

January 2021

Evidence-Based Patent Damages

Taorui Guan

Follow this and additional works at: <https://digitalcommons.law.uga.edu/jipl>



Part of the [Intellectual Property Law Commons](#)

Recommended Citation

Taorui Guan, *Evidence-Based Patent Damages*, 28 J. INTELL. PROP. L. 1 (2021).

Available at: <https://digitalcommons.law.uga.edu/jipl/vol28/iss1/2>

This Article is brought to you for free and open access by Digital Commons @ Georgia Law. It has been accepted for inclusion in Journal of Intellectual Property Law by an authorized editor of Digital Commons @ Georgia Law. [Please share how you have benefited from this access](#) For more information, please contact tstriepe@uga.edu.

Evidence-Based Patent Damages

Cover Page Footnote

S.J.D. Candidate, the University of Virginia School of Law; Thomas Edison Innovation Fellow, Center for the Protection of Intellectual Property at Antonin Scalia Law School. I owe my deepest gratitude to John Duffy, for generously sharing his wisdom and knowledge, and for inspiring me throughout the course of this research. I am grateful to Richard Hynes and Michael Risch for their comments, and to Dotan Oliar for his suggestions to the earlier drafts. I am also grateful to Pierre-Hugues Verdier, Apinop Atipiboonsin, Sarah Alsultan, Franz Erwin Oberarzbacher Davila, and the other participants in the Dissertation Colloquium at the University of Virginia School of Law for their criticism and encouragement. I thank Jon Ashley and Alexander Jakobow for their help in data collection and analysis. I thank Jace D. Williams, Ashton Williams, and Charles Turner for their excellent editing. All errors and omissions remain mine alone.

EVIDENCE-BASED PATENT DAMAGES

*Taorui Guan**

* S.J.D. Candidate, the University of Virginia School of Law; Thomas Edison Innovation Fellow, Center for the Protection of Intellectual Property at Antonin Scalia Law School. I owe my deepest gratitude to John Duffy, for generously sharing his wisdom and knowledge, and for inspiring me throughout the course of this research. I am grateful to Richard Hynes and Michael Risch for their comments, and to Dotan Oliar for his suggestions to the earlier drafts. I am also grateful to Pierre-Hugues Verdier, Apinop Atipiboonsin, Sarah Alsultan, Franz Erwin Oberarzbacher Davila, and the other participants in the Dissertation Colloquium at the University of Virginia School of Law for their criticism and encouragement. I thank Jon Ashley and Alexander Jakubow for their help in data collection and analysis. I thank Jace D. Williams, Ashton Williams, and Charles Turner for their excellent editing. All errors and omissions remain mine alone.

2

J. INTELL. PROP. L.

[Vol. 28:1

TABLE OF CONTENTS

I.	INTRODUCTION.....	3
II.	THE JUDICIAL DOCTRINES OF THE HYPOTHETICAL NEGOTIATION FOR CALCULATING REASONABLE ROYALTY DAMAGES.....	9
A.	DATE OF THE HYPOTHETICAL NEGOTIATION AND ROYALTY ADJUSTMENT	11
B.	THE ENTIRE MARKET VALUE RULE AND THE SMALLEST SALABLE PATENT-PRACTICING UNIT RULE	14
C.	ROYALTY STACKING.....	18
III.	ROYALTIES IN PATENT LICENSING CONTRACTS.....	20
A.	AN OVERVIEW OF ROYALTIES IN PATENT LICENSING CONTRACTS	20
B.	ROYALTY BASE	26
C.	ROYALTY ADJUSTMENT	33
D.	APPORTIONMENT METHODS.....	38
E.	ANTI-ROYALTY-STACKING CLAUSES.....	43
IV.	IMPLICATIONS	46
A.	ADJUSTMENTS TO REASONABLE ROYALTY.....	47
B.	APPORTIONMENT BY FORMULA	51
C.	ARRANGEMENTS TO DEAL WITH ROYALTY STACKING.....	56
V.	CONCLUSION.....	58
VI.	APPENDIX- THE DATASET	59

I. 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.¹ This movement began in the field of medicine² then gradually extended to other fields, including psychology,³ education,⁴ business,⁵ and public policy.⁶

This movement has also reached the field of law.⁷ Legal scholars and practitioners have embraced the idea of taking an evidence-based approach to

¹ See, e.g., 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 preferences”); David L. Sackett, *Evidence-Based Medicine*, 21 SEMINARS IN PERINATOLOGY 3, 3 (1997) (citing David L. Sackett et al., *Evidence Based Medicine: What it is and what it isn't*, 312 BMJ 71,71 (1996)) (defining evidence-based medicine as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients”).

² See generally Izet Masic, Milan Miokovic & Belma Muhamedagic, *Evidence Based Medicine – New Approaches and Challenges*, 16 ACTA INFORM MED 219, 225 (2008) (discussing how an evidence-based approach helps doctors treat patients); 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 1 (noting that medical practitioners use evidence-based practice to produce “more powerful, more accurate, more efficacious, and safer” diagnostic tests and treatment).

³ See generally American Psychological Association Presidential Task Force on Evidence-Based Practice, *supra* note 1.

⁴ See generally Robert E. Slavin, *Evidence-Based Education Policies: Transforming Educational Practice and Research*, 31 EDUC. RESEARCHER 15 (2002).

⁵ See generally Jeffrey Pfeffer & Robert I. Sutton, *Evidence-Based Management*, 84 HARV. BUS. REV. 62 (2006).

⁶ See generally RAY PAWSON, EVIDENCE-BASED POLICY: A REALIST PERSPECTIVE (2006); Ross C. Brownson, Jamie F. Chiqui & Katherine A. Stamatakis, *Understanding Evidence-Based Public Health Policy*, 99 AM. J. PUB. HEALTH 1576 (2009) (summarizing different 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 to inform 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) (“[E]vidence-based policymaking is a cornerstone of effective and efficient government.”).

⁷ See Jeffrey J. Rachlinski, *Evidence-Based Law*, 96 CORNELL L. REV. 901 (2011) (explaining the rise of empirical studies in law).

law by making improvements to law according to empirical findings.⁸ Since the 1990s, the quantity of empirical scholarship, which builds the evidence base for the reform of existing law, has increased continuously.⁹ 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 findings of a multi-year program of random controlled trials.¹⁰ 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.¹¹ Sonja B. Starr examined both evidence that came from the real world, and evidence that she generated through a “randomized experiment using fictional cases.”¹² Based on the findings, she proposed an adjustment to criminal sentencing.¹³ The idea of using evidence to inform legal practice has also spread among legal institutions. As Cecelia Klingele 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.¹⁴ These practices are based on evidence from criminological research about what constitutes effective crime prevention.¹⁵

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.¹⁶ As Jeffrey Rachlinski put it, “it is well short of creating an evidence-based legal system.”¹⁷ At least two problems impede the movement in

⁸ See *id.* at 905–07, 910–17 (explaining the rise of empirical studies of law).

⁹ See Michael Heise, *An Empirical Analysis of Empirical Legal Scholarship Production, 1990-2009*, 2011 U. ILL. L. REV. 1739, 1741-1746 (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 accelerated . . .”).

¹⁰ See Jeanne Charn, *Celebrating the “Null” Finding: Evidence-Based Strategies for Improving Access to Legal Services*, 122 YALE L.J. 2206, 2232–34 (2013).

¹¹ Christine Jolls, *Debiasing Through Law and the First Amendment*, 67 STAN. L. REV. 1411, 1413–14 (2015).

¹² Sonja B. Starr, *Evidence-Based Sentencing and the Scientific Rationalization of Discrimination*, 66 STAN. L. REV. 803, 803 (2014).

¹³ *Id.* at 803.

¹⁴ Cecelia Klingele, *The Promises and Perils of Evidence-Based Corrections*, 91 NOTRE DAME L. REV. 537, 537–39 (2016).

¹⁵ *Id.* at 537.

¹⁶ Rachlinski, *supra* note 7, at 910 (“Compared to other disciplines, evidence-based law lags.”).

¹⁷ *Id.* at 917.

this direction. The first is the law itself—“law has conflicting goals.”¹⁸ 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.¹⁹ 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 to building an evidence-based legal system. For the legal community, developing the research capacity for generating evidence can be a “challenge.”²⁰ In certain areas of law, such as intellectual property, a “heavy investment” might be necessary.²¹ This impediment is particularly 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 comes 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. Litigants, however, are unlikely to invest heavily in the production of empirical evidence when they can rely on anecdotal evidence to support their case.²² They have no incentive to collect empirical evidence to inform 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.”²³ In their view, evidence that reveals the operation of the intellectual property system and that supports potential reforms remains “frustratingly sparse.”²⁴ They also called for legal scholarship that would

¹⁸ *Id.* at 901, 917.

¹⁹ *Id.*

²⁰ See Charn, *supra* note 10, at 2233.

²¹ See Golden, Merges & Samuelson, *supra* note 9, 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, 26 (2002) (“[A]n empiricist must become not only a hunter for data, but also a hunter for money.”).

²² Cf. Rachlinski, *supra* note 7, 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”).

²³ Golden, Merges & Samuelson, *supra* note 9, at 1768.

²⁴ *Id.* at 1758.

generate the empirical evidence that would serve as the base for future legal reform.²⁵

This Article brings the field one step closer to 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.²⁶ A reasonable royalty is calculated by mimicking the ways that patent licensing parties calculate royalties.²⁷ Courts imagine the infringed patentee as a willing licensor and the infringer as a willing licensee. They 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.”²⁸ 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 “hypothetical negotiation.”²⁹

The hypothetical negotiation is designed to mimic the way that patent licensing parties calculate royalties. Despite this design, scholars devote little attention to testing the doctrines of the hypothetical negotiation against how parties calculate royalties in actual patent licensing contracts. Legal scholars have conducted several conceptual or analytic assessments to calculate patent damages but have not provided an empirical assessment in this regard.³⁰ Economists have

²⁵ *Id.* at 1759.

²⁶ 35 U.S.C. § 284 (2012). See Chris Barry et al., *Patent Litigation Study: Big Cases Make Headlines, While Patent Cases Proliferate*, 2013 PRICEWATERHOUSECOOPERS, at 5 (noting that reasonable royalty accounts for over 80% of awards from 2007 to 2013); *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1312 (Fed. Cir. 2011) (“A reasonable royalty is the predominant measure of damages in patent infringement cases.”).

²⁷ *Panduit Corp. v. Stahl 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.”) (emphasis omitted).

²⁸ *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1554 (Fed. Cir. 1995) (en banc).

²⁹ *Id.* See also *Minks v. Polaris Indus., Inc.*, 546 F.3d 1364, 1372 (Fed. Cir. 2008).

³⁰ 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) [hereinafter Lemley & Shapiro, *Holdup & Stacking*]; 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) [hereinafter Lemley & Carl, *Reasonable Royalties*];

conducted some empirical studies of royalty calculation in patent licensing. Still, none of these empirical studies examined the contractual terms against doctrines of patent damages.³¹ Without a study to compare actual licensing practices and the legal doctrines, we cannot know whether the hypothetical negotiation doctrine reflects actual patent licensing practices, as alleged.³²

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 being contracts between small private companies and possibly

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 & Chapman, *supra* note 27; Thomas F. Cotter, *Patent Holdup, Patent Remedies, and Antitrust Responses Innovation & Competition Policy*, 34 J. CORP. L. 1151 (2009) [hereinafter Cotter, *Holdup, Remedies, and Responses*]; 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) [hereinafter Sidak, *Proper Royalty Base*]; 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 COMPUT. & HIGH TECH. L. J. 725 (2011) [hereinafter Cotter, *Four Principles*]; J. Gregory Sidak, *How Relevant Is Justice Cardozo’s Book of Wisdom to Patent Damages*, 17 COLUM. SCI. & TECH. L. REV. 246 (2016) [hereinafter Sidak, *Book Of Wisdom*]; 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).

³¹ 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).

³² 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. Cotter, *Holdup, Remedies, and Responses*, *supra* note 30, at 1187. *Patent Holdup, Patent Remedies, and Antitrust Responses*, 34 J. CORP. L. 1151, 1187 (2009).

not significant enough to be regarded as material contracts, it is the best evidence available to the public. These contracts reveal how parties calculate royalties for high-value patents that are important to their businesses.

After a systematic examination of these patent licensing contracts and the doctrines of the hypothetical negotiation, this Article finds 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.”³³ To this end, this 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 follows:

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 parties 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 to determine the royalties on a patent incorporated into a multi-component product. Usually, a royalty equals a royalty base multiplied by a royalty rate.³⁴ 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.³⁵ But in litigation, the use of formulas is not available. Instead, 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

³³ Rachlinski, *supra* note 7, at 910.

³⁴ 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.

