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ABSTRACT

The patent system seeks to strike the ideal balance between competition and the rate of innovation – not to maximize innovation unconditionally. Clearly there must be limits on the manner and degree to which patents are used to diminish competition. A critical complication, however, is that this boundary is often obscure. As a matter of both economics and law, it is frequently very difficult to discern whether a given competition-suppressing practice is justified on patent policy grounds. In these cases, it is up to policymakers, economists, and jurists to discern what practices are likely to be efficient overall. To that end, this dissertation comprises four chapters on topics in competition policy, antitrust, and intellectual property, with emphasis on the intersection of antitrust and patent law.

The Patent Trial and Appeal Board (PTAB) is an adjudicative division of the Patent Office that permits parties to challenge patents as invalid. In Chapter 1 (coauthored with Jorge Lemus), we investigate whether PTAB's distinctive institutional characteristics—such as its lack of antitrust jurisdiction or traditional justiciability requirements—may be exploited to facilitate potentially anticompetitive "reverse settlements" between drug monopolists and prospective generic competitors. We offer empirical evidence that most pharmaceutical settlements reached in PTAB appear to forestall market entry by the generic-petitioner, even if the disputed patent claims had been deemed “reasonably likely” to be invalidated.

We also address the so-called "reverse patent troll" phenomenon – non-producing companies that use PTAB purely as a holdup device for extracting settlements. The practice has inspired widespread concern, but it appears to be rare. And we show that, for a number of reasons, it is not a particularly viable business model.

Chapter 2 applies classical law and economics machinery – in particular Coasean economics – to the intersection of antitrust and intellectual property policy. Most influential economic theories about private disputes, including the Coase theorem, assume that there are no *legal* restraints on alienability, i.e. the transactability of rights and property. However, the parties to a patent dispute are often competing firms, and their private dealings may thus be constrained by the antitrust laws. Antitrust prohibits private transactions that allocate commercial rights in ways that unreasonably subvert competition between the parties. This creates an asymmetry between (1) the allocations of rights that the parties can effect through contract; and (2) those a court can effect through its judgment. For example, antitrust may condemn a "reverse payment" settlement in which a monopolist-patentee pays an accused infringer to stay off the market for several years. But if the dispute were litigated to judgment, a court could produce the same exclusionary outcome by issuing an injunction. The result is ultimately that, in contrast to familiar Coasean logic, a court's delimitation of patent rights can influence the final allocation of such rights, even if the parties can bargain. Further, the parties may (rationally) litigate to judgment even if they have common beliefs about litigation, and even if they are perfectly capable of entering into a lawful settlement ex ante. The economics of these disputes is thus critically different from those usually studied in law and economics, and this leads to distinct normative conclusions, particularly with respect to the efficiency of settlement.

Chapter 3 addresses a critical but often overlooked feature of the patent system, which is that it relies in part on markets to discern which inventions are patentable and which ones are not. Indeed, patent rights are not the only important legal entitlements conferred by the Patent Act. It also vests "challenge rights" in third parties, permitting them to challenge granted patents as invalid or uninfringed, and potentially clearing a path for privileged competition. These classes of rights perform opposite policy functions, with patent rights providing an inducement for invention and challenge rights providing a check against unwarranted or overbroad patent enforcement. And, unlike patent rights, the Patent Act never suggests that challenge rights are alienable – i.e. that they may be transacted or suppressed through contract. It follows that challenge restraints – contractual provisions that bar or penalize the exercise of a party's challenge rights – are not within "the scope of the patent." This suggests not that they are categorically unlawful, but simply that they do not enjoy safe harbor from antitrust attack.

Challenge restraints are used within a variety of different patent agreements – ranging from ordinary licensing deals to "reverse settlements" – with varying competitive effects. However, the courts have failed to recognize challenge restraints as a distinct antitrust issue. This brief article explains why they ought to be viewed as such. The analysis also helps to clarify the proper ambit of antitrust intervention in patent agreements.

Chapter 4 addresses strategic litigation tactics by "Patent Assertion Entities" (PAEs). These firms – pejoratively known as "patent trolls" – buy and assert patents, but do not actually produce anything that relies on them (and in many cases they don't produce anything at all.) These

firms frequently bring dubious infringement lawsuits on which they are very unlikely to net a profit. Although seemingly irrational, I argue this is a profitable strategy of "predatory patent litigation" in which a PAE monetizes bad patents by demonstrating a willingness to lose money on litigation. This gives the PAE a litigious reputation that persuades future targets to pay licensing demands they would ordinarily rebuff for lack of legal merit.

I develop a novel recursive model of reputation building by a PAE, which is highly tractable and has interesting equilibrium dynamics. The unique equilibrium involves predatory litigation whenever litigation is sufficiently injurious for a defendant. I use the model to appraise some potential deterrence strategies. Fee shifting will improve matters, but is unlikely to deter PAEs from targeting small firms or startups. This article was heavily quoted by a recent Federal Trade Commission study on PAEs.

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1. REVERSE SETTLEMENT AND HOLDUP AT THE PATENT OFFICE

(Coauthored with Jorge Lemus)

I. INTRODUCTION

Since its inauguration in 2012, the Patent Trial and Appeal Board (PTAB) has broadened the scope of post-grant patent examination, making it less burdensome to challenge the validity of granted patents. By and large, PTAB has made the patent system more efficient. However, we argue that this forum may be used as a platform for potentially-anticompetitive *reverse settlements*: agreements in which a monopolist-patentee gives a potential market entrant (which is challenging its patents) something of value to terminate its challenge and stay out of the market. We provide empirical evidence suggesting that competing pharmaceutical firms may be settling PTAB proceedings through these kinds of agreements.

Reverse settlements typically occur in the pharmaceutical industry between a brand-name drug manufacturer, which has a patent-based monopoly, and a generic drug maker (a potential market entrant) that wishes to challenge those patents on the grounds that they are either invalid or not infringed by its proposed generic. If the challenge is successful, the result will be a marked decline in total market profits. Thus, the parties can jointly benefit from a settlement that serves to delay generic competition, with the patentee compensating the generic firm with something other than a (non-delayed) license. The compensation may consist of a cash payment, which is

known as "reverse payment" or "pay for delay."[1] (Edlin et al., 2015; Hemphill, 2006). But even noncash reverse settlements can raise antitrust concerns. (Carrier, 2016). An agreement of this nature restrains competition and keeps drug prices very high, whether or not the underlying patents are valid and infringed. Helland and Seabury (2016) estimate that restricting the entry of generic drugs reduced consumer surplus by about $800 million over a 5-year period. Of course, this metric probably does not capture the full weight of these settlements' social impact, as many of the drugs at issue are directed at serious illnesses with very limited treatment options.

In 2013, the Supreme Court's *Actavis* decision held that reverse payment settlements may violate the antitrust laws.[2] However, until now, the focus of scholars and the antitrust agencies has been entirely on reverse settlements of *district court litigation*. No scholars have addressed the propensity for competitors to enter such settlements in PTAB,[3] nor examined the important legal and institutional issues that distinguish this forum.

This paper's principal contribution is to analyze PTAB's potential use as a platform for striking reverse settlements, and to provide empirical evidence suggesting that pharmaceutical firms may be using it as such. To do so, we rely on an empirical method designed to identify post-settlement delay in market entry by the generic firm. About 84% of applicable settlements satisfy our empirical criteria for inferring potential reverse settlements. Further, of those satisfying our

[1] We use the term "reverse settlement" rather than the better-known "reverse payment" to signify that, while the agreement excludes the generic firm for some period of time, it does not necessarily involve a cash payment to the generic firm.
[2] FTC v. Actavis, Inc., 570 U.S., 133 S. Ct. 2233 (2013). The holding was clear with respect to reverse payment settlements, antitrust treatment of other kinds of reverse settlements remains an unresolved issue.
[3] A recent exception is Sturiale (2016), which discusses, among other things, the role PTAB could play in helping to deter reverse payment settlements.

inference criteria, nearly half occurred soon after the PTAB judge had determined that the challenged patent claims were "reasonably likely" to be invalidated on final judgment.

Because the exact *terms* of PTAB settlements are always kept confidential, and because this area of antitrust is still evolving, we cannot endeavor to say that any particular settlement in our dataset is a clear-cut antitrust violation under current law. However, many of the settlements in the data exhibit the markings of reverse settlement. As such, our results establish a very serious question as to whether firms are striking anticompetitive agreements in PTAB, suggesting at the very least that antitrust enforcement efforts should not focus exclusively on settlements reached in district courts. Further, given the unique institutional features that distinguish PTAB from district courts, our analysis highlights some new layers of complexity that antitrust must take into account if it is to police reverse settlements effectively.

Our results also suggest that PTAB, although efficient in many aspects, may not be serving a socially valuable function that it appears well-equipped to perform. The Hatch-Waxman Act's provisions on drug patents were aimed in large part at encouraging patent challenges to facilitate generic competition and thereby achieve lower prices for drugs that are undeserving of a patent monopoly. PTAB could help to streamline this by making it less burdensome to challenge drug patents. And, unlike district court judges, a PTAB adjudicator has the authority to continue a patent challenge to judgment even after the petitioner and patentee have settled. But our results indicate that pharmaceutical firms often settle in PTAB, and this virtually always results in termination of the proceedings. And, moreover, most of these settlements appear not to have resulted in expanded generic competition. Thus, aside from the relevant antitrust concerns, our

analysis raises new questions about the patent system's efficacy in encouraging challenges to pharmaceutical patents.

Our investigation makes use of data from a number of sources. First, we have data on all PTAB trials – and on characteristics of the underlying patents – from September 19, 2012 to August 31, 2016. This tells us, among other things, whether a given inter partes review (IPR) settled, and whether it settled before or after an "institution" decision[4] was rendered. Within this dataset, we focus on trials occurring between pharmaceutical firms, and in which the relevant patents cover a brand-name drug sold by the patentee. We also make use of the FDA's "Orange Book"[5] – an online database that provides information on FDA-approved drugs (both proprietary and generic); applicable patents; and the identities of firms that sell those drugs. In particular, generic firms show up in the Orange Book listings when they obtain approval for a previously-filed Abbreviated New Drug Application (ANDA) – a sort of streamlined FDA approval for generic versions of already-approved branded drugs. We also search public records to see whether the parties to a PTAB adjudication were also involved in contemporaneous district court infringement litigation and, if so, whether that case settled in parallel.

Although settlement terms are never publicly available on the PTAB database, we can use our data to infer whether it is an "ordinary" patent settlement – with the generic firm getting a license to begin practicing the patent immediately, and likely paying royalties in exchange – or a

[4] An institution decision, which is necessary for a PTAB trial to proceed to a final judgment, requires a showing that the challenged patent claims are reasonably likely to be invalidated.
[5] The Orange Book is publicly accessible at http://www.accessdata.fda.gov/scripts/cder/ob/.

reverse settlement that serves to keep the generic firm off the market for some period of time. Our principal tool for doing this is the Orange Book, although we supplement the inference with other data in some cases. In effect, if the generic firm does not show up in the Orange Book following the settlement, then we infer that it likely did not obtain the patent rights needed to enter the market without further delay, suggesting the parties may have entered into a reverse settlement.

One problem with the Orange Book is that its inferential power is stronger in one direction than the other. That is, if a firm is *not* listed in the Orange Book, then we know it is not selling a generic drug,[6] since it has not obtained the required ANDA approval. By contrast, some generic firms show up in the Orange Book after settlement, but they do not actively sell the drug, despite having the right to do so. We use a separate data source to identify the latter situations. In particular, we make use of a publication called the Anticipated Availability of First-Time Generics (AAFTG), which is compiled and circulated by *Pharmacist's Letter* – a subscription-based service that circulates news and information about the pharmacology industry to pharmacists, and which was last updated in September of 2016.[7]

The AAFTG is a (non-exhaustive) list of existing or anticipated generic versions of brand name drugs. For each generic in the list, it identifies the manufacturer, and the anticipated date of entry. As it happens, the explicit entry dates listed in the AAFTG are less consequential than the fact that a generic drug is listed in the first place. In many instances the anticipated availability

[6] A possible exception, which we are able to rule out empirically, is that the generic firm may have obtained the right to sell an "Authorized Generic," which does not require ANDA approval. We discuss this in more detail in Section III(A).

[7] Pharmacist's Letter's website is http://pharmacistsletter.therapeuticresearch.com/home.aspx?cs=NDPTL~CP&s=PL

dates are set by default to the dates of patent expiration, unless the authors are able to acquire some evidence of pre-expiration entry. But that does not rule out the possibility of a confidential agreement permitting the generic firm to enter before patent expiration. On the other hand, if a generic drug is listed in the AAFTG as having a future entry date, then we know that it is not yet being sold to consumers, and that there is no indication it will be available in the near future, even if it happens to be listed in the Orange Book. Thus, we can use the AAFTG as a check against the over-inclusiveness of the Orange Book listings – to identify generic drugs that are indeed listed in the Orange Book following the settlement, but which are not being actively sold to consumers.

In many instances, there are multiple IPR proceedings between a given pair of pharmaceutical firms, all of which involve patents covering a common brand-name drug (or a common set of closely related drugs) sold by the patentee, and all of which settle simultaneously. As such, this combination really reflects a single settlement agreement. Accordingly, we aggregate these sets of related into what we call "consolidated settlement agreements" (CSAs), and then focus on individual CSAs as the unit of account, rather than individual IPRs. This way we do not give more weight for drug settlements that happen to involve more patents. However, where no confusion arises, we will often use the terms "CSA" and "settlement" interchangeably.

There are 19 applicable CSAs in the data, which subsume about 40 distinct, settled IPRs. We find that 16 of them (84%) meet our criteria for inferring a potential reverse settlement. Interestingly, in 7 of these 16 settlements (44%), the IPR had been instituted soon before the settlement occurred. A decision by the judge to institute the IPR is by definition a signal that the disputed patent claims appear reasonably likely to be invalidated. In these post-institution

settlements, the inference of reverse settlement is particularly strong, for a petitioner is unlikely to walk away with nothing soon after the judge signals that its validity challenge is reasonably likely to succeed.

There are, in principle, some reasons other than reverse settlement that a generic firm might not enter the market post-settlement. We discuss a number of these possible alternative explanations in a later section. In each case, we argue either that the alternative explanation can be ruled out empirically, or else that it fails to allay competition policy concerns. For example, generic firm may have manufacturing issues that inadvertently delay its ability to commercialize its generic drug. To attempt to control for this, a later section considers how the results change when we restrict the dataset to settlements occurring more than a year before this paper was submitted for publication (late October, 2016), allowing some time for inadvertent delays. We find that a large majority (87%) of the relevant generic drugs in these older settlements still remain off the market.

Although PTAB judges lack antitrust jurisdiction, and thus there is no *direct* antitrust oversight in the forum, a statutory reporting requirement is intended to facilitate indirect oversight of certain pharmaceutical patent agreements. Specifically, the Medicare Modernization Act (MMA) of 2003 created a statutory requirement that certain Hatch-Waxman patent agreements be submitted to the FTC for antitrust review, most notably those relating to the "manufacture or sale" of either firm's drug. Since this applies broadly to "agreements," there is no reason to think it applies only to district court settlements. We think that the statute, while imperfectly drafted, probably *should* compel review of most or all of the PTAB settlements in our dataset. However,

there are a number of arguments – some of which hinge on institutional features of PTAB – that the parties might rely on in an attempt to justify non-submission of their PTAB settlement. Of course, another possibility is that the parties may simply defy the reporting requirement – perhaps by relegating profit-sharing terms to a private (possibly oral) agreement, while submitting everything else – which is something that has happened in the past.

One surefire way to avoid the MMA reporting requirement would be to strike a reverse settlement before the generic firm has applied for an ANDA under Paragraph IV of the Hatch-Waxman Act. The statute lists such application as a condition for triggering the reporting requirement. Using public records, we find most generic firms in our data had filed an ANDA before the PTAB petition, and hence we think these firms probably *should* have sent their settlement agreements for review to the FTC, but as already noted, there are some arguments the firms might use to attempt to justify non-submission of a PTAB settlement. For example, the FTC has suggested that an agreement that forecloses the possibility of ANDA approval under Paragraph IV[8] of the Hatch-Waxman Act must be submitted for review,[9] even if it does not otherwise include any express limitations on manufacture or sale of any drug. But a PTAB settlement relates only to *validity* challenges, not challenges asserting *non-infringement*, and thus it leaves open the possibility of Paragraph IV ANDA approval based on the infringement prong. As such, a PTAB settlement generally will not foreclose Paragraph IV approval as a matter of law,[10] and the parties

[8] Paragraph IV ANDAs are discussed in more detail in Section II. The important point is that Paragraph IV is the only way a generic firm can potentially enter the market before the relevant drug patents have expired.
[9] See the discussion in Section IV(C) for more detail on the FTC's interpretation of the reporting requirement.
[10] In at least one case, the parties attempted to block challenges to both validity and infringement through their PTAB settlement, even though they had never litigated the infringement issue. Specifically, in one IPR, the parties' joint request to settle purported that their proposed settlement would forestall all possible Hatch-Waxman litigation between the parties (including district court infringement litigation). This settlement is further discussed in Section IV(A).

may argue that this eliminates the need to submit the agreement. But, on the other hand, it may be that the validity issue is the only *viable* challenge in a particular case, implying that the settlement's practical effect is to block generic entry, albeit not as a matter of law. This is a good illustration of how PTAB's unique institutional features present some distinct challenges to antitrust enforcement.

The onus of antitrust enforcement rests largely on the shoulders of the antitrust agencies, in particular the Federal Trade Commission (FTC). Surprisingly, district court judges – who have the authority to enforce the antitrust laws – generally do not review inter-competitor patent settlements for antitrust compliance,[11] although there has been at least one exception to this trend.[12] This means that antitrust review must come in the form of an entirely separate antitrust action, which is usually brought by the FTC. As a result of this considerable burden, the FTC focuses its attention on district court settlements. And, as already noted, antitrust review can *never* come from a PTAB judge, since they lack authority to enforce the antitrust laws. For these reasons, it is not surprising that there has apparently never been an antitrust inquiry into a PTAB settlement, at least not on public record.

There is no publicly available information suggesting that these PTAB settlements were actually submitted to the FTC for antitrust review, and there are no public records suggesting that

[11] See, e.g., *In re Nexium (Esomeprazole) Antitrust Litig*., 968 F. Supp. 2d 367, at 396 (D. Mass. 2013). In this (post-*Actavis*) case, the court held that a patent settlement, even if entered as a consent decree, should generally not be treated as a judgment on the merits. The court noted that it is much more like a private contract, because the terms are drawn up by the parties, and the courts do not carefully review them. It noted that judges are "hard-pressed" to reject settlement proposals.

[12] In 2014, a court sought FTC review of a patent settlement before approving it. See *In re Effexor XR Antitrust Litig*., No. 11-5479, 2014 U.S. Dist. LEXIS 142206, at *37–40 (D.N.J. Oct. 6, 2014).

the FTC has *ever* launched an antitrust inquiry into a PTAB settlement. Rather, the FTC appears to focus its efforts entirely on settlements of district court litigation. In some settlements, we find no public records suggesting that the petitioner had filed an ANDA prior to settling (although this does not necessarily rule out the possibility that they did so[13]), and in these cases it is possible that the parties could lawfully avoid submission of their reverse settlement to the FTC.

Interestingly, some of the PTAB settlements, including some satisfying our inference criteria, did not coincide with any contemporaneous infringement litigation. This is unusual for a patent dispute arising under the Hatch-Waxman Act, as the patentee usually sues the generic firm almost immediately after the latter applies for FDA approval of its generic drug. (See, e.g., Hemphill, 2006). One possible explanation is that the parties may believe that, if they relegate their conflict entirely to PTAB, they may be able to fly under the antitrust radar, perhaps because PTAB's unique institutional features may provide a basis for arguing against the applicability of the MMA reporting requirement.

Importantly, even if a reverse settlement does not include a cash payment, it might still raise competition policy concerns – for example, if the patentee promises not to launch an "authorized generic" in exchange for the generic-petitioner's agreement to delay its own entry.[14] In fact, we argue that even if the settlement includes only a material delay in generic entry, but no

[13] The identities of ANDA applicants are not published by the FDA unless and until the application is approved. A reverse settlement will serve to preclude ANDA approval, and thus the FDA data does not tell us whether a petitioner in a reverse settlement had previously filed an ANDA. There are other sources, however, such as court documents, that occasionally reveal that a party has filed for an ANDA.

[14] The Third Circuit recently held that such agreements may violate the antitrust laws under *Actavis*. *SmithKline Beecham Corp. v. King Drug Co*., 791 F.3d 388, 397 (3d Cir. 2015). See also, e.g., Carrier (2016); Hemphill et al. (2015).

other compensation to the generic firm, it may injure consumers relative to litigation to judgment. That is, the firms will tend to pick a delay period such that consumers are left worse off than if the challenge were taken to final judgment. The reason is that, by settling, the parties will slow the rate of third party generic entry, because entry is costlier and more time-consuming if the patents remain valid and thus must be challenged by potential entrants. This is just an embodiment of the more general fact that a larger entry barrier will result in a diminished rate of market entry. This increases expected total profits over the patent term, and the patentee takes its share of these rents by taking a longer exclusion period than that which would leave consumers indifferent between settlement and final judgment.

Our paper's second contribution is to present a comprehensive economic theory of the so-called "reverse patent troll" phenomenon, which involves a non-producing company that uses PTAB purely as a holdup device for extracting reverse payment settlements (which, in this case, create no antitrust concerns[15]). Our economic model shows the driving economic forces behind this relatively new business model, and highlights how it differs from that of traditional "patent trolls"—non-practicing entities (NPEs) that make money by enforcing patents, but do not actually make any products that read on those patents. Reverse patent trolls do not directly benefit from patent invalidation, while patent trolls directly benefit from patent infringement (because it obtains a remedy), and this affects the practice's reliability and profitability. Another important point is that third parties can freeride on the reverse troll's petition, as they can use it to bring a challenge of their own, and this means that the reverse troll surrenders bargaining power upon filling its

[15] The parties are not competitors, nor would they be competitors but for the reverse payment settlement, so the agreement raises no antitrust issues.

petition. There is relatively little evidence for reverse trolling, and our model explains why, for a number of reasons, it simply is not a very viable standalone business model. However, there may be certain (rare) circumstances in which it could be profitable on a one-off basis.

On the suspicion that PTAB is being used to reach anticompetitive settlements or as a holdup forum, we offer a number of proposals for reform. First, we propose that reporting to the FTC should be mandatory for a broader class of agreements, and that the text of the reporting statute should include some less ambiguous triggers, such as any term that calls for a reverse payment or some other form of profit-sharing or delayed entry. Second, we suggest that, in trials that settle *post-institution*, PTAB judges should more often exercise their authority to continue the proceeding to judgment without the petitioner. The timing of these settlements suggests that they are designed to avoid invalidation at the last moment – a motive that is inimical to the very policies that underpin PTAB. Third, we propose that federal courts, when reviewing Hatch-Waxman settlements, should require that the drafted proposal include all terms that would arguably have to be submitted to the FTC under the MMA statute.

Further, in order to discourage reverse trolling activity without discouraging good faith challenges by non-competitors, it may be beneficial to reject settlement proposals involving reverse payments that are large in relation to the cost of bringing a PTAB petition. This would not preclude reverse pay settlements altogether – and it would *never* prohibit licensing settlements[16] – nor would it prevent any party (including a non-producing company) from taking a petition to final

[16] By "licensing settlement," we refer to one that permits the petitioner to begin selling a generic drug immediately. This excludes pay for delay agreements, where the generic firm is paid to wait several years before its license vests.

judgment. Rather, it would simply ensure that firms cannot turn a substantial profit by doing nothing more than filing and settling IPRs.

A. A BRIEF OVERVIEW OF PATENTABILITY REVIEW IN PTAB

The Leahy-Smith America Invents Act (AIA) in 2011 established three new procedures conducted at the Patent Trial and Appeal Board (PTAB): Post Grant Review (PGR), Inter Partes Review (IPR), and Covered Business Method (CBM). In all these procedures, the petitioner –who must identify all real parties in interest and must pay a fee– files a petition to the PTAB to reconsider the validity of patent claims. The petition, which is made available to the public as soon as it is filed, contains supporting evidence that would help invalidate claims of the targeted patent.[17] Then, the patent owner may respond to the petition, each party may file observations, and they could potentially bargain and drop the case at any point before the PTAB reaches the final decision. The petition is reviewed by the PTAB, or *instituted*, only if the board determines that there is a reasonable likelihood that the petitioner would prevail with respect to at least one of the claims in the petition.[18] If the petition is instituted, the procedure must be completed within 12 months from institution, with 6 months good cause exception possible. If the petition is not instituted, the decision is final and not appealable.

PGR can be used to challenge patents issued under the first-to-file priority rule (i.e. patents issued on applications filed on or after March 16, 2013). It may be filed within 9 months from

[17] 35 U.S.C. § 312 (a), (b).
[18] 35 U.S.C. § 314 (a).

patent grant or reissue by anyone who is not the owner of the patent, has not (or whose real party in interest has not) already filed a civil action challenging a claim in the patent, and is not estopped by a prior action.[19] A PGR may be instituted upon a showing that, it is more likely than not that at least one claim challenged is unpatentable (under sections 101, 102, 103, or 112).[20]

IPR can be used to challenge patents issued under first-to-invent and first-to-file from 9 months after the issued date. An IPR's petitioner may request to cancel as unpatentable some of the patent's claims only on a ground that could be raised under section 102 or 103 (novelty and nonobviousness) and only on the basis of prior art consisting of patents or printed publications. An IPR may be instituted if there is a reasonable likelihood that the petitioner would prevail with respect to at least one of the claims challenged in the petition.[21]

CBM allows the petitioner to review the patentability of one or more claims in a covered business method patent. It applies to first-to-file and first-to-invent patents and the challenge can be raised under sections 101, 102, 103, or 112 of the Patent Act.[22]

B. Empirical Overview of PTAB Adjudication and Settlement

We collected all PTAB petitions as of August 31, 2016, from the public records of petitions. There have been about 5,500 PTAB petitions, 91% of which correspond to IPR, 8.5% correspond

[19] 35 U.S.C. §§ 325 (a), (e); 37 C.F.R. § 42.201 (2014).
[20] 35 U.S.C. § 324(a).
[21] 35 U.S.C. § 311(b), (c).
[22] 37 C.F.R. § 42.304(b)(1).

to CBM and less than 1% correspond to PGR.[23] As Figure 1 shows, the number of PTAB petitions has steadily increased since September 16, 2012. Out of all these petitions, about 33% (1846 petitions) are still pending and have not been terminated. Out of those pending decisions, 51% have been instituted. To this date, there are around 3,700 petitions that have been terminated. Out of those petitions, 31% have been denied institution, while 19% have finished before an institution decision, and about 50% have been finished after institution.

