjustment is critical for patent infringement litigation. To meet this need, this Article proposes two modifications to the hypothetical negotiation. First, courts should allow parties to prove that they would have incorporated royalty adjustment clauses into their hypothetical license. Either party may use comparable licenses and expert testimony to satisfy the burden of proof. If the court finds the proof convincing, it may envision a hypothetical license with royalty adjustment clauses. Of course, the parties might fail to prove that they would have done so, in which case the court may base its decision on a hypothetical license without these clauses. It may, for example, follow its current practice of envisioning a hypothetical license with a flat percentage rate.

To illustrate, the patentee might use comparable licenses or expert testimony to prove that at the start of the contract, it would have collected 1% of the net sales of the infringing product, but that it would have raised the royalty rate from 1% to 2% when the infringer's net sales reached $500,000 per year. If the court finds this proof convincing, it can require the infringer to pay 1% of the initial net sales of the infringing product, and 2% in the years in which its sales revenues reached $500,000. Suppose the infringer's net sales are $400,000 in the first year, and $600,000, in the second year. Then the reasonable royalty for the first year's infringement will be $400,000 × 1% = $4,000; and for the second year, $600,000 × 2% = $12,000. If the court finds the patentee's proof of a potential royalty adjustment clause unconvincing, it would only require the infringer to pay 1% of its net sales. Then the reasonable royalty for both the first and the second year would be $400,000 × 1% = $4,000 and $600,000 × 1% =

[236] *Cf. Id.* at § 226.
[237] *See* Jarosz and Chapman, *supra* note 28 at 801 ("Similarly, if realized profits greatly exceed expected profits, a reasonable royalty determined using only ex ante information may substantially undercompensate the patent holder.").
[238] *See Id.* at 800–01.

$6,000 respectively. In this situation, the infringer's sales revenues would not affect the royalty rate.

In addition, courts should be able to use ex post information to calculate reasonable royalties if either party can prove that it would have renegotiated the hypothetical license. During the litigation, either party may seek to show that an extraordinary event occurred in the course of the infringement. The claim would be that this event substantially affected the value of patent and/or the value of the hypothetical license, but that neither party could reasonably have foreseen it based on information available at the time of the hypothetical negotiation. In this situation, they would have renegotiated the terms of the hypothetical license to adjust the reasonable royalties, based on the ex post information. Either party can use comparable licenses, amendments to these licenses, and/or expert testimony to establish the un-foreseeability of the event and the likelihood of renegotiation. If the court decides that the parties would have renegotiated the hypothetical license, it may take into account the ex post information to calculate the reasonable royalty.

To illustrate, a patentee might claim that it would have charged a infringer 3% of the net sales of the infringing product in the hypothetical negotiation, where the parties established the 3% royalty rate based on the infringer's expectation of the market performance of the infringing product. The infringer might then seek to prove that after the date of the hypothetical negotiation, its rivals applied a newly developed technology to their products. These products competed directly with the infringing product, resulting in a significant drop in the infringer's profits. The infringer must show that neither party could have reasonably foreseen the application of the newly developed technology based on ex ante information. In fact, the infringer might further suggest that to maintain the profitability of its sales, it cannot maintain a royalty rate of 3% and that the unexpected development would have triggered a renegotiation. If the court finds the infringer's proof convincing, it might take the intensification of market competition after the date of the hypothetical negotiation into account in its determination of the reasonable royalty.

### B. Apportionment by Formula

When a court calculates a reasonable royalty for an infringed patent used in a multi-component product, it needs to apportion the value of the product between the patented and the unpatented components.[239] Currently, the court uses two rules to accomplish apportionment — the entire market value rule and the smallest salable patent-practicing unit rule. Under the entire market value rule, the court may use the value of the entire multi-component product as royalty base and determine a royalty rate from it. But in this case, the patentee-plaintiff must prove that the patented feature is what drives the

[239] Garretson v. Clark, 111 U.S. 120, 121 (1884).

consumer's demand for the entire product.[240] Otherwise, the court will reduce the royalty base to the value of a patented component.[241] Under the smallest salable patent-practicing unit rule, the court takes the value of the smallest salable patent-practicing component as the royalty base for determining a royalty rate.[242] Both rules share the characteristic that whenever possible, they use the value of a patented component, rather than the value of the entire multi-component product, as the royalty base from which to calculate reasonable royalties.