³⁵ See Section II.D, Table 2, items 3-8 and accompanying text.

data from entering the calculation of reasonable royalties and can weigh economically relevant criteria for apportionment.

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 where aggregate royalties become so excessive the licensee no longer implements the patent. 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.³⁶ This Article suggests that courts and litigants can learn ways to deal with royalty stacking in litigation from these anti-royalty-stacking clauses.

Section II 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 III 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 IV 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.

II. 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.³⁷ After a court

³⁶ *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 & Shapiro, *Reasonable Royalties*, *supra* note 30, at 1150 (suggesting that courts learn from the commercial arrangements that licensing entities adopt).

³⁷ 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.

determines that an infringer has infringed a patentee's patents, it needs to determine an amount that will 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.³⁸ “Reasonable royalty” refers to the royalties that an infringer would have paid for a license but for the infringement.³⁹ 35 U.S.C. § 284 stipulates that the damages for infringements should not be “less than a reasonable royalty for the use made of the invention by the infringer.”⁴⁰ Even if patent holders fail to prove lost profits, they can seek reasonable royalty damages.⁴¹ Reasonable royalty is currently the kind of damages that courts use most frequently.⁴²

Courts have various approaches for calculating reasonable royalties,⁴³ but the hypothetical negotiation is the predominant one.⁴⁴ 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.”⁴⁵ When a court envisions these terms, it considers a list of factors and follow certain rules.⁴⁶ The rules affect how it calculates reasonable royalties and

2007) (en banc) (“[A]ctual damages provable at law . . . could nevertheless be less than sufficient to compensate the patentee.”).

³⁸ See *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1156 (6th Cir. 1978); Lemley, *supra* note 30, at 657.

³⁹ *Panduit*, 575 F.2d at 1157-58; *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1580 (Fed. Cir. 1989).

⁴⁰ 35 U.S.C. § 284 (2012).

⁴¹ See *Panduit*, 575 F.2d at 1157 (“When actual damages, e.g., lost profits, cannot be proved, the patent owner is entitled to a reasonable royalty.”).

⁴² 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, 1312 (Fed. Cir. 2011) (“A reasonable royalty is the predominant measure of damages in patent infringement cases.”).

⁴³ *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.”).

⁴⁴ *Jaros & Chapman*, *supra* note 27, 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”).

⁴⁵ *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1554 (Fed. Cir. 1995) (en banc). See also *Minks v. Polaris Indus.*, 546 F.3d 1364, 1372 (Fed. Cir. 2008).

⁴⁶ *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970) (setting out 15 factors for courts to consider). Scholars, however, have criticized this list as

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 considering later developments. Specifically, courts place this negotiation on “the date when the infringement began.”⁴⁷ 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 Computer, 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.”⁴⁸

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*, 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.”⁴⁹ 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.

being too malleable and difficult to implement. See Cotter, *Four Principles*, *supra* note 30 at 730 (2011).

⁴⁷ *Rite-Hite*, 56 F.3d at 1576; see also *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 75 (Fed. Cir. 2012) (“In general, the date of the hypothetical negotiation is the date that the infringement began.”); *Panduit Corp. v. Stahl Bros. Fibre Works*, 575 F.2d 1152, 1158 (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.”).

⁴⁸ *LaserDynamics*, 694 F.3d at 75 (quoting *Riles v. Shell Expl. & Prod. Co.*, 298 F.3d 1302, 1313 (Fed. Cir. 2002)).

⁴⁹ *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.”).

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 rests on a 1933 Supreme Court case, *Sinclair Refining Co. v. Jenkins Petroleum Co.*⁵⁰ 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 these limited situations, 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 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 an 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

⁵⁰ *Sinclair Ref. Co. v. Jenkins Petroleum Co.*, 289 U.S. 689 (1933).

⁵¹ *Id.* at 697-99.

⁵² *Id.* at 697.

⁵³ *See Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1333 (Fed. Cir. 2009) (“[C]ase 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.”).

⁵⁴ *Lucent Techs.*, 580 F.3d at 1334.

⁵⁵ *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 772 (Fed. Cir. 2014).

⁵⁶ In *Aqua Shield*, 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*, 774 F.3d at 772.

⁵⁷ *See Suzanne Michel, Bargaining for RAND Royalties in the Shadow of Patent Remedies Law*, 77 ANTI-TRUST L.J. 889, 898 (2011); *see also Lee & Melamed, supra* note 30, at 403 (“If the parties would not have known about those *ex post* matters at the time of the *ex ante* bargain,

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 *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* information as evidence by which to infer parties' knowledge at the time of, but no later than, the hypothetical negotiation. These commentators hold that courts can rely on such information to approximate what parties knew at the time of the hypothetical negotiation, but cannot use such information 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.

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 See Lee & Melamed, *supra* note 30, 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, *Book of Wisdom*, *supra* note 30, at 282–83.

⁶⁰ See Jarosz & Chapman, *supra* note 27, 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 801.

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

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 33% of the net sales price of the patent-infringing products, in which the net sales price of patent-infringing products is the royalty base, and 33% is the royalty rate.⁶⁴ 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.”⁶⁵ In *Rite-Hite Corp. v. Kelley Co.*, the Federal Circuit held that courts can use the entire market value of a multi-component product as the royalty base. Courts may only do this where the patentee proves that “the patent-related feature is the ‘basis for customer demand.’”⁶⁶ 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* and *Uniloc USA, Inc.*, the Federal Circuit declined to use the entire market value of the multi-component product as the royalty base because the patentees could not meet the burden of proof.⁶⁷

⁶³ *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1338-39 (Fed. Cir. 2009).

⁶⁴ *Trend Prod. Co. v. Metro Indus. Inc.*, No. CV 84-7740 AHS (JRX), 1989 WL 418778, at *8 (C.D. Cal. Jan. 12, 1989) (finding that 3% of net sales of the infringing product as the reasonable royalty for the plaintiff’s damages).

⁶⁵ *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* Seaman, *supra* note 30, at 1699 (noting that the entire market value rule is “often invoked by patentees to calculate the royalty base for a reasonable royalty award”); Yang, *supra* note 30, at 655.

⁶⁶ *Rite-Hite*, 56 F.3d at 1549 (quoting *State Indus. v. Mor-Flo Indus.*, 883 F.2d 1573, 1580 (Fed. Cir. 1989)).

⁶⁷ *See* *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 software’s product activation feature was the basis for consumer demand); *Lucent Techs.*, 580 F.3d at 1337–38 (denying the use of the entire market value rule because the patentee failed to prove that the patented date-picker tool was the basis of consumer demand for the infringing software, Outlook).

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. Notably, there is no standard definition of the smallest salable patent-practicing unit. The term first appeared in the district court case, *Cornell University v. Hewlett-Packard Co.*⁶⁸ Here, the patent at issue applied to a component of an instruction reorder buffer that was part of a computer processor, which itself worked in larger servers or workstations.⁶⁹ The court declined to use the sales price of the larger servers and workstations as a royalty base.⁷⁰ The court 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.⁷¹

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 computers.⁷² 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. It is based “instead on the ‘smallest salable patent-practicing unit.’”⁷³ The court also held that the entire market value rule was a “narrow exception to this general rule.”⁷⁴ 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.”⁷⁵

The selection of the royalty base is relevant to a requirement called “apportionment” that was set by an 1884 Supreme Court case, *Garretson v. Clark*.⁷⁶ Both the entire market value rule and the smallest salable patent-practicing unit rule are derived from this case.⁷⁷ In the case, the Court required

⁶⁸ *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 67 (Fed. Cir. 2012) (citing *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 283 (N.D.N.Y. 2009) (formulating the smallest salable patent-practicing unit rule)). *See also* Kappos & Michel, *supra* note 30, at 1438–44 (describing the origin and development of the smallest salable patent-practicing unit rule).

⁶⁹ *Cornell*, 609 F. Supp. 2d at 283.

⁷⁰ *Id.*

⁷¹ *Id.* at 288.

⁷² *LaserDynamics, Inc.*, 694 F.3d at 68.

⁷³ *Id.* at 67.

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ *See generally* *Garretson v. Clark*, 111 U.S. 120 (1884).

⁷⁷ *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-

the patentee to give evidence tending to separate 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.⁷⁸

According to this holding, the patentee has two choices. Like the requirement of the 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."⁷⁹ 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 the entire market value rule, courts reduce the royalty base from the value of the multi-component products to that of the patented components. The exception to this is when the patentee proves that the patented feature is the "basis for customer demand."⁸⁰ 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.⁸¹ 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.⁸²

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 30, at 656 (noting that apportionment is a closely related concept to the entire market value rule); see also Kappos & Michel, *supra* note 30, 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).

⁷⁸ *Garretson*, 111 U.S. at 121.

⁷⁹ *Id.*

⁸⁰ *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1336 (Fed. Cir. 2009).

⁸¹ *Ericsson*, 773 F.3d at 1226.

⁸² See Cotter, *Holdup, Remedies, and Responses*, *supra* note 30, at 1186 n.166 ("[I]n theory use of the entire market value as a royalty base need not lead to excessive awards, as long as an appropriately small royalty rate is used, in practice juries may find it difficult to accept appropriately small rates.").

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,⁸³ particularly when a jury, instead of a judge, calculates the reasonable royalty. Due to cognitive bias, these commentators believe that juries are less equipped to reach a sufficiently low rate.⁸⁴ The resulting overcompensation might give patentees, especially non-practicing entities, the incentive to enforce their patents aggressively and make less effort to design, manufacture, and distribute products.⁸⁵ It might also increase the aggregate royalties for manufacturing new products to an excessively high level, discouraging companies from trying to innovate.⁸⁶

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

⁸³ See Lemley, *supra* note 30, at 664; see also Love, *supra* note 30, 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).

⁸⁴ 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.*, 773 F.3d at 1226-27 (holding that jury might be “less 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”); see also Yang, *supra* note 30, at 655 (noting that “it is difficult for the trier of fact to arrive at a sufficiently low rate if the overall product is too far removed from the patent component”); see also Bailey, Leonard & Lopez, *supra* note 30, at 259-60. *But cf.* Sidak, *Proper Royalty Base*, *supra* note 30, at 999; Kappos & Michel, *supra* note 30, 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”).

⁸⁵ See Lemley, *supra* note 30, 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 30, 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).

⁸⁶ See Yang, *supra* note 30, at 652 (claiming that the potentially over-compensatory effect of the current law of patent damages might lead to a royalty stacking problem when a product involves multiple patented inventions); see also Love, *supra* note 30, at 280–81 (claiming that the application of the entire market value rule causes overcompensation, which can exacerbate the royalty stacking problem).

reference to the retail price of the downstream product.”⁸⁷ 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.⁸⁸ 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.⁸⁹ 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.⁹⁰ 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.⁹¹

C. ROYALTY STACKING

In some industries, such as electronics and biotechnology, one product can involve multiple patents.⁹² 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.⁹³

⁸⁷ Sidak, *Proper Royalty Base*, *supra* note 30, at 990; *see also* Cotter, *Four Principles*, *supra* note 30, 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*.”).

⁸⁸ Sidak, *Proper Royalty Base*, *supra* note 30, at 990. *See also* Cotter, *Four Principles*, *supra* note 30, 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 & Michel, *supra* note 30, 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 should not trump market evidence).

⁸⁹ Sidak, *Proper Royalty Base*, *supra* note 30, at 994; *see also* Bailey, Leonard, & Lopez, *supra* note 30, 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”).

⁹⁰ *See* Sidak, *Proper Royalty Base*, *supra* note 30, at 994.

⁹¹ *Id.* at 1019–20. *See also* Bailey, Leonard & Lopez, *supra* note 30, at 260–62 (analyzing the value that synergies generate).

⁹² *See* Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, 1 INNOVATION POL’Y & ECON. 119, 119 (2000).

⁹³ *See, e.g.*, Lemley & Shapiro, *Holdup and Stacking*, *supra* note 30, at 1993, 2011–12. BRIAN G. BRUNSVOLD, DENNIS P. O’REILLY & D. BRIAN KACEDON, DRAFTING PATENT LICENSE AGREEMENTS 172–73 (6th ed. 2008).

The Federal Circuit acknowledged that royalty stacking can be treated as a factor in the calculation of reasonable royalties.⁹⁴ In *Integra Lifesciences I, Ltd. v. Merck KGaA*, the patent at issue was 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.⁹⁵ 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.⁹⁶ Other technologies might affect the value of any technology invention used in the process of drug creation.⁹⁷

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.⁹⁸ The Federal Circuit recognized that the stacking royalties paid to multiple patents relating to a technology standard might “become excessive in the aggregate.”⁹⁹ Despite this, 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.”¹⁰⁰ 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.”¹⁰¹ 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 stacking theory, and qualitative testimony that an invention is valuable—without being anchored to a quantitative market valuation—are insufficiently reliable.”¹⁰²

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.”¹⁰³ If the negotiation fails to take third parties' licenses into account properly, it might “obscure the value of other technologies in the accused

⁹⁴ *Integra Lifesciences I, Ltd. v. Merck KGaA*, 331 F.3d 860, 871 (Fed. Cir. 2003), *vacated on other grounds*, 496 F.3d 1334.