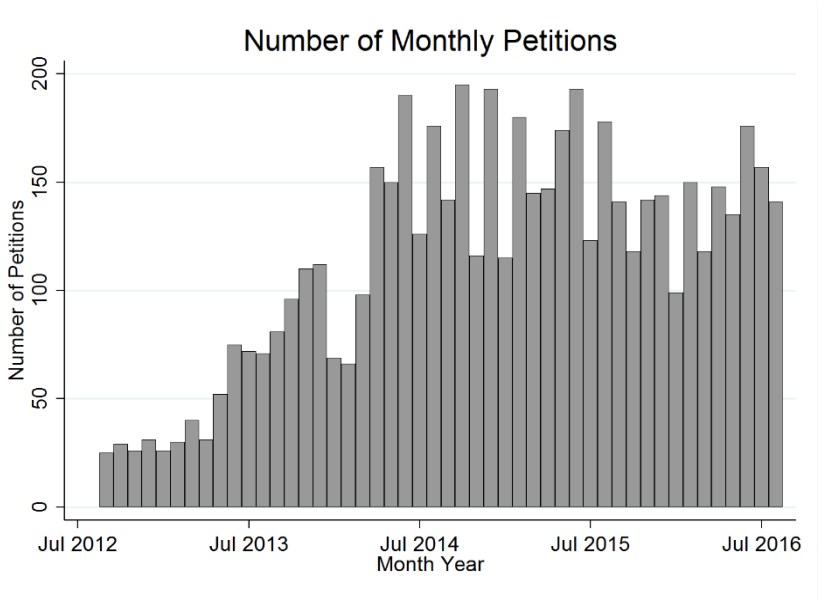

FIGURE 1.1: MONTHLY PTAB PETITIONS BETWEEN SEPTEMBER 2012 AND AUGUST 2016.

We augment our database with patent information by linking the patent numbers in PTAB petitions with patent information from the USPTO. Using the NBER classification numbers in Hall et al. (2001), we find patents involved in PTAB petitions[24] are dominated by the NBER category

[23] Source: LexMaxchina PTAB report.
[24] There are about 4000 unique patents involved in PTAB petitions, since a petitioner can file multiple petitions on the same patent.

"Computers and Communications." About 50% of the patents involved in PTAB petitions correspond this category, while about 12% correspond to the category "Drugs and Medical," and 13% to "Electrical and Electronic."

Table 1 presents the top 5 most frequent PTAB petitioners who are jointly responsible for about 12% of the total number of petitions.

Petitioner	Number of Petitions
Apple Inc.	276
Samsung Electronics Co., Ltd.	149
Google Inc.	127
Microsoft Corporation	93
LG Electronics, Inc.	73

TABLE 1.1: TOP 5 MOST FREQUENT PTAB PETITIONERS

Notice that large producing companies are the most frequent users of PTAB, in contrast to what happens in district courts where non-practicing entities are the most active players in filing patent infringement complaints. We also determine which patent owners are most frequent targets of PTAB petitions. As Table 2 shows, non-practicing entities are the patent owners most frequently targeted in PTAB petitions.

Patent Owner	Number of Petitions
Zond, LLC.	125
Intellectual Ventures LLC	106

Magna Electronics Inc.	71
VirnetX Inc.	65
Innovative Display Technologies	48

TABLE 1.2: TOP 5 MOST FREQUENTLY TARGETED PATENT OWNERS IN PTAB PETITIONS.

Finally, we describe to what extent different companies are targeting the same patent on PTAB. This may happen, for instance, when the patent owner is suing multiple companies for patent infringement, all of which are trying to invalidate claims in the patent. Another reason is "free-riding:" Since petitions are made public shortly after they are filed, in principle, multiple companies can use the arguments of the first petitioner and "free-ride" on those arguments to file a petition. The data shows that almost 66% of the patents are challenged in PTAB by a single petitioner, about 25% by two or three, and only about 10% by four to eight petitioners.[25]

Tables 1 and 2 illustrate the fact that PTAB petitioners are mostly practicing entities and that patents owned by non-practicing entities are frequent targets.

Further, Vishnubhakat, Rai, and Kesan (2016) find that about 70% of petitions involve a common formula – namely that the petitioner is the defendant in an infringement suit brought by the patent holder. This is precisely the way PTAB was intended to be used for: to help eliminate patents of questionable validity. However, as we will show in the rest of the paper, PTAB has created opportunities for some perverse practices which have not yet been fully scrutinized. Specifically, we will focus on the potential of PTAB to sustain anticompetitive settlements in the pharmaceutical industry, and on the problem of "reverse patent trolling."

[25] The patents with the largest number of different petitioners are: US7365871 (8 petitioners), US6108704, and US7434974 (7 petitioners).

II. ANTICOMPETITIVE PATENT SETTLEMENTS: ECONOMIC THEORY AND APPLICABLE LAW

The patent system is a conscious trade-off between innovation and competition. A patent restrains post-grant competition in exchange for the disclosure of the invention. However, this concession is predicated upon the satisfaction of all statutory requirements for patentability – the metrics such as novelty, usefulness and non-obviousness that the USPTO uses to discern whether a particular invention actually deserves patent protection. An invalid patent is, by definition, one that does not satisfy some of these metrics of the inventor's contribution.

Every granted patent enjoys a presumption of validity in litigation,[26] but since the patent examination process is an imperfect screening device, in practice many litigated patents end up being invalidated. In the language of Lemley and Shapiro (2005), patents are "probabilistic." An important corollary is that much of the costs of weeding out bad patents are private, for this process is largely reliant on patent litigation (and now PTAB review), which is virtually always private. From a social perspective, the result is an externality problem in patent invalidation. Successful validity challenges create a public benefit by eliminating undeserved restraints on competition, but the firms who bring these challenges capture only a fraction of this benefit. This externality problem is one reason why there is generally an undersupply of validity challenges (Farrell and Merges 2004; Lemley and Shapiro 2005), which is exacerbated by the possibility of settlement between the parties to avoid re-examination and invalidation of truly invalid patents.

[26] 35 U.S.C. §282(a).

Since PTAB trials offer an additional avenue to challenge the validity of patent besides district court litigation, patent challengers choose strategically which of these two alternatives to use (Vishnubhakat et al. 2016). Relative to district court litigation, the PTAB procedure is cheaper, often shorter, it follows a different claim construction procedure, and the settlements are not thoroughly scrutinized by antitrust authorities. As we will explain in the following sections, these differences can be exploited by firms to profit from settlement payments under the threat of filing a PTAB petition, which could lead to antitrust violations similar to those encountered in pay-for-delay cases. In this section, we explain the economic incentives provided by PTAB to competitors looking to settle for reverse payments, which raises antitrust concerns.

When the PTAB petitioner and the patent owner are competitors, they can reach a larger set of settlement agreements to avoid invalidation of patent claims compared to what they can agree on had they not been competitors. The petitioner may prefer to settle for a royalty-free license rather than waiting for the PTAB's final decision. After all, invalidation and a free license both provide the relevant rights, but the latter preserves some restraints on third party competition. Competing parties with market power in particular have an interest in preserving validity, even if the probability of invalidation is high (Shapiro 2003; Lemley and Shapiro 2005), to deter entry that would make the market more competitive and would erode profits. Intuitively, the firms would like to form whatever agreement leaves their joint profits as large as possible, and then they can allocate these rents through a transfer. In particular, joint surplus is maximized by a monetary settlement in which the rival is paid not to challenge the validity of the patent and to restrain competition.

A. Incentives to Avoid Procompetitive Judgments

Ultimately the problem is that, no matter the likelihood of invalidation, competing parties virtually always have an interest in avoiding that outcome, provided they can spread out the rents of preserving the patentee's monopoly. First, reverse payment may be the firms' first choice; this is so whenever exclusion of the defendant maximizes joint profits. Further, even if reverse payment is off the table (because, say, the parties cannot avoid antitrust oversight), then a potential entrant (the patent challenger) would *always* prefer to have a royalty-free license rather than invalidate the patent, even though both results let it use the patented invention for free, because the former outcome has the benefit of excluding third party rivals. As this reflects, competing firms generally have a joint-interest in avoiding a judgment that might serve to increase competition in the relevant market. Jacobo-Rubio et al. (2014) use pharmaceutical litigation decisions and a stock market event study to estimate by how much brand-firms value entry deterrence and by how much a generic-firms value entry. They estimate that brand-firms value entry deterrence at $4.6 billion while generic firms value entry at $237 million.

It is easy to see this in a simple (but general) model. There are two firms in a PTAB trial. Firm 1 is the patent owner, and Firm 2 is the petitioner. The firms are competitors in some product market, which also includes some third party competitors. Each firm's profits depend on the validity of the claims in Firm 1's patent, since the patent serves to exclude everyone but Firm 1 from using the patented invention. Let π_i^v be the profit of firm *i* when Firm 1's patent is valid and let π_i^{nv} be the profit of firm *i* when Firm 1's patent claims are invalid. We assume that $\pi_1^v >$

π_1^{nv} and $\pi_2^{nv} \geq \pi_2^{v}$, so the patent owner's profits decrease with an invalidation and the petitioner's profits increase. In other words, we assume the patent grants market power to Firm 1. We also assume that the joint profits are higher when Firm 1's patent is valid, that is, $\pi_1^{v} + \pi_2^{v} > \pi_1^{nv} + \pi_2^{nv}$. This assumption reflects the reduction in competition caused by more competitors entering the market after an invalidation.

Although firms are jointly worse off from invalidation, Firm 2 is weakly better off invalidating Firm 1's patent than simply staying out of the market without being compensated. To avoid the loss in joint surplus caused by invalidation, Firm 1 must compensate Firm 2 to drop the validity challenge. Firm 1 could compensate Firm 2 by granting a license and excluding all the other rivals. Alternatively, Firm 1 could make a reverse payment for Firm 2 to "go-away" and to drop the patent challenge. If part of the joint monopoly rents are dissipated by duopoly competition, then Firm 1 would always prefer to compensate Firm 2 with a reverse payment instead of a license. Notice that this argument goes through regardless of the probability of invalidation, which only determines the size of the compensation (Edlin et al., 2015). All else equal, a challenger will demand a larger fee if the probability of invalidation is higher. For this reason, one cannot rule out an anticompetitive impetus simply because a reverse payment is not particularly large.

Of course, we know that firms do not always settle and preserve validity. There are at least three reasons why this might happen. First, they may have different beliefs about the likelihood of invalidation. If the patent holder maintains a lower prior probability of invalidation, it may not be willing to settle for any fee that the petitioner would accept. Second, a party may decline to settle for reputational reasons. For example, a petitioner may maintain a strategy of not settling before

the PTAB's final decision in order to create a credible threat for future petitions. Similarly, as a way of dissuading infringement claims, a firm may challenge all patents that are asserted against it, and it may take all such challenges to judgment. Third, the parties preferred rent-sharing settlement may be unlawful under the antitrust laws. Pay-for-delay agreements are one possible example of this, but there are other possibilities. For example, competing parties could not lawfully form a settlement in which they agree to set prices cooperatively until the patent expires. In these cases, the parties still *want* to form a rent-sharing settlement; they are simply constrained by the antitrust laws. However, PTAB settlements are not scrutinized by antitrust authorities nearly as much as district court settlements, which may allow for settlements that are not attainable in district court litigation.

B. *ACTAVIS* AND THE HATCH-WAXMAN ACT

The Supreme Court's recent decision in *FTC v. Actavis*,[27] held that reverse payment settlements may violate the antitrust laws, although it stopped short of declaring them illegal per se. These settlements are most common in pharmaceutical markets. This is not surprising, since a pharmaceutical drug may be covered by just a few patents, and thus individual patents can command substantial market power in the relevant *product* market.

Under the Hatch-Waxman Act,[28] generic drugs can receive expedited FDA approval through an Abbreviated New Drug Applications (ANDA). This requires a demonstration that the

[27] 133 S. Ct. 2223 (2013).
[28] Pub. L. No. 98-417, 98 Stat. 1585 (1984).

generic drug is "bioequivalent" to one that has already gone through the full FDA approval process.[29] This legislation avoids redundant testing of safety and therapeutic efficacy. ANDA approval is predicated on the applicant's certification that, to the best of its knowledge, its generic drug will not infringe any active patent that is valid and enforceable.[30] If the brand-name drug is indeed patented, the ANDA applicant must certify that the patent is either invalid or would not be infringed by its proposed generic[31] – an option known as "Paragraph IV certification." If the applicant takes this route, it must immediately provide notice to the patent holder, which will typically then sue the applicant.

If the patent holder sues the generic producer within 45 days of receiving notice, ANDA approval is stayed for up to thirty months to allow litigation to proceed.[32] That is, assuming the generic applicant does not obtain a license in a settlement, the ANDA will not be approved until the earlier of the dates on which (a) the ANDA applicant wins in court; or (b) litigation reaches the 30-month mark. Thus, if litigation lasts for more than 30 months, the ANDA will be approved at the 30-month mark, notwithstanding that the patent litigation has not yet concluded. If, by contrast, the generic maker receives a license, the ANDA would then be approved without further delay.[33] The first party to file for Paragraph IV certification receives a "generic exclusivity" period of 180 days.[34] This means that, if the first-filer succeeds in obtaining Paragraph IV certification, it gets to be the exclusive generic firm in the market for 180 days. This is a major impetus for

[29] 21 U.S.C. § 355(j).
[30] 21 U.S.C. §355(b)(2)(A).
[31] 21 USC §355(j)(2)(A)(vii)(IV).
[32] 21 U.S.C. § 355(j)(2)(B)(iii)
[33] Another possibility is that the generic applicant could attempt to invalidate the patent through a PTAB challenge, which could expedite Paragraph IV approval.
[34] 21 U.S.C. §355(j)(5)(B)(iv). See also Hemphill (2006).

reverse payment settlement, since later-filing generic firms will not receive the exclusivity bonus if they successfully invalidate the patent, leaving them with a smaller incentive to challenge the patent. (Hemphill, 2006). However, prices typically do not fall into the neighborhood of marginal cost when only two or three generic firms are in the market, and generic entry is a gradual process even after a successful invalidation, and thus even some later-filers may still have an incentive to challenge the patent, provided they are not too far back in the line. For example, in the *Actavis* agreements, patentee Solvay agreed to pay off multiple challengers, not just the first filer.

In *Actavis*, the defendants were pharmaceutical companies Solvay, Actavis, and Paddock. Solvay owned a patent for a brand-name FDA-approved drug –marketed under the name Androgel– used to treat low testosterone levels in men. The FDA approved Solvay's New Drug Application (NDA) for Androgel in 2000, and Solvay received its patent in 2003.[35] Actavis was the first to file an ANDA for a generic version of Androgel. Paddock soon followed with a second ANDA. Both firms certified that Solvay's patent was invalid and not infringed. Actavis received ANDA approval from the FDA after litigation hit the 30-month threshold, at which point it became the sole generic firm that could obtain exclusivity. Despite the ANDA approval, the litigation was ultimately settled in 2006. Actavis agreed not to market a generic version of Androgel for a period of about 9 years.[36] In exchange, Solvay would pay Actavis an estimated $19-$30 million annually during this exclusion period. Solvay reached similar pay for delay agreements with other generic

[35] *Actavis*, at 2229.
[36] This 9 year period would end 65 months prior to expiration of the patent.

firms, including Paddock, although these deals afforded smaller payments than those received by Actavis,[37] presumably because these firms had no right to generic exclusivity.

The settlement agreements portrayed these payments as compensation for various services to be provided by the generic firms, such as advocating the use of Androgel. However, the FTC deemed these explanations pretextual, and asserted that the pay for delay agreements were in fact collusive agreements in which Solvay paid generic entrants not to enter the market. It filed suit against the defendants in 2009. The district court dismissed the complaint, and the Eleventh Circuit affirmed the dismissal on appeal. The latter decision asserted that public policy generally favors settlement, and that the FTC's claim rests without justification on a presumption that the relevant patent is likely invalid.[38]

The Supreme Court reversed, holding that the FTC should have been entitled to argue the antitrust claim.[39] It thus held that a pay for delay settlement could violate the antitrust laws. It listed a number of considerations relevant to the antitrust inquiry. One point of emphasis was that traditional motivations for settlement do not explain a payment that significantly exceeds the cost of litigation. On the contrary, such a payment provides a strong inference that the generic firm is being paid a share of the monopoly rents in exchange for agreeing not to threaten the patent holder's monopoly position.[40] Edlin et al. (2015) describe this point as the "Actavis inference," and they provide a number of economic and legal arguments supporting its application in antitrust

[37] *Actavis*, at 2229.
[38] 677 F.3d 1298, at 1312-15.
[39] *Actavis*, at 2227.
[40] *Id*. at 2235.

litigation. The authors argue that it is unnecessary – and largely unhelpful – to litigate the patent before addressing the antitrust question, because it is the parties' *ex ante* expectations about validity and infringement that determine the antitrust implications of the settlement agreement.

C. Noncash Payment and Pure Delay Settlements

The *Actavis* decision involved reverse payment, but this does not suggest that alternative settlement formats could not also raise antitrust concerns. For example, the patent holder provided something other than cash, but which still makes the deal potentially anticompetitive. As already noted, the patentee could provide a promise not to launch its own authorized generic. The economic terms of the licensing agreement could also raise antitrust concerns. For example, the patentee might impose price or output restraints, which could serve an anticompetitive function.

What if the settlement is merely an agreement to delay generic entry? In dicta, the majority in *Actavis* suggested that this would be permissible.[41] However, even if one believes these settlements are generally benign, this does not rule out the possibility that such a deal may include some anticompetitive terms. For example, because a PTAB challenge does not address *infringement* claims, a PTAB settlement (if not accompanied by parallel infringement litigation) may unreasonably subvert competition if it purports to preclude litigation on the infringement question. An agreement to forestall a non-infringement challenge could be used to exclude noninfringing competition, which is plainly "outside the scope of the patent."

[41] The court noted that the parties "may … settle in other ways, for example, by allowing the generic manufacturer to enter the patentee's market prior to the patent's expiration, without the patentee paying the challenger to stay out prior to that point."

More generally, we disagree with the premise that a delayed licensing settlement must be competitively-benign if there is no reverse payment (or other compensation) made by the patentee to the challenger. This "pure delay" settlement is designed to share the rents of slowing the rate of third party entry (by preserving patent validity as costly barrier to entry) and – more importantly – to provide the patentee's compensation in the form of temporary exclusion (i.e. delayed entry), as opposed to royalties (with immediate entry). Some readers might object to describing a pure delay agreement as a "reverse settlement," since there is ostensibly no consideration made from the patentee to the generic firm. But we would point out that the patentee may be said to offer something of value in these agreements: it offers a promise not to charge royalties, which is something it would never offer in an ordinary (non-delayed) licensing settlement.

By using exclusion rather than monetary transfers to compensate the patentee, a pure delay agreement provides larger joint profits than an ordinary (non-delayed) licensing settlement. A royalty charged in an ordinary (non-delayed) licensing settlement may keep prices high (if the patent is likely valid and infringed), but it is very unlikely to preserve them at the *monopoly* level that will persist while the generic firm is excluded entirely. So the firms can enhance total profits by using a pure delay agreement in place of a royalty agreement without delay. Of course, there are *some* periods of delay such that the corresponding pure delay agreement is better for consumers (in expected value) than litigating the challenge to judgment – for example, if the patent is very likely valid and infringed, but the delay period is short. But the more important question is what delay period the firms would actually agree to in practice, given their beliefs about how litigation would play out, and whether *that* delay period enhances expected consumer welfare.

In fact, the parties will tend to pick a delay period that leaves consumers worse off (in expected value) than if the patent adjudication proceeded to final judgment. To illustrate, suppose that the patent has a 50% likelihood of being invalidated on final judgment, and the firms reach a settlement such that the generic firm gets a license for the second half of the remaining patent term, but is excluded from the first half. At first blush, this seems to be a reasonable and proportionate settlement. So are consumers indifferent between this settlement and a final judgment? The answer is no; they are strictly worse off under the settlement. A final judgment has a 50% chance of invalidating the patent, which would permit free entry to all interested nonparty generic firms (at least after 180 days). By contrast, the settlement splits time equally between monopoly and duopoly; it never permits third party entry. (At the very least, settlement will slow the rate of third party generic entry over the patent term, which still benefits firms and injures consumers.) For the same reason, this settlement is actually more generous to the petitioner than the patentee needs to be – i.e. the patentee could demand an even longer delay period.[42] By diminishing the rate of third party entry, total profits will be higher, and the patentee can claim its share of these rents by demanding a delay of more than 50% of the remaining patent term. For these reasons, the firms will tend to choose an exclusion period such that consumers are left worse off than if the adjudication proceeded to judgment.

[42] To see this, note that the settlement involves a 50-50 split between monopoly and duopoly, while litigation to judgment involves a 50-50 split between monopoly and free entry for everyone. Both firms strictly prefer the former.

This discussion is important because it suggests that the actual delay period in a settlement will generally exceed the "expected delay from judgment" (EDJ), which is the expected period of time that a final judgment would delay entry, given that it may or may not result in a permanent injunction. The EDJ is equal to the remaining patent term multiplied by the probability that the patent will be held invalid.[43] For example, suppose again that the patent is 50% likely to be invalidated, and that there are 10 years remaining in the patent term. Then the EDJ is 5 years. The EDJ is a natural benchmark for evaluating consumer welfare in a delay settlement. If a pure delay settlement calls for less delay than this, then one may suggest that the agreement ought to be permitted. However, the above discussion indicates that the firms will tend to pick a longer delay period than the EDJ, not a shorter one, because the settlement suppresses the rate of third party entry post-settlement, whereas an invalidation will permit a higher rate of third party entry, since prospective entrants need not file a patent challenge. The patentee claims its share of these rents by claiming a delay period that is longer than the EDJ. A second point is that the EDJ is probably not the best benchmark for consumer welfare, since the above example shows that a pure delay settlement will diminish expected consumer welfare even if the delay period is exactly equal to the EDJ. Thus, consumers could be indifferent between pure delay and litigation to judgment only if the agreed-upon delay period were strictly shorter than the EDJ.

III. INFERRING REVERSE SETTLEMENT IN PTAB

[43] Here we are assuming that, if the patentee is successful, third party generics will not bother challenging it on substantially the same grounds.

One obstacle faced in researching PTAB settlements is that their terms are virtually always kept confidential. If the parties wish to settle and terminate the proceeding, the Patent Act permits them to request that the settlement agreement be treated as "business confidential," in which case it is not publicly available.[44] Such requests are generally accommodated as a matter of course. The only hints left in the public record are the generally-vague statements *about* the settlement that appear in various observable documents, such as the parties' joint motion requesting termination of the IPR.

However, that we cannot see the parties' contract does not mean we are powerless to draw some inferences about its impact on competition. After all, the critical feature of reverse settlement is a delay in generic competition, and a post-settlement delay is generally observable, either by discerning that the generic firm did not subsequently receive the necessary FDA approval, or that it obtained approval but continues not to sell the drug anyway. The timing of the settlement – namely in relation to the institution decision – also carries inferential weight, as a generic-petitioner is unlikely to walk away emptyhanded after receiving a signal that its challenge is "reasonably likely" to succeed on final judgment.

We use a number of data sources to help identify potential reverse settlements. All trial documents are publicly available on the PTAB database –the Patent Review Processing System (PRPS[45]). This includes petitions, motions, exhibits, judgments, etc., for every PTAB proceeding.

[44] 35 U.S.C. §317(b).
[45] The PTAB database can be accessed at the following URL: http://www.uspto.gov/patents-application-process/appealing-patent-decisions/trials/patent-review-processing-system-prps-0

We also have data from the FDA's Orange Book, which lists, among other things, the identities of any firms that have obtained ANDA approval to market a generic version of a brand-name drug, and the time at which such approval was obtained. This gives us an accurate timeline of generic entry within any given drug market.

To infer potential reverse settlements that potentially violate the antitrust laws, we search the data for IPRs exhibiting each of the following three conditions:

(C1) *The parties are competing drug manufacturers and the disputed patent covers an FDA-approved brand-name drug;*

(C2) *the dispute was settled, resulting in termination of the proceeding; and*

(C3) *following the settlement, the challenger did* ***not*** *market a generic version of the patented drug.*

Condition (C3) is particularly important. It signals that the agreement may have stipulated a delayed generic entry. For our analysis to be useful to antitrust policy, it is essential that our inference condition does not flag "ordinary" patent settlements that would not raise antitrust concerns – namely those that give the generic firm a (non-delayed) license in exchange for its promise to pay royalties on all sales. Such agreements are expressly authorized by the patent act, whereas agreements to forestall patent challenges (which are critical to the stability of a reverse settlement agreement[46]) are not. (Hovenkamp, 2016b; Cheng, 2016).

[46] The patentee will not give something valuable to the generic firm unless that consideration is contingent on the generic firm's promise to waive its right to challenge the patent.

The Orange Book is our principal tool for drawing this distinction. When the IPR begins, the generic firm is always unlisted in the Orange Book, because it has not yet demonstrated that the relevant patents are invalid or uninfringed, and thus has not yet obtained ANDA Approval under Paragraph IV. If the generic-petitioner receives a non-delayed license to practice the relevant patents, then it has everything it needs to satisfy its Paragraph IV certification. We would thus expect to see these petitioners show up in the Orange Book after the settlement, and some of the generic firms do. On the other hand, if the parties were to enter into a reverse settlement, this would typically withhold the relevant patent rights from the generic firm for some period of time, and as such it would ordinarily not show up in the Orange Book listings ex post.

However, as already noted, the Orange Book listings are better at identifying delayed entry than they are at identifying immediate entry. That is, an unlisted generic firm can safely be regarded as off-market,[47] but a firm that *does* show up in the Orange Book post-settlement is not necessarily an active market participant. Indeed, some generic firms show up in the Orange Book following the settlement, but they are still not selling a generic drug, despite having the FDA approval needed to do so.[48] To deal with this, we also make use of the AAFTG, which tells us about some generic drugs (whose manufacturers are identified) that have not yet entered the market, and which are not anticipated to enter soon. There are a few settlements where the generic

[47] The only possible exception is if the generic firm sells an "authorized generic," as these are not listed in the Orange Book, but in the next subsection we show that this happened in just one settlement, but that settlement also imposed a substantial delay, and thus it is still an example of reverse settlement.