But the findings reveal another way to accomplish this apportionment: The parties can retain value of the entire multi-component product as the royalty base, determine a royalty rate for it, and then multiply the result by a formula, such as "A/(A+B)." This is one of the six possible formulas that this Article found,[243] but this Article does not rule out the possibility that additional ones could appear in patent licensing practices. The option of apportionment by formula is currently not available in litigation, but it has two advantages over the courts' current rules.

First, retention of the value of the multi-component product as the royalty base can keep economically irrelevant data from entering the calculation of reasonable royalties. A multi-component product and its patented component have different manufacturing costs, distribution expenses, sales price, customer bases, and uses. A royalty base of the value of a patent component would contain economic data idiosyncratic to the manufacture and sale of the patented component, but would not relate directly to the sale of the multi-component product, since it would not take the economic data relating to manufacture and sale of the product into account. In patent licensing, it has been regarded as a good practice for the royalty base to "relate directly to the licensee's use the licensed rights."[244] If the "use of the licensed rights" is to sell the product and its component separately, then the royalty base should reflect the two types of sales.[245] In this way, the royalty base would build "a logical connection between the benefit given to the licensee and the amount paid by the licensee."[246]

To illustrate, real negotiations often use net sales as the royalty base. These equal gross

[240] Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1337–38 (Fed. Cir. 2009).
[241] *Id.*
[242] LaserDynamics, Inc. v. Quanta Computer, Inc., 694 F.3d 51, 67 (Fed. Cir. 2012).
[243] *See* Section II D Table 2 Item 3 to 8 and the accompanying text.
[244] BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 158 (pointing out that an ideal royalty base needs to meet two criteria: 1. It should "relate directly" to the use of the patent by the licensee, and 2. it should be "amenable to reliable accounting and auditing").
[245] *See* Sidak, *supra* note 31 at 990 ("In real-world patent licensing negotiations, firms often calculate royalties with reference to the retail price of the downstream product"); *see also* Cotter, *supra* note 31 at 751 (noting that for convenience, licensing parties "sometimes" choose "sales revenue from sales of the end product" as the royalty base for convenience). The findings of this Article support the commentators' view, in that, to some extent, they confirm the position that licensing entities often calculate royalties on the basis of the sales price of the patented products. Admittedly, we cannot directly observe the complete calculation process in licensing agreements that use lump sum or unit royalty. Nevertheless, we can directly observe the royalty base in those agreements that apply percentage royalties, which account for 62% percent of the agreements that I studied. 98% percent of those contracts use net sales or gross sales as royalty base. Only 2% of them use profits or costs as royalty base. Thus, we know that more than 60% of the licensing agreements studied use the sales price of the products as royalty base.
[246] BRUNSVOLD, O'REILLEY, AND KACEDON, *supra* note 91 at 158.

sales less a defined set of deducible items, such as promotional expenses, the cost of transportation, and returns to customers.[247] Suppose a licensee sells both multi-component products and the patented component, say, computers and the hardware used in the computers. It will collect two sets of data, corresponding to the nets sales of the two items. Data such as the expenses for promoting the sale of the computers, the cost of shipping the computers, and the sales returns to customers who purchase the computers indicate the net computer sales. Similarly the net hardware sales incorporate the expenses for promoting it, shipping it, and the sales returns to customers who purchase it. But the data related to the sale of the hardware is probably not relevant to the sale of computer. For instance, the sales returns made to the customers who purchase the hardware might reflect the market performance of the hardware, but they are probably not relevant to the market performance of the computer. Broadly, we might use the net hardware sales as the royalty base for calculating reasonable royalties for the sale of the computers. But doing so would sever the logical connection between the amount that the licensee pays the patentee and the benefits that the licensee gets from selling computers that implement the patent.