⁹⁵ *Id.* at 871.

⁹⁶ *Id.* at 871-72.

⁹⁷ *Id.* at 871.

⁹⁸ *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1207 (Fed. Cir. 2014).

⁹⁹ *Id.* at 1209, 1234.

¹⁰⁰ *Id.* at 1209, 1234.

¹⁰¹ *Id.* at 1234 (alteration in original).

¹⁰² *Commonwealth Sci. & Indus. Rsch. Org. v. Cisco Sys., Inc.*, 809 F.3d 1295, 1302 (Fed. Cir. 2015) (citing *Ericsson*, 773 F.3d at 1234).

¹⁰³ Lemley & Shapiro, *Reasonable Royalties*, *supra* note 30, at 1149.

product.”¹⁰⁴ 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.¹⁰⁵ They also recommend that the tribunals learn from the “commercial arrangements” that parties use in licensing to deal with royalty stacking.¹⁰⁶

III. 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.¹⁰⁷ Though royalties can take many forms, in general, they can be classified into four categories—percentage royalty, unit royalty, lump sum, and royalty-free.

¹⁰⁴ See Seaman, *supra* note 30, 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”).

¹⁰⁵ Lemley & Shapiro, *Reasonable Royalties*, *supra* note 30, at 1151.

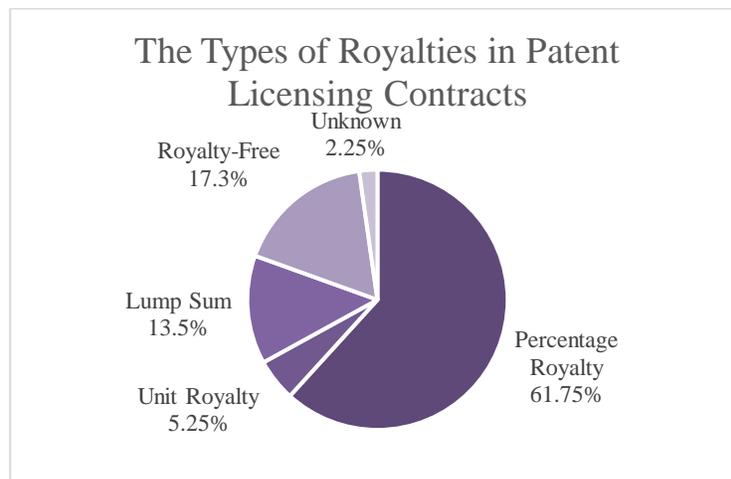
¹⁰⁶ *Id.* at 1150.

¹⁰⁷ See, e.g., Ali Manesh & Meridian Innovations, LLC, Exclusive Commercial Patent License Agreement (Form 8-K) 1, 2 (Nov. 9, 2017), 2017 WL 05182776 (stock); Dr. Malireddy S. Reddy & Greenhouse Sols., Inc., Patent and Technology License Agreement (Form 8-K) 1, 4 (Jan. 20, 2015), 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 (Form S-1) 2, 3 (Mar. 13, 2007), 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.

2020]

EVIDENCE-BASED PATENT DAMAGES

21



(Figure 1)

The Types of Royalties	Percentage	Quantity
Percentage Royalty: $\text{Royalty Base} \times \text{Royalty Rate}$	61.75%	247
Unit Royalty: $\text{License Fee Per Unit} \times \text{Number of Units}$	5.25%	21
Lump Sum	13.5%	54
Royalty-Free	17.25%	69
Unknown ¹⁰⁸	2.25%	9

(Table 1)

¹⁰⁸ The consideration clause in nine of the licensing contracts was redacted, making it impossible for me to determine the types of royalties involved.

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 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 $\$2 \times 500 = \$1,000$. 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,¹⁰⁹ per use of the products,¹¹⁰ or per month of usage.¹¹¹ In addition, parties occasionally count units after they are manufactured rather than when they are sold.¹¹²

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.¹¹³ For example, a patentee might require a

¹⁰⁹ See Honeywell Fed. Mfg. & Techs., LLC & Itec Env't Gr'p., Patent License Agreement (Form 10-QSB) 1, 12 (Mar. 31, 2004), 2006 WL 8362304.

¹¹⁰ See eSpeed, Inc. & Intercontinental-Exchange, Inc., Patent License Agreement §§ 3.1 (d), 1.2, 1.5, 1.6 (Form S-1) 2, 4 (Mar. 29, 2002), 2005 WL 8037959.

¹¹¹ See OptionTech, LLC & NCM Fin., LLC, Patent License Agreement §§ 1.2, 3.1 (Form S-1) (Oct. 1, 2012), 2014 WL 10591887.

¹¹² See Max Sound Corp. & Santos Ltd., License Agreement § 4, Table D § 2 (June 17, 2015), 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.”).

¹¹³ In most circumstances, the upfront fee is non-refundable. See, e.g., Anterios, Inc. & The Bd. of Supervisors of La. State Univ. and Agric. and Mech. Coll., Patent License Agreement (Form S-1) 1, 4 (June. 12, 2008), 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 (Form 10-Q) (Feb. 12, 2009), 2009 WL 10600461

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.¹¹⁴ 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.¹¹⁵ 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.¹¹⁶ 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.¹¹⁷ 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 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.¹¹⁸ Sometimes parties impose a cap on the total royalty that the

(“[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 (Form 10-Q) 1, 10 (Dec. 17, 2007), 2008 WL 11019169 (“EES shall pay Licensor the non-refundable sum of \$9.5 Million”).

¹¹⁴ Glycomed, Inc. & ParinGenix, Inc., Exclusive Patent License Agreement §§ 6.1, 6.2 (Form 10-Q) 1, 7 (June 18, 2009), 2009 WL 10598720.

¹¹⁵ *See, e.g.*, Document Sec. Sys., Inc. & Ergonomic Grp., Inc., Limited Exclusive Patent License Agreement (Form 10-Q) 1, 6 (Dec. 29, 2006), 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 instances, an upfront fee is not creditable. *See, e.g.*, The Nat’l Insts. of Health & KineMed Inc., Patent License Agreement Appendix C (Form S-1) 1, 22 (Jan. 8, 2014), 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).”).

¹¹⁶ *See* MARK S. HOLMES, PATENT LICENSING AND SELLING: STRATEGY, NEGOTIATION, FORMS §4:2 (2d ed. 2014).

¹¹⁷ *See, e.g.*, MyMedicalRecords, Inc. & Surgery Ctr. Mgmt., LLC, Settlement and Patent License Agreement (Form 8-K) 1, 3 (Dec. 9, 2011), 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 Techs. Co. & Gateway, Inc., Settlement Agreement, Release and Patent License (Form 8-K) (May 12, 2004), 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).”).

¹¹⁸ *See, e.g.*, Broadcom Corp. & Verizon Wireless, Patent License Agreement (Form 10-Q) 2, 4 (July 19, 2007), 2007 WL 9454680 (a quarter); Total SA & La Compagnie Generale de Geophysique & Mr. Jean Laurent Mallet & Earth Decision Scis., License Agreement for The Utilization of DSI Patents (Form S-1) 1, 4 (Dec. 31, 2003), 2006 WL 8329066 (a year); Advanced Micro Devices, Inc. & Intergraph Hardware Techs. Co., Patent License and Settlement Agreement (Form 8-K) (Apr. 7, 2004), 2004 WL 7232118 (three-year period).

licensee must pay for the license.¹¹⁹ A floor refers to the minimum royalties that the licensee must pay within a certain period of time.¹²⁰ If after calculating the relevant payment, the sum of the royalties comes to less than the floor, the licensee must make up the difference.¹²¹ 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).”¹²² A patentee can demand that the licensee pay the lump sum in a single payment. Or the patentee 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.¹²³ 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.”¹²⁴

In the fourth category, we see contracts that are royalty-free, so such agreements do not require the licensee to pay any money. However, a royalty-free agreement does not mean that the patentee has surrendered its entitlement

¹¹⁹ See, e.g., OPTi Inc. & NVIDIA Corp., Pre-Snoop Patent License Agreement (Form 8-K) 1, 4 (Aug. 3, 2006), 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 Tech. Corp., Inc. & NCR Corp., Patent License Agreement (Form 10-KSB) 1, 3 (Nov. 7, 2003), 2004 WL 7299727 (requiring the licensee to pay royalties “until the total payment equals five hundred thousand dollars (\$500,000).”); DOV Pharm., Inc. & Biovail Lab’ys Inc., Confidential Patent License, Settlement, and Special Mutual Release Agreement (Form 10-K) 2, 5 (Mar. 31, 2003), 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”).

¹²⁰ See BRUNSVOLD, O’REILLY & KACEDON, *supra* note 93, at 178 (“It is not unreasonable to require a licensee to pay a specified minimum each year for the privilege of keeping the license alive.”); HOLMES, *supra* note 116, at § 4:5 (giving an example of a minimum royalty provision, which requires the licensee to pay the owner \$100,000 per year).

¹²¹ See, e.g., Lifestream Techs., Inc. & LifeNexus, Inc., Patent License Agreement (Form 8-K) (Oct. 1, 2005), 2005 WL 8085195.

¹²² Avistar Commc’ns Corp. & Tandberg ASA, Patent License Agreement (Form 10-Q) 1, 8 (Feb. 15, 2007), 2007 WL 9518810.

¹²³ Finjan, Inc. & Proofpoint, Inc. & Armorize Techs., Inc., Confidential Patent License, Settlement and Release Agreement (Form 10-Q) 1, 4 (June 3, 2016), 2016 WL 04180473. See also, Quantum Corp. & Storage Tech. Corp., Patent Cross License Agreement (Form 8-K) 1, 8 (Feb. 27, 2006), 2006 WL 8280647 (containing a payment scheme that requires the licensee to pay \$1,000,000.00 at each date that the contract specifies).

¹²⁴ AutoNavi Info. Tech. Co.& AutoNavi Software Co., Patent License Agreement Appendix 2, 2010 WL 11372376.

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.¹²⁵ Sometimes, a patentee will grant a license to a licensee for purposes other than collecting royalties.¹²⁶ 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.¹²⁷ It purchased the products from the supplier, and then sold them to one of its customers.¹²⁸ The purpose

¹²⁵ See, e.g., Data Domain, Inc. & Quantum Corp., Patent Cross-License Agreement (Form S-1) 3, 5 (Mar. 12, 2007), 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 P'ship, Patent License Agreement (Form S-4) 1-2 (Apr. 3, 2000), 2009 WL 10596895. For the transaction background of this patent license, see Cellco P'ship, Registration Statement (Form S-4) 124 (Jul. 6, 2009), <https://www.sec.gov/Archives/edgar/data/1175215/000119312509144450/ds4.htm>. See also e.g., GPS Indus., Inc. & GolfView Invs., LLC, Patent License Agreement (Form 10-K) § 2 (Jan. 12, 2009), 2009 WL 10611986 (A royalty-free license); GPS Indus., 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.”).

¹²⁶ 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 Tech. Innovation Grp., Inc. & FT Sols. LLC, Patent and Trademark License Agreement (Form 8-K) 2, (June 15, 2004), 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 (Form 10-Q) 2 (Oct. 1, 2014), 2014 WL 10843429. There are many other purposes as well.

¹²⁷ See Accuray Inc. & Forte Automation Sys., Inc., Patent and Trademark License Agreement (Form S-1) 2, (Nov. 29, 2006), 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 Inc. & Forte Automation Sys., Inc., Exclusive Manufacturing Agreement (Form S-1/A) (Jan. 16, 2007), https://www.sec.gov/Archives/edgar/data/1138723/000104746907000223/a2175548zex-10_46.htm.

¹²⁸ See Accuray Inc. & Forte Automation Sys., Inc., Patent and Trademark License Agreement (Form S-1) 1, (Nov. 29, 2006), 2007 WL 9502032; Accuray Inc., Amendment No. 5 to Registration Statement (Form S-1/A) 72 (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.”).

of the license was to enable the supplier to manufacture the products, rather than to earn royalties from it.¹²⁹

B. ROYALTY BASE

As noted earlier, a percentage royalty consists of two parts, a royalty base and a royalty rate.¹³⁰ 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. Net sales refer to the total amount of the revenues that the licensee earned by selling the patented products.¹³¹ *Net sales* refer to the amount “paid by the customer for the product alone.”¹³² Gross sales minus deductible items become net sales.¹³³ Deductible items include promotion costs, operation costs, refunds, and government charges.¹³⁴ 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.¹³⁵ Only one contract used the costs of manufacturing patented

¹²⁹ See Accuray Inc. & Forte Automation Sys., Inc., Exclusive Manufacturing Agreement (Form S-1/A) § Recitals (Jan. 16, 2007), https://www.sec.gov/Archives/edgar/data/1138723/000104746907000223/a2175548zex-10_46.htm.