[48] This is not attributable to the possibility that the 30-month stay on ANDA approval (to accommodate ongoing infringement litigation between the parties) has run, which would result in ANDA approval before the patent dispute has ended. In fact, we provide an example of a settlement in which the generic firm was listed in the Orange Book post-settlement, but where there was no district court infringement litigation between the parties, implying there was no 30-month stay at all.

firm shows up in the Orange Book post-settlement, but is also listed in the AAFTG as not being available for some material period of time. As such, the AAFTG provides a check against the Orange Book's inability to tell us whether an approved generic is actually being sold to consumers.

A. Evaluating Alternative Explanations

Our inference procedure gives rise to a reasonable likelihood of an agreement to exclude generic competition, at least for some material period of time. There are a number of possible alternative explanations why a petitioner might not show up in the Orange Book following a settlement, even if there was no reverse settlement. First, some of the possible alternative explanations would indeed allay antitrust concerns, but we are able to rule them out using public data. Second, some alternative explanations cannot be ruled out in every settlement in every case, but at the same time they do not necessarily preclude antitrust concerns, and thus remain suspicious.

Authorized Generic Agreements

Our inference procedure rests on the assumption that, if the generic-petitioner began selling a generic version of the brand-name drug, it would be listed in the Orange Book. However, there is an exception to this rule, which is that an "authorized generic" does not require ANDA approval, and its manufacturer is therefore not listed in the Orange Book. An authorized generic is the brand-name firm's "official" generic version (which must be an identical copy), of its branded drug, which it may or may not manufacture internally. By contrast, most generics are "ANDA generics," which are not necessarily authorized by the branded firms, and which may differ from the brand-

name drugs in some non-therapeutic respects, such as size, color, and taste. An ANDA filed under Paragraph IV may be approved on the ground that the generic applicant obtained a patent license,[49] but this is not the same as an authorized generic, and it must be listed in the Orange Book.

In principle, a PTAB settlement could give the generic-petitioner the right to sell an authorized generic. This would be functionally equivalent to a licensing settlement, but it would evade our inference method, which relies on Orange Book listings. Fortunately, we can rule out the possibility that this is what the settlements actually involve. To do so, we make use of the FDA's listings of authorized generics, which specify the particular date on which each authorized generic enters the market.[50] For each settlement in our database, we checked whether an authorized generic was launched within a year after the PTAB settlement. There is just one settlement in the data that appears to have resulted in an agreement that permits the petitioner to sell an authorized generic,[51] and thus the possibility of authorized generic agreements does not undermine our inference procedure. In fact, for a very large majority of the drugs in these settlements, there is no authorized generic at all.[52]

In fact, additional details surrounding this authorized generic settlement suggest it is highly suspicious. The petitioner, Mylan, challenged a patent that covers Loestrin and Moestrin. (The

[49] 21 C.F.R. §314.94(a)(12)(v).
[50] *FDA Listing of Authorized Generics as of June 29, 2016*, Food and Drug Administration (June 29, 2016). Available on the FDA website.
[51] The apparent authorized generic settlement occurred between Mylan (petitioner) and Warner Chilcott (patent owner). See IPR2015-00682, paper 10 (P.T.A.B., Aug. 20, 2015). See the notes on this settlement in the appendices for more information.
[52] There were only two additional cases such that there is some authorized generic on record for the relevant drug (although we cannot verify they are actively being sold). However, in these cases the generics had been authorized by the patentee long before the settlements in our data, implying the manufacturer of the authorized generic is some other firm, not the petitioner from the settlement.

only difference between these drugs is that the latter is a chewable version of the former.) The patent holder is Warner Chilcott, which is owned by Actavis. An authorized generic of Loestrin was approved for sale on November 5, 2015 – just three months after the PTAB settlement, suggesting that petitioner Mylan may have obtained the right to sell an authorized generic in the settlement. However, the AAFTG indicates that sales of Mylan's generic were delayed by the settlement.[53] In fact, Warner Chilcott has been accused of paying generic firms to delay entry of Loestrin, and then lengthening its own patent exclusivity by switching over to the chewable form, Moestrin – a process known as patent "evergreening." (Upadhye, 2014). Retail pharmacists CVS and Rite Aid filed an antitrust claim against Warner Chilcott and two generic firms (Lupin and Watson) for this alleged agreement to delay generic entry.[54]

EXISTENCE OF ADDITIONAL, UNCONTESTED PATENTS

A brand-name drug could in principle be covered by additional patents that were not subject to the settled IPRs. In this case, the petitioner's challenge may not eradicate the barrier to generic entry, even if it is successful. In this case the generic firm would not show up in the Orange Book, even if it received an immediate license, because it still lacks some patent rights needed to market a generic product.

[53] In the AAFTG, the listed manufacturer for the delayed generic is Jai Pharma, which is a wholly-owned subsidiary of Mylan.

[54] See Kass, Dani, "CVS, Rite Aid Hit Warner Chilcott with Loestrin Antitrust Suit," Law360 (April 6, 2016). Available at http://www.law360.com/articles/781046/cvs-rite-aid-hit-warner-chilcott-with-loestrin-antitrust-suit

However, these uncontested patents do not pose a threat to generic entry unless they are "essential" in the sense that one cannot market a viable generic without reading on them. In fact, there is reason to believe that many Orange Book patents are not essential, as it suffers from a notorious over-listing problem. As Eisenberg and Crane (2015) note, the FDA makes virtually no effort to make sure listed patents actually cover the drugs that supposedly read on them, preferring "to avoid any responsibility for reading patents." As such, drug companies can list patents that do not actually cover their drugs, but which nevertheless create substantial barriers to generic entry. As such, the fact that a generic-petitioner challenges only *some* patents may reflect that it is only bothering with the ones that actually cover the brand-name drug.

In a similar vein, drug companies may engage in patent "evergreening" – listing additional patents in the Orange Book over time, protracting its patent monopoly beyond the term of the originally-listed patents (Upadhye, 2014). A generic petitioner may recognize that the evergreen patents do not actually cover the drug, but it may nevertheless want them to persist, so that they will continue to exclude third parties post-settlement. Thus the generic firm may challenge only the originally-listed patents, demanding a license that begins when these patents expire, ensuring that it will be the sole generic firm during the "evergreen period."

A final point is that the settlement may be anticompetitive to the extent that it involves a promise by the petitioner not to challenge the other, uncontested patents in the future, perhaps in exchange for cash. Such an agreement may be only superficially distinct from ordinary reverse payment.

INVOLUNTARY DELAYS IN COMMERCIALIZATION

In principle, a settlement might provide an immediate license, but the petitioner may be significantly delayed – for reasons outside its control – in getting its generic product to market. For example, it might suffer some setbacks in production, or there may be a delay in administrative approval of the license at the FDA. However, we attempt to account for this possibility by focusing on settlements occurring more than a year ago, allowing for time to overcome such delays. And we still find that many of the settlements satisfy our conditions for inferring reverse settlement. In particular, 15 of the 19 CSAs in our dataset settled on or before October 14, 2015. Of those, 13 (87%) satisfy our criteria for inferring reverse settlement.

IV. POTENTIALLY-ANTICOMPETITIVE PTAB SETTLEMENTS

Using conditions (C1), (C2), and (C3), we can identify potential reverse settlements reached in PTAB. We begin by discussing some examples of PTAB settlements that satisfy these conditions, and we then provide a broader empirical overview of our findings. Note that, because we cannot identify the exact terms of settlement, and because this is a new and largely undeveloped area of antitrust law, we are unable to say that any particular settlement in the data is a clear-cut antitrust violation under current law. Rather, what we can show is that many PTAB settlements have the markings of reverse settlement, and that PTAB settlements thus warrant a degree of antitrust scrutiny that they have thus far not received.

A. EXAMPLES

Example 1: Dr. Reddy's Laboratories, Inc. v. Fresenius Kabi USA, Inc.[55]

The challenger, Dr. Reddy's, is pharmaceutical manufacturer that markets many generics. The patent holder, Fresenius, is also a pharmaceutical firm. The patent in question[56] is directed at a delivery method for Propofol, sold under the brand name Diprivan, which is used to help patients relax before receiving anesthetic. In particular, the patent claims a delivery method involving a "siliconized" rubber stopper, rather than an ordinary rubber stopper. At least one legal commenter has characterized the patent as "particularly weak." (Silbersher, 2015). The patent was also the subject of a number prior litigations and IPRs, which all appear to have settled.[57] In April of 2015, Dr. Reddy's and Fresenius settled before an institution decision was reached.[58] An Orange Book search shows that Dr. Reddy's is not marketing a generic form of Propofol, suggesting that it did not receive a license in the settlement.

At least two other commenters have suggested that the *Dr. Reddy's* IPR settlement likely involved a reverse payment. In a letter to Congress, experienced PTAB petitioner Kyle Bass cited the *Dr. Reddy's* settlement as an example of pay for delay achieved through PTAB.[59] He noted that generic makers' goal "is not to eliminate the brand's monopoly profits based on weak patents – it is to share in those profits," and that "[t]he recent record from IPRs filed by generics challenging brand patents shows this same pattern continuing," and he expressly listed the *Dr.*

[55] No. IPR2015-00715, Paper 12 (P.T.A.B. April 2, 2015).
[56] U.S. Patent No. 8,476,010.
[57] See Silbersher (2015), who writes that "the [Fresenius] patent was already asserted in seven or eight different Hatch-Waxman cases against generic ANDA filers, but all those cases appear to have been dismissed pursuant to stipulations of dismissal. In other words, the cases all settled." See also No. IPR2015-00715, Paper 9 at 2 (P.T.A.B. Feb. 27, 2015) (providing a list of suits involving the patent).
[58] Ibid, Paper 12 (P.T.A.B. April 2, 2015). The joint request for settlement (Paper 10) states this would coincide with a settlement of pending infringement litigation between the parties.
[59] Statement of J. Kyle Bass to the U.S. House of Representatives, Committee on the Judiciary, H.R. 9, The "Innovation Act," 114th Congress (April 14, 2015). (On file with the authors).

Reddy's settlement as an example of this. Similarly, Silbersher (2015) writes, "[i]t appears that Fresenius may be avoiding this patent from falling by paying off all generic ANDA filers to drop their challenges against the patent."

Example 2: Ranbaxy Laboratories, LTD v. Vertex Pharmaceuticals, Inc.[60]

In late 2012, generic drug manufacturer Ranbaxy challenged a drug patent[61] held by pharmaceutical maker Vertex. The challenged patent covers a brand-name HIV drug, Lexiva, which is sold by Vertex. The parties' joint request to settle was both filed and approved *after* the Board's decision to institute IPR, which is (by definition) a signal that the challenged patent claims are reasonably likely to be invalidated on final judgment.

One particularly interesting aspect of this settlement is that the parties appear to have openly revealed that it would preclude Ranbaxy from achieving ANDA approval through Paragraph IV certification. In particular, in their joint motion to settle, the parties stated that the proposed settlement would resolve "any potential Hatch-Waxman litigation on this patent between these parties."[62] Orange Book listings verify that Ranbaxy did not subsequently market a generic version Lexiva. Thus, in addition to precluding Hatch-Waxman litigation, the settlement declined to provide a license to Ranbaxy. As such, the settlement appears to have left no channel through which Ranbaxy could achieve ANDA approval prior to patent expiration.

[60] No. IPR2013-00024, Paper 71 (P.T.A.B. Nov. 15, 2013).
[61] U.S. Patent No. 6,436,989.
[62] No. IPR2013-00024, Paper 69 at 2 (P.T.A.B. Oct. 31, 2013). The motion also notes (on page 3) that there was no related infringement litigation ongoing between the parties.

Example 3: Metrics Inc. et al. v. Senju Pharmaceutical Co., LTD et al.[63]

Pharmaceutical maker Metrics (and two later-joining co-petitioners) challenged a drug patent[64] owned by Senju. The drug, marketed in the U.S. by co-respondent Bausch & Lomb under the proprietary name Prolensa, is used to treat pain and swelling following cataract surgery. The joint request to settle was filed after the Board instituted IPR.[65] An Orange Book search shows that Metrics did not go on to market a generic version of Prolensa (nor, apparently, did any of the co-petitioners). However, the petition filed by Metrics notes that it had previously filed an ANDA for a generic version of Prolensa.[66]

The joint request to settle notes that Metrics and Senju had also agreed to settle their ongoing infringement litigation involving the challenged patent, which arose out of Metrics' ANDA filing.[67] Specifically, the litigation was resolved through a stipulated consent judgment,[68] which was attached as an exhibit in the PTAB proceeding.[69] In addition to the patent challenged in the PTAB proceeding, the litigation involved several related patents directed at the same active ingredient found in Prolensa – bromfenac sodium – and the Orange Book verifies that Metrics does not offer any approved drug with this active ingredient. The stipulated judgment applies to all of the patents with equal force and effect.

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[63] Ibid, Paper 39 (P.T.A.B. July 8, 2015).
[64] U.S. Patent No. 8,129,431.
[65] No. IPR2014-01041, Paper 19 (P.T.A.B. Feb. 19, 2015) (decision to institute IPR); Ibid, Paper 37 (July 1, 2015) (joint request to settle); Ibid, Paper 39 (Feb. 19, 2015) (final judgment terminating the IPR in accordance with the joint settlement request).
[66] Ibid, Paper 1 at 9-10 (P.T.A.B. June 6, 2014).
[67] Ibid, Paper 37 at 2 (P.T.A.B. July 1, 2015).
[68] A stipulated consent judgment, also known as a consent decree, is a judgment that imposes a settlement agreement negotiated by the parties. This usually has the same claim-preclusive effect as an ordinary judgment.
[69] No. IPR2014-01041, Paper 2028 (P.T.A.B. July 1, 2015).

The consent decree begins by resolving the infringement and validity issues in patentee Senju's favor. It stipulates that the patents are "valid, enforceable, and would be infringed by … the Metrics Product." Here the "Metrics Product" refers to the generic drug embodied in Metrics' ANDA. The stipulated judgment goes on to issue a permanent injunction against Metrics' generic. It states that Metrics "will be *enjoined until expiration* of [the patents] … from making, using, offering to sell, selling, or importing … the Metrics Product" (emphasis added). The consent decree has a claim-preclusive effect, meaning that it bars the parties from later litigating the invalidity or infringement questions that were resolved in the settlement, and this may serve as an indirect barrier to generic entry.

Unsurprisingly, the consent decree does not mention a reverse payment. But it includes no representation that it comprises the *entirety* of the parties' agreement and, as already noted, the courts tend to approve settlements summarily, without little or no substantive antitrust review. As such, the parties would not likely include profit-sharing terms within the proposal submitted to the court. The judgment concludes by acknowledging that Metrics can still obtain Paragraph IV ANDA approval by receiving a license from Senju. But the Orange Book listings imply this did not happen.

B. Empirical Evidence

We linked the patents involved in PTAB trials[70] with those in the Orange Book.[71] Combining these databases we get a comprehensive look at PTAB settlements that involve Orange Book-listed patents. There are 309 PTAB petitions involving a patent listed in the Orange Book, which corresponds to 177 unique patents. Table 3 shows the current status of PTAB trials involving Orange Book patents. Given the relatively short period of observation, we found that 128 petitions are still pending as of May 2016.

		Institution Decision Reached?		
		Yes	No	Total
Pending as of August 31, 2016?	Yes	69	73	142
	No	135	32	167
		204	105	309

TABLE 1.3: INSTITUTION DECISIONS AND CURRENT STATUS FOR PETITIONS INVOLVING ORANGE BOOK PATENTS

We focus on the 167 finalized cases. Table 4 provides an overview of the timing of settlements relative to institution decisions. The table shows that 27 IPRs settled before a final decision was reached. Interestingly, about half of those settlements were reached *after* the PTAB decided to institute the IPR. This is disconcerting, since an institution reflects, by definition, that the patent claims are reasonably likely to be invalidated. Note that when petition is instituted, the patent owner believes that invalidation is more likely. Hence, the patent holder has more incentives

[70] For each referenced PTAB trial, the relevant documents (excluding confidential materials) are easily accessed on the PTAB database (PRPS).
[71] http://www.fda.gov/Drugs/InformationOnDrugs/default.htm

to settle after receiving this news. If instead, the petition is not instituted, the trial ends automatically, and this decision is non-appealable.

		Institution Decision Reached?		
		Yes	No	Total
Settled?	Yes	12	27	39
	No	123	5	128
		135	32	167

TABLE 1.4: SETTLEMENT AND INSTITUTION DECISIONS FOR THE NON-PENDING TRIALS INVOLVING ORANGE BOOK PATENTS

In narrowing our focus to PTAB settlements, we exclude not only IPRs that reached a final decision, but also those terminated following a party's request for adverse judgment against itself. We also exclude IPR settlements that occurred after the generic firm was successfully enjoined in district court. After doing this, our database includes 39 applicable IPR settlements that involve Orange Book patents, and which arise between pharmaceutical firms, with the patent holder being the seller of an FDA-approved brand-name drug. However, in many instances there are groups of several IPRs that: (a) involve the same parties; (b) surround patents targeted at a common drug (or a common set of related drugs) sold by the patentee; and (c) settle at the same time. As such, these groupings correspond to a single challenge by a generic firm against a set of patents that cover a particular drug sold by the patentee. Thus, we group them together into "consolidated settlement agreements" (CSAs). The CSA is our unit of measurement throughout most of the empirical analysis. When no confusion arises, we will often use the words "settlements" and "CSA" interchangeably. In the online appendix, we provide detailed information on all of the CSAs we

observe. The in-text appendix provides a more concise table of basic information about the CSAs, including details about whether they satisfy our inference criteria, and whether they occur post-institution.

As already noted, the Orange Book is less effective at identifying active commercialization of generics than it is at ruling out such activity. Specifically, a few generic firms show up in the Orange Book post-settlement, but they are not actively selling the generic drugs that are the subjects of their ANDAs. To deal with this, we make use of the "Anticipated Availability of First-Time Generics" (AAFTG), which is circulated through a subscription-based service called *Pharmacist's Letter*, which provides information about the pharmaceutical sector to pharmacists and other medical practitioners. The AAFTG offers a (non-exhaustive) list of anticipated entry dates for particular generic drugs to be sold by particular manufacturers. The AAFTG's anticipated entry dates usually (but not always) state the date of patent expiration, unless the authors obtain information of earlier entry. This leaves open the possibility that the firms have reached a private deal that permits pre-expiration entry by the relevant generic firm. As such, we cannot rely on the specific entry dates in the AAFTG as an indicator of how long delay will last. But the listings are nevertheless invaluable, because they can tell us that a particular firm is not actively selling a particular generic drug, and that it is not anticipated to do so anytime soon, even if that firm has obtained FDA approval to sell the relevant generic. We can thus cross-check the Orange Book-listed generic firms from our settlements to ascertain whether they are actually selling the drugs for which they have obtained ANDA approval. In some cases, they are not.

There are 19 unique CSAs in the PTAB data. In 16 of them (84%), our inference criteria are satisfied. That is, in these cases, it appears that the petitioner is not selling a generic version of the disputed drug after the settlement. Accordingly, we find that a large majority of the PTAB settlements have the markings of reverse settlements. Moreover, of the 16 settlements satisfying our inference conditions, 7 (43%) were settled *post-institution*, implying that the challenged patent claims were reasonably likely to be invalidated.[72] In this case, the inference of reverse settlement is particularly strong, for a petitioner is unlikely to walk away with nothing soon after receiving a signal that it is reasonably likely to prevail on final judgment. The following table gives an example of such a case.

CSA	*Apotex Corp. v. Alcon Research, Ltd.*	
Drug(s)	*Travatan Z*	
PTAB Settlement Date	7/21/2014	
IPRs (Patents)	IPR2013-00428 (8268299); IPR2013-00429 (8323630); IPR2013-00430 (8388941)	
Post-Institution?	Yes. 1/2/2014	
District Court Litigation	**Overview**	These three patents are involved in 6 district court cases. All of these cases were filed after the PTAB petition, and all these cases settled.
	Same Parties:	No. There is no district court litigation involving between Apotex and Alcon involving these three patents.
Generics in Orange Book	**Petitioner?**	Yes (approval on July 10, 2015).
	Others?	No.
AAFTG-Listed Entry Date (if applicable)	Apotex is listed as a generic for Travatan Z with anticipated availability date of October, 2029.	
OB-Listed Patents and Exclusivity for Proprietary Drug	Travatan Z (8268299) Oct 13, 2029; (8323630) Sep 20, 2027; (8388941) Sep 20, 2027. *No exclusivity.*	

[72] In one of these CSAs, which involved two settled IPRs, just one of the IPRs had been instituted prior to settlement. In all other post-institution CSAs, every IPR had been instituted prior to settlement.

Additional Notes	Apotex Corp. filed a Paragraph IV ANDA (No. 203431) on September 30, 2011.

TABLE 1.5: CSA EXAMPLE

The above example includes a number of interesting characteristics. First, the settlement occurred post-institution (all three patent challenges were instituted), indicating that the challenged patent claims were reasonably likely to be invalidated. Despite this fact, the parties' settlement appears not to have permitted petitioner Apotex to enter the drug market, as the AAFTG states that petitioner Apotex is not actively selling a generic version of the relevant drug. Additionally, the petitioner shows up in the Orange Book listings, indicating that it has approval to sell the relevant generic drug. This is perhaps because there was no 30-month stay on ANDA approval, because in this case there was no contemporaneous infringement litigation on these patents between these parties – an interesting property that appears in a few of the CSAs in the data. The absence of infringement litigation is highly unusual for a Hatch-Waxman patent dispute, because the patentee usually files an infringement claim immediately after the generic firm files an ANDA under Paragraph IV.

To that end, in most (but not all) of the settlements we are able to find some public records indicating that the petitioner had indeed filed an ANDA before the PTAB settlement date (usually a court document stating that fact). It should be noted, however, that even if we cannot find evidence of a pre-settlement ANDA-filing,[73] we cannot presume that no such filing occurred. The

[73] See the table in the appendix for the CSAs in which we found no evidence of a pre-settlement ANDA-filing by the petitioner.

FDA does not itself publish the identities of ANDA-filers unless and until they have been approved (which usually does not happen in a reverse settlement).

In another interesting CSA, petitioners Agila and Mylan challenged some patents owned by respondent Cubist – all directed at the brand-name drug Cubicin. The CSA settled in April of 2015.[74] Then in February of 2016, district court litigation between these parties settled, with the court's decree[75] stipulating that the relevant patent claims were invalid. This would seem to suggest that, after the issuance of the consent decree, there was nothing left to block entry by these petitioners. However, the petitioners remain unlisted in the Orange Book as of October 2016. On the other hand, two new generic versions of the drug – marketed by pharmaceutical firms Teva and Crane, which were not parties to the PTAB settlement – have been approved in the time since the district court's invalidity decree.

We have also performed a simple regression analysis. In order to explore further the decision of settlement of PTAB trials involving Orange Book patents, we collect information on the patents such as the number of claims, the number of words, the number of figures, the number of references, and the number of forward citations. We also construct a measure of remaining time of protection since the filing date of the PTAB trial. We estimate the following model:

$$Prob(Settlement_i) = \alpha + \beta\, inst_i + X_i + \gamma_t + \varepsilon_i.$$

[74] The IPRs are: IPR2015-00140; IPR2015-00131; IPR2015-00132; IPR2015-00144; IPR2015-00141. The judgment imposing the settlement is IPR2015-00131, Paper 17. See the appendix for more info on these and other disputes that settled more than a year before May 2016.

[75] *Cubist Pharmaceuticals LLC v. Agila Specialties Inc. and Mylan Laboratories Limited*, 1:13-cv-01679-GMS (D. Del., Feb. 2016).

In words, the probability that trial *i* ends up in a settlement conditional on whether it was instituted or not, characteristics of the patent involved in the petition and a year fixed effect.[76] The regression results shown in the Appendix reveal that a favorable institution decision, a patent with fewer claims, more forward citations, and more figures, imply that a settlement agreement is less likely to occur.

C. Evading Antitrust Scrutiny

The MMA includes a statutory requirement that some agreements between Hatch-Waxman firms be submitted to the FTC for review.[77] Specifically, it requires submission of an agreement between a brand-name drug manufacturer and a generic Paragraph IV ANDA filer if the deal is directed at any of the following matters:

> **(A)** *The manufacture, marketing, or sale of the brand name drug listed in the ANDA;*
>
> **(B)** *the manufacture, marketing, or sale of the generic drug for which the ANDA was submitted; or*
>
> **(C)** *the 180-day exclusivity period as it applies to such ANDA or to any other ANDA based on the same brand-name drug.*

Importantly, the statute applies to any "agreements" meeting one of these conditions, which would include settlement agreements in any kind of adjudication. A subsequent provision notes

[76] Given that our sample is not very large, we do not add petitioner or patent holder fixed effects.

[77] Medicare Prescription Drug, Improvement, and Modernization Act. Pub. L. 108-173, 117 Stat. 2461. Sec. 1112.

that any agreements that are "contingent upon, provide a contingent condition for, or are otherwise related to" the above subject matters must also be submitted, suggesting that the reporting requirement should be interpreted broadly.

However, as presently constituted, the MMA reporting statute does not capture all possible agreements that ought to be deemed anticompetitive. The clearest example is a reverse payment agreement reached before the generic firm has filed an ANDA under Paragraph IV. (Unfortunately, the FDA does not publish the data needed to answer this question.[78]) There is nothing about the *antitrust* claim that hinges on ANDA filing, and thus there is no reason to think that such an agreement could not violate the antitrust laws. But the plain language of the statute says that it applies only to agreements in which one firm has filed an ANDA under Paragraph IV. Thus the parties could avoid antitrust scrutiny by striking their agreement before the generic firm has filed an ANDA. Alternatively, the generic firm could file an ANDA under Paragraph III – which says it will wait to sell its generic until the relevant patents have expired – and threaten to change it to a Paragraph IV in order to compel a settlement.