The apportionment methods by formula retain the value of the multi-component product as the royalty base from which to calculate the royalties for the sale of the product. Irrelevant data that only relates to the patented component will not enter the calculation. However, when courts apply the smallest salable patent-practicing unit rule, data idiosyncratic to the sale of the smallest salable patent-practicing component will enter the calculation. When courts apply the entire market value rule and the patentee fails to prove that the patented feature is the basis of customer demand, the royalty base is reduced to the value of a patented component. Then data idiosyncratic to the sale the patented component enter the calculation. Either way, courts risk introducing economically irrelevant data into the calculation of reasonable royalties.[248]

Second, the use of formulas can introduce economically relevant criteria into the apportionment. They allow parties to consider sales price, costs, or profits as economically relevant criteria for apportioning the value of multi-component products. In instances of patent licensing, the parties can select a formula that best connects their criteria to the calculation of royalties. For example, parties may choose to consider the sales prices of the patented component and other components as the relevant criteria. They use the formula A/(A+B), in which "A" is the sales price of the patented component while "B" is the total sales price of the other components. Then they multiply the royalty base by the formula and then multiply the royalty rate. This translates the changes in the sales prices of the patented component and the other components into the adjustments to the formula, fine-tuning the apportionment.

The entire market value rule and the smallest salable patent-practicing unit rule do not

[247] *See* Section II B.

[248] Cotter, *supra* note 31 at 752 ("there is no reason to adopt bright-line rules either forbidding the use of end product sales as a royalty base or of requiring its use in the presence of arbitrary, economically irrelevant factors").

bring in enough of the relevant criteria to allow accurate apportionment. When a court applies the entire market value rule, it asks the patentee-plaintiff to prove that the patent feature drives the customer's demand. If the patentee-plaintiff cannot do so, the court reduces the royalty base to the value of patented component. There is no room in this scenario for the patentee-plaintiff to introduce a formula that accounts for other relevant criteria. Similarly, when a court uses the smallest saleable patent-practicing rule, it uses the value of the smallest saleable patent-practicing component as royalty base. Apportioning in this way also reduces the royalty base. It only requires the royalty base to be the value of "the smallest" salable patented component, but does not provide room for the parties to introduce a formula that contains relevant criteria, such as sales prices, costs, and the number of components, into the calculation of reasonable royalties.

This Article suggests that courts should allow litigants to use formulas to accomplish apportionment in litigation. Specifically, courts should allow either party to prove that but for the infringement it would have used a formula to apportion the value of multi-component product. Either party can use expert testimony, pre-existing licenses, and/or comparable licenses to satisfy the burden of proof. For example, the experts might testify that in field of the patented technology, it is conventional to use a certain formula to accomplish apportionment. Litigants can use existing licenses and comparable licenses to show that a certain formula has been applied repeatedly in the licensing context similar to that of the hypothetical license. If courts find the proof convincing, then they can apply the formula toward the apportionment while retaining the value of the multi-component product as the royalty base.

The Federal Circuit and some commentators have voiced concern that using the value of the multi-component product, instead of the value of a patented component, as royalty base might lead to overcompensation. They fear that a jury will be less equipped to apply sufficiently low rate to a large royalty base.[249] But employing formulas in the calculation reduces this risk. To illustrate, suppose a patented component is sold alone at $100, and that it is also the smallest salable component of a multi-component product. That product, consisting of the patent component and four other components, sells for $500. Now suppose that the jury comes up with a 2% royalty rate for the net sales of both the patented component and the multi-component product and decides to use the formula "1/(1+N)" to apportion the value of the multi-component product. This makes the reasonable royalty for one sale of the multi-component product $500 × 1/(1+4) × 2% = $2. The formula reduces the royalty rate from 2% to one-fifth of that, or 0.4%, which is fairly low. Here, even if the court apportions using the smallest salable patent-practicing unit rule, the result will be the same; that is $100 × 2% = $2.