¹³⁰ See *supra* Section II.A and accompanying graphs.

¹³¹ Here, “patented products” also refers to patented services.

¹³² BRUNSVOLD, O’REILLY & KACEDON, *supra* note 93, at 166.

¹³³ See HOLMES, *supra* note 116, at §§ 1:256-1:262 (providing several examples regarding the definitions of net sales in patent-licensing contracts).

¹³⁴ *Id.*

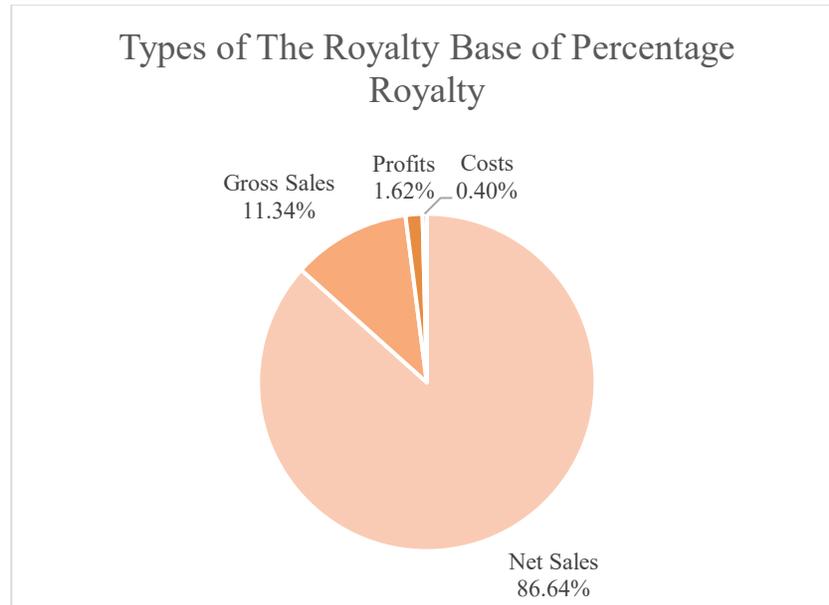
¹³⁵ See Michael D. Farkas & Balance Holdings, LLC & Car Charging Grp., Inc. Patent License Agreement (Form 10-K) 2 (Mar. 29, 2012), 2013 WL 11206461 (defining profits as “total gross revenues less any discounts, manufacturing costs, rebates, shipping costs, handling costs, transportation insurance costs, installation costs, marketing and sales costs, applicable taxes, importation fees, and duties on any and all Licensed Products and/or Licensed Processes sold or used by the Licensee.”); Q BioMed Inc. & Bio-Nucleonics Inc., Patent and Technology License and Purchase Option Agreement (Form 10-Q) 3 (June 20, 2016), 2016 WL 06066675 (defining gross profits as gross revenues derived from the patented product minus “[T]he costs directly associated with (i) the acquisition of raw materials, (ii) direct manufacturing cost, (iii) logistics and delivery, and (iv) contract sales and marketing

2020]

EVIDENCE-BASED PATENT DAMAGES

27

components as the royalty base, accounting for 0.4% of contracts using the percentage royalty.¹³⁶



(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 invoices¹³⁷ or to the gross revenues that it receives.¹³⁸ The scope of the gross revenue invoiced in general is larger than the gross revenue received because the buyers of the

organizations but which shall not exceed 50% of the net profits. . . .” to the licensee from the sales of the licensed products).

¹³⁶ Oryon Techs., Inc., Oryon Techs., LLC, Oryon Techs. Dev., LLC & Oryon Techs. Licensing, LLC & Myant Cap. Partners Inc., Patent License Agreement (Form 10-Q) § 4, Exhibit A, Exhibit B (Nov. 28, 2014), 2014 WL 10613895.

¹³⁷ See, e.g., AutoGenomics, Inc. & Mayo Found. for Med. Educ. and Rsch., Nonexclusive Patent License Agreement (Form S-1) 2 (Apr. 14, 2006), 2012 WL 12473859 (“total of the gross invoice amounts”); Document Sec. Sys., Inc. & Ergonomic Grp., Inc., Limited Exclusive Patent License Agreement (Form 10-Q) 2 (Dec. 29, 2006), 2007 WL 9540382 (“invoiced amount of a product or service”); Cardion Pharms., Inc. & Diacrin, Inc., Patent License Agreement (Form 10-QSB) § 1.7 (Sept. 30, 2002), 2007 WL 9505297 (“gross invoice prices from the sale”).

¹³⁸ See, e.g., Cerebain Biotech Corp. & Dr. Surinder Singh Saini, Patent License Agreement (Form 8-K) 2 (June 10, 2010), 2012 WL 12408443 (“the revenue acquired from the gross sales”); John C. Bedini & Bedini Tech., Inc., Exclusive Technology License Agreement and Right to Purchase Patents (Form 10-K) § 2.11 (May 1, 2001), 2005 WL 8071582 (“gross amount received”); Celltech Therapeutics Ltd. & Medimmune Inc., Patent License Agreement (Form 10-Q) 3 (Jan. 19, 1998), 2005 WL 8079147 (“monies received”).

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 if it cannot receive the payment, the amount of the payment still goes into the royalty base to calculate the royalties that the licensee owes 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.¹³⁹ They require gross revenues either “invoiced or received, whichever occurs sooner”¹⁴⁰ or whichever is greater¹⁴¹ 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-by-case basis.¹⁴² In general, this Article has found five types of deductible items — operating costs, promotion costs, refunds, government charges, and bad debts.¹⁴³ 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, insurance in transit, and packaging and

¹³⁹ See *Genocea Biosciences, Inc. & Univ. of Wash., Patent License Agreement (Form S-1) 3* (July 19, 2012), 2014 WL 10825227 (“gross amount invoiced or otherwise received”); *LDN Rsch. Grp. LLC & Dr. Jill P. Smith, Patent License Agreement § 1.2* (Dec. 24, 2012), 2014 WL 10875746 (“consideration received or expected from, or the fair market value attributable to, each Sale”).

¹⁴⁰ *Samsung SDI Co., Ltd & Universal Display Corp., OLED Patent License Agreement (Form 10-Q) 1* (Apr. 19, 2005), 2005 WL 8036678.

¹⁴¹ See, e.g., *ProQR Therapeutics B.V. & The Gen. Hosp. Corp., Exclusive Patent License Agreement (Form F-1) 2* (May 29, 2012), 2014 WL 10866678.

¹⁴² See *HOLMES*, *supra* note 116, at § 4:6.2. See also *BRUNSVOLD, O'REILLEY & KACEDON*, *supra* note 93, at 166.

¹⁴³ But these do not 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 (Form 10-Q) 1* (Nov. 28, 2016), 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.”).

handling.¹⁴⁴ 147 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.¹⁴⁵ Similarly, some contracts treat expenses for insurance in transit and the expenses for packaging and handling as deductible items, while others do not.¹⁴⁶

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.¹⁴⁷ Of the contracts using net sales, 167 out of 214 (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

¹⁴⁴ See, e.g., Mass. Inst. of Tech. & Sontra Med., Inc., Patent License Agreement (Form S-4) 5 (June 30, 1998), 2002 WL 35608498 (“insurance costs and outbound transportation charges prepaid or allowed”); ValiPharma Ltd. & HyperGenomics Pte. Ltd., Patent License Agreement (Form 8-K) 1 (June 9, 2011), 2012 WL 12408411 (“costs of packaging, insurance, carriage and freight”); Michael D. Farkas, Balance Holdings, LLC & Car Charging Grp., Inc., Patent License Agreement (Form 10-K) 2 (Mar. 29, 2012), 2013 WL 11206461 (“shipping costs, handling costs, transportation insurance costs”).

¹⁴⁵ See, e.g., The Univ. of N. Tex. Health Sci. Ctr. at Fort Worth & SignPath Pharms., Inc., Patent and Technology License Agreement (Form 10-K) 2 (Nov. 25, 2013), 2015 WL 6611745 (“outbound transportation actually prepaid or allowed”); ProQR Therapeutics B.V. & The Gen. Hosp. Corp., Exclusive Patent License Agreement (Form F-1) 2 (May 29, 2012), 2014 WL 10866678 (“amounts for outbound transportation, insurance, handling and shipping”).

¹⁴⁶ See, e.g., ProQR Therapeutics B.V. & The Gen. Hosp. Corp., *supra* note 141, at 2 (including insurance and handling costs); AnnaMed, Inc., & Dermin Sp. zo.o.a, Patent and Technology Development and License Agreement (Form S-1) 1-3 (June 28, 2012), 2016 WL 01469341 (not including insurance and handling costs).

¹⁴⁷ See, e.g., Can-Fite BioPharma, Ltd., & The Nat’l Insts. of Health, Patent License Agreement § 2.10 (Dec. 3, 2002), 2013 WL 11160921 (“cash discounts in amounts customary in the trade to the extent actually granted.”); The Univ. of Tex. at Austin & AEMase Inc., Patent License Agreement (Form S-1) A-1 (Dec. 24, 2013), 2015 WL 6654817 (“discounts in amounts reasonable or customary in the trade”); BioMimetic Pharms., Inc., & ZymoGenetics, Inc., Exclusive Patent License Agreement (Form S-1) § 1.11 (Mar. 28, 2001), 2006 WL 8310939 (“normal and customary rebates, and cash and trade discounts, actually taken”).

deductible promotion costs.¹⁴⁸ The rest of the contracts do not do so. In fact, 32 of them explicitly exclude it as a deductible promotion cost.¹⁴⁹

Refunds are amounts that sellers repay to customers, including sales returns, chargeback, and retroactive price reduction.¹⁵⁰ In contracts using net sales, 173 of the 214 (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.¹⁵¹ A “chargeback” is a forced transaction reversal that the credit card holder’s bank initiates in response fraudulent or disputed transactions.¹⁵² “Retroactive price reduction” refers to the discount covering all preceding sales during the measurement period; the amount reduced is never collected. Twenty-six licenses explicitly regard retroactive price reduction as deductible.¹⁵³

Government charges are the fees that the government collects in the course of sales, including taxes and duties.¹⁵⁴ Of the contracts using net sales, 176 out

¹⁴⁸ See, e.g., LightLab Imaging, LLC & Lantis Laser, Inc., Non-Exclusive License Agreement (Form SB-2) 2 (Aug. 8, 2001), 2007 WL 9541615; Science Applications Int’l Corp. & VirnetX Inc., Patent License and Assignment Agreement (Form 10-K) 5 (Aug. 2, 2005), 2010 WL 11366671; Stephen Key Design, LLC & AquaBlue Int’l, Inc., Patent License Agreement (Form S-1) 1 (Oct. 2, 2009), 2009 WL 10564050.

¹⁴⁹ See, e.g., Am. Power Grp., Inc. & GreenMan Tech., Inc., Exclusive Patent License Agreement § Recital 1.6 (Form 8-K) 2 (June 1723, 2009), 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 Nat’l Insts. of Health, Patent License Agreement § 2.10 (Form 20-FR-12G) (Sept. 10, 2013), 2013 WL 11160921 (“No deductions shall be made for commissions paid to individuals”).

¹⁵⁰ See, e.g., PDL BioPharma, Inc. & Alexion Pharm., Inc., Patent License Agreement (Form 10-K) 2 (Dec. 31, 2008), 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., P.F. Lab’ys, Inc. & KV Pharm. Co., Patent License Agreement (Form 8-K) 2-3 (June 10, 2009), 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”).

¹⁵¹ GlaxoSmithKline LLC & NPS Pharm., Inc., Exclusive Patent License Agreement (Form 10-K) 6-7 (July 29, 2011), 2011 WL 12975350.

¹⁵² See, e.g., DOV Pharm., Inc. & Biovail Lab’ys Inc., Confidential Patent License, Settlement, and Special Mutual Release Agreement (Form 10-K) 2 (Mar. 31, 2003), 2003 WL 27319236; Essex Chemie AG & Cerecor Inc., Exclusive Patent and Know-How License Agreement § 1.35(b) (Form EX-10) (Apr. 21, 2014), 2014 WL 10817805.

¹⁵³ See, e.g., The Univ. of Wash. & Solid GT, LLC, Exclusive Patent License Agreement (Form S-1) 2 (Dec. 29, 2017), 2017 WL 06627723; Cue Biopharma, Inc., & Merck Sharp and Dohme Corp., Exclusive Patent License and Research Collaboration Agreement (Form S-1) 8 (Nov. 14, 2017), 2017 WL 06347621.