The FTC has contended that the MMA statute compels disclosure if an agreement requires the generic firm to switch its ANDA from Paragraph IV to Paragraph III, which would mean that the generic firm cannot enter the market until the patents expire.[79] This could be interpreted to mean that an agreement must be reported if it directly or indirectly rules out Paragraph IV ANDA

[78] The FDA's Orange Book does not identify ANDA *applicants* unless and until those applications are approved, but of course a reverse payment deal would forestall such approval.
[79] Federal Trade Commission, *Letter to Helene D. Jaffe, Counsel for Sanofi-Aventis*, May 9, 2011. Available at https://www.ftc.gov/tips-advice/competition-guidance/industry-guidance/health-care/pharmaceutical-agreement-filings.

approval. To that end, the parties may argue (rightly or wrongly) that they need not submit any agreement that preserves the possibility of Paragraph IV approval, even if it makes such approval difficult or impossible to obtain successfully. For example, in the third example presented in Section IV(A), the parties' settlement (enunciated in a consent decree) noted that the generic firm (Metrics) could still obtain Paragraph IV approval by getting a license from the patent owner. But of course, the patent owner can unilaterally prevent this by simply declining to provide a license (which the evidence suggests it did).

A PTAB settlement could be used to reach a similar result. If the parties are not litigating the infringement issue in district court, then a PTAB settlement may simply foreclose future challenges to patent *validity*. But Paragraph IV approval can be obtained on grounds of either invalidity or non-infringement, and hence this settlement does not preclude such approval. However, it may be that the only *viable* path to Paragraph IV approval was to establish that the patent was invalid. That is, it may be that the generic drug contemplated by the ANDA clearly infringes, but there is a serious question as to whether the patent is valid. (This is particularly likely if the generic drug is essentially a copy of the brand-name drug, which is common.) In such cases, the settlement has a claim-preclusive effect that eliminates the only viable means of obtaining Paragraph IV approval – suggesting it will have the effect of preventing generic entry – but it does technically rule out such approval as a matter of law.

This highlights an important point, which is that the parties can benefit from using claim preclusion as an indirect barrier to generic entry, as opposed to expressly agreeing that the generic firm will stay off the market. Claim preclusion prevents two parties from litigating a cause of

action on which a court already issued a judgment.[80] Importantly, a stipulated consent judgment generally has the same claim-preclusive effect as a court-rendered judgment on the merits.[81] If the parties wish to avoid or limit this preclusive effect, they must explicitly reserve a right to re-litigate a claim.[82] Similarly, a stipulated dismissal with prejudice[83] – will generally have a claim-preclusive effect.[84] The Federal Circuit has explicitly noted that settlement of patent litigation generally precludes the defendant from subsequently challenging the validity of the litigated patent, since the validity issue could have been (and may have been) addressed in the original suit.[85] While a PTAB settlement does not have a preclusive effect by *default* – even if entered as the final judgment (which they virtually all are) – the parties may build such preclusion into the settlement agreement.

Some courts have acknowledged that a consent decree does not trigger Noerr-Pennington immunity[86] if the judge did not carefully review the settlement on the merits, but rather summarily approved it, which is quite common.[87] But this simply suggests that the FTC is not barred from bringing an antitrust action against a settlement that has been approved without being carefully

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[80] Of course, this does not preclude an *appeal* of the prior judgment.
[81] See, e.g., *Arizona v. California*, 530 U.S. 392, 414 (2000) (noting that consent decrees generally trigger claim preclusion.)
[82] *Pactiv Corp. v. Dow Chemical Co*., 449 F.3d 1227, 1231 (Fed. Cir. 2006) ("the parties can ... reserve right to litigate a claim that would otherwise be barred by res judicata... But that reservation must be express.")
[83] A dismissal "with prejudice" is one that cannot be re-litigated.
[84] Pactiv Corp. v. Dow Chem. Co., 449 F.3d 1227, 1230 (Fed. Cir. 2006) ("A dismissal with prejudice is a judgment on the merits for purposes of claim preclusion.")
[85] Ibid, at 1231-32. See also Cheng (2016).
[86] Noerr-Pennington immunity precludes antitrust liability for efforts to influence the creation or enforcement of law, even if such efforts are motivated by the desire to diminish competition. See *Eastern Railroad Presidents Conference v. Noerr Motor Freight, Inc*., 365 U.S. 127, 135 (1961); *United Mine Workers v. Pennington*, 381 U.S. 657, 670 (1965).
[87] See *In re Nexium (Esomeprazole) Antitrust Litig*., 968 F. Supp. 2d 367, 396 (D. Mass. 2013). The court noted that a consent decree is much more like a private contract than an opinion, since they are formed by the parties, and the courts almost always approve them as a matter of course.

reviewed on antitrust grounds. It does not mean that the settlement would not have a claim-preclusive effect on the *parties*. As such, a consent decree or stipulated dismissal creates a robust barrier to generic entry.

This allows the parties to achieve exclusion in a less transparent way, as they can rely on otherwise-innocuous legal diction to achieve the desired result. For example, the parties' agreement may simply say that the parties agree to terminate the IPR, and that the generic-petitioner is precluded from attacking the validity of the patent again. There is no statute requiring the parties to include the entirety of their settlement in their joint request to terminate the IPR, so the parties could achieve the reverse payment through a private side-deal. The parties may argue that this agreement does not affect "manufacture or sale" – and thus does not trigger the MMA reporting requirement – since it just terminates an administrative proceeding and leaves open the possibility of litigation on the infringement issue, which could result in Paragraph IV proposal. And, on the other hand, there is no adjudicator with antitrust authority to look over the settlement terms directly.

In our view, however, a PTAB settlement that precludes a validity challenge ought to trigger the reporting statute, at least if it has a preclusive effect. Even if the generic firm maintains the right to litigate the infringement issue, the agreement may have the practical effect of making generic entry non-viable until the patent expires, and hence it relates significantly to the generic firm's ability to compete.

A final possibility is that the parties may simply not submit their agreement, at least not in its entirety, notwithstanding that there is no good argument to justify such nondisclosure. This has happened in the past. For example, in 2009, drug maker Bristol-Myers Squibb (BMS) was made to pay a fine of $2.1 million for withholding (and lying about) some terms of a settlement with rival Apotex.[88] Part of the settlement was an (oral) agreement that BMS would not launch an authorized generic version of brand-name drug Plavix. And, while BMS submitted most of the agreement's terms to the FTC, it withheld this exclusion term, and it lied about its existence. However, since the FTC appears to be focused exclusively on district court settlements, the parties may feel more comfortable not submitting a settlement reached in PTAB.

V. REVERSE PAYMENT BETWEEN NON-COMPETITORS

In this section, we explore other practices that have arisen after the creation of PTAB. We first explore the economics behind reverse patent trolls, which are companies that file PTAB petitions with the sole purpose of obtaining a settlement payment. Finally, we explain that PTAB has been used for the right reasons by companies trying to weed out bad patents, which we call "good-faith" petitioners.

A. REVERSE PATENT TROLLS

[88] See "Bristol-Myers Squibb Pleads Guilty to Lying to the Federal Government About Deal Involving Blood-Thinning Drug," United States Department of Justice, 2007, available at http://www.justice.gov/opa/pr/2007/May/07_at_388.html.

Two of the main features of PTAB trials, relative to filing lawsuits in district courts, are their low cost and their quick resolution. Although one of the reasons to create the PTAB trials was to reduce the burden of verifying patent validity – in part as a means of countering so called "patent trolls," which cannot be countersued for *infringement* – PTAB has also opened the door for a new kind of entity called "reverse patent troll." In this section, we address this new business model. We begin by comparing it to the classical patent troll business model.

BENCHMARK: TRADITIONAL PATENT TROLLS

The business model of traditional patent trolls is to leverage from the high cost of litigation and infringement to obtain a settlement payment. A non-producing entity that owns a patent, even of questionable validity, may be able to extract rents from a practicing entity when verifying patent infringement is costly and leads to a significant transfer from the defendant to the plaintiff.

To illustrate this point, consider a simple economic model of patent trolling. There are two risk neutral players, the plaintiff and the defendant, and three parameters: the probability of infringement (p), the payment from the defendant to the plaintiff in case of infringement (F), and the cost paid for each party to verify infringement (c). The plaintiff has a credible litigation threat when, in expectation, it does not lose money by filing a lawsuit, i.e. when $pF > c$.[89] If this is the case, then the defendant expects to pay $pF+c$ from going to court. Notice that any settlement payment S from the defendant to the plaintiff that satisfies $pF - c < S < pF + c$ makes both parties

[89] This condition is demanding since the plaintiff could file a lawsuit with negative expected value if there are future gains such as reputation building, as in Hovenkamp (2016a).

better off compared to going to court. Hence, the defendant is faced with the decision of paying to verify whether there is infringement, which is an uncertain outcome, or to settle and pay the patent troll without verifying the validity of the infringement claim. This simple model explains that defendants with larger infringement payments at risk (larger *F*) are more attractive to traditional patent trolls, which is consistent with the empirical finding that trolls target companies with deep pockets (Cohen et al. 2016)

Reverse Patent Trolls

The reverse patent troll business model is even simpler than that of traditional patent trolls. It does not even require the entity to own any form of intellectual property. The idea of this business model is to leverage from the expected losses of the patent holder to obtain a settlement. A patent holder may have too much to lose if one of its patents is invalidated. Therefore, reverse trolls are most likely to emerge in industries where individual patents are particularly valuable, or else where a patent holder appears to be on the verge of obtaining a lucrative settlement or damages award. In contrast with traditional patent trolling, the firm targeted by a reverse troll does not need to be a producing entity. For example, a company that makes profit from selling licenses would be a suitable target for a reverse troll.

As an illustration, consider the following case. In 2013, a reverse patent troll called New Bay Capital brought an IPR against patents held by VirnetX, a patent licensing entity. VirnetX had recently won a $368 million infringement judgment against Apple, although that judgment was still pending appeal. New Bay threatened to bring the IPR to judgment – which, if successful,

would extinguish the damages award – unless VirnetX agreed to pay it 10% of the judgment.[90] VirnetX refused to pay, and subpoenaed New Bay to ascertain whether it was working on Apple's behalf,[91] and New Bay ultimately withdrew its petition. Another example involves a (now-defunct) reverse troll called Iron Dome.[92] This firm branded itself as a sort of "patent Robin Hood," using IPR settlements to take licenses from NPEs and give them to the NPE's litigation targets. But the firms it was purportedly defending had never spoken with them. Its real strategy appears to have been to appropriate settlement proceeds from its litigation targets. In threatening an IPR, Iron Dome would demand either transferrable, retroactive licenses (which it could sell to the patent owner's litigation targets), or else to receive a large payment for each infringement settlement ultimately recouped by the patent holder. In the two IPRs in which Iron Dome was the sole petitioner, Iron Dome lost one (the IPR was not instituted),[93] but secured a settlement in the other.[94]

Although reverse trolling is theoretically feasible and it has been documented in practice (Schuster, 2016),[95] it does not seem to be a widely observed phenomenon. One explanation is that the institution decision and the probability of invalidity are influenced by the arguments given in the petition. A valuable patent is likely to have been already scrutinized by licensees and competitors, narrowing the possibilities for an outsider to be the first making invalidation claims.

[90] See Haggin (2014).
[91] Apple was precluded from bringing its own IPR, since its litigation with VirnetX had been ongoing for more than one year.
[92] See Haggin (2014).
[93] Case IPR2014-00674, paper 10 (P.T.A.B., Oct 10, 2014).
[94] Case IPR2014-00439, paper 45 (P.T.A.B., March 6, 2015).
[95] See also Cavan et al. (2015) and Haggin (2014).

Also, since firms have very large patent portfolios, in particular in the high-tech industry, it may be too costly for a reverse troll to invalidate enough patents in a portfolio to make the patent holder incur a significant loss.

Another important distinction between traditional trolls and reverse trolls is the problem created by making PTAB petitions public. Traditional trolls claim patent infringement on assets that *only they own* (the patents), so no other company but the troll benefits from the court ruling infringement. In PTAB, however, any firm is allowed to file a petition against a patent owner, allowing firms to "free-ride" on the arguments made by the first petitioner. This feature of PTAB can improve the bargaining position of the first petitioner *before filing* the petition, since once the petition is filed the patent holder may be forced to bargain with multiple petitioners to avoid losing the patent. Thus, both a reverse patent troll and the patent holder have incentives to settle before a PTAB petition has been filed. Despite the fact that reverse trolling does not (yet) appear to be prominent, it is possible that many of the settlements are occurring before PTAB petitions are even filed, so the data is not necessarily revealing the true extent of this practice.

Inferring reverse patent trolling from the data is more challenging here than in the case of potentially unlawful settlements involving pharmaceutical patents. Unlike the pharmaceutical disputes discussed in Section III, reverse patent trolling involves PTAB settlements between non-competitors. In principle, one could infer reverse trolling by identifying disputes in which the challenger is not a producing company, but this is often hard to discern from the documents available on the PTAB database – and, as discussed below, some non-operating companies bring good faith challenges. Another way to infer reverse trolling activity is to identify settlement

demand letters from companies that appear not to produce anything or represent any producing firms, and whose demands appear difficult to explain as anything other than an effort to extract a reverse payment. These demand letters are generally difficult to find, but at least a few of them have become public.[96] (Haggin, 2014).

THEORETICAL MODEL

To better understand this new business model, we present a simple theoretical model of reverse patent trolling.[97] There are two players, the reverse troll petitioner and the patent owner, and four main parameters: the probability q that the patent will be invalidated on final judgment; the adjudication cost, c, paid by each firm if the petition is actually filed; the patent owner's total monetary loss, L, if the petitioner successfully invalidates the patent; and the fraction δ of the expected loss qL that is still incurred by the patentee if the petition is filed, but settled before a final decision is entered. That is, δqL represents the harm suffered by the patent holder as a result of the public disclosure of the petition, whose arguments can now be used by anyone, even if the petitioner and patent holder settle. We can think of δ as capturing the extent to which the petitioner's argument for invalidation provides new insights to third parties, i.e. a large value of δ means that the petitioner has thought of an argument that third parties had not. By contrast, a low value of δ means that the petitioner has disclosed very little that third parties could not come up

[96] A similar type of inference has been proposed by the FTC on traditional patent trolls: https://www.ftc.gov/sites/default/files/documents/federal_register_notices/2013/09/130926paefrn.pdf
[97] See Meurer (1989) for similar model that also includes private information.

with themselves. We assume the disclosure injury δqL does not occur if the petitioner loses on final judgment.[98]

Just like in the case of patent trolls, we assume that reverse trolls are non-producing entities, and therefore they do not gain a market advantage in case of patent invalidation. The difference with traditional patent trolling is that the PTAB petitioner's payoff depends on the action taking by the patent owner. If the patent owner could commit to never settle, then the reverse troll would expect a loss of *c* and would have no incentives to file a petition in the first place. However, it is not *credible* (i.e. subgame perfect) for the patent owner to always let an IPR proceed to judgment.

There are two negotiation stages, ex ante (before the petition has been filed) and ex interim (after the petition has been filed, but before final judgment). Adjudication costs, *c*, are sunk at the ex interim stage, but not ex ante. At the ex ante stage, they negotiate over a reverse payment r. If they do not reach an agreement here, the petitioner can file, and they will then negotiate over an ex interim reverse payment, denoted r'. If the parties reach no ex interim agreement, then a judgment is entered, and the petitioner wins (and the patent is invalidated) with probability q. The game is depicted in the following figure.

[98] This says that third parties will regard the petition's novel arguments as non-helpful if the petitioner loses on final judgment.

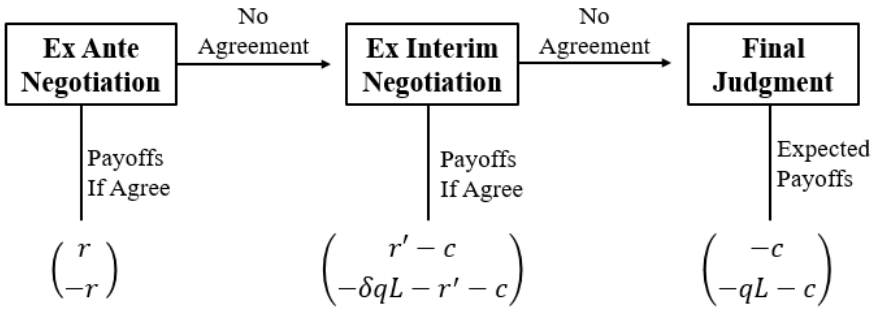

FIGURE 1.2: TIMING OF THE REVERSE TROLLING GAME.

We assume a Nash Bargaining framework.[99] At the ex ante stage, the petitioner's bargaining power is α, while it is α' at the ex interim stage. We assume that $\alpha' \leq \alpha$, which reflects that filing the petition diminishes the petitioner's bargaining power, as this publicly discloses the relevant arguments for invalidation, so the petitioner now lacks any private information that might invalidate the patent.

We work by backward induction. After the petition has been filed, adjudication costs are sunk. However, the disclosure cost δqL will persist if they settle, but not if the patent holder prevails on final judgment. Hence, the joint surplus from agreeing at this stage rather than proceeding to judgment is $(1 - \delta)qL$. Accordingly, the Nash Bargaining (ex interim) settlement fee is

$$r' = \alpha'(1 - \delta)qL$$

[99] This means that each party will get its disagreement payoff (the payoff it gets if they reach no agreement) plus some exogenous fraction of the joint surplus from reaching an agreement.

The petitioner will not file (i.e. its threat to file is non-credible) if $r' < c$. But if $r' \geq c$, the petitioner has an incentive to file the petition in the event that they reach no agreement in ex ante negotiations. Assuming that this condition is met, consider the ex ante stage. The joint surplus from reaching an agreement rather than settling at the ex interim stage is $2c + \delta qL$. On the other hand, the petitioner's disagreement payoff is $r' - c$. Thus, the Nash Bargaining (ex ante) reverse payment is:

$$r = r' - c + \alpha(2c + \delta qL) = [\alpha' + (\alpha - \alpha')\delta]qL - (1 - 2\alpha)c$$

Thus, provided that $r' \geq c$, the equilibrium will result in an ex ante reverse payment of r. Otherwise there will be no settlement, and the petitioner will not file an IPR. Intuitively, both r and r' are increasing in q and L. This reflects that settlement creates larger rents when the patentee stands to lose a lot, or when the probability of invalidation is high. Thus, if the patentee has a lot on the line – say, because it has recently secured a large damages award that is now on appeal – then reverse trolling may be lucrative. But if the patent is not very valuable, then reverse trolling will not be very profitable.

By contrast, r and r' are affected asymmetrically by the magnitude of the disclosure made when the petition is filed, as captured by δ. Intuitively, the ex ante payment, r, is increasing in δ, which reflects that an ex ante settlement avoids the cost of publicly disclosing the petition. But, on the other hand, ex interim payment, r', is decreasing in δ. This reflects that, if the petition presents a lot of potentially-invalidating information that was not generally known to third parties

ex ante, then the act of filing has already proven devastating for the patentee. Thus, at the margin, the patentee gets very little benefit from settling the IPR, since everyone is now armed with a stronger argument for invalidating the patent. The result is that, if the petitioner has a very novel argument for invalidation (i.e. one that third parties would not likely come up with), then reverse trolling is actually *less* credible, all else being equal, because the act of filing destroys the value of settlement.

On the other hand, if the petitioner does not reveal much new information, i.e. if δ is small, then the patent holder has a reputation-based interest (which is not modeled here) in not settling with anyone. Indeed, this means that everyone has essentially the same info, so if the patentee settles with anyone, then many other challenges will follow. Thus, the parameter δ creates a wedge between settlement value and credibility: both high and low levels of δ can undermine reverse trolling. As such, the practice will tend not to be very viable.

One possible exception is where most of the value captured by L consists in a settlement or damages award (from infringement litigation with a third party) that is just about to go through, and is therefore only temporarily vulnerable to a patent challenge. In this case, the threat of future validity challenges is less concerning to the patent holder, as it will have received its litigation payout by then. Thus, if the patentee has just won a large judgment, as in the Iron Bay Capital Example, then reverse trolling could be profitable, because filing the petition does not necessarily destroy the value of settlement.

B. Good-Faith Challenges by Non-Competitors

Sections II and V(A) examined the possibility of settlement payments to stop a PTAB petition filed by a competitor or by a non-competitor reverse patent troll. Settlement among competitors can have antitrust consequences and harm consumer welfare. Reverse patent trolls have a direct impact on innovation, since they reduce the rents appropriated by patent holders by making them own a more risky asset.

Despite these potential harmful incentives created by PTAB, tables 1 and 2 show that PTAB is mostly used by "good-faith" petitioners, defined as petitioners that do not seek monetary payments to settle but instead have the goal of either reaching the PTAB's final decision or obtaining a license that will be used for production. Apple Inc., for example, has not filed a single petition against its most prominent rivals in personal computers (Dell, Hewlett-Packard, Acer, or Lenovo), in mobile computers and smartphones (Google, Samsung, Nokia, or Asus), or in mobile payments (Paypal). Instead, Apple Inc. has filed petitions against non-practicing entities such as VirnetX Inc. or Smartflash LLC, most of which have reached final decision. Thus, many companies are taking advantage of the lower costs and the relatively fast decision of PTAB, compared to district court litigation, to determine the validity of patent claims, and they are not willing to accept settlement payments.

Further, there are some non-producing entities that file PTAB challenges for reasons that appear inconsistent with the reverse trolling story. For example, a non-producing entity called Unified Patents (henceforth, UP) has filed 41 PTAB petitions (as of May 2016), the majority which involve patents in the NBER category "Computers and Communications." Producing companies

pay a membership fee to UP under the promise that UP will work on invalidating patents of non-producing entities that put at risk the business of the subscribed companies. UP not only works on invalidating patents that directly threaten its subscribers, but it also preempts and deters the use of bad quality patents by challenging patents of questionable validity in certain technology areas, even when they have not been (yet) asserted.[100] Even more, UP will only settle for a transferable license and never for a monetary compensation.[101] This practice is in some sense the reverse of "patent privateering" (Lemus and Temnyalov, 2016); it involves outsourcing of patent challenges rather than patent enforcement. UP could offer a strategic advantage in filing PTAB petitions, due to its expertise, and also provide identity protection to its members, since the "real party of interest" in the PTAB petition is UP, and not the subscribed companies, which could be kept secret.

Multiple petitioners could also be a signal that firms are filing petitions in order to reach a final decision in PTAB rather than settle for monetary payments. Since settling with multiple parties is costly for the patent owner, this can be a commitment strategy that limits the scope for monetary settlements. In our database we have found examples of several competitors filing PTAB against the same patent, usually owned by a non-practicing entity.[102] Obviously, it has to do with parallel district court litigation. However, it is costly to have multiple petitioners filing against the same patent.

VI. PROPOSED REFORMS

[100] http://arstechnica.com/tech-policy/2016/07/patent-defense-group-seeks-to-knock-out-top-three-trolls-of-2015/
[101] http://www.unifiedpatents.com/faq/. Visited on June, 2016.
[102] For example, petitions filed against patent number US7365871.

Settlements limit the PTAB's efficacy in eliminating bad patents from the system. Of course, PTAB has some other very important benefits, such as avoiding the high costs of litigation and facilitating more patent licensing. But, if some of the patent claims were indeed granted in error, then clearly settlement is second best; preferably, these patent claims would be invalidated (or at least voluntarily amended), so that even third parties obtain access to the rights that ought not have been claimed in the first place. The welfare damage of settlement is exacerbated when there is evidence indicating a reasonable likelihood that some of the patent claims are invalid, i.e. when parties settle after the case has been instituted by PTAB. The social value provided by PTAB is hindered even further when settlements not only preserve "bad" patents in the system, but when they also reduce market competition by restricting entry.

A number of authors have noted that large reverse payments may signal the patent owner's lack of confidence in the validity of its patent.[103] (Dolin 2011, Edlin et al. 2015.) Thus, Dolin (2011) proposes that the FTC police these settlements by requesting the re-examination of the patents involved. Notice that a large reverse payment is not *always* a signal of patent invalidity. In the model presented in Section V(A), the settlement payment depends on both the probability of invalidity as well as the loss incurred by the patent owner after invalidity. However, this possibility does not allay antitrust concerns. As Hovenkamp (2016b) notes, the generic firm has a statutory right to challenge the patent – which is a competitive act – and the Patent Act gives no authority to write agreements that restrain these "challenge rights." Further, antitrust generally prohibits agreements that restrain one party's right to perform a competitive act, at least unless

[103] Similarly, a licensing settlement with very low license fees could suggest an effort by the patentee to avoid a likely invalidation.

there is some countervailing procompetitive reason for it. For example, suppose firm A approaches firm B, who operates in a neighboring state, and offers $100K if B promises never to enter A's territory. This is a per se violation of the antitrust laws. And this is so even though B was not likely to enter A's territory anyway, just as the patent in a reverse payment deal may be likely valid. The point is that, if the agreement precludes the *possibility* of competition, there must be some good reason for it. Settlement may be such a reason, but we can rule it out if the payment exceeds the litigation costs that are avoided.

Settlement of a patent challenge is not always detrimental for welfare. A party in a PTAB petition could have received new information during the procedure that makes them reassess the value of challenging the patent. For example, parties could have a better assessment of the quality of the patent after reviewing some evidence. A licensing settlement is generally procompetitive, provided that it is not simply an effort to avoid invalidation of a questionable patent. Further, a settlement that results in a voluntary amendment of the patent's claims may be an efficient way to resolve the dispute, particularly if an outright invalidation of the relevant claim would be unduly prejudicial.

However, the fact remains that many settlements of patent challenges pose a threat to the efficiency of the patent system. Thus, in light of our analysis, we propose the following reforms:

1. In concentrated industries where individual patents create significant entry barriers, all inter-competitor reverse settlements should be submitted to the FTC.

Our analysis highlights the need for greater antitrust scrutiny when there are large reverse payments between competitors with market power. In an industry like pharmaceuticals, where an individual patent can strongly affect the intensity of competition, such an agreement can have significant anticompetitive effects.

(And, outside these industries, patentees will not make large reverse payments at all.[104]) We suggest that the FTC designate some industrial categories such that all reverse payment settlements within that category must be submitted for review of antitrust compliance. But, importantly, agreements in which the patentee provides some nonmonetary benefit that is not a license – such as a promise by the patentee not to launch its own authorized generic[105] – should also be reported.