Formulas are only one alternative for accomplishing apportionment in litigation. Allowing the use of formulas does not mean that courts should discard the entire market value rule or the smallest salable patent-practicing unit rule. Courts might find that neither party is able to prove that it would have used formula to determine

[249] *See supra* note 82 and the accompanying text.

apportionment. In this case, the current two rules would serve as backup methods that would allow courts to finish the task. In fact, these two rules have their equivalents in patent licensing practices. As the findings show, parties sometimes use the value of the patented component as the royalty base when calculating the royalty for the sale of multi-component product.[250] This type of apportionment is similar to the smallest salable patent-practicing unit rule, though it does not require the patented component to be the "smallest" salable component. It is also similar to one aspect of the entire market value rule, where a court will use *the value of patented component* as the royalty base if the patentee *fails to prove* that the patented feature is the basis of the customer demand.

In patent licensing, parties sometimes retain the value of the multi-component product as the royalty base but apply a reduced royalty rate to it.[251] The royalty rate is lower than the rate that the patentee charges for the sale of patented component. This method of apportionment is similar to the other aspect of the entire market value rule, under which courts will use the *value of the entire multi-component product* as the royalty base, if the patentee *successfully proves* that the patented feature is the basis of the customer demand. But courts also need to determine a royalty rate that is lower than the rate that it would have applied to the value of a patented component, i.e. to determine a sufficiently low royalty rate to a large royalty base. Otherwise, the reasonable royalty damages award will overcompensate the patentee.

### C. Arrangements to Deal with Royalty Stacking

There are times when the infringer will need to pay royalties to third parties in addition to the reasonable royalty that it pays the patentee. The Federal Circuit has already acknowledged the need to prevent the aggregate of reasonable royalties and third party royalties from becoming excessive, holding that the presence of royalty stacking might "play a role" in the calculation of reasonable royalties,[252] as long as there is "actual evidence" to support it.[253] Such actual evidence can be the evidence of other licenses that the infringer has taken or royalty demands on the patented product.[254] What the Federal Circuit has not yet specified is the "role" royalty stacking should play in the calculation of reasonable royalties. To answer this question, courts and litigants can refer to the "commercial arrangements" that parties adopt to address the same problem in patent licensing — the anti-royalty-stacking clauses.[255]

Anti-royalty-stacking clauses create a contractual mechanism for the licensee to offset

[250] *See* Section II D Table 2 item 1 and the accompanying text.
[251] *See* Section II D Table 2 item 2 and the accompanying text.
[252] Integra Lifesciences I, LTD. v. Merck KGaA, 331 F.3d 860, 871-72 (Fed. Cir. 2003).
[253] Ericsson, Inc. v. D-Link Sys., 773 F.3d 1201, 1234 (Fed. Cir. 2014).
[254] *Id.*
[255] Lemley and Shapiro, *supra* note 31 at 1150 (suggesting that tribunals need to learn from the "commercial arrangements" that entities adopt to solve the royalty stacking problem).

third party royalties against the royalties otherwise payable to the patentee. Patentees often allow licensees to offset a portion of their third party royalties, say, up to 50%. Frequently, patentees set a floor for the royalties paid to them. For example, a patentee might require that the royalties after offset should not be lower than two-third of the royalties before the offset.[256] Or, a patentee might not allow the offset unless the third party patent license meets certain criteria. For example, a patentee might require the third party license to be necessary to the implementation of its patent. Some patentees require the licensee to present the evidence of royalty stacking. Sometimes they only allow the offset only when the licensee's profits drop below a certain threshold or when the aggregate royalties exceed a pre-determined one.[257]

Anti-royalty-stacking clauses can provide courts with some hints about how to deal with third party royalties when they calculate reasonable royalties. Courts might allow third party royalties to offset reasonable royalties in the presence of royalty stacking. To establish the presence of royalty stacking, the infringer-defendant would have to prove that it takes licenses from third parties. But showing that third party licenses exist is not enough to establish the presence of royalty stacking; the third party license might be royalty-free, with no royalty due from the infringer-defendant.[258] Therefore, the infringer-defendant would also need to prove that the third party licenser is charging it positive royalties.