¹⁵⁴ See, e.g., Cerebain Biotech Corp. & Dr. Surinder Singh Saini, Patent License Agreement (Form 8-K) 2 (June 10, 2010), 2012 WL 12408443 (“Sales taxes, tariffs, duties, and/or other taxes directly imposed and with reference to particular sales”); The Univ. of Tex. M. D. Anderson Cancer Ctr. & Arrowhead Rsch. Corp., Patent and Technology License Agreement

of 214 (or 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 are generally deductible but not value-added taxes, which are a form of sales taxes assessed on income derived from sales.¹⁵⁵ Income taxes are generally not deductible.¹⁵⁶

Only 24 of the 214 contracts using net sales (or 11.2%) treat bad debts as deductible.¹⁵⁷ Bad debts are the amount that the buyer owes the licensee but 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.”¹⁵⁸

Patent licensing contracts in the pharmaceutical industry may have a special deductible item as a part of the net sales royalty base.¹⁵⁹ That special deductible item is the rebate that drug manufacturers pay to the government. This is relevant with regard to the program that the U.S. government launched to

(Form 10-Q) 4-5 (Dec. 14, 2010), 2011 WL 12997286 (“sales and/or use taxes actually paid, import and/or export duties actually paid”).

¹⁵⁵ *See, e.g.*, Cardion Pharm., Inc. & Diacrin, Inc., Patent License Agreement (Form 10-QSB) § 1.7 (Sept. 30, 2002), 2007 WL 9505297; Document Sec. Sys., Inc. & Ergonomic Grp., Inc., Limited Exclusive Patent License Agreement (Form 10-Q) 2 (Dec. 29, 2006), 2007 WL 9540382; Lawrence Livermore Nat’l Sec., LLC & RainDance Techs., Inc., Coexclusive Patent License Agreement (Form S-1) 7 (Aug. 20, 2008), 2015 WL 8546486.

¹⁵⁶ *See, e.g.*, ASDERA & QBioMed Inc. & Q BioMed (Cayman) SEZC, License Agreement on Patent & Know-How/Technology (Form 8-K) 3 (Apr. 21, 2017), 2017 WL 01454932; AutoGenomics, Inc. & Mayo Found. for Med. Educ. and Rsch., Nonexclusive Patent License Agreement (Form S-1) 2 (Apr. 14, 2006), 2012 WL 12473859; Bracco Int’l BV & Acusphere Inc., Patent License Agreement (Form 10-Q) 6 (June 1, 2006), 2006 WL 8344255.

¹⁵⁷ *See, e.g.*, MERCK and CO. & Regeneron Pharm., Inc., Non-Exclusive Patent License Agreement (Form 10-Q) 2 (Aug. 18, 2003), 2003 WL 27322915; Roche Molecular Systems, Inc. & Expression Diagnostics, Patent License Agreement (Form S-1) 4 (Nov. 16 2004), 2014 WL 10625116; Moleculin, LLC & The Bd. of Regents of The Univ. of Tex. Sys., Patent And Technology License Agreement (Form S-1) 3 (June 21, 2010), 2016 WL 1090185.

¹⁵⁸ Mass. Inst. of Tech. & Cheung Lab’ys, Inc., Patent License Agreement § 1.16(a)(v) (Oct. 24, 1997), 2014 WL 10629913. *See also e.g.*, TNI BioTech, Inc. & The Penn State Rsrch. Found., Patent License Agreement § 1.2 (Jan. 18, 2013), 2013 WL 11212660; Strategic Sci. and Technologies-D LLC & Strategic Sci. and Techs., LLC & Daré Bioscience, Inc., License and Collaboration Agreement (Form 10-K) 9 (Feb. 11, 2018), 2018 WL 01516513.

¹⁵⁹ *See, e.g.*, Myriad Genetics, Inc. & Genetic Techs. Ltd., Patent License Agreement § 2.8 (Oct. 2002), 2005 WL 8067334; Derma Sciences, Inc. & Quick-Med Techs., Inc., Patent and Technology License Agreement (Form 8-K) 2 (July 12, 2012), 2012 WL 12408968; Roche Molecular Sys., Inc. & Expression Diagnostics, Patent License Agreement (Form S-1) 4 (Nov. 16, 2004), 2014 WL 10625116.

provide health coverage to its low-income population.¹⁶⁰ 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.¹⁶¹ The licensee pays the rebate to the government “to offset the overall cost of prescription drugs under the Medicaid Program.”¹⁶² In other words, though the drug manufacturer 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.¹⁶³ 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.¹⁶⁴ The revenues might derive from sublicensing and enforcing the licensed patents.¹⁶⁵ The profits in this situation are the revenues

¹⁶⁰ *Program History*, MEDICAID.GOV, <https://www.medicaid.gov/about-us/program-history/index.html> (last visited Jan. 18, 2020).

¹⁶¹ *Medicaid Drug Rebate Program*, MEDICAID.GOV, <https://www.medicaid.gov/medicaid/prescription-drugs/medicaid-drug-rebate-program/index.html> (last visited Jan. 18, 2020).

¹⁶² *Id.*

¹⁶³ *See e.g.*, Michael D. Farkas & Balance Holdings, LLC & Car Charging Grp., Inc., Patent License Agreement (Form 8-K) 2 (Mar. 29, 2012), 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 any and all Licensed Products and/or Licensed Processes sold or used by the Licensee.”); Q BioMed Inc. & Bio-Nucleonics Inc., Patent and Technology License and Purchase Option Agreement (Form 10-Q) 3 (June 20, 2016), 2016 WL 06066675 (defining gross profits as gross revenues derived from the patented product minus “[T]he costs directly associated with (i) the acquisition of raw materials, (ii) direct manufacturing cost, (iii) logistics and delivery, and (iv) 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).

¹⁶⁴ 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 Corp. & IV Digit. Multimedia Inventions, LLC, Patent License Agreement (Form 10-Q) § Recitals (Oct. 5, 2010), 2016 WL 04136497. *See also* Digimarc Corp., Annual Report (Form 10-K) 1-5, 24 (Mar. 3, 2011), <https://www.sec.gov/Archives/edgar/data/1438231/000119312515056195/d843140d10k.htm>

¹⁶⁵ Digimarc Corp. & IV Digit. Multimedia Inventions, LLC, Patent License Agreement (Form 10-Q) §§ 2, 10 (Oct. 5, 2010), 2016 WL 04136497.

minus the costs of generating the revenues.¹⁶⁶ These costs may include, for example, the costs of litigating and maintaining the licensed patents.¹⁶⁷

Parties may use the costs of patented components as the royalty base. Only one license out 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 of the patented technologies, “multiplied by 1.1 . . .”¹⁶⁸ To be clear, the royalty base of this contract is limited to the direct costs attributable to the patented technology in the final product, not the direct costs of the entire final product.¹⁶⁹ Experts note that in patent licensing, parties sometimes use the costs of the final products’ raw materials as the royalty base.¹⁷⁰

C. ROYALTY ADJUSTMENT

Parties may adjust royalties according to information that develops after the date on which they sign their patent licensing contract.¹⁷¹ 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.¹⁷²

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 revenue, and profit margin.¹⁷³ The contracts specify the

¹⁶⁶ *Id.* § 2.

¹⁶⁷ *Id.*

¹⁶⁸ Oryon Techs., Inc., & Oryon Techs., LLC, & Oryon Techs. Dev., LLC & Oryon Techs. Licensing, LLC & Myant Cap. Partners Inc., Patent License Agreement (Form 10-Q) § 4, Exhibit A, Exhibit B (Nov. 28, 2014), 2014 WL 10613895.

¹⁶⁹ *Id.* § 1(6).

¹⁷⁰ See BRUNSVOLD, O’REILLEY & KACEDON, *supra* note 93, at 159 (noting that the costs of raw materials may serve as royalty bases).

¹⁷¹ See Keith J. Crocker & Scott E. Masten, *Pretia ex Machina—Prices and Process in Long-Term Contracts*, 34 J.L. & ECON. 69, 75–76 (1991).

¹⁷² *Id.*

¹⁷³ A high gross margin may lead to a higher royalty rate. See, e.g., Mass. Inst. of Tech. & The ExOne Co., Amended & Restated Exclusive Patent License Agreement (Form S-1) 8 (Jan. 1, 2011), 2013 WL 11168668 (the licensor charges 5% of net sales when the sales have a gross margin greater than 65% and reduces the royalty rate to 2.5% when the gross margin is less than 50%); The Anthon Leon Smith and Rosalie Joyce Johnson Smith Revocable Living Trust & EnShale, Inc., License Agreement for Use of Patent (Form 10-KSB) §§ 1.4, 1.5, 1.6, 5 (Feb. 8, 2006), 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 (Form S-1) 4 (Mar. 29, 2002), 2005 WL 8037959 (the licensee shall pay the licensor \$2,000,000 when the number of units sold exceeds 25,000,000 and shall make an additional

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.¹⁷⁴ In some contracts, this situation triggers a rise or a reduction of the royalty rate.¹⁷⁵

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.¹⁷⁶ In the field of pharmaceutical and medical devices, a drug or device needs to overcome several regulatory hurdles in order to obtain marketing approvals.

payment of \$2,000,000 for each additional 25,000,000 units sold in a given year); iCurie Lab Holdings Ltd. & Asia Vital Components Co., Patent License and Sales Exclusivity Agreement (Form 10-KSB) 3 (Nov. 9, 2005), 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, and the percentage reduces by 1% for each additional 2,000,000 units of the sale of the licensed product; 6% percent, however, is the minimum royalty rate, which is when the sales volume exceeds 8,000,000 units).

¹⁷⁴ The Univ. of Tex. Sys. & Trinity Biotech, Inc., Patent License Agreement (Form 20-F) 5 (Apr. 18, 2005), 2015 WL 6644267 (the licensee should pay \$30,000 when the gross, aggregate income from the sale of the licensed products reaches 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).

¹⁷⁵ Commonwealth Biotechnologies, Inc. & Prism Pharm., Inc., Patent License And Development Agreement (Form 8-K) 11 (Jan. 3, 2006), 2006 WL 8367942 (raising the royalty rate); The Nat'l Insts. of Health & NeoPharm, Inc., Patent License Agreement (Form 8-K) 12 (Feb. 27, 2006), 2006 WL 8341343 (raising the royalty rate); The Univ. of N. Tex. Health Sci. Ctr. & SignPath Pharm., Inc., Patent and Technology License Agreement (Form 10-K) § 4.2(a) (Nov. 25, 2013), 2015 WL 6611745 (raising the royalty rate); Unither Pharma, Inc. & Real Health Lab'ys, Inc., Patent License Agreement (Form 8-K) 4 (May 1, 2002), 2005 WL 8119756 (raising the royalty rate same); The Nat'l Insts. of Health & KineMed Inc., Patent License Agreement (Form S-1) 22-24 (Dec. 22, 2011), 2014 WL 10610049 (raising the royalty rate); UCL Bus. PLC & Coronado Biosciences, Inc., License Agreement § 4.3 (Nov. 5, 2007), 2011 WL 13017955 (raising the royalty rate); Ecoenergy Pat. GmbH & Aqua Soc'y GmbH, Patent License Agreement (Form 8-K) § 9 (Aug. 21, 2006), 2006 WL 8331651 (reducing the royalty rate); The Eye Microsurgery Intersectoral Rsch. and Tech. Complex & STAAR Surgical AG, Patent License Agreement (Form 10-K) 5 (May 9, 2001), 2001 WL 37100872, (reducing the royalty rate); Panther Biotechnology Inc. & The Univ. of Rochester, Exclusive Patent License Agreement (Form 10-K) 9 (Mar. 31, 2015), 2015 WL 6667526 (reducing the royalty rate).

¹⁷⁶ *See, e.g.*, The Bd. of Regents of the Univ. of Tex. Sys. & DOR Vaccines, Inc., Exclusive Patent and Technology License Agreement (Form 10-KSB) § 5.1(e) (June 30, 2003), 2004 WL 7252866 (charging extra specified fees); Mass. Inst. of Tech. & Arch Therapeutics, Inc., Amended and Restated Exclusive Patent License Agreement (Form 8-K) 14 (Sept. 7, 2005), 2013 WL 11057569 (charging an extra specified fee); The Trs. of the Univ. of Pa. & PolyMedix, Inc., Patent License Agreement (Form 10-K) 8 (Jan. 3, 2003), 2013 WL 11059119 (raising royalty rate).

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.¹⁷⁷

Parties might reduce royalties due to the intensification of market competition because that can reduce the licensee's profits. This intensification might be attributable to a grant of the license to third parties, especially on more favorable terms. The third parties could 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.¹⁷⁸ 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.¹⁷⁹ Generic products work in the same way that brand-name drugs do but did not

¹⁷⁷ The Regents of the Univ. of Cal. & TomoTherapy Inc., Limited Exclusive Patent License Agreement (Form 8-K) 44 (Feb. 23, 2007), 2008 WL 11049468.