There are a few problems with the current MMA reporting statute. The first is that there is no good reason why it should be limited to Hatch-Waxman firms at all. As already noted, the question of whether the generic firm has already filed an ANDA under Paragraph IV has no bearing on the *antitrust* claim, and thus ought not be critical factor in the reporting requirement. A second and similar point is that the reporting statute should be applied to other industries where individual patents can strongly influence the intensity of competition, which will tend to be industries in which an entire product is covered by a relatively small number of patents. Third, a large reverse payment should itself be a triggering event in the statute. The focus on terms relating to "manufacturing and sale" is appropriate too, and should remain in place, but it opens up too much room for disputes over semantics. Another point is that the statute should perhaps be triggered by

[104] The payment reflects the profit value derived specifically from the patent in question, so the patent is just a tiny incremental influence on profits, the patentee will not make a large reverse payment to protect it. This means that a broad rule requiring submission of all inter-competitor reverse payments would not lead to excessive oversight. Indeed, as the *Actavis* majority noted, these settlements are very uncommon outside of the pharmaceutical industry.
[105] See *Authorized Generics: An Interim Report*, Federal Trade Commission (June, 2009).

agreements that directly or indirectly prevent the generic firm from challenging the patents, at least if those challenges have not already been litigated in district court. This would mean, for example, that a PTAB settlement that purports to forestall any possible infringement litigation would have to be reported.

2. In post-institution settlements, PTAB judges should more frequently exercise their authority to continue the adjudication without a petitioner. And they should do so after ***any*** *post-institution settlement that does not provide a (non-delayed) license to the petitioner.*

The parties have an incentive to preserve validity at the last moment through settlement – either through a token licensing deal or reverse payment – even if the patent is likely invalid. To suggest that such settlements are undesirable is not to assume that any such patent is certain to be invalidated. Rather, the problem is that these settlements are a concerted effort to disrupt the public administration of the patent laws by forestalling judgments on patentability. As such, the courts and PTAB ought not summarily approve every settlement that is proposed to them. (Hovenkamp, 2016b).

When the parties reach a settlement, the PTAB judge will virtually always agree to terminate the proceeding *with respect to the petitioner*,[106] meaning that the petitioner is excused from the proceeding. But the Patent Act gives PTAB judges the authority to continue the

[106] The judge may refuse this request only if it has already made a decision on the merits. 35 U.S.C. 317(a).

adjudication to final judgment even after the petitioner's exit.[107] However, in our investigation, we found very few situations in which this actually happened (and none in pharmaceutical settlements). While we do not suggest that PTAB judges ought to exercise this right in every case, we think they should at least do so more frequently in situations where preliminary evidence suggests a reasonable likelihood that the patent is invalid. In particular, judges should regularly continue the adjudications following *post-institution* settlements. By definition, when PTAB institutes an IPR, it is because the petitioner is reasonably likely to prevail on final judgment. Thus, knowing that the parties have a joint interest in avoiding invalidation at the last moment, PTAB judges should be quite skeptical of post-institution settlement. Further, because exclusion presents the greatest threat to consumer welfare, PTAB judges should probably review *every* post-institution settlement that does not provide a (non-delayed) license to the petitioner.[108]

3. When evaluating a proposed settlement of a Hatch-Waxman litigation, federal judges should require that the parties' proposal include all terms that would be subject to the MMA reporting statute.

As already noted, in light of some longstanding precedents that patent settlements may violate the antitrust laws,[109] the courts take surprisingly little care to review such settlements for antitrust compliance. This substantially (and unnecessarily) increases the costs of effective

[107] *Id.* ("If no petitioner remains in the inter partes review, the Office may terminate the review or proceed to a final written decision...")
[108] Sturiale (2016) similarly proposes expanding the practice of continuing IPRs after the petitioner has settled out.
[109] For example, in 1963 the Supreme Court condemned a settlement between competing sewing machine manufacturers in which they agreed not to challenge each other's patents, and not to license third party manufacturers. *United States v. Singer Mfg. Co., 374 U.S. 174, 197-98* (1963).

antitrust enforcement, for it requires the FTC to clean things up ex post through an entirely separate antitrust action. (Hovenkamp, 2016b). As such, the courts should take more care to evaluate settlement proposals. This requires not only that they look at what the parties show them, but that they require the parties to show them *everything* in their agreement. An easy way to accomplish this would be to require the parties to include in their proposal anything that would have to be submitted to the FTC under the MMA reporting statute. The court might also require a "merger clause" in the settlement contract, rendering unenforceable any terms of the agreement that are not enumerated within the four corners of the proposed settlement contract.

4. PTAB should limit the magnitude of reverse payments in order to discourage bad faith challenges by non-producing companies.

As discussed in Section V, reverse patent trolls do not actually want to "police" the patent system. Rather, they want to settle for cash, which is something that creates no social benefit.[110] This is made possible by the absence of any standing requirement in PTAB. However, the lack of a standing requirement also has beneficial effects, as it permits good faith challenges by certain non-producing companies with a bona fide interest in policing the system. Thus, rather than introducing a standing requirement, we suggest simply that PTAB limit the magnitude of reverse payments so as to prevent any parties from treating bad faith patent challenges as a for-profit enterprise. In particular, PTAB judges should preclude reverse payments that are sufficiently large

[110] The only potential benefit is that, if the reverse troll *filed* a petition before settling, and if that petition includes arguments that interested third parties would not likely come up with otherwise, then the disclosure of the petition may provide a social benefit.

in relation to the cost of bringing a petition to provide the petitioner with a large net return on its investment. An alternative to this proposal is to continue these adjudications to judgment if there is a reverse payment, as this would dissuade the patentee from making the payment in the first place. By effectively eliminating the possibility of scoring a lucrative settlement after filing, this substantially diminishes the reverse troll's bargaining power – even before it files a petition.

VII. CONCLUSION

PTAB improves efficiency in the patent system by providing a (comparatively) quick and inexpensive alternative to district court litigation as a vehicle for challenging patents. However, the scarce antitrust scrutiny applied to PTAB settlements may make the forum a vehicle for competitors to sign reverse payment agreements that can harm consumer welfare. Also, PTAB trials could be exploited as a holdup device, attracting non-producing companies to extract settlement fees from patent owners.

In this paper, we analyzed the possibility of these two negative uses of PTAB by focusing mostly in the pharmaceutical industry. Linking the patents in the FDA's Orange Book with those in PTAB trials, we are able to assess whether a competitor that challenged the patent validity of an incumbent through a PTAB trial, enters the market after the parties agree to settle. The empirical evidence indicates that entry does not occur for a large fraction of the settlements, which is an indication of potential reverse settlements, which may violate the antitrust laws. We then presented a theory for reverse patent trolling and we contrasted the incentives of these firms with those of traditional patent trolls. Reverse trolls can exploit the losses incurred by a patent owner in case of

invalidity and the lack of commitment to extract settlement fees. The data reveals that reverse trolling does not seem to be a pervasive practice, which we rationalized by the public good nature of a PTAB petition, i.e. the firm with the highest willingness to invalidate the patent is the one filing the review, and reverse patent trolls are not likely to be that firm.

Concerned by the potential missuses of an otherwise efficient tool, we proposed a series of reforms that would help prevent firms from abusing the system. In the case of potentially anticompetitive reverse settlements, we suggest that PTAB receive more antitrust scrutiny to ensure that it is not used as a platform for striking harmful agreements. We also suggest that PTAB judges more often exercise their authority to continue an IPR to judgment after the petitioner settles and exits the adjudication, particularly if the settlement was reached post-institution.

2. COMPETITION, INALIENABILITY, AND THE ECONOMIC ANALYSIS OF PATENT LAW*

I. INTRODUCTION

Why do private parties litigate their disputes? The canonical answer is that they are beset by some kind of bargaining failure. For example, the parties may disagree as to which of them is likely to prevail, preventing them from agreeing on settlement terms. But a bargaining failure is not the only possible explanation. It may be the law itself that induces the parties to litigate – namely legal restraints on private contracting, broadly known as *inalienability rules*.[111] Such restraints may prohibit the parties' preferred exchange of rights on public policy grounds. In any such case, the parties' preferences are necessarily in conflict with some protected public policy interests. As a result, the question of whether a disputed property right is alienable is critical to determine the proper role of the court in facilitating an appropriate resolution.

To illustrate, suppose two private parties are involved in a property dispute, and consider the following question: What can the court infer simply from the fact that the parties are litigating? If there are no inalienability rules that might constrain the parties' private dealings – as is typical in private disputes – then the court knows they were free to strike whatever agreement they like

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[111] More specifically, an inalienability rule is a legal restraint prohibiting the transaction of a particular property right, at least under certain circumstances. For example, a person cannot sell her right to vote in a political election. *See* Guido Calabresi and A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARVARD L. REV. 1089, 1092 (1972).

prior to litigation. Perhaps that hypothetical contract would have imposed some externalities[112] on third parties – many contracts do – but the fact is they were permitted to form it. Thus, the court may infer that the parties are litigating due to a bargaining failure. Accordingly, settlement should generally be regarded as the best possible resolution,[113] for it signals that the parties have overcome the bargaining problem that led them to court. Furthermore, there is no particular reason the court should fuss over the *terms* of a proposed settlement. The parties were free to adopt them before trial, so why scrutinize them now?

But what if the disputed property rights are subject to some restraints on alienability? Now the court cannot presume that the parties were entitled to strike their preferred agreement to avoid litigation.[114] That hypothetical contract might be unlawful and unenforceable, and the parties may be litigating only because there is no lawful alternative that they mutually prefer to litigation. Thus the court cannot infer a bargaining failure. This ought to shift its policies on how the dispute should be resolved. It is no longer appropriate to approve any settlement as a matter of course. Rather, the court should carefully scrutinize the terms of a proposed settlement to ensure they are not antithetical to the policies underpinning the relevant inalienability rule. By the same token,

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[112] An externality problem arises when one party's conduct inadvertently affects another party (for better or worse), but the actor does not take this into account when choosing his course of conduct. *See, e.g.,* James M. Buchanan & W. Craig Stubblebine, *Externality*, 29 ECONOMICA 371, 371 (1962).

[113] Settlement is generally viewed as the most desirable way for a private dispute to resolve. *See, e.g.,* Carrie Menkel-Meadow, *For and Against Settlement: Uses and Abuses of the Mandatory Settlement Conference*, 33 UCLA L. REV., 485, 485 (noting that most courts and commenters agree that "dispute resolution outside of full adjudication is a good thing").

[114] For example, suppose that zoning law prohibits a homeowner from selling her land to an adjacent factory. Then, if the homeowner and the factory are embroiled in a property dispute, they may be prohibited from entering into a settlement in which the factory takes possession of some of the homeowner's land, even though this might be their mutually-preferred option.

litigation to judgment should not necessarily be viewed as problematic,[115] for it may reflect that the only arrangements the parties can agree on would run counter to some protected public policy interests. That means the court may be better-suited than the parties to elicit an appropriate resolution, even if the parties suffer no transaction costs.[116]

Consistent with the latter scenario, patent disputes often arise in the shadow of alienability restraints, although the courts have not recognized this fact, nor the important normative implications that flow from it. The parties to a patent dispute are often competing firms with market power, and their private dealings may thus be constrained by antitrust law.[117] Antitrust often prohibits competing firms from transacting commercial property (which could be real property or IP) with one another.[118] The result is *antitrust inalienability* – antitrust laws prohibiting commercial property transactions that unreasonably suppress competition between the parties.[119] This paper is the first to provide a comprehensive theory of antitrust inalienability in patent disputes, and to demonstrate how such inalienability distorts the law and economic analysis of private conflicts over property rights. I then use this theory to explain why adjudicative policies

[115] In law and economics, the conventional wisdom is that litigation is generally an undesirable way to resolve a private dispute. *See, e.g.,* Kathryn E. Spier, *Litigation, In* 1 Handbook of L. & Econ. 259, (A. Mitchell Polinsky & Steven Shavell eds., 2007) ("trials are a decidedly inefficient way for private parties to resolve their disputes.")

[116] A common example that I will reference throughout this paper is patent invalidation. In many instances, the invalidation of a patent is socially efficient. But private parties (even non-competitors) will virtually never form an agreement that effectively rescinds the patent. They would both prefer a royalty-free licensing deal, as this would still exclude third parties.

[117] Section 1 of the Sherman Act prohibits any contract, combination…, or conspiracy in restraint of trade." 15 U.S.C. §2.

[118] The Clayton Act prohibits mergers or acquisitions between rivals where the result is "substantially to lessen competition." 15 U.S.C. §18.

[119] Antitrust inalienability often arises outside the patent context. For example, firms are often prohibited from buying stock in one another, or from merging. But, unlike patents, these kinds of property are unlikely to be the subject of a (non-antitrust) private dispute.

in patent disputes ought to differ from those normally embraced in private law, at least when the parties are competing firms.

Antitrust inalienability may condemn various kinds of patent agreements. For example, a firm may be prohibited from buying patents covering technologies that compete with its own, just as competitors are often prohibited from selling stock or commercial assets to one another.[120] Competitors may be prohibited from striking a cross-licensing deal under which they agree to divide the market, with each firm permitted to make only one distinct variety of the patented product.[121] Firms' are also generally prohibited from striking agreements imposing restraints "beyond the scope of the patent." For example, patentee and its licensee cannot strike an agreement that requires the latter to continue paying royalties after the patent expires or is invalidated.[122]

The Supreme Court's recent *Actavis* decision highlights a particularly interesting form of antitrust inalienability.[123] It held that "reverse payment settlements"– also known as "pay for delay" – may violate the antitrust laws.[124] In a typical case, the plaintiff has a patent-based monopoly, and it sues a rival that is planning to sell an allegedly-infringing product. The rival's

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[120] *See* U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST GUIDELINES FOR THE LICENSING AND ACQUISITION OF INTELLECTUAL PROPERTY § 3.1 (1995) ("[a]n acquisition of intellectual property may lessen competition in a relevant antitrust market"); *Id* at §5.7 (noting that IP acquisitions should be evaluated under the same antitrust statutes that apply to ordinary mergers or acquisitions). *See also* Erik Hovenkamp and Herbert Hovenkamp, *Buying Monopoly: Antitrust Limits on Damages for Externally Acquired Patents*, TEX. INTELL. PROP. L. J. (forthcoming, 2017).
[121] *See* Hartford-Empire Co. v. United States, 323 U.S. 386, 392–400 (1945).
[122] Kimble v. Marvel Enters., Inc., 135 S. Ct. 781 (2014).
[123] F.T.C. v. Actavis, Inc., 133 S. Ct. 2223 (2013).
[124] *Id.* at 2227. *See also* Aaron S. Edlin et al., *The* Actavis *Inference: Theory and Practice*, 66 Rutgers L. Rev. 585, 587-88 (2015).

defense – which, if successful, will permit it to enter the market – is that the patent is either invalid or uninfringed. But in a reverse payment settlement, the monopolist-patentee simply pays the defendant-rival to stop challenging the patent and stay off the market for some material period of time (but no later than the date of patent expiration).[125] This agreement is certain to achieve exclusion, whether or not the patent is valid and infringed. This maximizes the joint profits of the parties, since competition and profits are inversely related.

Reverse settlements are best-known for their prevalence in pharmaceutical markets, which have four important properties that make them vulnerable to collusion. First, a drug monopolist (or a cartel) can earn huge profits, since consumers are generally willing to pay high prices for health care products. Second, in lieu of monopoly, competition is particularly intense, because a branded drug and generic equivalent are essentially fungible.[126] Third, in a drug market, even individual patents may create substantial barriers to entry.[127] Finally, poorly designed statutes in the Hatch-Waxman Act prevent (or at least discourage) most generic drug makers – namely all but the first to file for FDA approval – from challenging the patents on branded drugs, even if those patents are likely invalid.[128] The result is that a reverse payment settlement can effectively block

[125] *Actavis*, 133 S. Ct. at 2227.

[126] Of course, consumers might pay a few dollars more for a branded drug than a generic equivalent. Thus, for example, the price of Bayer is higher than off-brand aspirin. But such examples involve off-patent drugs that are sold at competitive price levels (even branded aspirin costs just a few dollars a bottle, after all). If the branded drug is patented and costs, say, $1000 per dose, consumers will be much more price-sensitive, and will be eager to find a generic equivalent at a lower price.

[127] Drugs are usually covered by a relatively small number of patents – in contrast to, say, a smartphone, which typically reads on more than a thousand narrow or incremental technologies. The result is that barriers to entry – on a per-patent basis – are much larger.

[128] To encourage patent challenges, the Hatch-Waxman Act gives 180 days of generic exclusivity to the first generic firm to file for FDA approval. If the first-filer enters into a reverse settlement with the branded firm, later-filing generics cannot get that exclusivity for themselves by filing their own approval and successfully challenging the patents. *See* 21 U.S.C. § 355(j)(5)(B)(iv); Scott Hemphill, *Paying for Delay: Pharmaceutical Patent Settlement as a Regulatory Design Problem*, 81 N.Y.U. L. REV. 1553, 1583-88 (2006); Michael A. Carrier, *Unsettling Drug Patent*

generic entry (and thus preserve monopoly rents) even if most generic firms are not paid to stay out of the market.

In *Actavis*, the defendants were drug monopolist Solvay and a number of generic drug makers, including the eponymous Actavis. Solvay's patent monopoly covered a product called AndroGel, which is used to treat testosterone deficiency in men.[129] The generic firms filed applications for FDA approval to begin selling generic versions of AndroGel, notwithstanding that it was covered by an active patent. These applications required them to "certify" that the AndroGel patent is either invalid or uninfringed.[130] That certification entitled Solvay to sue for infringement, which temporarily stayed FDA approval of the generic drug applications. The firms quickly settled, however. Solvay agreed to make annual payments of several million dollars to the generic firms, who agreed to stop challenging the patent and stay off the market for about a decade.

The Supreme Court held that reverse payment settlements may be unlawful, depending on a number of factors.[131] The most important factor is the magnitude of the payment, which provides a basis for an economic inference as to the likely function of the agreement. If the payment is large – in particular, if it is larger than the anticipated cost of continued litigation – then this creates an inference that the patent is likely invalid, and that the patentee is offering a share of the monopoly rents to stop the generic firm from securing a procompetitive judgment (invalidation of

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Settlements: A Framework for Presumptive Illegality, 108 MICH. L. REV. 37 (2009). However, this paper will not delve into the complex statutory structure that helps to support reverse payment settlements, which has been widely addressed throughout the literature.

[129] *Actavis*, 133 S. Ct. at 2229.

[130] For an overview of the generic approval and litigation process, *see* Hemphill, note __ *supra*, at 1579.

[131] *Actavis*, 133 S. Ct. at 2234-37.

the patent) that would serve to destroy those rents.[132] Since patent-based exclusion is appropriate only if the relevant patent is both valid and infringed, this suggests the agreement likely restrains competition without justification.

A reverse payment settlement occurs before any court has issued a judgment on the patent's validity. Hence, at the time of settlement, no court has upheld the patentee's right to exclude the defendant from the market. By contrast, if the dispute proceeded to judgment, and if the patentee were successful, the court might issue an injunction, excluding the defendant's product from the market. This elicits the same allocation of rights as a reverse payment agreement: it strips the defendant of any right to sell its product, at least temporarily. The only difference, which does not bear on the allocation of rights, is that the injunction does not compel the patentee to make a payment.

Thus, while a court's judgment may act to exclude the defendant, the parties may be prohibited from entering into a pre-judgment settlement that achieves the same result. In the same vein, if a district court holds a patent invalid or uninfringed, the parties cannot bargain around this in order to restore the patent's exclusionary power, but the Federal Circuit could do just that by reversing the district court judgment on appeal. Additionally, through its patent granting decisions,

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[132] *Id*. at 2234 (noting that a large payment may "provide strong evidence that the patentee seeks to induce the generic challenger to abandon its claim with a share of its monopoly profits that would otherwise be lost in the competitive market."). *See also* Gregory Dolin, *Reverse Settlements as Patent Invalidity Signals*, 24 HARV. J. L. & TECH. 281, 322 ("[i]f the size of the settlement exceeds reasonable litigation costs and cross-license fees, it would indicate that the doubts [about patent validity] are substantial"); Edlin et al., *supra*, at 585 ("a large and otherwise unexplained payment, combined with delayed entry, supports a reasonable inference of harm to consumers from lessened competition.")

the Patent and Trademark Office (PTO) can influence how patent rights are ultimately allocated on the market, even if the relevant firms can bargain.[133]

This highlights an asymmetry created by antitrust inalienability, which is that it constrains only *private* influences on the allocation of commercial rights, not public ones. A court's holding may inherently diminish competition, but the parties may be prohibited from entering into a private agreement that does the very same thing. This asymmetry distinguishes antitrust inalienability from more typical inalienability rules, most of which would never be circumvented by a judgment. For example, person *A* is prohibited from selling his kidney to *B*, but there is also no conceivable circumstance under which a court might order *A* to provide a kidney to *B*. Thus, this inalienability rule creates no asymmetry between private and public influences on the allocation of "kidney rights."

As a result of antitrust inalienability, patent disputes arising in antitrust's shadow are distinct from most conventional private disputes. Most theories that shape our understanding of private conflicts over property rights assume implicitly that there are no noteworthy restraints on alienability. Perhaps the best-known example of this is the Coase theorem, which posits that, if the relevant parties can bargain,[134] then the initial assignment of rights (or a court's delimitation

[133] *See* Section II(B), *infra*.

[134] When I say "the parties can bargain," it is just as good to say there are no prohibitive transaction costs between those two parties. However, it is usually impossible for a firm to bargain with its consumer base so as to maximize aggregate welfare, so there are substantial transaction costs between the party firms and nonparty consumers, which is of course why antitrust exists. But the Coase theorem allows for the possibility that the parties to a legal dispute can bargain with each other but cannot bargain with outsiders who are indirectly affected by their dealings. In such a case, the Coase theorem implies only that a court's delimitation of rights will not affect the final allocation of rights (the one that maximizes the joint welfare of the parties); it does not imply that this final allocation will be *socially* efficient.

of property rights) will not influence the efficiency with which those rights are ultimately allocated.[135] Instead, the initial assignment or rights (or a court's judgment) merely influences who must pay, and how much. A corollary is that parties who can bargain effectively will always settle in advance of costly litigation; their expectations about litigation influence only the terms of the exchange, not the allocation of rights.

However, these propositions rest critically on Coase's assumption that "it is always possible to modify by transactions on the market the initial delimitation of rights."[136] That is, Coase assumed the disputed rights were entirely alienable. And in the kinds of tort and real property disputes he explores in *The Problem of Social Cost*, that assumption is perfectly appropriate.

But the Coase theorem's familiar logic does not carry over to disputes whose parties are constrained by inalienability, as is often the case in patent disputes between competing firms. In such a case, the court may influence the final allocation of patent rights, even if the parties can bargain. The same is true of the "initial assignment" of patent rights by the Patent Office. In effect, the joint profits of competing parties are largest when commercial rights are allocated in ways that diminish competition. Thus, if a court's judgment serves to suppress competition, then the parties often have no joint-interest in bargaining around it, although they are permitted to do so. On the other hand, if the court's judgment enhances competition – in particular, if it holds the

[135] Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 15 (1960). S*ee also, e.g.* Richard Posner, *Nobel laureate: Ronald Coase and methodology*, 7 J. ECON. PERSPECTIVES 195, 195 (2013).
[136] Coase, *supra*, at 15.

patent invalid or not infringed – then the parties would *like* to bargain around it but antitrust prohibits them from doing so.[137]

If the threat of antitrust sanctions sufficiently deters the parties from executing an anticompetitive settlement, they may (rationally) litigate to judgment. This is so even if they have common expectations about litigation, and even if they are perfectly capable of forming a lawful settlement before trial.[138] Such litigation occurs when there is no lawful settlement agreement that both parties prefer to litigation, which may have positive expected value for both parties.[139] For example, it may be that the parties would like to enter into a reverse payment settlement, but antitrust precludes them from doing so. And the patentee may prefer litigation to any licensing settlement that an accused infringer would accept, since litigation to judgment offers the possibility of preserving its monopoly, while licensing generally does not, and the defendant will pay only so much for a license. Section II provides an intuitive and accessible model demonstrating these points.

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[137] If a patent is held invalid or uninfringed, then patent law becomes irrelevant, and antitrust alone governs the permissibility of the firms' agreement. And, in lieu of patent law, competitors are virtually always prohibited from striking agreements that serve to exclude one of them from the market. *See, e.g.*, F.T.C. v. Actavis, Inc., 133 S. Ct. 2230 (2013) (noting that antitrust precludes a firm from paying a competitor to stay out of its market).

[138] Section II(A) demonstrates this using a model in which reverse payment settlements are unlawful if the payment is sufficiently large. As a means of preserving monopoly rents, an alternative to reverse settlement would be for the patentee to permit entry by the other firm, but to fix prices or output in the product market, effectuating a cartel. In a game-theoretic model of licensing settlements, Michael Meruer shows that antitrust restrictions on collusive *licensing* terms may prevent the firms from settling. *See* Micahel J. Meurer, *The Settlement of Patent Litigation*, 20 RAND J. ECON. 77, 77 (1989) ("[t]his incentive for licensing is diminished, however, by antitrust rules that impair the ability of parties … to maintain monopoly output restrictions.")

[139] For a monopolist-patentee, successful litigation allows it to preserve monopoly rents without having to share them. On the other hand, the defendant, if successful, will secure the right to compete without having to pay royalties.

A third departure from traditional law and economic analysis is that, even if the parties settle ex ante, the agreed-upon allocation of rights (and the efficiency of that allocation) may vary depending on the parties' expectations about litigation.[140] This would never happen in a conventional private conflict. On the contrary, if allocation *X* maximizes the parties' joint welfare, and if there are no limitations on alienability, then the parties will always wind up at *X* – both in an ex ante settlement and after any possible final judgment. In a pretrial settlement, their expectations about litigation affect only the monetary terms on which they arrive at *X*. Note, however, that allocation *X* is not necessarily *socially* efficient, for the litigants may fail to take account of some third parties who are indirectly affected by their dealings. But the point is that, if the parties can bargain with one another, the court's judgment will not affect the efficiency of the final allocation of rights.[141]

These deviations from classical law and economic analysis have important legal policy implications. The conventional wisdom on private disputes is that the parties are generally better suited than a court to resolve the dispute efficiently,[142] implying that settlement is the best possible outcome. And, as already noted, there is little reason to fuss over the terms of settlement in the absence of any legal restraints on alienability, for such absence signals that the parties are entitled to allocate the relevant rights however they like. But this is not the case in a patent dispute whose

[140] For example, in the Appendix, I show that an ex ante settlement between competitors may take two forms: a licensing agreement, or a *lawful* reverse payment (i.e. one in which the payment is sufficiently small), depending on the parties' expectations about the patentee's likelihood of winning in court.