Further, even when the third party royalties are positive, the aggregate of third party royalties and reasonable royalties might not be enough to trigger royalty stacking. Courts need to find a standard by which to determine whether royalty stacking is present or not. To make similar determinations in patent licensing, parties sometimes compare the gross margin on the sales of the patented product to a threshold; royalty stacking exists if the gross margin is lower than the threshold. Alternatively, they might compare the aggregate royalty to a threshold; if the former is higher, royalty stacking is present.[259] Likewise, courts might require the infringer-defendant to establish a threshold below which its profits are unreasonably low, or a threshold above which the aggregate royalties are unreasonably high. The infringer-defendant might introduce expert testimony, comparable licenses with anti-royalty-stacking clauses, industrial reports concerning normal profits, and so forth, to establish the threshold. On the other hand, the patentee-plaintiff can challenge the establishment of the threshold with counter-evidence. Once the infringer-defendant successfully establishes the threshold, it would also have to compare its profits or aggregate royalties to prove the presence of royalty stacking.

Once the infringer-defendant establishes the presence of royalty stacking, the court can

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[256] *See, e.g.*, The Board of Regents of The University of Texas System & Bio-Path Inc., Patent and Technology License Agreement § 4.7, 2013 WL 11158697.
[257] *See supra* notes 215 and 216.
[258] *See supra* Section II A.
[259] *See, e.g.*, Miragen Therapeutics, Inc. & The Brigham and Women's Hospital, Inc., Exclusive Patent License Agreement § 4.5(b), 2016 WL 07030675.

allow the third party royalties to offset the reasonable royalties that it would otherwise pay the patentee. At this point, the patentee-plaintiff might need to prove that there should be limitations to the offset. As patentees often do in patent licensing, the patentee-plaintiff might seek to limit the offset of reasonable royalties in two ways. First, it might claim that the third parties' technologies are only remotely associated with the implementation of its patent, and therefore the infringer should not be able to deduct the royalties for these technologies from the reasonable royalties. To prove this claim, the patentee-plaintiff can rely on comparable licenses. For example, it may show that although it allowed third party royalties to offset its royalties in previous comparable licenses, the third party licenses must be *necessary* to the implementation of its patent.[260]

Second, the patentee-plaintiff might claim that only a percentage of the third party royalties is deductible. Similarly, it might use its previous comparable licenses to prove that it would only have allowed only a portion, such as 50%, of third party royalties to offset its royalties. For another thing, the patentee-plaintiff might claim that there should be a floor below which its royalties should not fall, despite the offset. After all, the presence of royalty stacking is not a justification for depriving the patentee-plaintiff of its entitlement to fair compensation. To establish the floor, the patentee-plaintiff can, again, rely on its previous comparable licenses. Or it might introduce expert testimony to prove a minimum reasonable royalty for the infringing use of its patent.

## Conclusion

By examining the law governing patent damages, this Article takes one step toward a legal system that rests on a solid evidence base. It uses 400 patent licensing contracts as the evidence against which to test the judicial doctrines for calculating reasonable royalty damages. Courts currently use these doctrines to determine patent damages equal to the royalties that infringers would have paid to the patentees for a patent license but for the infringement. This Article presents three areas of divergence between the doctrines and actual patent licensing practices. First, courts do not allow royalty adjustments based on ex post information, while licensing parties can adjust royalty based on this information. Second, courts do not employ formulas to accomplish apportionment as parties do in patent licensing. Third, where courts do not have an effective way to deal with royalty stacking, parties have a sophisticated method doing so by allowing licensees to third party royalties to offset against the royalties that the infringer owes the patentee.