¹⁷⁸ InterDigital Tech. Corp. & Samsung Elecs. Co., TDMA Patent License Agreement (Form 10-Q) 7 (Jan. 22, 2006), 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 a third party, the third party is able to compete with the licensee in the relevant market. The licensee might require the patentee to reduce royalties 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 in royalties. *See, e.g.*, GlaxoSmithKline LLC & NPS Pharms., Inc., Exclusive Patent License Agreement (Form 10-Q) 17 (July 29, 2011), 2011 WL 12975350 (entitling the licensee to reduce the royalty rate to the compulsory license royalty rate when the royalty rate for a compulsory license is lower than the royalty rate of the patent license agreement). Among the 400 patent licensing contracts surveyed by this Article, 14 contracts contained a "most favored licensee" clause. *See, e.g.*, AutoGenomics, Inc., & Mayo Found. for Med. Ed. and Rsch., Nonexclusive Patent License Agreement (Form S-1) 3 (Apr. 14, 2006), 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 Rsch. Inst. & The Nat'l Insts. of Health, Patent License Agreement (Form 10-K) 4-5 (Mar. 25, 1998), 2003 WL 27343652. Parties might make amendment to reduce royalties because the licensee is enforcing the most favorable licensee clause. *See, e.g.*, InterDigital Tech. Corp. & NEC Corp., Amendment to Patent License Agreement (Jan 1, 2007), 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>.

¹⁷⁹ *See, e.g.*, Moleculin, LLC & The Bd. of Regents of The Univ. of Tex. Sys., Patent and Technology License Agreement (Form S-1) 12 (June 21, 2010), 2016 WL 1090185 (reducing royalties by 25% due to the presence of generic products); Strategic Sci. and Technologies-D LLC & Strategic Sci. and Techs., LLC & Daré Bioscience, Inc., License and Collaboration Agreement (Form 10-K) 35 (Feb. 11, 2018), 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 ([***] %)"). *But cf.* Essex Chemie AG & Cerecor Inc., Exclusive Patent and Know-How License Agreement § 7.03 (b) (Mar. 19, 2013), 2014 WL 10817805 ("There shall be no reduction in the royalty due to Merck in the event of generic product commercialization.").

have to repeat the costly clinical studies that brand-name drugs did.¹⁸⁰ The price of generic products is always substantially lower than that of brand-name drugs.¹⁸¹ Sometimes, the presence of generic products entirely discharges the licensee's obligation to pay royalties.¹⁸²

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.¹⁸³ Renegotiation allows more freedom for adjusting the payment according to changing market conditions.¹⁸⁴ In the process of data collection, this Article also found 61 amendments to the 400 licenses examined. Twenty of them adjusted the royalties of a previous patent licensing contract. Parties might specify that they are making the amendment "in light of unforeseen circumstances."¹⁸⁵

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%

¹⁸⁰ 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 Bus. PLC & Coronado Biosciences, Inc., License Agreement § 1 (Nov. 5, 2007), 2011 WL 13017955; Moleculin, LLC & The Bd. of Regents of The Univ. of Tex. Sys., Patent And Technology License Agreement (Form S-1) 2 (June 21, 2010), 2016 WL 1090185; Strategic Sci. and Technologies-D LLC & Strategic Sci. and Techs., LLC & Daré Bioscience, Inc., License and Collaboration Agreement (Form 10-K) 6 (Feb. 11, 2018), 2018 WL 01516513.

¹⁸¹ *Generic Drug Facts*, FDA.GOV, <https://www.fda.gov/drugs/generic-drugs/generic-drug-facts> (last visited Jan 18, 2020).

¹⁸² *See, e.g.*, UCL Bus. PLC & Coronado Biosciences, Inc, License Agreement § 1 (Nov. 5, 2007), 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"); Mass. Inst. of Tech. & Visterra, Inc., Exclusive Patent License Agreement (Form S-1) 15 (Nov. 15, 2013), 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 (Form 20-F) 11-12, 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.).

¹⁸³ Crocker & Masten, *supra* note 171, at 75–77.

¹⁸⁴ *Id.* at 77.

¹⁸⁵ Rambus Inc. & SK hynix Inc., Amendment 1 to Semiconductor Patent License Agreement (Form 10-Q) 1 (July 1, 2013), 2015 WL 6595433.

annually until it reached a flat rate of 5%.¹⁸⁶ The contract required the licensee to pay a minimum royalty of \$2,000,000 per calendar year.¹⁸⁷ 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.¹⁸⁸ In other words, the amendment 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 dual-fuel conversion.¹⁸⁹ The patentee required the licensee to pay percentage royalties, including 10% of the net sales of product and product installment.¹⁹⁰ On June 30, 2011, the parties amended their licensing contract.¹⁹¹ 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 \$15,000,000.¹⁹² The amendment also completely eliminated the licensee's obligation to pay royalties once the cumulative sum of all payments reached \$36,000,000.¹⁹³ The patentee agreed to assign to the licensee all of its rights to the patent thereafter.¹⁹⁴

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. Additionally, 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 the 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

¹⁸⁶ SweeGen, Inc. & Conagen Inc., Inter-Company Patent License Agreement (Form 10-Q) 2 (Nov. 28, 2016), 2017 WL 00583070.

¹⁸⁷ *Id.* at 2.

¹⁸⁸ SweeGen, Inc. & Conagen Inc., First Amendment to Inter-Company Patent License Agreement (Form 8-K) 1 (Aug. 16, 2017), 2017 WL 03536377. *See also* SweeGen, Inc., Current Report (Form 8-K) 3 (Aug. 16, 2017).

¹⁸⁹ Am. Power Grp., Inc. & GreenMan Techs., Inc., Exclusive Patent License Agreement (Form 8-K) 1 (June 17, 2009), 2009 WL 10579493.

¹⁹⁰ Am. Power Grp., Inc. & GreenMan Techs., Inc., Exclusive Patent License Agreement (Form 8-K) 6 (June 17, 2009), 2009 WL 10579493.

¹⁹¹ Am. Power Grp., Inc. & GreenMan Techs., Inc., Amendment No 2 To Exclusive Patent License Agreement (Form 8-K) 1 (June 30, 2011), 2011 WL 12991193.

¹⁹² *Id.* at § 1(a)(i); GreenMan Techs., Inc., Current Report (Form 8-K) 2 (June 30, 2011), <https://www.sec.gov/Archives/edgar/data/932699/000117152011000497/eps4278.htm>.

¹⁹³ Am. Power Grp., Inc. & GreenMan Techs., Inc., Amendment No 2 To Exclusive Patent License Agreement (Form 8-K) 1 (June 30, 2011), 2011 WL 12991193.

¹⁹⁴ *Id.* § 3A.2.

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.¹⁹⁵ However, the overall value of a multi-component product consists of the value of the patented component plus the value of the other components.¹⁹⁶ 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 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

1. Using the value of a patented component \times a royalty rate
2. Using the value of the multi-component product \times a reduced royalty rate
3. Using the value of the multi-component product \times a royalty rate \times $A/(A+B)$
4. Using the value of the multi-component \times a royalty rate $\times A/C$
5. Using the value of the multi-component product \times a royalty rate $\times (1 - B/C)$
6. Using the value of the multi-component product \times a royalty rate $\times D/(D+E)$
7. Using the value of the multi-component product \times a royalty rate $\times D/F$
8. Using the value of the multi-component product \times a royalty rate $\times 1/(1+N)$
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

¹⁹⁵ See Lemley & Shapiro, *Holdup & Stacking*, *supra* note 30, at 1992 (noting that “more and more products incorporate not a single new invention but a combination of many different components, each of which may be the subject of one or more patents”).

¹⁹⁶ See Lemley, *supra* note 30, at 664 (mentioning that “there is always at least some value to the defendant’s product not attributable to the patent”).

<p>“A” = the sales price of the patented component, if sold separately “B” = the total sales price of other components, if sold separately “C” = the sales price of the multi-component product “D” = the cost of the patented component “E” = the total cost of other components “F” = the cost of the multi-component product “N” = the number of other components</p>
--

(Table 2)

1. Using the value of a patented component \times 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.¹⁹⁷ 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 are $\$1,000 \times 1\% = \10 .

2. Using the value of the multi-component product \times 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 a single agent patented product (one that achieves the desired therapeutic response without using any other components).¹⁹⁸ The patentee charges 5% of the sale of the multi-component product. This type of product relies on one or more additional components to achieve the desired therapeutic response and 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.¹⁹⁹

¹⁹⁷ See, e.g., Ethicon Endo-Surgery, Inc. & Cyberonics, Inc., Exclusive Patent License Agreement (Form 10-K) 13 (Dec. 17, 2007), 2008 WL 11019169; BioTrove, Inc. & Mass. Inst. of Tech., Exclusive Patent License Agreement (Form S-1) 12 (Dec. 21, 2004), 2008 WL 11046253; The Regents of The Univ. of Cal. & Lantis Laser, Inc., Limited Exclusive Patent License Agreement (Form SB-2) 32 (Sept. 2001), 2007 WL 9541613; Cue Biopharma, Inc. & Merck Sharp & Dohme Corp., Exclusive Patent License and Research Collaboration Agreement (Form S-1) 9 (Nov. 14, 2017), 2017 WL 06347621.

¹⁹⁸ See BioMimetic Pharm., Inc. & ZymoGenetics, Inc., Exclusive Patent License Agreement (Form S-1) §§ 1.2, 1.4, 1.12, 4.2 (Mar. 28, 2001), 2006 WL 8310939.

¹⁹⁹ See *id.*; see also The George Wash. Univ. & Protea Biosciences, Inc., Patent License Agreement (Form 10-K) 4 (Nov. 28, 2012), 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).

3. Using the value of the multi-component product \times a royalty rate $\times A/(A+B)$.

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.²⁰⁰ 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 $\$1,200 \times 1\%$ by the fraction $1,000/(1,000+500)$, which comes to eight dollars.

4. Using the value of the multi-component \times a royalty rate $\times A/C$.

Likewise, the parties can retain the value of the multi-component product 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.²⁰¹ 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 fraction A/C would equal $1,000/1,200$. Multiplying the royalty base by the royalty rate then by the fraction, the sum will be \$10. Though this method sometimes can reach the same result as the first method, it reaches 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.²⁰²

5. Using the value of the multi-component product \times a royalty rate $\times (1- B/C)$.

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

²⁰⁰ See, e.g., CyberHeart, Inc. & Accuray Inc., Patent License Agreement (Form 10-K) 3 (Dec. 10, 2010), 2014 WL 10830787.

²⁰¹ See, e.g., Samsung SDI Co., Ltd. & Universal Display Corp., OLED Patent License Agreement (Form 10-Q) 2 (Apr. 19, 2005), 2005 WL 8036678; Imperial Coll. Innovations Ltd. & Imperial Coll. of Sci., Techn. & Med. & CytRx Corp., Patent License Agreement (Form S-1) § 1.1 (May 19, 2004), 2008 WL 11045458; Dharmacon, Inc. & Quark Pharm., Inc., Patent License Agreement (Form S-1) 3 (Jan. 10, 2010), 2010 WL 11351382; Regents of the Univ. of Minn. & Synageva BioPharma, Exclusive Patent License Agreement (Form 10-Q) § 1.4, 2011 WL 13023543; The Univ. of Tex. Sys. & Miragen Therapeutics, Inc., Exclusive Patent License Agreement (Form S-4) 2 (Apr. 29, 2008), 2016 WL 07030678.

²⁰² 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 \$1,200; the average sales price is \$1,400. If we use the first method, we use \$1,000 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.

price of other products and “C” is sales price of the multi-component product.²⁰³ In this example, we assume that the total sales price of the 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 \times a royalty rate $\times D/(D+E)$.

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.²⁰⁴ 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 \times 1\% \times 800/(800 + 200) = \9.6 .

7. Using the value of the multi-component product \times a royalty rate $\times D/F$.

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 the manufacturing cost of the patented component and “F” is the manufacturing cost of the multi-component product.²⁰⁵ 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 royalty rate of 1%, royalties after apportionment will be $\$1,200 \times 1\% \times 800/900 = \10.67 .

²⁰³ See, e.g., Imperial Coll. Innovations Ltd. & Imperial Coll. of Sci. and Tech. & Cytrx Corp., Patent License Agreement (Form S-1) § 1.1 (May 19, 2004), 2008 WL 11045458; The Univ. of Tex. at Austin & AEMase Inc., Patent License Agreement (Form S-1) 1-2, 7 (Dec. 24, 2013), 2015 WL 6654817.