[141] Consistent with this, Judge Richard Posner states the Coase theorem as follows: "if transaction costs are zero, the initial assignment of a property right … will not affect the efficiency with which resources are allocated." Richard Posner, *Nobel laureate: Ronald Coase and methodology*, 7 J. ECON. PERSPECTIVES 195, 195 (2013). If there are also no transaction costs between the parties and any nonparties who might be indirectly affected by the allocation, then the final allocation of rights will be *socially* efficient.

[142] *See, e.g.*, Spier, *supra*, at 270.

parties are subject to antitrust inalienability. Now the courts ought to scrutinize settlements carefully to ensure that they do not undermine the underlying inalienability rule. In the patent-antitrust context, that means the settlement should not suppress competition to a greater extent than is reasonably justified by patent law.[143] By the same token, litigation to judgment should not necessarily be regarded as undesirable or inefficient, for it may reflect that the socially efficient outcome is one that the parties would never implement volitionally, such as invalidation of the patent.[144]

Although private settlements are almost always awarded as a matter of course, there are other important situations in which settlement proposals are closely scrutinized. A familiar example involves judicial review of class action settlements. When a settlement is proposed in a class action lawsuit, courts carefully review them to ensure they are fair to the plaintiff class.[145] In lieu of such scrutiny, lawyers for the plaintiff class have an incentive to strike settlements that provide them with large legal fees, but offer comparatively little relief for class members.[146] The problem is that class members' interests are often not adequately "internalized" by class attorneys,

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[143] Antitrust condemns patent agreements that suppress competition and are not justified on patent policy grounds. *See, e.g., Actavis,* 133 S. Ct. 2230, at 2232 (noting that "[Supreme Court] precedents make clear that patent-related settlement agreements can sometimes violate the antitrust laws"); Hovenkamp and Hovenkamp, *supra*, at 11-12 (noting that, even if the Patent Act creates a broad authority to do something, e.g. assign a patent, such conduct may be unlawful when used substantially to diminish competition).

[144] No matter their own beliefs about patent validity, the parties generally have an interest in preserving validity by settling. This allows them to exclude third party competition, which benefits them both.

[145] FED. R. CIV. P. 23(e) (noting that a court may approve a proposed class action settlement only upon a "finding that it is fair, reasonable, and adequate"). *See also* In re Online DVD-Rental Antitrust Litig., 779 F.3d 934, 944 (9th Cir. 2015) (enumerating various factors for assessing the fairness of a class section settlement); In re Trulia, Inc. Stockholder Litig., 129 A.3d 884, 890 (Del. Ch. 2016) (noting that Delaware law requires that courts "examine the fairness of a class action settlement before approving").

[146] *See, e.g.*, Edward A. Purcell Jr., *The Class Action Fairness Act in Perspective: The Old and the New in Federal Jurisdictional Reform,* 156 U. PENN. L. REV. 1823, 1853 (2008).

because the large number of parties makes it very difficult to negotiate the terms of legal representation.

The rationale for evaluating settlements in inter-competitor patent disputes is similar. Here too there are some parties who are not effectively represented: consumers. In fact, here they are not parties at all. But antitrust nevertheless protects them from certain anticompetitive settlements. As this reflects, the impetus for antitrust inalienability – and for most inalienability rules – is an externality problem.[147] Thus we apply inalienability rules when some group of parties have the interest and ability to enter into a transaction that improves their own joint welfare, but which imposes a large negative externality on third parties, generating an overall reduction in aggregate social welfare.

Since the Supreme Court has noted that patent settlements may violate the antitrust laws, all courts should take care not to rubber-stamp patent settlements that create an actionable antitrust injury. Of course, one might think that the courts are already inclined to review patent settlements carefully before approving them. After all, the *Actavis* opinion was hardly the first to recognize that some patent settlements run afoul of the antitrust laws. The majority cited some longstanding precedents to that effect.[148] But the truth is that these precedents have had relatively little impact on how courts adjudicate *patent disputes*, as distinguished from subsequent antitrust actions

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[147] *See* Calabresi & Melamed, *supra*, at 1111 (noting that inalienability rules may be efficient "when a transaction would create significant externalities").

[148] 133 S. Ct. at 2227. For example, the Court cited the well-known *Singer* case in support of its claim that patent settlements may violate the antitrust laws if they restrain competition to a greater extent than is justified by patent law. *See* United States v. Singer Mfg. Co., 374 U.S. 174, 197-98 (1963) ("the possession of a valid patent or patents does not give the patentee any exemption from the provisions of the Sherman Act beyond the limits of the patent monopoly").

challenging settlements of those disputes. In particular, the courts generally continue to approve settlement proposals summarily, just as they do in ordinary private conflicts over fully-alienable rights.[149] In some cases, the consent decrees do not reflect the parties' full agreement, leaving some terms (such as profit-sharing[150]) to be achieved through separate, private contracts,[151] reflecting that the courts are not even making an effort to see the entirety of the parties' agreement.

The paradoxical result is that, while all courts acknowledge that some patent settlements may violate the antitrust laws, they usually do not review proposed settlements before approving them. This reflects an institutional failure to recognize how antitrust inalienability distinguishes many patent disputes from ordinary private conflicts over fully-alienable rights. The impetus for settlement may have little to do with avoiding costly litigation, and may rather reflect the parties' interest in avoiding a procompetitive judgment that they would be prohibited (on antitrust grounds) from bargaining around later.[152]

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[149] *See, e.g., In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014) (observing that the patent judge had simply "rubber-stamped the proposed consent judgment"); *In re* Ciprofloxacin Hydrochloride Antitrust Litigation, 261 F.Supp.2d 188, 212-213 (E.D.N.Y. 2003) (noted that the patent court had "played no role [in the settlement of the patent suit] other than signing the Consent Judgment."); *In re* Nexium (Esomeprazole) Antitrust Litig., 968 F. Supp. 2d 367, 396 (D. Mass. 2013) (noting that consent decrees are often much more like private contracts than judicial opinions, because the courts do not carefully review them on the merits, and are "hard-pressed" to reject them).

[150] The profit-sharing term (i.e. the payment) is important, for as already noted, this is the principal basis for economic inference as to the settlement's competitive effects.

[151] *See, e.g. In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *7 (N.D. Ga. Apr. 21, 2014) (noting that the parties' proposed settlement had not disclosed the profit-sharing component of the deal, which was instead implemented in a separate, private agreement.)

[152] The result, which many scholars have noted, is that the parties have a joint interest in striking a settlement simply to avoid patent invalidation. *See*, e.g., Edlin et al., note __ *supra*, at 3 (noting that the parties' motivation is "to preserve patent exclusivity for as long as possible"). Note, however, that in an ordinary property disputes, the parties (assuming they can bargain) are not jointly concerned with "avoiding" any particular judgment, since they can bargain around any order they dislike.

I propose that if the parties' patent dealings appear reasonably capable of materially suppressing competition (in a way that is not authorized by patent law), then the patent court should carefully review a proposed settlement before approving it, i.e. entering it as a consent decree. This could come entirely from the judge's own deliberations, or the court could rely on an evaluation solicited from one of the antitrust agencies,[153] or an appointed expert. Although the court's refusal to approve a settlement cannot prevent the parties from dismissing the suit and striking the agreement privately, it can nevertheless undermine the settlement by making it more difficult to enforce, undermining its stability. First, judgments (including stipulated judgments) are generally easier to enforce than contracts. Second, and more importantly, a court's deliberation of the antitrust issues could have a preclusive effect on the parties. This requires that the reviewing court's deliberation suggests the antitrust issue was "actually litigated" in the sense required by res judicata.[154] This could make it enforceable (provided it is has not been successfully challenged by a third party) even if the approving court erred in finding the settlement antitrust-compliant, for it precludes either party from re-raising the antitrust issues as a defense for its failure to perform. The parties have a strong interest in ensuring that their agreement is enforceable, so judicial review would create an incentive to settle on less restrictive terms. Aside from explaining the benefits of

[153] At least one court has sought FTC review of a patent settlement before approving it. *See* In re Effexor XR Antitrust Litig., No. 11-5479, 2014 U.S. Dist. LEXIS 142206, at *11 (D.N.J. Oct. 6, 2014) (noting that, after the parties requested that their settlement be entered as a consent decree, the patent judge had "issued a scheduling order requiring the parties to provide the FTC with the proposed settlement and associated license agreements and soliciting the FTC's views on any antitrust issues concerning the proposed settlement"). This appears to be the exception to the rule, however.

[154] CHARLES ALLEN WRIGHT ET AL., 18 FEDERAL PRACTICE AND PROCEDURE, § 4419 (2d ed. 2016) (noting that a party is precluding from re-litigating an issue only if it was "actually litigated" and "actually decided"). The authors go on to write that "issue preclusion generally is appropriate if some effort is made to litigate the issue, but the evidence introduced is held insufficient to carry the burden of persuasion or even the burden of production." *Id*. As such, if the court reviews the settlement and finds no antitrust violation, this may have a preclusive effect on the parties even though the settlement review may be less procedurally rigorous than a bona fide antitrust litigation.

review, I address the specific things courts should look for when evaluating settlements for antitrust compliance.[155]

An important question is how settlement approval should affect prospective third party antitrust plaintiffs. Those courts that have addressed the issue have suggested that a rubber-stamped settlement cannot bar a collateral attack on the antitrust issue. However, in reliance on antitrust's *Noerr-Pennington* doctrine, these courts contend that a carefully-reviewed settlement may indeed block collateral attack if the court's review of the antitrust issue was sufficiently thorough to make the decree's terms reasonably "attributable to the [reviewing court's] deliberation."[156] *Noerr-Pennington* immunizes firms from antitrust liability for "political activity," which usually involves "petitioning" a government decision-maker to do something that serves to lessen competition.[157] The doctrine's stated justification is, in effect, that everyone – even titans of industry – has a protected right to make their desires known to government decision-makers.

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[155] *See* Section IV(B), *infra*.

[156] *See, e.g. In re* Nexium (Esomeprazole) Antitrust Litig., 968 F. Supp. 2d 367, 398 (D. Mass. 2013) (suggesting that immunity may be justified if the parties "work with" the judge "to develop a judgment and order" that the judge then signs); *In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014) (immunity may be justified if the parties "work with" the judge "to develop a judgment and order" that the judge signs); MedImmune, Inc. v. Genentech, Inc., No. 03–2567, 2003 WL 25550611 at *6 (C.D.Cal. Dec.23, 2003) (writing that, if the court makes a sufficient effort to make the settlement comply with the antitrust laws, it may be immunized from collateral attack even if the terms could have been reached in a purely private contract, since "[n]o law supports [the] contention that Noerr-Pennington immunity does not attach to petitioning if the petitioner's desired result could have been accomplished through means not involving petitioning,"), rev'd on other grounds, 549 U.S. 118 (2007).

[157] Eastern Railroad Presidents Conference v. Noerr Motor Freight, Inc., 365 U.S. 127, 135 (1961) ("no violation of the Act can be predicated upon mere attempts to influence the passage or enforcement of laws"); United Mine Workers v. Pennington, 381 U.S. 657, 670 (1965) ("efforts to influence public officials do not violate the antitrust laws even though intended to eliminate competition").

This standard for applying *Noerr* to patent settlements is critically flawed.[158] First, in a patent settlement, it is the parties' pursuit of judicial approval that constitutes protectable "political activity" – not the commercial agreement encoded in the decree. Second, and more importantly, by effectively allowing for categorical preclusion of nonparties (potential antitrust claimants) based on the patent court's deliberation of the antitrust issue, the prevailing *Noerr* standard defies basic principles of res judicata. The courts have not even recognized the latter concern, let alone overcome it.[159]

The possibility that a private dispute may arise in the shadow of inalienability is not unique to patent law. To that end, the paper concludes by providing some examples of other kinds of disputes that center on rights that are at least partially inalienable. This paper's arguments about settlement review will often carry over to these other contexts.

II. COMPETITION AND INALIENABILITY IN PATENT DISPUTES

The Coase theorem posits that, if transaction costs are sufficiently low, the initial assignment of property rights will have no influence on the efficiency with which those rights are ultimately allocated through private bargaining.[160] The implication is that legal rules that serve to delineate property rights to resolve private disputes – such as tort standards that distinguish

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[158] Similarly, Randal Picker has argued against applying *Noerr-Pennington* to shield copyright settlements from collateral antitrust attack. *See* Randal C. Picker, *Antitrust and Innovation: Framing Baselines in the Google Book Search Settlement*, 2 ANTITRUST CHRONICLE 1, 2 (Oct., 2009).

[159] Some commenters – including the FTC – have argued against the prevailing *Noerr* standard on the ground that a commercial agreement cannot constitute protectable political activity. But this paper is the first to highlight the standard's inconsistency with longstanding limits on nonparty preclusion. *See* Section IV(B), *infra*.

[160] Coase, *Supra* note 1, at 15. *See also* Posner, *supra*, at 195.

nuisance from privileged conduct – will not affect the final allocation of rights, provided that property rights are clearly defined and the relevant parties can bargain.[161] Coase's work is often misconstrued as suggesting that transaction costs are negligible and thus the government does not affect the allocation of property rights, but in fact Coase made no such claim, nor would he agree with it. Rather, the power of Coase's idea in in highlighting transaction costs as a key friction on market efficiency, and as a principal reason why legal rules matter.[162]

Importantly, even if the parties to a dispute can bargain, it does not follow that their negotiated allocation will be *socially* efficient. The parties will allocate the relevant rights in whatever way maximizes their joint welfare, but they may not account for nonparty interests.[163] That is, even if the parties can bargain, transaction costs may undermine bargaining between the parties and some affected nonparties. This can lead the parties to adopt an inefficient agreement. But the point is that the court's judgment will not affect the final allocation of rights, because the parties will always bargain to their privately-preferred allocation of rights, which may or may not be socially efficient. In patent disputes, the parties often impose externalities on consumers, for the allocation of patent rights affects the marketplace – it influences the prices, quality, and availability of products. This is just an embodiment of the more general fact that firms generally do not internalize consumer welfare. If they did, the antitrust laws would be largely superfluous.[164]

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[161] *See, e.g.,* Calabresi & Melamed, *supra*, at 1094 (in "the absence of transaction costs, Pareto optimality or economic efficiency will occur regardless of the initial entitlement.")

[162] Coase, *supra*, at 36 (noting that when bargaining is unlikely to achieve efficiency on its own, "a different set of circumstances may make it economically desirable to change the legal rule regarding the delimitation of rights").

[163] This is an example of the well-known externality problem. *See* supra.

[164] If firms internalized consumer welfare in addition to profits, then they would never act in a way that generates deadweight loss, and thus all markets would operate efficiently, regardless of market structure.

However, this result – that the courts do not affect the allocation of rights when the parties can bargain – does not hold up if we depart from the classic Coasean framework and consider disputes over property rights that are not entirely alienable as between the parties. This is common in patent disputes between competing parties.[165] The reason is not simply that the firms compete, although this plays a critical role in shaping their incentives. Rather, the divergence occurs because antitrust inalienability may prohibit the parties from executing their preferred settlement, or from bargaining around a judgment they dislike. The result is that a court's judgment can influence the final allocation of patent rights, even if the parties can bargain. The same is true of the "initial assignment" of patent rights by the PTO.

There are a few things to note before demonstrating these points. First, the analysis does not rely on any particular *normative* claims about patent eligibility or patent scope. It does not presume, for example, that narrower patents are generally better for social welfare. Not does it presuppose any particular theory about which patents are valid and which patents are invalid. Rather, it is deliberately agnostic on these questions, because the economic results do not hinge on the reader's own views about patent eligibility or scope.

Second, the analysis assumes that an injunction would keep the defendant off the market for a material amount of time. That is, the enjoined defendant cannot instantly invent around the patent (or simply remove the patented feature from its product). The assumption reflects this paper's focus on patent agreements that can materially influence the market. If the defendant can

[165] An infamous contemporary example is the contentious litigation between rival smartphone makers Apple and Samsung. *See* Apple Inc. v. Samsung Electronics Co., Ltd., 727 F. 3d 1214 (Fed. Cir. 2013).

work around the patent with relative ease, then the patent does not create a significant barrier to market entry, and is unlikely to support an anticompetitive patent agreement.

Third, the analysis will usually assume that total profits are higher under monopoly than under duopoly. This is true in most markets, particularly those in which products are not very differentiated. Among other things, this assumption implies that the parties would always prefer an exclusion agreement (such as reverse payment) to a licensing settlement that obliges them to compete.

Finally, this paper's analysis presents no challenge to Coase. The Coase theorem is like the Pythagorean theorem: if the relevant assumptions are satisfied, the stated result must follow. The preceding arguments merely reflect that, when the parties to a patent dispute are competing firms, Coase's assumptions about alienability are not satisfied. But it is nevertheless important to acknowledge how the results may differ from classical Coasean analysis, given the extent to which the Coase theorem has shaped our understanding of private disputes.

In fact, Coase did occasionally consider situations in which markets are not free. But he focused principally on the extreme case in which the market is strictly regulated. In his 1959 article on the Federal Communications Commission (FCC),[166] Coase focused on its stringent regulation of radio frequencies. At that time, the FCC assigned a radio frequency to a particular applicant of its choosing, and it forbade the recipient from subsequently transacting those rights.[167]

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[166] Ronald Coase, *The Federal Communications Commission*, 2 J. L. & Econ. 1 (1959).
[167] *Id*. at 5 (noting that the relevant statutes served "to prevent licensees establishing property rights in frequencies").

This served to displace the counterfactual market for "frequency rights." Since the FCC's initial assignment is unlikely to be optimal, Coase recognized that private parties could likely induce a more efficient allocation of frequency rights if they were permitted transact them, casting doubt on the regulations' sensibility.[168] The problem was thus that, while a market would be beneficial, stringent regulations precluded its existence. In *The Problem of Social Cost*, Coase's attention moved from all-out regulation to the other extreme, focusing on (mostly bilateral) markets for real property rights, which are usually not subject to any noteworthy restraints on alienability.[169] In these cases, only transaction costs can thwart private exchange.[170] Patent rights, by contrast, do not correspond to either of these extreme cases. Certainly a market for patent rights exists, and such rights are *mostly* alienable.[171] But antitrust stipulates a few kinds of transactions that firms may not lawfully enter into. This results in some private disputes such that the parties' preferred resolution involves an unlawful exchange of rights, which is not a possibility addressed in The Problem of Social Cost.

A. JUDICIAL DELIMITATIONS OF PATENT RIGHTS

The right to compete is generally inalienable. If a firm has a right to perform a competitive act against a rival, then antitrust generally prohibits any agreement in which the rival pays it to

[168] *Id*. at 16 ("it is not clear why we should have to rely on the Federal Communications Commission rather than the ordinary pricing system.")

[169] Of course, there are some important exceptions, like zoning laws that constrain what kinds of parties can occupy a particular tract of land.

[170] In the first footnote of *The Problem of Social Cost*, Coase notes that this argument was implicit in his FCC paper. That is, eliminating the FCC's overbroad regulations would help only if private parties are capable of effectively bargaining over radio frequencies. Coase (1960), *supra*, at 1.

[171] The Patent Act provides that patents can generally be licensed or assigned. 35 U.S.C. §261. Antitrust simply creates a few important exceptions to this general, just as it creates exceptions to other general authorizations, such as the general rule that corporations are entitled to enter into contracts with one another.

give up that right.[172] For example, a firm generally has the right to expand into its rival's territory, and thus the rival cannot lawfully pay the firm to stay out.[173] Patents create an exception to the rule that competitive activity is generally privileged. Accordingly, patent law gives a patentee the right to exclude (or demand royalties for) unlicensed uses of the patented invention. However, such exclusion is appropriate only if the patent is valid and infringed, which is not up to the parties to decide.[174] If a court holds that the patent is either invalid or uninfringed, then the defendant is entitled to sell its product in competition with the plaintiff, and thus antitrust prohibits the parties from bargaining around the judgment.

The result, which has been widely-recognized by scholars and jurists, is that patent litigants (particular competing ones) generally have a joint-interest in settling to avoid the possibility invalidation, no matter the perceived likelihood of validity.[175] This preference exists not because litigation is costly (although this independently motivates settlement), but because invalidation would endow all third party rivals with an inalienable right to compete, which is something both parties prefer to avoid.

By contrast, if the relevant rights are entirely alienable, then the benefit of settlement is simply to avoid litigation costs. Indeed, if the parties can bargain and all rights are alienable, then

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[172] F.T.C. v. Actavis, Inc., 133 S. Ct. 2223, 2230, (2013) (noting that the antitrust laws prevent agreements in which a firm pays a rival not to compete.)

[173] That agreement would be naked market division, which is illegal per se.

[174] 35 U.S.C. §282(b) (providing that a defendant can avoid any liability by showing that the patent is invalid or uninfringed).

[175] The principal exception, which is largely immaterial here, is that a repeat litigant may prefer to litigate to judgment in order to build a litigious reputation that helps to ward off future litigation threats. *See, e.g.* Erik Hovenkamp, *Predatory Patent Litigation: How Patent Assertion Entities Use Reputation to Monetize Bad Patents,* unpublished manuscript (2016). Available at https://papers.ssrn.com/abstract=2308115.

they know they will end up at their jointly-preferred allocation one way or another. Thus, if not for antitrust alienability, traditional Coasean logic would carry over to patent disputes without a hitch. If exclusion of the defendant maximizes the firms' joint profits, they will always agree to allocate all commercial rights to the plaintiff, no matter what a court might do.

But this is not possible when antitrust imposes some limitations on how the firms resolve their dispute. The introduction discussed a number of such antitrust restrictions. This section focuses on the juxtaposition of two of them. The first is antitrust limits on patent settlements, namely those involving reverse payment.[176] The second is antitrust's prohibition of commercial restraints "beyond the scope of the patent" which, among other things, prohibits the firms from bargaining around a judgment that holds the patent invalid or uninfringed. It is this combination of antitrust rules that creates the asymmetry between (1) the allocations of rights the parties can effect through private contracting; and (2) those a court can effect through its judgment.

These two sources of antitrust inalienability fundamentally change the economic analysis of the dispute. It alters the manner in which the parties view litigation, and how they will act to resolve the dispute (under the assumption that they can bargain). This is evinced in a number of possible outcomes that are distinctly non-Coasean. For example, the parties may rationally litigate to final judgment even if they have common beliefs about patent validity, and even if litigation is

[176] The arguments also apply to other kinds of collusive settlements – e.g. those that call for the firms to fix prices in the product market. But reverse settlement is particularly helpful when illustrating how inalienability influences the law and economics of private disputes. A reverse settlement is directly analogous to a settlement that would be entirely innocuous in a typical real property dispute. For example, my neighbor may be entitled to display an ugly statue in his yard, but I can pay him to give up that entitlement, and there is nothing concerning about this agreement. By contrast, price fixing does not appear to be analogous to any aspect of a typical real property dispute.

costly. Alternatively, it could be that the parties enter into a settlement ex ante, but that its stipulated allocation of rights depends on the parties' beliefs about what a court would do on final judgment. Finally, if the parties do not settle, the court's judgment may influence the final allocation of patent rights.

The appendix establishes these possibilities formally using a model of negotiation and litigation between a patent holder (*P*) and potential market entrant (*D*) that is accused of infringement.[177] The model assumes that total profits are highest if *D* is excluded from the market, but that the antitrust laws may preclude them from entering into exclusionary agreements. The parties cannot bargain around a judgment that holds the patent valid and infringed. And, consistent with the *Actavis* decision, a reverse payment settlement is lawful if and only if the payment is no greater than the cost of litigation. The parties can bargain, and they have common beliefs about *P*'s likelihood of winning in court. To keep the exposition simple, I assume that, if licensing occurs, it is financed through a lump sum fee, rather than a royalty applied to output or revenue. However, the appendix shows that the main results hold up even if the parties license through royalties.[178]

[177] *See* Appendix Section A, *infra*.

[178] The reason is that, even if the firms use a royalty, aggressive price competition will still substantially erode profits (particularly for the defendant). Thus, just like a lump sum fee, a royalty cannot preserve monopoly rents unless the parties coordinate on price, which is generally unlawful. This result hinges on the assumption that the products are undifferentiated and that a lower price can capture the market. This is a realistic assumption for drug markets, where most reverse settlements occur, since a branded drug and its generic equivalents are essentially fungible. *See* Appendix B.

With these basic assumptions in place, the model's equilibrium takes one of four possible forms, depending on certain exogenous parameters, such as the plaintiff's probability of winning in court.[179] The four possibilities are:

1) **Status Quo.** If *P* is very likely to win in court, then the parties will not enter into a settlement agreement, nor will they litigate. In this case *D* gets a negative expected value from challenging the patent in court, and thus *P* has no reason to offer a settlement, since *D*'s litigation threat is non-credible.
2) **Lawful reverse payment settlement.** If *P*'s probability of prevailing in court is fairly high, but not so high to as to make litigation unprofitable for *D*, then the parties will agree on a *lawful* reverse payment settlement, i.e. one whose payment is no larger than the cost of litigation.
3) **Litigation to judgment**. If *P*'s probability of prevailing in court is intermediate – not particularly high, nor particularly low – then there is no lawful settlement that the parties mutually prefer to litigation. The parties rationally litigate to judgment, despite having common beliefs about what the court will do. The reason is twofold: first, *D* will not accept the largest reverse payment that *P* can lawfully make, because it gets a larger expected payoff from challenging the patent in court (which could permit it to enter the market without paying license fees). Second, the parties cannot mutually benefit from choosing licensing over litigation. In this case Litigation still has a non-negligible possibility of

[179] The parties are assumed to have identical beliefs about the plaintiff's odds of succeeding on final judgment.

preserving monopoly rents, and it thus provides larger joint profits (in expected value) than licensing.

4) **Licensing settlement.** If *P*'s probability of winning is quite low, then the (certain) costs of litigation outweigh the (very unlikely) possibility of preserving monopoly through a successful infringement action. And, as in the preceding case, *D* will not agree to any lawful reverse payment, because it would not be high enough. Thus the parties will enter into a licensing settlement before litigation.