The ultimate goal of the evidence-based approach to law is to "create better law — law

[260] *See, e.g.*, The Board of Regents of The University of Texas System & Bio-Path Inc., Patent and Technology License Agreement § 4.7, 2013 WL 11158697.

informed by reality."[261] To this end, this Article recommends that courts and litigants should use a more evidence-based approach to the determination of patent damages by incorporating certain elements of licensing contacts into the current judicial doctrines. First, courts should allow litigants to adjust reasonable royalties based on ex post information. Second, courts should allow litigants to use formulas to accomplish apportionment and to retain the value of multi-component products as the royalty base. Third, courts should allow the infringer-defendant to offset third parties' royalties against the reasonable royalty that it owes the infringed patentee-plaintiff. The incorporation of these elements makes the patent damages assessment more fair, sophisticated, and economically logical.

This Article is part of a wave of scholarship that seeks to make the current legal system more evidence-based. This transformation is far from complete, as two impediments remain in the way. First, the conflicting goals of a law can impose a delay of law reform; when a law's goal is contestable, the direction in which to reform it — and by extension, on which evidence to base the reform — is unclear as well.[262] But reform is the only way to incorporate new evidence into law. Second, the high costs of collecting evidence impede the establishment of a solid evidentiary base for the law.[263] This impediment is particularly relevant when it comes to the establishment of evidence-based judicial doctrines. As this Article shows, the structure of judicial doctrines is often intricate, so as the contents of evidence. Scholars or practitioners need to put in a significant effort in order to collect and analyze the evidence before they can test against the doctrines against it. However, under the current legal system, judges tend to base the judicial doctrines that they make on the evidence that litigants present to them. Yet, litigants are likely not to invest heavily in production of such empirical evidence when anecdotal evidence is sufficient to support their case. They have no incentive to collect empirical evidence for the purpose of informing future judicial doctrines. Given the impediments, it is a difficult task to make the building of a evidence-based legal system a reality and not just an aspiration.

[261] Rachlinski, *supra* note 8 at 910
[262] *Id.* at 901, 917.
[263] *See* Warren, *supra* note 22 at 27; Golden, Merges, and Samuelson, *supra* note 10 at 1758; Charn, *supra* note 11 at 2233.

## Appendix-The Dataset

Information about actual patent licensing practices of companies is difficult to obtain because patent license agreements are often held in confidence as trade secrets. The reasons for holding such information secret are compelling, as they can reveal licensee's costs, strategic partnerships, future business plans, etc. Much of this information could be helpful to competitors. If firms are not legally required to reveal that information, they are very likely not to do so. But the Securities Act of 1933 and the Securities Exchange Act of 1934 authorize the U.S. Securities and Exchange Commission (the SEC) to require public companies to disclose certain information in order to protect investors and to insure fair dealing. The SEC has exercised that statutory authority to promulgate rules requiring the disclosure of certain information that is "material" to public companies. Companies must disclose to the public all patent license agreements that fall into the category of "material contracts."[264]

Specifically, under Section 7 of the Securities Act of 1933 and Section 12 of the Securities Exchange Act of 1934, when a company makes a public offering, it must file a registration statement, and the relevant material contracts, with the SEC.[265] Under Sections 13 and 15(d) of the Securities Exchange Act of 1934, a public company must file material contracts, along with annual reports and both quarterly and current reports, with the SEC.[266] According to 17 CFR § 229.601(a)(4), public companies must file their material contracts as exhibits to the reports, and their registration statements if the material contracts are executed or become effective during the reporting period reflected by the annual reports, quarterly reports, or current reports, or if the text of the registration statement incorporates them by reference.[267] 17 CFR § 229.601(b)(10) defines "material contracts" as contracts that are not made in the ordinary course of business, which are material to the registrant.[268] The same rule regards patent licenses, even when made in the ordinary course of business, as "material contracts" if the registrant's business substantially depends on them. [269] This means that if a registrant files a patent license as an exhibit with its reports, it is, by definition, a material contract that is important to the registrants' business.