²⁰⁴ See, e.g., LightLab Imaging, LLC & Lantis Laser, Inc., Non-Exclusive License Agreement (Form SB-2) 2-5 (Aug. 8, 2001), 2007 WL 9541615; Peregrine Pharm., Inc. & The Univ. of Tex. Sys., Exclusive Patent License Agreement (Form 8-K) 2 (Aug. 18, 2005), 2010 WL 11321026; Cue BioPharma, Inc. & Merck Sharp & Dohme Corp., Exclusive Patent License and Research Collaboration Agreement (Form S-1) 9 (Nov. 14, 2017), 2017 WL 06347621; Evelo Biosciences, Inc. & Mayo Found. for Med. Ed. & Rsch., Patent License Agreement (Form S-1) § 1.08 (Aug. 6, 2017), 2018 WL 01771872.

²⁰⁵ See, e.g., Imperial Coll. Innovations Ltd. & Cronos Therapeutics Ltd., Patent License Agreement (Form 8-K) 5 (June 7, 2005), 2012 WL 12408465; Ethicon Endo-Surgery, Inc. & Cyberonics, Inc., Exclusive Patent License Agreement (Form 10-Q) 13 (Dec. 17, 2007), 2008 WL 11019169; Regents of the Univ. of Minn. & Synageva BioPharma, Exclusive Patent License Agreement (Form 10-Q) § 1.4 (Nov. 14, 2011), 2011 WL 13023543; Samsung SDI Co. & Universal Display Corp., OLED Patent License Agreement (Form 10-Q) 2 (Apr. 19, 2005), 2005 WL 8036678.

8. Using the value of the multi-component product \times a royalty rate $\times 1/(1+N)$.

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 of components other than the patented component in the multi-component product.²⁰⁶ 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.²⁰⁷ Here too, the royalty base is the \$1,200 value of the multi-component 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 $\$1,200 \times 1\% \times 1/(1+3)$, 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-upon apportionment methods, they often incorporate a clause in the contract in which they agree to delegate the power to determine the apportionment method, if necessary. The parties might delegate the power to either the of sides²⁰⁸ or to a third party.²⁰⁹ Or they might choose to renegotiate the method of apportionment and determine it together.²¹⁰ They might set the relevant criteria

²⁰⁶ See, e.g., Cerecor Inc. & Essex Chemie AG, Exclusive Patent and Know-How License Agreement (Form S-1) 7 (Mar. 19, 2013), 2015 WL 6606686; Entegris, Inc., & Entegris Cayman Ltd. & Asyst Tech., Inc., Patent Assignment and Cross-License And Trademark License Agreement (Form 10-Q) § 1.35 (Feb. 11, 2003), 2003 WL 27348850.

²⁰⁷ HOLMES, *supra* note 116, at § 4:6.4.

²⁰⁸ Accuray Inc. & CyberHeart, Inc., Patent License Agreement (Form 10-K) 3 (Dec. 10, 2010), 2014 WL 10830787 (licensor); GlaxoSmithKline LLC & NPS Pharm., Inc., Exclusive Patent License Agreement (Form 10-K) 6 (July 29, 2011), 2011 WL 12975350 (licensor); Aquamer, Inc. & Partners in Biomaterials, Inc., Patent License Agreement (Form 10-KSB) § 3.2 (Mar. 31, 2006), 2006 WL 8365901 (licensee); The Univ. of Tex. Sys. & The Univ. of Tex. M.D. Anderson Cancer Ctr. & Intron Therapeutics, Inc., Patent and Technology License Agreement (Form S-1) 6 (July 20, 1994), 2015 WL 8052069 (licensee).

²⁰⁹ Imperial Coll. Innovations Ltd. & Imperial Coll. of Sci., Tech. & Med. & CytRx Corp., Patent License Agreement (Form S-1) § 1.1 (May 19, 2004), 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 Found. for Med. Educ. & Rsch., Nonexclusive Patent License Agreement (Form S-1) 3 (Apr. 14, 2006), 2012 WL 12473859 (same); ValiPharma Ltd. & HyperGenomics Pte. Ltd., Patent License Agreement (Form 8-K) 5 (June 9, 2011), 2012 WL 12408411 (same).

²¹⁰ See, e.g., Dharmacon, Inc. & Quark Pharm., Inc., Patent License Agreement (Form S-1) 3-4 (Jan. 29, 2010), 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 (Form S-1) 7 (Mar. 19, 2013), 2015 WL 6606686 (same); PDL BioPharma, Inc. & Alexion Pharm., Inc., Patent License Agreement (Form 10-K) 13 (Dec. 31, 2008), 2009 WL 10585004 (same).

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,²¹¹ on the proprietary protection of the components,²¹² or on the relative importance of the component to the efficacy of using the multi-component product.²¹³

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 the sale of its products,²¹⁴ which might, in turn, lead it to give up innovation. The phenomenon of excessive royalty payments to several parties is called royalty stacking.²¹⁵

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. We might call them anti-royalty-stacking clauses.²¹⁶ 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

²¹¹ See, e.g., *AutoGenomics, Inc. & Mayo Found. Med. Educ. & Rsch., Nonexclusive Patent License Agreement (Form S-1) 3-4* (Apr. 14, 2006), 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 . . .”).

²¹² See, e.g., *Univ. Tex. Genprex, Inc., Patent and Technology License Agreement (Form S-1) 6* (July 20, 1994), 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.”).

²¹³ See, e.g., *Nat'l Insts. of Health & Gen Vec, Inc., Patent License Agreement (Form 10-K) 6-7* (Mar. 9, 2000), 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).

²¹⁴ BRUNSVOLD, O'REILLEY & KACEDON, *supra* note 93, at 172–73.

²¹⁵ Lemley & Shapiro, *Holdup and Stacking*, *supra* note 30, at 1993, 2011–12.

²¹⁶ See BRUNSVOLD, O'REILLEY & KACEDON, *supra* note 93, at 172–73 (calling these clauses as “royalty stacking provision”). See also HOLMES, *supra* note 116, §4:26 (calling these clauses as “Anti-stacking provision”).

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.²¹⁷ However, the royalties that the licensee owes the patentee shall not be less than 2% of the net sales of the patented products.²¹⁸

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.²¹⁹

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.²²⁰ The minimum such royalty rate is 50% of the original royalty rate.²²¹ The floor is important because the patentee has no control over the licensee concerning how many third-party licenses the licensee

²¹⁷ Bd. of Regents of The Univ. of Tex. Sys. & Bio-Path Holdings, Inc., Patent and Technology License Agreement (Form 10-Q) 5 (Nov. 2, 2007), 2013 WL 11158697.

²¹⁸ *Id.*

²¹⁹ *See, e.g.*, Cardion Pharm., Inc. & Diacrin, Inc., Patent License Agreement (Form 10-QSB) § 3.1(b) (Sept. 30, 2002), 2007 WL 9505297; Imperial Coll. Innovations Ltd. & Imperial Coll. of Sci., Tech. and Med. & CytRx Corp., Patent License Agreement (Form S-1) § 4.12 (May 19, 2004), 2008 WL 11045458; RXi Pharm. Corp. & Invitrogen IP Holdings, Inc., Patent License Agreement (Form S-1) 10 (Nov. 1, 2007), 2008 WL 11045564; Mass. Inst. of Tech. & Sontra Med., Inc., Patent License Agreement (Form S-4) 12 (June 30, 1998), 2002 WL 35608498; Trinity Biotech Mfg. Ltd. & Nat’l Insts. of Health, Patent License Agreement (Form 20-F) 14 (May 22, 2012), 2015 WL 6644266; Ariz. Bd. of Regents on Behalf of The Univ. of Ariz. & Wildcap Energy, Inc., Exclusive Patent License Agreement (Form S-1) 14 (Mar. 2, 2011), 2011 WL 13039236.

²²⁰ For the exception, *see* Pierre Fabre Medicament S.A. & Novacea, Inc., Patent and Know-How License Agreement (Form S-1) 24 (July 19, 2005), 2006 WL 8377440.

²²¹ *See, e.g.*, Regents of The Univ. of Colo. & V-Clip Pharm., Inc., Exclusive License Agreement (Form 8-K) 6 (Nov. 2007), 2007 WL 9582375 (“However, in no event shall the Earned Royalty paid to University be less one half the specified royalty.”); Imperial Coll. Innovations Ltd. & Cronos Therapeutics Ltd., Patent License Agreement (Form 8-K) 5 (Oct. 19, 2005), 2012 WL 12408465 (“royalties paid under the Third Party License [sic] 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”).

might take and how much it will pay in royalties for these licenses.²²² Setting a floor keeps the royalties from dropping to an unreasonably low level after the offset.²²³

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’s patent. Many of the 40 contracts employ a similar standard, requiring that the third-party licenses be *necessary* to prevent the product from infringing third parties’ patents²²⁴ or be “legally required.”²²⁵ Some of the contracts employ less restrictive standards, which require the third-party licenses to be “necessary or desirable”²²⁶ or simply require that the third-party licenses are made to “make, use, or sell” the product that the patentee’s patent covers.²²⁷ 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.²²⁸ And a few contracts only allow the offset when the licensee’s

²²² See BRUNSVOLD, O’REILLEY & KACEDON, *supra* note 93, at 173 (mentioning that licensors commonly set a floor for the royalties that are subject to an offset because they have “no control over what the licensee agrees to pay a third party”).

²²³ *Id.*

²²⁴ Imperial Coll. Innovations Ltd. & Cronos Therapeutics Ltd., Patent License Agreement (Form 8-K) 5 (Oct. 19, 2005), 2012 WL 12408465; *see also* Mass. Inst. of Tech. & Synlogic, Inc., Exclusive Patent License Agreement (Form 8-K) 12 (Nov. 9, 2015), 2017 WL 03688461 (“[T]o exploit, or avoid or settle claims of infringement of such rights by the practice of,” the licensed patent).

²²⁵ BioHaven Pharm. Holding Co. & Gen. Hosp. Corp., Exclusive Patent License Agreement § 4.5(a)(ii) (Sept. 13, 2014), 2017 WL 01289105.

²²⁶ Genencor Int’l, Inc. & The Nat’l Insts of Health, Patent License Agreement (Form 10-K) § 6.11 (Nov. 29, 2004), 2005 WL 8057067.

²²⁷ The Regents of The Univ. of Colo. & V-Clip Pharms., Inc., Exclusive License Agreement (Form 8-K) 6 (Nov. 2007), 2007 WL 9582375; *see also* Koninklijke Philips Elecs. N.V. & Hansen Med., Inc., Patent and Technology License and Purchase Agreement (Form 10-Q) 16 (Feb. 3, 2011), 2011 WL 13022426 (“[T]o exploit the licenses granted” under the agreement); Miragen Therapeutics, Inc. & The Brigham and Women’s Hosp., Inc., Exclusive Patent License Agreement (Form S-4) 10 (May 10, 2016), 2016 WL 07030675 (Third-party license “in order to develop, manufacture, use, or sell a Licensed Product”); Mass. Inst. of Tech. & Sontra Med., Inc., Patent License Agreement (Form S-4) 12 (June 30, 1998), 2002 WL 35608498 (“[T]o manufacture, use or sell such LICENSED PRODUCTS or practice of any method, process or procedure within the PATENT RIGHTS”).

²²⁸ Mass. Inst. of Tech. & Synlogic, Inc., Exclusive Patent License Agreement (Form 8-K) 12 (Nov. 9, 2015), 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).”).

profits drop below a certain threshold;²²⁹ or when the aggregate royalties exceed a determined threshold.²³⁰

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.²³¹ 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.

IV. 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.²³² 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.

²²⁹ GlaxoSmithKline LLC & NPS Pharms., Inc., Exclusive Patent License Agreement (Form 10-Q) 17 (July 29, 2011), 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 [*]”).

²³⁰ Miragen Therapeutics, Inc. & The Brigham and Women’s Hosp., Inc., Exclusive Patent License Agreement (Form S-4) 10 (May 10, 2016), 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 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”).

²³¹ Lemley & Shapiro, *Holdup and Stacking*, *supra* note 30, at 2042. For the arrangements that set a cap on royalties, *see also* Section II.B, notes 119 and 118.

²³² Rite-Hite Corp. v. Kelley Co., Inc., 56 F.3d 1538, 1576 (Fed. Cir. 1995) (en banc).

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.²³³ They date this hypothetical negotiation to the time when the infringement began.²³⁴ 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.”²³⁵ We have seen, however, that there are circumstances in which courts do allow parties to introduce *ex post* information as probative evidence.²³⁶ This is for the purpose of determining what the parties would have known at the date of the hypothetical negotiation.²³⁷ 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.²³⁸ These economic factors are not fully in the control of either party, and no one can completely predict them.²³⁹ 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.²⁴⁰

To illustrate, a royalty adjustment clause might increase the royalty rate when the sales revenues of the patented product reach a benchmark.²⁴¹ Merely relying on *ex ante* information, parties cannot know whether the sales revenue will reach

²³³ *Id.* (determining reasonable royalties by “envision[ing] 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”).