The first two outcomes are the only ones that maximize joint profits with certainty. The others provide much lower profits in expected value. That the latter two possibilities may also arise in equilibrium is a direct result of antitrust inalienability. Note that both possibilities 2 and 4 involve pre-litigation settlement, but these two settlements involve totally different allocations of rights. One excludes the defendant, while the other lets him enter the market for a fee. As this illustrates, the allocation of rights effectuated by the parties' pretrial settlement varies depending on the plaintiff's likelihood of succeeding on final judgment.

The next section provides a simple numerical example, which ultimately results in outcome 3 from the above list. Since the parties litigate to judgment in this equilibrium, it becomes easy to see how the court's judgment influences the final allocation of rights.

1. NUMERICAL EXAMPLE

There are two drug companies, *P* and *D*. *P* sells a patented drug that treats some disease, X. *D* is a generic maker that seeks to make a generic version of *P*'s drug. Doing this will require that *D* either obtain a license or establish that *P*'s patent is invalid.[180] If *P* operates as a monopolist, it will earn a profit of 100. However, if *D* sells a generic, the resulting duopoly will result in profits of just 10 per firm, so that generic entry reduces total profits from 100 to 20.[181] This reflects the intense price competition that tends to occur between drugs that are therapeutically equivalent. The game has two major stages: pre-trial negotiation and, if no agreement is reached, litigation. There is technically a third stage – post-trial negotiation – but as the results show, the parties will never bargain around the court's judgment, either because they do not want to or because antitrust prohibits it.

- **Negotiation Stage.** The parties negotiate in the shadow of litigation. The negotiations are assumed to take the form of a take-it-or-leave-it offer by *P*. There are two kinds of settlements offers *P* could make. First, it could offer to license at a (lump sum) fee of f. Alternatively, it could offer a reverse payment settlement, with a payment of r. (Note that *P* chooses the values of f and r.) However, the antitrust laws limit the magnitude of a reverse payment, requiring that it cannot exceed the cost of litigation. Litigation costs are assumed to be 1 for each firm, and thus *P* is constrained to set $r \leq 1$ if it chooses to make a reverse payment settlement offer. If *D* accepts any settlement offer made by *P*, the game ends. If not, then *D* chooses whether

[180] It could also show that the patent is not infringed, but for simplicity I will focus on the validity prong alone.
[181] This reflects the fact that competition – even between a single pair of firms – substantially erodes profits (relative to monopoly) when the firms' products are essentially fungible in consumption. Note we are assuming that, if they compete, the parties do not collude on price (which is also an antitrust violation).

or not it wants to litigate. If it does not litigate, then the game ends. Otherwise, the game progresses to the litigation stage.

● **Litigation Stage.** *P* brings an infringement claim, and *D* argues that the patent is invalid. The parties both believe that the patent will be held valid and infringed with probability ½. If *P* wins, the court will enjoin *D*. If *P* loses, *D* has a right to sell its product without penalty. At the post-trial stage, the parties are free to bargain around the injunction if *P* wins, but antitrust prohibits them from bargaining around a verdict for the defendant.

To solve the game, it is helpful to note a few preliminary points. First, *D* would never pay more than 10 for a license, since this is the profit it would get from selling a generic. Second, if litigation gives *D* a positive expected payoff, then *D* must get at least that same value from any settlement offer made by *P*, or else it will reject the offer. Third, if *D* does not get positive expected value from litigation, then *P* knows that *D*'s litigation threat is empty. In this case *P*'s best option is to offer something that *D* would never accept, which can be interpreted as refusing to make any offer at all.

To discern what settlements the parties might agree on, we must know each party's expected payoff from litigating to judgment. That requires us to discern what the firms' final payoffs would be for each of the two possible judgments. First suppose that *P* wins in court. Then, net of litigation costs, final payoffs are 99 for *P* and -1 for *D*, since the injunction preserves *P*'s monopoly and thus *D* earns no profits. Would the parties bargain around this? At the margin, joint profits are 100 if *P* enforces its injunction, since litigation costs are sunk at the post-trial

stage. Any licensing deal would provide joint profits of 20 at the margin (this is invariant to the size of the license fee, which is just a transfer between the parties.) Thus the parties will never choose to bargain around the injunction, although they are perfectly entitled to do so. Alternatively, if *P* loses in court, then final payoffs net of litigation costs are 9 for each firm. They are not permitted to bargain around this. Based on these observations, we can already see that the results are at odds with traditional Coasean analysis. They demonstrate that, if the parties litigate, the final allocation will be entirely determined by what the court does, even though they can bargain.

Figure 2.1 displays the game tree[182] for this numerical example. Payoffs are given in parentheses, with the top and bottom components specifying *P*'s and *D*'s payoffs, respectively. The dashed lines and grayed text correspond to actions that may be prohibited by the antitrust laws.[183]

[182] Each black dot is a "decision node" at which the labeled actor makes a choice. Each available choice corresponds to one of the lines that stems downward from the decision node. (Note that the court's "decision" is modeled as a probabilistic event to capture the parties' expectations.) Each decision either leads to another decision by someone else, or to a conclusion of the game, in which case final payoffs are given.

[183] To keep the diagram somewhat clean, it does not depict *D*'s "accept or reject" decision in the case where *P* makes a reverse payment offer. But we will of course consider that decision in solving the game.

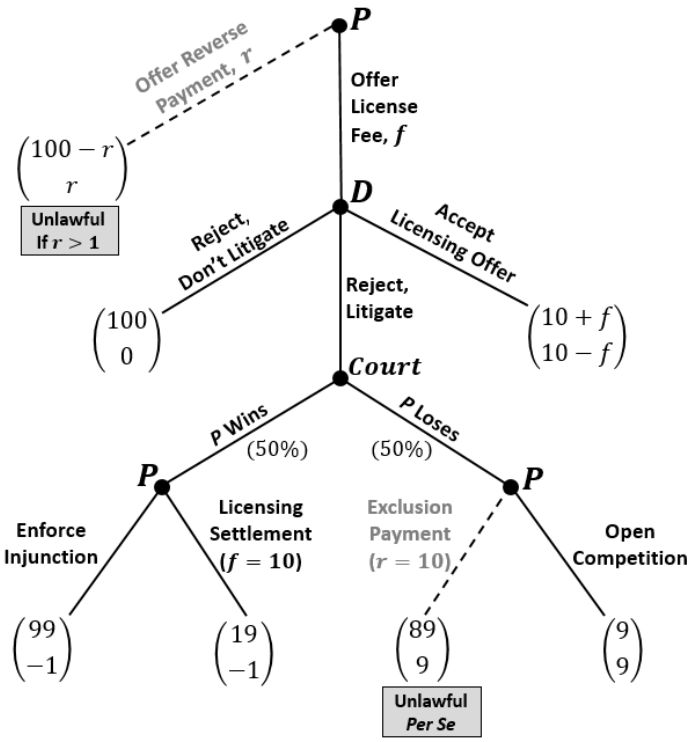

FIGURE 2.1: GAME TREE

This is enough to compute the expected value of litigation for each party and finish solving the game. Note that expected payoffs are computed net of litigation costs, since those costs are not sunk at the pretrial negotiation stage.

P's expected litigation payoff: $\frac{1}{2}(99) + \frac{1}{2}(9) = 54$

D's expected litigation payoff: $\frac{1}{2}(-1) + \frac{1}{2}(9) = 4$

Since *D* gets an expected benefit of 4 from litigation, it will definitely choose to litigate if *P* does not offer something that provides at least this amount. Does *P* want to offer a licensing settlement that provides that much value? It is easy to rule this out. In order to provide *D* with a

payoff of 4, a licensing settlement could impose a license fee of at most $f = 6$. This would leave *P* with a final payoff of 16, which is much worse than the payoff of 54 that it expects to get from litigation. Thus, there is no way the parties will mutually-agree to a licensing settlement; there is no fee level that appeals to both of them.

What about a reverse payment settlement? This would, of course, be the parties' preferred option. In particular, *P* would like to simply offer a reverse payment of $r = 4$, which would be acceptable for *D*, and would provide the highest possible joint-profit of 100. However, the antitrust laws prevent the parties from striking this deal. They are constrained to keep any reverse payment weakly lower than the cost of litigation, i.e. $r \leq 1$. But we know that *D* would not accept such a low reverse payment, since it gets a larger payoff of 4 from litigating. This reflects that the defendant will demand a large payment when there is a strong chance of invalidity, which supports the *Actavis* decision's assertion that we can generally infer an anticompetitive effect if the payment is large. The result of this antitrust restriction is that the parties will not enter into a reverse payment settlement, because there is no payment that is both lawful and mutually-preferred to litigation.

As this demonstrates, the parties will not reach a settlement and will instead litigate to judgment, notwithstanding that they maintain identical beliefs about how litigation will play out. The appendix demonstrates the other possible outcomes of the game, and identifies the specific conditions under which they occur.

B. The Initial Assignment of Patent Rights

This is a second sense in which antitrust inalienability distorts the law and economics of private disputes. In this case considered below, the focus is on how the "initial assignment" of patent rights (by the PTO) influences the final allocation of patent rights, under the assumption that the relevant firms can bargain. Here antitrust inalienability comes in the form of antitrust restrictions on purchases of patents covering substitute technologies.

Antitrust does not (and should not) condemn a monopoly earned through competition on the merits. But it prohibits a firm from acquiring or perpetuating a dominant position by simply purchasing rival firms or their commercial assets.[184] A natural application is that a firm cannot buy a monopoly[185] by combining substitute patents that it purchases from other parties.[186] This can suppress competition between substitute technologies that are covered under separate patents that were granted to separate parties – something the Patent Act never authorizes.[187] The Patent Act authorizes a party to exclude competition within the boundaries of its own, "home-grown"

[184] 15 U.S.C. §18 (holding that mergers or acquisitions are anticompetitive and unlawful when the result is substantially to lessen competition.)

[185] The monopoly could be in a product market if the patents are sufficiently powerful to serve as a barrier to competing products. This will be our focus in this section. Alternatively, the monopoly could be in a market for licensing rights for a particular technology class.

[186] U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST GUIDELINES FOR THE LICENSING AND ACQUISITION OF INTELLECTUAL PROPERTY § 3.1 (1995) ("[a]n acquisition of intellectual property may lessen competition in a relevant antitrust market"); *Id* at §5.7 (noting that IP acquisitions should be evaluated under the same antitrust statutes that apply to ordinary mergers or acquisitions). Intellectual ventures, a well-known patent assertion entity, has recently been sued for violating the antitrust laws by acquiring many patents used for online banking. *See* Intellectual Ventures, LLC v. Capital One Financial Corp., 99 F.Supp.3d 610, 623 (D.Md. 2015) (describing the practice of aggregating substitute patents from external patentees as a potential antitrust violation).

[187] *See* Hovenkamp and Hovenkamp, *supra*, at 1 ("[t]he "monopoly" authorized by the Patent Act refers to the exclusionary power of individual patents. That is not the same thing as the acquisition of individual patent rights into portfolios that dominate a market, something that the Patent Act never justifies and that the antitrust laws rightfully prohibit.")

patents. It does not authorize agreements that eliminate competition between separately-held patents.

The initial assignment of patent rights consists in the granting decisions of the PTO. This section's focus will be on PTO decisions on how broad patent claims may be in relation to the applicant's disclosure. The ideal breadth of patents has long been the subject of debate. For example, some scholars – most notably Edmund Kitch – have embraced the "prospect theory" of patents, which posits that patents should be quite broad to prevent rivals from stealing the fruits of the inventor's hard work, which would discourage invention.[188] Others are quite skeptical of this argument. They argue that some degree of competitive pressure helps to spur innovation.[189] This section will not attempt to resolve this debate. It purports only to show that, as a result of antitrust inalienability, the choice between alternative policies on patent breadth may influence how patent rights are ultimately allocated on the market,[190] even if the relevant firms can bargain.

The argument can be generalized as follows. Suppose the PTO awards a single broad patent covering a relatively large number of embodiments of the relevant invention. Then the patentee is entitled to exclude others from using any embodiment in this space of claimed technologies. And, assuming monopoly maximizes total profits, it has no incentive to invite competition by dividing up these rights with rival firms through licensing deals. Thus the final

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[188] Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J. L. & ECON. 265 (1977).
[189] *See, e.g.* Robert P. Merges and Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUMBIA L. REV. 839 (1990); Erik Hovenkamp, *Patent Prospect Theory and Competitive Innovation*, unpublished manuscript (2016). Available at https://papers.ssrn.com/abstract=2765478.
[190] Note that a very liberal use of the doctrine of equivalents may have the same practical effect as awarding broad patents, and thus could similarly affect how patent rights are ultimately allocated.

allocation is that one firm retains all patent rights over the relevant technological space. But suppose the same set of embodiments were instead covered by two or more narrow patents, and that those patents were granted to separate parties. Then the antitrust laws may prohibit an agreement that serves to aggregate these separate patent rights into a single firm's control, although such an agreement would enhance total profits. Thus, under the narrow patent regime, the final allocation involves several firms that each control only a portion of the same technology space.

The antitrust concerns are easiest to see in situations where even individual patents can create a substantial entry barrier in the product market. Pharmaceutical patents are a good example of this. Many patented drugs are covered by a relatively small number of patents. And their owners often earn massive profit during the patent term. But if just a few of the patents expire (or are invalidated), rivals are able to enter the market with relative ease, and in time aggressive price competition will devastate market profits. The result is often that profits depend much more on patents than on the drugs themselves. For example, a patented drug for a minor illness may earn huge profits, while off-patent vaccines for potentially-deadly viruses often earn comparatively little. Such is the economic power of pharmaceutical patents.

With this, suppose there are two possible pharmaceutical compounds, Alpha and Beta, that are both effective in treating a particular disease, X. Assume that Alpha and Beta are equally effective, but that they are moderately distinct in composition. As such, a patentee who invents one of the drugs may or may not be able to obtain broad claims that also cover the other drug, depending on the PTO's granting policies. There are two pharmaceutical firms, F1 and F2. F1 initially discovers Alpha and applies for a patent. A year later, F2 comes up with Beta. Assume

that, as in the last example, a monopolist in this drug market would earn a profit of 100, while two duopolists would earn 10 apiece, reflecting aggressive price competition.

Under the kind of broad patent regime endorsed by prospect theory, F1 gets a very broad patent that covers both Alpha and the moderately distinct Beta. By contrast, if patents are narrower, F1's cannot get broad claims that subsume Beta. In principle Beta could still be regarded as obvious in light of Alpha, but we will instead assume that it is independently patentable. Then F2 obtains a patent on Beta. These two possibilities are shown in the diagram below. The terms Π_1 and Π_2 denote the profits earned by F1 and F2, respectively.

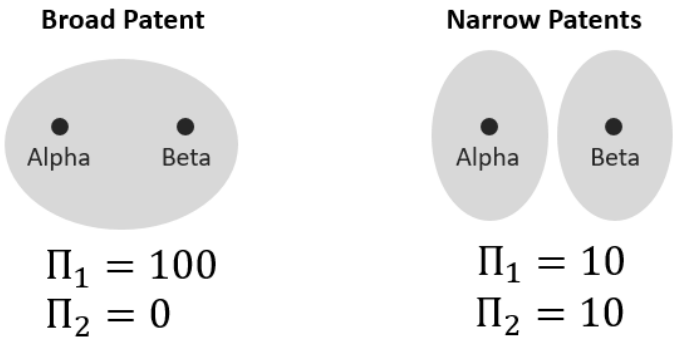

FIGURE 2.2: BROAD VERSUS NARROW PATENTS IN A PHARMACEUTICAL MARKET

As the figure shows, the broad patent provides much larger total profits. Accordingly, if the PTO granted a narrow patent on Alpha, then the parties would benefit from an agreement that assigns the Beta patent to F1 (or vice versa) to concentrate ownership. That is, F1 would pay F2 some amount between 10 and 90 in exchange for the latter's patent on Beta. However, the antitrust laws may block that acquisition, since it transforms a duopoly market into a monopoly. Thus the patent rights will remain divided between the two firms. By contrast, if F1 gets a single broad

patent covering both drugs, it is perfectly entitled to split up the rights by selling a license for Beta to F2. But that would reduce joint profits to 20, and thus the parties cannot mutually benefit from such a deal. As such, when the initial assignment gives F1 a broad patent, the final allocation is that F1 controls all of the relevant patent rights. As this example illustrates, the result of antitrust restrictions on patent acquisitions is that the PTO's initial assignment of patent rights can influence how those rights are ultimately allocated on the market, even if the parties suffer no transaction costs.

C. PATENT SETTLEMENTS AND "RULE 4"

Judgments delimit and protect legal rights in a number of different ways. Calabresi and Melamed famously generalized the different possibilities, organizing them into four types of "rules."[191] Each rule depends on two determinations. The first, which relates to the merits of the dispute, is the specification of which party holds the relevant "entitlement." The plaintiff has the entitlement if it has a protected legal right not to suffer the injury imposed on it by the defendant. For example, a landowner is generally entitled not to suffer a nuisance created by a neighbor. By contrast, the defendant holds the entitlement if it has a right to engage in the disputed activity, notwithstanding that it aggravates the plaintiff.

The second determination is of the remedy that is used to protect the entitlement. A property rule provides unqualified protection, giving the entitlement holder an absolute right to stop the other party from undermining its entitlement. Property rules are thus enforced through

[191] Calabresi & Melamed, note __ *supra*, at 1118.

injunctive relief. By contrast, a liability rule is not so unyielding. It permits the non-entitled party to continue to encroach on the entitlement, provided that it pays damages to the entitlement holder. For example, if a factory's pollution is creating a nuisance for neighboring homeowners, the court may decline to issue an injunction that would serve to shut down the factory, and instead require the factory to pay damages to the homeowners as a condition of its continued operation.[192]

As illustrated in the table below,[193] each combination of these two determinations gives rise to a distinct rule. The table contemplates a generic private dispute in which the plaintiff (*P*) is suing the defendant (*D*) for doing something that injures the plaintiff, but which may or may not be unlawful. For example, it might be that *D* is producing a lot of noise, which may or may not rise to the level of an actionable nuisance.

	Property Rule	**Liability Rule**
***P* is the entitlement holder**	Rule 1 *D* is liable and enjoined.	Rule 2 *D* is liable, but can continue its activity by making a payment to *P*.
***D* is the entitlement holder**	Rule 3 *D* is not liable, and *P* cannot compel *D* to halt its activity.	Rule 4 *D* is not liable, but *P* can compel *D* to halt its activity by making a payment to *D*.

TABLE 2.1: THE CALABRESI-MELAMED RULES

[192] *See, e.g.* Boomer v. Atlantic Cement Co., 257 N.E.2d 870 (N.Y. 1970) (declining to issue an injunction that would likely result in the closure of a large cement factory, and instead obligating it to pay "permanent damages" for the prospective harm created by its continued operations.)

[193] This well-known matrix was first produced by Ian Ayres. *See* Ian Ayers, *Protecting Property with Puts*, 32 VAL. U. L. REV. 793 (1998).

Rule 4, which lets the unentitled party pay to force the alienation of the entitlement, is unusual and somewhat counterintuitive. It has long been a subject of intrigue and debate among legal theorists, particularly within law and economics.[194] However, in practice it is very rarely applied.[195] The exceptions are typically cases of "coming to the nuisance," meaning that a plaintiff facilitated its own injury by carelessly situating itself in a position where it is likely to suffer a nuisance. For example, in *Spur*, the plaintiff, a housing development, sued an adjacent feedlot for creating a nuisance by causing various odors and insects to enter into the development.[196] However, the parties' proximity arose only because the development had expanded over time, bringing its boundary increasingly close to the feedlot. The development had thus "come to the nuisance," and the court ultimately held that it lacked an entitlement to be protected from the alleged injury. However, the feedlot's adverse impact on the development's residents was acute – and no longer avoidable – so the court held that the appropriate solution was to compel the feedlot to relocate, but make the plaintiff pay for it.

The Calabresi-Melamed framework is easily applied to patent disputes.[197] In a patent infringement case, the plaintiff is the entitlement holder if its patent is valid and infringed by the defendant's product. In that case it is entitled to exclude (or at least obtain damages for) the defendant's prospective sales.[198] An injunction order corresponds to Rule 1, while Rule 2 reflects an award of "ongoing royalties" for prospective infringement. By contrast, if the patent is either

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[194] *See, e.g.* Peter DiCola, *Valuing Control*, 113 MICH. L. REV. 663, 665 (2015).
[195] *Id* at 672.
[196] Spur Industries v. Del E. Webb Development Co., 108 Ariz. 178, 494 P.2d 700, 706-07 (1972).
[197] For a more comprehensive discussion of how the framework may be applied to intellectual property, *see, e.g.* Dan L. Burk, *Intellectual Property in the Cathedral*, ACCESS CHALLENGES FOR THE 21ST CENTURY (Dana Beldiman ed., 2013); DiCola, supra. These papers do not discuss the sort of antitrust issues address here, however.
[198] It can also recover back-damages for past infringement.

invalid or uninfringed, then *D* is the entitlement holder; it has the right to sell its product without penalty, and the patentee cannot force it (through a liability rule) to halt its sales. Thus, an unsuccessful patent infringement suit results in application of Rule 3. And the result of Rule 3 is unrestrained competition between the parties, for once the plaintiff loses antitrust prohibits the defendant from selling its entitlement to compete.

What is the policy justification for not applying Rule 4 in patent disputes? If the relevant entitlement surrounds the defendant's right to compete with the plaintiff, then Rule 4 has an important economic interpretation. It would effectuate an exclusionary transaction in which the plaintiff pays the defendant to take its product off the market, notwithstanding that the defendant is entitled to compete with the plaintiff.[199] Innovation policy offers no justification for this, while antitrust policy strongly opposes it. As such, to apply Rule 4 in patent disputes would be antithetical to the public interest. Note that this proposition does not hinge on the fact that the resulting transaction is executed through reliance on a court-fashioned liability rule. Rather, it is simply the nature of the resulting transaction – a payment to exclude privileged competition – that makes Rule 4 so adverse to social welfare. However, one result of antitrust inalienability is that the *parties* may be very attracted to Rule 4. And, as I demonstrate below, the parties may attempt

[199] Dan Burk offers a different way one might interpret Rule 4 in intellectual property disputes. In Burk's characterization, Rule 4 would mean that the patent is in fact valid and infringed, but that the patentee must pay the defendant in order to obtain an injunction. *See* Burk, supra, at 2. (The patentee is presumably still entitled to damages if it declines to pay for injunctive relief.) For example, Burk proposes that this might be an effective way to curb holdup problems created by litigious patent assertion entities ("patent trolls") who may seek injunctions despite not being commercially threatened. *Id*. at 6. The difference between my and Burk's characterizations is that he focuses on the patentee's entitlement *to enjoin the defendant*, while I focus more generally on the patentee's entitlement to be compensated in *some* way (damages or injunctive relief). Thus, in my analysis, to say the defendant is entitled means that he has the right to sell its product without penalty. This distinction is critical to the normative analysis, and thus my admonishment of Rule 4 is limited to my own interpretation of the rule.

to rely on a collusive settlement agreement to achieve substantially the same result as a Rule 4 judgment.

A plaintiff always prefers Rule 4 to Rule 3, since it gives him an option he would not possess under Rule 3. But contrary to other disputes studied in the law and economics literature (such as that in *Spur*), here the defendant may also prefer Rule 4 to Rule 3. This is highly unusual. A defendant would ordinarily have a clear preference for Rule 3, since this gives it unimpeachable control over the entitlement.[200] Indeed, even if the defendant is inclined to sell its entitlement to the plaintiff, it does not want a court's liability rule to place a cap on how much it can charge. The difference here is that, once a Rule 3 judgment officially names the defendant as the entitled party, antitrust inalienability prevents the defendant from selling that entitlement for *any* price.[201] That means the parties are obliged to stick with Rule 3, which facilitates open competition and thereby erodes monopoly rents. In contrast, Rule 4 would allow the parties to preserve and share those rents, even though the price might not be exactly what the defendant would have preferred to charge.

This unusual result – that *both* parties may prefer Rule 4 to Rule 3 – is emblematic of how antitrust inalienability fundamentally changes the law and economic analysis of private disputes. Note, however, that it is merely a positive observation about the firms' preferences; it does not undermine the normative case against Rule 4 in patent disputes between competing firms. Indeed,

[200] Peter DiCola cites the defendant's value of control as something that might bear on a court's choice between Rule 3 and Rule 4. DiCola, *supra*, at 672.

[201] If the plaintiff loses in court, a subsequent exclusion agreement would be illegal per se. *See, e.g.* F.T.C. v. Actavis, Inc., 133 S. Ct. 2223, 2230 (2013) (noting that antitrust prohibits naked exclusion agreements in which one firm simply pays its rival not to compete).

antitrust's goal is to promote competition, even (and especially) in cases where firms would rather avoid it.

If the parties think the patent would very likely be invalidated on final judgment, they may attempt to circumvent this policy against Rule 4 preemptively. If the patent is indeed invalid, a reverse payment settlement operates as a sort of contractual surrogate for Rule 4.[202] This is not *literally* Rule 4, since the terms were not fashioned by the court (although they may be entered as a stipulated judgment). But the settlement elicits precisely the same kind of transaction. It stipulates that the defendant – who is entitled to sell its product – must give up that entitlement, provided that the plaintiff makes the specified payment. Thus, we would undermine the clear policy against Rule 4 if the litigants were free to enter into reverse settlements when they think the disputed patent is invalid. Antitrust inalienability mitigates that problem by imposing some limits on how the parties may transact rights through settlement.