The patent license agreements that were examined for this Article were all "material contracts" that SEC registrants filed as exhibits to their reports. They were retrieved from the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) of the SEC. But EDGAR does not store documents by category, which made it hard to collect EDGAR's patent licenses systematically. Fortunately, Westlaw has drawn the exhibits from EDGAR since January 1, 2000 and stored them by category, including a category

264 17 CFR § 229.601 (a) (4) (2018).
265 15 U.S.C. §§ 77g, 78l (2012).
266 15 U.S.C. §§ 78m, 78o (d) (2012).
267 17 CFR § 229.601(a) (4) (2018).
268 17 CFR § 229.601 (b) (10) (2018).
269 *Id.*

for patent license agreements. Specifically, Westlaw created a library called "Patent License Agreements" in which to store the patent licenses that registrants disclosed as material contracts. The "Patent License Agreements" library picks out and stores an agreement if (1) its title contains the terms of "license," "royalty," or "sub-license"; (2) its title contains the word "patent"; and (3) its title does not contain any of "collateral," "amendment," or "amended." Westlaw regards agreements that meet these three criteria as patent license agreements that it should store in the library.

Admittedly, this data selection method is bound to neglect some patent license agreements with titles that do not meet these three criteria. For example, patent license agreements with the titles of "intellectual property agreement" or "license agreement" will be not be included by this library. But this selection method is relatively efficient and accurately picks out patent license agreements among millions of documents without intensive analysis of their contents. Because of a lack of a better database that systematically collects patent license agreements, this Article chose this library as the data source.[270]

From the "Patent License Agreements" library, this Article collected agreements filed between January 1, 2000 and May 14, 2018, collectively 659 documents. Some of these were not suitable for patent license analysis, however, because they contained duplications or irrelevant documents, such as press releases, patent security agreements, and patent sublicense agreements. This Article examined the documents one by one to identify and delete the irrelevant ones. Finally, 400 patent license agreements and 61 amendments to patent license agreements were left. This Article examined the royalty clauses of each of these. It also looked at the amendments, in order to find whether and how the parties adjusted the royalties in their original contracts.

Several factors might have caused biases to the conclusions in this Article. First, all of the patent licenses in this research came from companies that registered with the SEC or from their subsidiaries; none covered patent licenses between private companies with no relationship to SEC registrants. Second, the SEC does not require the disclosure to the public of patent licensing agreements that are "immaterial in amount or significance."[271] Therefore, the data might not represent the patent licenses that are insignificant. Third, Westlaw's selection of patent license agreements might be biased. It filtered out any patent licenses whose title did not contain the word "patent," "license," "royalty," or "sub-license." Fourth, some of the patent licenses were redacted because of their confidentiality, so the information about licensed patents and royalty rates was not available.[272] Since there was no way to retrieve the redacted data, this Article has

[270] Westlaw states that its "EDGAR Precedent Agreements" database "provides access to over a million executed business agreements with language, clauses, and provisions drafted by leading law firms and in-house counsel." The "Patent License Agreements" library is one of the sub-databases. *See Patent License Agreements*, Westlaw Edge, https://1.next.westlaw.com (follow "EDGAR Precedent Agreements" hyperlink under "Business Law Center") (last visited Oct 25, 2018).
[271] 17 CFR § 229.601 (b) (10) (2018).
[272] Pursuant to 17 CFR § 230.406 (2018) and 17 CFR § 240.24b-2 (2018), the registered company can choose to redact information that might adversely affect the company if the information is made publicly available.

explicitly reported its uncertainty, where relevant.