²³⁴ *Id.*

²³⁵ *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 75 (Fed. Cir. 2012).

²³⁶ *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).

²³⁷ *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 772 (Fed. Cir. 2014).

²³⁸ *See supra* Section II.C.

²³⁹ ERIC. E. BENSON, *BENSEN ON PATENT LICENSING TRANSACTIONS* § 3.04 (2019).

²⁴⁰ *Id.*

²⁴¹ *See supra* note 175.

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.²⁴² 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.²⁴³ 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.”²⁴⁴ What the Federal Circuit did not consider was the possibility that parties might have incorporated into the contract a royalty adjustment clause based on profit margins.

The cases show that the Federal Circuit assumes away the possibility of renegotiation. In *LaserDynamics, Inc. v. Quanta Computer*, 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.”²⁴⁵ 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.²⁴⁶ 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-

²⁴² For a summary of adjudicated royalties see the case table in 1 CHISUM ON PATENTS § 20.07 (2019).

²⁴³ *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 770 (Fed. Cir. 2014).

²⁴⁴ *Id.* at 772.

²⁴⁵ *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.”).

²⁴⁶ See *supra* Section II.C.

determined royalty floor, and so forth.²⁴⁷ When they amend a contract, it is inevitable that the parties 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, 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.²⁴⁸ The parties might expect other events, 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.²⁴⁹

A patent licensing agreement is a contract governed by the principles of contract law. Under contract law, obligors are usually liable for a breach of the terms even if the *ex post* events make the obligation harder or less desirable than they expected.²⁵⁰ 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.”²⁵¹ Such relief is an adjustment to the obligation in the original contract. In the context of patent licensing, the obligation to pay royalties is within the 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.²⁵²

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 the infringing use generated.²⁵³ 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 use *ex post* information to adjust

²⁴⁷ *See id.*

²⁴⁸ *See Crocker & Masten, supra* note 171, at 70, 73.

²⁴⁹ *See BENSON, supra* note 239.

²⁵⁰ RESTATEMENT (SECOND) OF CONTRACTS ch. 11, intro. note (AM. L. INST. 1981).

²⁵¹ *Id.*

²⁵² *Cf. id.* at § 226.

²⁵³ *See Jarosz & Chapman, supra* note 27, 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.”).

the reasonable royalties, the award that they assess is more likely to be “fair and complete.”²⁵⁴ As we have seen, it is also the case that taking *ex post* information into account is consistent with actual licensing practices.²⁵⁵

The need for 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.²⁵⁶

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 $\$400,000 \times 1\% = \$4,000$; and for the second year, $\$600,000 \times 2\% = \$12,000$. 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 $\$400,000 \times 1\% = \$4,000$ and $\$600,000 \times 1\% = \$6,000$, 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 during 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, or expert testimony to establish the un-foreseeability of the event and the likelihood of renegotiation.

²⁵⁴ See *id.* at 800–01.

²⁵⁵ See *supra* Section II. C.

²⁵⁶ For a summary of adjudicated royalties see the case table in 1 CHISUM ON PATENTS § 20.07 (2019).

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 an 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.²⁵⁷ 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 consumer's demand for the entire product.²⁵⁸ Otherwise, the court will reduce the royalty base to the value of a patented component.²⁵⁹ 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.²⁶⁰ Both rules share the characteristic that they tend to 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,

²⁵⁷ *Garretson v. Clark*, 111 U.S. 120, 121 (1884).

²⁵⁸ *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1337–38 (Fed. Cir. 2009).

²⁵⁹ *Id.*

²⁶⁰ *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 67 (Fed. Cir. 2012).

such as “ $A/(A+B)$.” This is one of the six possible formulas that this Article found,²⁶¹ 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 unavailable 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 prices, 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 it would not relate directly to the sale of the multi-component product. This is because it would not take the economic data relating to the 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 of the licensed rights.”²⁶² 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.²⁶³ 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.”²⁶⁴

To illustrate, real negotiations often use net sales as the royalty base. These equal gross sales minus a defined set of deductible items, such as promotional expenses, the cost of transportation, and returns to customers.²⁶⁵ Suppose a licensee sells both multi-component products and the patented component, say, computers and the hardware used in the computers. The licensee will collect

²⁶¹ Section II.D, Table 2, Items 3 to 8 and accompanying text (referring to six possible formulas).

²⁶² BRUNSVOLD, O’REILLY & KACEDON, *supra* note 93, 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”).

²⁶³ See Sidak, *Proper Royalty Base*, *supra* note 30, 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, *Four Principles*, *supra* note 30, 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.

²⁶⁴ BRUNSVOLD, O’REILLY & KACEDON, *supra* note 93, at 158.

²⁶⁵ See Section II.B.

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 shipping cost, and the customer sales returns indicate the net computer sales. Similarly, the net hardware sales incorporate the expenses for promoting, shipping, and returning it to customers who purchase it. But the data related to the sale of the hardware is probably not relevant to the sale of computers. For instance, the sales returns made to the customers who purchase the hardware might reflect the market performance of the hardware. Still, 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 computer sales. 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 multi-component product's value 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. 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 consumer demand is based on the patented feature, the royalty base is reduced to the patented component's value. Then data idiosyncratic to the sale of the patented component will enter the calculation. Either way, courts risk introducing economically irrelevant data into the calculation of reasonable royalties.²⁶⁶

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 calculating 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 patented component's sales price, 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 patented component's sales price 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 bring in enough of the relevant criteria to allow accurate apportionment. When a court applies the entire market value rule, it asks the

²⁶⁶ Cotter, *Four Principles*, *supra* note 30, at 752 ("[I]here 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.").

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 patented component's value. 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.²⁶⁷ But this apportionment 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 calculating the 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 the 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 specific 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 patented component's value, as royalty base might lead to overcompensation. They fear that a jury will be less equipped to apply a sufficiently low rate to a large royalty base.²⁶⁸ 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

²⁶⁷ *LaserDynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 67 (Fed. Cir. 2012) (citing *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 283 (N.D.N.Y. 2009)).

²⁶⁸ See 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'"). See Bailey, Leonard & Lopez, *supra* note 30, at 260 n.19 (stating that "a jury might be hesitant to award a royalty rate of 0.0001 percent" even the royalty base is large). *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226-27 (Fed. Cir. 2014) (holding that jury might be "less 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").

that the jury comes up with a 2% royalty rate for the net sales of both the patented component and the multi-component product. Then they decide to use the formula “ $1/(1+N)$ ” to apportion the value of the multi-component product. This calculation makes the reasonable royalty for one sale of the multi-component product $\$500 \times 1/(1+4) \times 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 \times 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 can prove that it would have used a formula to determine 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 a multi-component product.²⁶⁹ 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.²⁷⁰ The royalty rate is lower than the rate that the patentee charges for the patented component’s sale. This apportionment method 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. This rule is applied 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. This may include determining a sufficiently low royalty rate to a large royalty base. Otherwise, the reasonable royalty damages award will overcompensate the patentee.

²⁶⁹ See e.g., Ethicon Endo-Surgery, Inc. & Cyberonics, Inc., Exclusive Patent License Agreement (Form S-4) § 4f (May 10, 2016), 2008 WL 11019169 (using the net selling price of licensed product sold as a “stand-alone product” as the royalty base to calculate the royalties for the sale of combination products of which the licensed product is a part).

²⁷⁰ See e.g., The George Wash. Univ. & Protea Biosciences, Inc., Patent License Agreement (Form 10-K) 4 (Nov. 28, 2012), 2013 WL 11056988 (reducing the royalty rate from 7% to 5% when the royalty base for calculation is the value of a multi-component product).

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. The Federal Circuit decided that the presence of royalty stacking might “play a role” in the calculation of reasonable royalties,²⁷¹ as long as there is “actual evidence” to support it.²⁷² Such actual evidence can be the evidence of other licenses that the infringer has taken or royalty demands on the patented product.²⁷³ 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.²⁷⁴

Anti-royalty-stacking clauses create a contractual mechanism for the licensee to offset 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-thirds of the royalties before the offset.²⁷⁵ 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 for implementing 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 threshold²⁷⁶ or when the aggregate royalties exceed a pre-determined one.²⁷⁷

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

²⁷¹ *Integra Lifesciences I, LTD. v. Merck KGaA*, 331 F.3d 860, 871-72 (Fed. Cir. 2003).

²⁷² *Ericsson*, 773 F.3d at 1234.

²⁷³ *Id.*

²⁷⁴ Lemley & Shapiro, *Reasonable Royalties*, *supra* note 30, at 1150 (suggesting that tribunals need to learn from the “commercial arrangements” that entities adopt to solve the royalty stacking problem).

²⁷⁵ See, e.g., Bd. of Regents of The Univ. of Tex. Sys. & Bio-Path Inc., Patent and Technology License Agreement (Form 10-Q) 5 (Nov. 2, 2007), 2013 WL 11158697 (charging 3% of the net sales as royalties; and allowing an deduction of third party royalties on the condition that “in no event shall the royalties payable to [the licensor] . . . be less than two percent (2%)” of net sales).

²⁷⁶ See *GlaxoSmithKline LLC & NPS Pharms., Inc.*, *supra* note 229.

²⁷⁷ See *Miragen Therapeutics, Inc. & The Brigham and Women’s Hosp., Inc.*, *supra* note 227.

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.²⁷⁸ Therefore, the infringer-defendant would also need to prove that the third-party licensor is charging its 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.²⁷⁹ 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 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.²⁸⁰

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-

²⁷⁸ See *supra* Section II.A.

²⁷⁹ See, e.g., Miragen Therapeutics, Inc. & The Brigham and Women's Hosp., Inc., Exclusive Patent License Agreement (Form S-4) 10 (May 10, 2016), 2016 WL 07030675.

²⁸⁰ See, e.g., The Bd. of Regents of The Univ. of Tex. Sys. & Bio-Path Inc., Patent and Technology License Agreement (Form 10-Q) 5 (Nov. 2, 2007), 2013 WL 11158697.

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.

V. 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 of 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 informed by reality.”²⁸¹ 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—

²⁸¹ Rachlinski, *supra* note 7, at 910.

is unclear as well.²⁸² 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.²⁸³ 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, and so are the contents of evidence. Scholars and practitioners need to put in a significant effort to collect and analyze the evidence before they can test the doctrines against it. However, under the current legal system, judges tend to base the judicial doctrines they write on the evidence that litigants present to them. Yet, litigants are unlikely to invest heavily in the production of such empirical evidence when anecdotal evidence is sufficient to support their case. They have no incentive to collect empirical evidence to inform future judicial doctrines. Given the impediments, it is a difficult task to make the building of an evidence-based legal system a reality and not just an aspiration.

VI. 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 maintaining the secrecy of such information 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 unlikely 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 to protect investors and to ensure fair dealing. The SEC has exercised 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 a "material contract."²⁸⁴

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.²⁸⁵ 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.²⁸⁶ According to 17 C.F.R. § 229.601(a)(4), public companies must file their material contracts as exhibits to

²⁸² *Id.* at 901, 917.

²⁸³ *See* Warren, *supra* note 21, at 27; Golden, Merges & Samuelson, *supra* note 9, at 1758-59; Charn, *supra* note 10, at 2233.

²⁸⁴ 17 C.F.R. § 229.601 (a) (4) (2018).

²⁸⁵ 15 U.S.C. §§ 77g, 78l (2012).

²⁸⁶ 15 U.S.C. §§ 78m, 78o (d) (2012).

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.²⁸⁷ 17 C.F.R. § 229.601(b)(10) defines “material contract” as a contract “not made in the ordinary course of business which is material to the registrant.”²⁸⁸ The same rule regards patent licenses as “material contracts,” even when made in the ordinary course of business, if the registrant’s business substantially depends on them.²⁸⁹ 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 registrant’s 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 difficult 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 for patent license agreements. Specifically, Westlaw created a library called “Patent License Agreements” 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.²⁹⁰

²⁸⁷ 17 C.F.R. § 229.601(a) (4) (2018).

²⁸⁸ 17 C.F.R. § 229.601 (b) (10) (2018).

²⁸⁹ *Id.*

²⁹⁰ 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).

From the “Patent License Agreements” library, this Article collected agreements filed between January 1, 2000 and May 14, 2018, for a total of 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 remained. This Article examined the royalty clauses of each of these. It also looked at the amendments 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 their subsidiaries; none covered patent licenses between private companies with no relationship to SEC registrants. Second, the SEC does not require the public disclosure of patent licensing agreements that are “immaterial in amount or significance.”²⁹¹ 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.²⁹² Since there was no way to retrieve the redacted data, this Article has explicitly reported its uncertainty where relevant.

²⁹¹ 17 C.F.R. § 229.601 (b) (10) (2018).

²⁹² Pursuant to 17 C.F.R. § 230.406 (2018) and 17 C.F.R. § 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.