Of course, a reverse settlement preempts a judgment on the patent issues, at least between those two parties. But a patent's validity is generally uncertain until such a judgment issues. Thus, in a reverse settlement case, we cannot say with certainty that the defendant is the entitled party. However, antitrust often relies on economic inference to resolve uncertainty as to the likely nature or function of a commercial agreement, and we can make further use of it here. If the settlement

[202] Some other authors have discussed private agreements in which the parties effectively "contract into" (or "around") particular rules. *See, e.g.* Robert P. Merges, *Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations*, 84 CAL. L. REV 1293, 1296 (1996); Mark A. Lemley, *Contracting Around Liability Rules*, 100 CAL. L. REV. 463, 464 (2012). Note that it is not exactly right to regard reverse settlement as "contracting out of Rule 3." A court has not yet issued a Rule 3 judgment, and the reverse settlement is designed to preempt such a judgment. If the court had already done so, the exclusion agreement would be transparently anticompetitive.

requires the patentee to make a sufficiently large payment, this suggests the patent is likely invalid,[203] and by extension that the settlement likely elicits a "Rule 4 transaction" – i.e. one in which an unentitled plaintiff pays the defendant to give up its entitlement. A benefit for the parties is that they need not acknowledge it as such, for they can write a consent decree stating that the patent is valid and infringed, even if this is very likely false.[204] This way, instead of calling it Rule 4, the parties may stylize the outcome as "Rule 1 plus a side-payment."[205]

In other contexts, Rule 4 may be appropriate, as is arguably reflected in the *Spur* example. This may be so when it is clear that the defendant has a right to engage in the disputed activity – and thus should not be penalized for it – but such activity appears to injure the plaintiff by much more than it benefits the defendant, and the parties appear incapable of striking an efficient bargain. In *Spur*, the relevant injury stemmed from the alleged nuisance, the effects of which were inarguably harmful. But in a commercial dispute between rivals, the plaintiff's injury is the profit-eroding impact of competition. Unless there is a valid patent that justifies exclusion, the public interest views competition not as an injurious, but as something to be encouraged. Hence, while we allow most entitlement holders to sell their rights to someone else, we generally prohibit firms

[203] *See e.g.*, Dolin, *supra*, at 322 ("[i]f the size of the settlement exceeds reasonable litigation costs and cross-license fees, it would indicate that the doubts [about validity] are substantial"); Edlin et al., note __ *supra*, at 1 ("a large and otherwise unexplained payment, combined with delayed entry, supports a reasonable inference of harm to consumers from lessened competition.")

[204] It is permissible (and quite common) for a defendant to forego an admission of wrongdoing in a consent decree, even if it is likely culpable in fact. *See, e.g.* Dorothy Shapiro, *Lessons from SEC v. Citigroup: The Optimal Scope for Judicial Review of Agency Consent Decrees,"* 15 MICH. ST. L. REV. 63, 72 (2014). But here the parties prefer take the opposite approach: the consent decree will portray the defendant as a guilty infringer that must be estopped from making sales, even if that is likely untrue as a matter of law.

[205] It is interesting to note that "Rule 1 plus a side-payment" is not consistent with any of the four rule types, and is largely nonsensical on its own terms. None of the rules compel the entitlement holder to pay the non-entitled party. Indeed, the principal significance of stipulating that a party is entitled is to ensure that, in the event of a conflict, it is the *other party* who will have to pay.

from trading away their entitlements to compete with one another. It follows that Rule 4 is untenable when the defendant's entitlement is a right to compete.

III. JUDICIAL POLICY IN ANTITRUST'S SHADOW

Among Coase's most important contributions was his emphasis of transaction costs as an important reason why legal rules are important to economic efficiency.[206] The Coase theorem is less a prediction of efficiency than an explanation of why we often fail to obtain it. If the parties to a property dispute cannot bargain, then they are reliant on the law (and the courts' administration of the law) to allocate the disputed rights. As such, in situations where transaction costs are likely to be high, it becomes very important to have well-crafted laws and effective enforcement by the courts.[207]

In property disputes arising in the shadow of antitrust, we can make a similar statement, albeit for different reasons. If the parties have a joint-interest in striking agreements that suppress competition, and if their private dealings might be constrained by antitrust inalienability, then it becomes particularly important for the courts to "get it right," both in issuing judgments and in approving or rejecting settlements. Indeed, the judiciary is in a precarious position: if a court's decision is socially inefficient as a matter of patent policy, the parties may be either unwilling or unpermitted to bargain around it.

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[206] Coase, *supra*, at __.
[207] Calabresi and Melamed, *supra*, at __.

On one hand, if the court's error is to allocate rights in a way that is overly-restrictive of competition (e.g. to enjoin an infringer of a patent that should have been invalidated), then the parties will not bargain around this, for by hypothesis their joint profits are highest when the defendant is excluded.[208] On the other hand, if the court's error is to delineate rights in a way that elicits too much competition (e.g. by holding a patent uninfringed when the defendant should have been enjoined), then the antitrust laws prohibit the parties from bargaining around this judgment and instituting the efficient exclusionary allocation, even though they are otherwise willing and able to do so.

The prospect of social efficiency thus rests on a knife-edge: if the court's judgment fails to strike a socially efficient balance between competition and patent policy, then the judgment's inefficiency will persist ex post, even if the parties can bargain.

Although antitrust is usually regarded as private law, it deviates from more conventional examples of private law in some important respects.[209] Of particular significance is its insistence on considering nonparty interests – namely consumer welfare – when adjudicating disputes between private firms. This means that a court may (and should) not regard a particular resolution to be prudent simply because it is good for the parties, which reflects a strong public policy component of antitrust that is absent from most private law.

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[208] Similarly, if the court awards an excessive ongoing royalty rate, the parties will not bargain around it (e.g. by reverting to a two-part tariff fee schedule with a lower royalty rate), since joint profits are larger with a more restrictive royalty rate.

[209] *See, e.g.*, Randy E. Barnett, *Four Senses of the Public Law-Private Law Distinction*, 9 HARV. J.L. & PUB. POL'Y 267 (1986) (noting that there is "an important public law component of antitrust laws.")

This is in part because many private disputes will not have any significant impact on nonparties, or else because the third parties do not have a legal right to be protected from the parties' dealings. Thus, for example, in many real property disputes, it is reasonable to presume that the "efficient allocation" is the one that maximizes the parties' joint welfare, either because this is literally the case, or because it would be imprudent let nonparty interests influence the judgment. Thus, throughout most private law, the implicit policy is that the dispute would be best-resolved through the market. This leads the courts to view settlement as the most desirable way to resolve a private dispute – and to view final judgment as an undesirable last resort. This reflects that, although the court's underlying objective is typically to reach the outcome that best serves the parties, it is uncertain as to which allocation of rights will accomplish this, and it would prefer not to guess at it.

This has led scholars to propose that a property rule is best when transaction costs are low, as this creates a clear bilateral market without forcing the parties into a compulsory transaction on judge-made terms. On the other hand, if transaction costs are high – i.e. if the bilateral market is likely to fail – then a liability rule may be the best option.[210] But in a patent dispute between powerful competitors the court faces precisely the opposite problem. It generally knows what allocation of rights will maximize the joint profits of the parties – exclusion of the defendant. Instead, the biggest challenge is to determine whether that outcome is justified as a matter of legal policy. That means that when the parties seek approval of a settlement that erodes competition,

[210] *Id*.

the court should ask itself whether its restrictive terms are reasonable as a matter of patent law and competition policy.

The antitrust limits on the parties' private dealings reflect the law's determination to protect the interests of nonparty consumers. As such, there is much less reason to believe that the bilateral market between the firms would be an efficient medium for resolving the patent dispute. On the contrary, there is good reason to believe that unrestrained private contracting would elicit a result that is inimical to public policy. Thus, in contrast to most conflicts in private law, a determination that transaction costs are low would not justify a court in applying a property rule, nor would high transaction costs necessarily create a prescription for applying a liability rule.

These arguments highlight an important point about patent disputes between powerful competitors: until a final judgment is entered, the court cannot determine whether principles of private law or competition policy should carry the day. If the patent holder wins and the defendant is enjoined, then private law principles displace most of the relevant antitrust concerns. Indeed, the antitrust concerns underpinning *Actavis* center on the parties' efforts to *forestall* a final judgment that might serve to make the market more competitive. By contrast, if the patent is held invalid or uninfringed, then antitrust displaces patent law entirely: the parties are subsequently prevented from entering into any agreements that serve to restrain the defendants' sales – e.g. placing a cap on the defendant's sales – even though such restraints might be lawful if implemented within the scope of a valid patent.

At the pre-judgment stage, however, the nature of the dispute is not binary, and principles of both competition policy and private law may be relevant, particularly when appraising a proposed settlement. For example, the patent holder is perfectly entitled to charge the infringer royalties for a license (which looks like private law), but a large reverse payment may be unlawful (which looks like competition policy). And yet either one of these agreements – if implemented at *after* judgment[211] – could be either permissible or impermissible, depending on the holding.[212] Thus the dispute is a little like Schrödinger's cat: until it reaches final judgment and thereby resolves the underlying uncertainty, it is neither purely private law, nor purely competition policy, but rather exists in both states simultaneously. As such, at the pre-judgment phase, canons of private law ought not to dominate the analysis. Rather, both competition policy and private law considerations should enter into the fold.

A. POLICIES TOWARD SETTLEMENT AND FINAL JUDGMENT

When a dispute centers on rights that are not entirely alienable, the court cannot infer that the parties are litigating only because of a bargaining failure, as is usually safe to assume in most private disputes. Rather, the parties may be litigating only because their preferred agreement – which they are perfectly capable of forming – would be unlawful and unenforceable. Judicial

[211] A pre-judgment reverse payment could be unlawful even if the patent goes on to be upheld as valid and infringed. Because the parties did not know that the patent holder would prevail in court at the time the reverse payment was made, it may suggest that they were conspiring to avoid a judgment that might increase competition, which is unlawful in its own right.

[212] Since royalties' diminish the defendant's sales (by acting like a marginal cost), a *post-trial* royalty agreement would be illegal if the court held the patent to be either invalid or uninfringed. In this case the royalty is a restraint beyond the scope of any valid patent. On the other hand, if a patent were held valid and infringed, then there would ostensibly be no antitrust ground for condemning a *post-trial* reverse payment (but, of course, this is just heuristic observation; the patent holder has no reason to offer a reverse payment if it has already prevailed in court.)

attitudes toward private settlement should be very different in such cases. The impetus for settlement may have little to do with avoiding litigation costs. It may be motivated principally by the parties' interest in avoiding a procompetitive judgment that, if issued, cannot lawfully be bargained around. Or it might be an attempt to get a judicial stamp on what would otherwise be an unlawful contract.

The *Actavis* dissenters, who extolled the virtues of settlement,[213] thus failed to account for how antitrust inalienability fundamentally alters the nature of a private dispute. They failed to appreciate that, even if the cause of action is directed entirely at patent law, antitrust remains important to the efficient resolution of the dispute, for it provides a clear legal basis for preventing a settlement that would unreasonably injure nonparty consumers. The parties know that, if the proper judgment is to hold the patent invalid or uninfringed, then antitrust will displace patent law, leaving the parties with no basis for evading competition law. They thus have an interest in forestalling the effective administration of patent law, for they might not like what they get.

For the same reasons that settlement may produce deleterious results, final judgment may actually be a desirable way to resolve the dispute. We know that competing parties may be litigating only because they were prohibited from entering into an anticompetitive agreement that would have made litigation unnecessary. Thus, it may be that the only settlement on which they could mutually agree would likely be unreasonably injurious to consumers. Consequently, if the socially efficient judgment would deny the plaintiff a right to exclude the defendant, then litigation

[213] *Actavis*, 133 S.Ct., at 2242-44

to judgment may be the *only* way to elicit the efficient allocation of rights, for the parties may be unwilling to settle on it. Hence, these cases may present an exception to the conventional wisdom that the parties – and not the courts – are best-suited to resolve a private dispute efficiently.

IV. JUDICIAL REVIEW OF PATENT SETTLEMENTS

The last section illustrated why conventional attitudes toward private settlement – namely that it is virtually always a good thing, regardless of the particular terms – does not carry over to patent disputes arising between competing firms. This suggests that a broader degree of settlement review would be beneficial, as it could prevent firms from securing a consent judgment embodying an anticompetitive agreement. However, at present, patent courts regularly decline to engage in any comprehensive settlement review, even when there are clear reasons to worry about the settlement's compliance with the antitrust laws. For example, the courts often do not carefully review settlements between pharmaceutical rivals, despite the fact that such parties have a clear interest in writing an agreement that serves to exclude competition.[214] This wastes a valuable opportunity to improve and streamline antitrust oversight through proactive settlement review. To that end, I propose that, under particular circumstances,[215] the patent judge should review a proposed settlement on antitrust grounds before approving it.

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[214] *See, e.g. In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014) (noting that the patent court had simply "rubber-stamped the proposed consent judgment"); *In re* Ciprofloxacin Hydrochloride Antitrust Litigation, 261 F.Supp.2d 188, 212-213 (E.D.N.Y. 2003) (writing that "[t]he challenged agreements in this case are private agreements between the defendants, in which [the patent court] played no role other than signing the Consent Judgment. The Consent Judgment did not include the terms of the agreements, nor was the judge even apprised of the terms before he "so ordered" the Consent Judgment."); *In re* Nexium (Esomeprazole) Antitrust Litig., 968 F. Supp. 2d 367, 395 (2013) (noting that consent decrees are often more like private contracts that judicial opinions, because they merely reflect the parties' preferences and the courts "are hard pressed to reject" settlement proposals).

[215] Such circumstances, which are discussed in a later section, are used to identify cases in which the parties appear reasonably capable of materially undermining competition in some relevant product market. *See* Section IV(A), *infra*.

There is no statute that requires a patent court to review proposed patent settlements for antitrust compliance. This is true even in cases involving pharmaceutical patents, which are covered by a number of other regulations directed at competition policy concerns, and which are notorious for their penchant to suppress competition.[216] This is in contrast to some other contexts, such a class action litigation, where settlement review is compelled by the laws of civil procedure.[217] However, courts have discretion to review settlements before entering them as judgments, and some jurists posit that they ought to do this regularly as a matter of public policy. For example, Judge Richard Posner writes that a "judge in issuing [a consent decree] must determine that it does not offend public policy, as by harming third parties, before he can approve it."[218]

Even if a court rejects a proposed patent settlement on antitrust grounds, it cannot bar the parties from dismissing the suit and striking the agreement privately.[219] But settlement review would still help to discourage anticompetitive settlements by undermining their stability and enforceability. If the settlement is just a private contract, then its enforceability depends on whether it is lawful under the antitrust laws, which is a question that no court has addressed. This means that, if a party wishes to re-negotiate or simply abandon the agreement later on, it may be

[216] On the other hand, there is a statute requiring certain pharmaceutical patent settlements to be submitted to the FTC (as opposed to a court). Medicare Prescription Drug, Improvement, and Modernization Act. Pub. L. 108-173, 117 Stat. 2461. Sec. 1112.
[217] FED. R. CIV. P. 23(e) (noting that a court may approve a proposed class action settlement only upon a "finding that it is fair, reasonable, and adequate").
[218] SmithKline Beecham Corp. v. Pentech Pharms., 261 F.Supp. 2d 1002, 1008 (N.D. Ill. 2003).
[219] *See SmithKline* 261 F.Supp. 2d at 1005. Judge Posner, sitting by designation, wrote that a judge has "no authority to deny [a plaintiff's motion to dismiss] on the basis of concerns, however substantial they may be … that the motion is based on a settlement agreement that may be contrary to public policy as expressed in the antitrust laws, the doctrine of patent misuse, or any other source of policy; that may in fact be illegal." *Id*.

able to do so by arguing (or threatening to argue) that the deal violates the antitrust laws, which is a defense to a claim of contract breach.[220] This makes the agreement unstable, because no party knows if it can actually enforce it; by the same token, each party knows that, if it wants to defect from its obligations, it may not suffer any penalty for it. Further, even ignoring the antitrust issues, enforcement of a private contract is much more burdensome than enforcement of a judgment. For example, a consent judgment can be enforced through simple contempt proceedings, but enforcement of a private agreement requires full-fledged contract litigation.

By contrast, if the court reviews the settlement on antitrust grounds before approving it, then this may have a preclusive effect on relitigation of the antitrust issues (as between the parties[221]), preventing such issues from being raised as a defense to breach of contract. If the antitrust issue was "actually litigated" or "actually decided" in the patent litigation, which could be reflected in the court's settlement approval and judgment, then issue preclusion may ensure that the agreement is enforceable as between the parties. Because the parties greatly prefer that their agreement be enforceable, settlement review would give the firms a strong incentive to reach settlement terms that comply with the antitrust laws. Thus, if the judge declines to sign off on their proposed agreement, they have an interest in making the terms less restrictive.

[220] Continental Wall Paper Co. v. Louis Voight & Sons Co., 212 U.S. 227 (1909) (holding that a party may defend itself from liability for breach of contract by showing that the contract violates the antitrust laws, since the contract is in that case unenforceable).

[221] As a later section argues, this ought not to bar third parties from challenging the agreement on antitrust grounds. Though this sounds straightforward, it differs from how the antitrust courts are presently treating potentially-anticompetitive agreements that are memorialized consent decrees. *See* Section IV(B), *infra*.

This is similar to how antitrust deals with some other kinds of collusive agreements, such as naked price-fixing.[222] To impose antitrust liability on price-fixing firms, the plaintiff must prove that the parties had in fact formed an agreement to coordinate their price levels. This is often very challenging, since the firms know about this evidentiary requirement, and they are usually smart enough not to leave a paper trail. However, antitrust nevertheless has a major weapon to combat such agreements, which is that it renders them unenforceable. As such, the firms have a very limited ability to prevent one another from "cheating" – lowering price below the cartel level in order to capture more sales. Indeed, even if they attempt to enforce it through the threat of commercial retaliation, such punitive action might just persuade the cheating firm to blow the whistle and alert the antitrust authorities (which would significantly limit its own liability for participating in the agreement). These instability issues will tend to make collusive agreements non-viable in many cases.

In any case where an anticompetitive settlement is avoided through this review process, the benefits for consumers may be immense. If it had not been forestalled at the conclusion of the patent suit, antitrust intervention would have to come from a subsequent antitrust litigation, which would be much slower and costlier. That means that drug prices will remain artificially high for a longer period of time, which may be devastating for patients with a limited ability to pay. A second issue is that third party antitrust actions are largely dependent on public enforcement, which is why the FTC is the plaintiff in most reverse settlement cases. However, like all agencies, the FTC has limited resources. It cannot afford bring an antitrust action against every settlement it regards as

[222] Naked price-fixing refers to an agreement between competing firms to keep prices high, and which is not justified by any countervailing procompetitive effects.

a likely violation. By undertaking some initial review of patent settlements, the courts could help to alleviate this burden.

A. The Scope and Focus of Review

How should patent settlement review operate in practice? As a threshold matter, it is important to note that thorough settlement review should not be a categorical requirement. In most cases, the circumstances will suggest that there are no real antitrust concerns, either because the firms (or their patents) appear incapable of materially influencing the relevant product market, or because the terms of the agreement are plainly privileged under the Patent Act. As such, it is useful to begin by discussing some factors that will tend to make thorough settlement review unnecessary.

If the settlement effects an ordinary licensing agreement – meaning that the defendant continues to operate, and pays license fees for its sales – then there is no basis for antitrust intervention. This is so even if the parties have market power, and even if the royalty obligation is likely to raise the defendant's price by acting as a marginal cost. The reason is that the Patent Act creates a general authority to license patents,[223] and competition policy generally maintains a favorable attitude toward licensing, since it presumptively expands the competitive field. The exceptions, discussed below, arise when the licensing terms do more than simply apply a royalty obligation on the defendant's sales.

[223] 35 U.S.C. § 261 ("[t]he applicant, patentee, or his assigns or legal representatives may … grant and convey an exclusive right under his application for patent, or patents").

Additionally, if the firms appear to lack market power, this will likely allay antitrust concerns. Unless the settlement includes a clear per se violation – for example, if it calls for naked price fixing in the product market – there is no reason to suspect unlawful activity, for the firms are not powerful enough to create a consumer injury. That the parties' products are covered by a patent does not rule this possibility out, for many patents are narrow, and the Supreme Court has held that a patent does not itself create a presumption of market power.[224] Along similar lines, if the patents appear to have only an incremental effect on the relevant product – i.e. if they are not essential to a party's ability to be a viable competitor in the market – then antitrust concerns are unlikely to arise. In such cases, the patents cannot create significant barriers to entry in the product market, and thus are unlikely to provide a basis for suppressing competition. This would tend to make individual "tech patents" an unlikely basis for an anticompetitive settlement, since such patents are notoriously narrow.[225]

Finally, if the parties are not competitors in products – for example if the patentee is a nonpracticing entity[226] – then the scope of antitrust intervention is quite narrow. In this case, the parties are in a "vertical relationship," meaning they are not competitors but rather transacting parties along a supply chain. But vertical restraints on competition are no longer the subject of significant antitrust enforcement.[227]

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[224] Ill. Tool Works, Inc. v. Indep. Ink, Inc., 547 U.S. 28, 45–46 (2006).

[225] For example, a typical smartphone subsumes thousands of patented technologies, most of which cover very small features of the phone.

[226] Nonpracticing entities – pejoratively known as "patent trolls" – are firms that own and enforce patents, but do not sell any goods or services that read on them.

[227] Vertical restraints used to be per se illegal, but most are now evaluated under the reason. Leegin Creative Leather Prods., Inc. v. PSKS, Inc., 551 U.S. 877 (2007) (overruling per se rule against resale price maintenance); Continental T.V., Inc. v. GTE Sylvania, Inc., 433 U.S. 36, 47-48 (1977) (overturning the per se rule against vertical nonprice restraints).

What things are suggestive of a potentially-anticompetitive settlement? Delayed market entry by the defendant is a clear example. This means that, in contrast to an ordinary licensing settlement, the defendant is agreeing to keep its product off the market for some material period of time. This is the hallmark of reverse payment settlements, which are often coined "pay for delay" agreements. The *Actavis* decision suggests that courts should review such settlements and it enumerated some factors for evaluating them.[228] But the opinion is somewhat nonspecific, and left many open questions. For example, the court focused on a cash payment, leaving it to lower courts to discern whether other kinds of payments may trigger antitrust liability under its decision.[229] These are the kinds of questions that could be addressed through initial settlement review once it has been determined that the settlement is likely to facilitate delay. The court should ask the parties if the settlement vests a license in the defendant immediately so as to permit it to make sales straight away. If the answer is no, the court should make further inquiries to discern whether the parties have built delay into their agreement,[230] and whether such delay appears reasonable under the circumstances.

If the defendant does obtain a license (without delay), the court should still review it to the extent that it includes some inordinate restraints on competitive activity. As already noted, an

[228] F.T.C. v. Actavis, Inc., 133 S.Ct. 2223, 2234-37 (2013).
[229] The Third Circuit held that a "no authorized generic" promise is a cognizable payment under the *Actavis* standard. *SmithKline Beecham Corp. v. King Drug Co*., 791 F.3d 388, 397 (3d Cir. 2015). This is a promise by the patentee that it will not launch its own generic version of the drug, which reduces the level of competition that will be faced by the generic defendant.
[230] It could be that there will be delay, but for reasons outside the parties' control. For example, the defendant may require approval of its product by a federal agency before making sales. However, the court should take care to ensure the parties' agreement does not protract any such hurdles unnecessarily.

ordinary licensing settlement simply applies a royalty obligation to the defendant's sales. It does not affirmatively regulate the defendant's price or output (although it may affect them indirectly), and it certainly does not place restrictions on the *patentee*'*s* competitive behavior. But a licensing settlement could include such provisions, and in that case it may or may not comply with the antitrust laws.[231] However, answering this question is complicated by the fact that any unsavory elements of the agreement must be balanced against its procompetitive function, which is to provide licensing rights to the defendant. Thus, as one commenter rights, [d]rawing the line between 'price-fixing agreements' and 'procompetitive licensing arrangements' is not a simple matter."[232] If the licensing agreement serves to impose restraints on the licensee's price or sales, the court should ask whether the restraint appears to be reasonably justified, or reasonably necessary to facilitate a well-functioning licensing relationship. If the answer is no, then those restraints should not be approved. If the licensing agreement imposes price or output restraints on *both* parties, the court should be particularly cautious, for this kind of coordination may serve to effect a cartel between the parties.

Patent settlements are often quite complex, and it may difficult for a generalist court to identify the salient antitrust concerns. As such, it may be beneficial for the court to ask for the input of the antitrust agencies. In fact, this has happened in at least one case. The court in *Effexor* noted that the patent judge had "issued a scheduling order requiring the parties to provide the FTC with the proposed settlement and associated license agreements" as a means of "soliciting the

[231] The antitrust agencies publish guidelines on patent licensing and antitrust. *See* U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST GUIDELINES FOR THE LICENSING AND ACQUISITION OF INTELLECTUAL PROPERTY (1995), available at http://www.justice.gov/atr/public/guidelines/0558.htm. *See also, e.g.* Carl Shapiro, Antitrust Limits to Patent Settlements, 34 RAND J. Econ. 391, 391-97 (2003); Meurer, note __ *supra*, at 77.
[232] Shapiro, note __ *supra*, at 394.

FTC's views on any antitrust issues concerning the proposed settlement."[233] Unlike the patent judge, FTC experts have extensive experience in evaluating patent settlement on antitrust grounds, and the patent court could take advantage of this. This could also help to mitigate the most serious deficiency with settlement review, which is that it is generally ex parte with respect to prospective antitrust plaintiffs. Although not literally a party to the patent litigation, the FTC's input on the settlement's legality may help to identify serious antitrust concerns that the patent court might otherwise have missed.[234]

B. Collateral Attack on Approved Settlements

In lieu of judicial review of patent settlements, antitrust intervention in anticompetitive patent settlements will always require collateral attack – a separate antitrust action brought by a third party.[235] Antitrust oversight would be cheaper and more expedient if patent courts reviewed potentially-anticompetitive settlement proposals before approving them. However, while preferable to rubber-stamping all proposed settlements, settlement review is not a perfect substitute for bona fide antitrust litigation. Unlike a true antitrust adjudication, this manner of antitrust review is not adversarial: there is no party before the court arguing *in favor* of antitrust intervention. It is therefore systematically inclined to err in the parties' favor. Although settlement review can help to forestall agreements with relatively clear anticompetitive features, effective

[233] *In re* Effexor XR Antitrust Litig., No. 11-5479, 2014 U.S. Dist. LEXIS 142206, at *11 (D.N.J. Oct. 6, 2014)

[234] In some cases, pharmaceutical firms have a statutory requirement to submit their settlement terms to the FTC for antitrust review. *See* Medicare Prescription Drug, Improvement, and Modernization Act, Pub. L. 108-173, 117 Stat. 2461. Sec. 1112. For a simple overview of the statute, *see* Hovenkamp & Lemus, note __ *supra*, at 29. This statute never compels *judicial* review, but it seems logical that the court should seek the FTC's input before approving a settlement that the FTC may be inclined to attack in the future.

[235] The third party antitrust plaintiff could be a federal agency (the FTC or DOJ), or else a consumer or firm that is injured by the settlement.

enforcement may still require collateral attack of some settlements involving less transparent violations. Put differently, if the patent court mistakenly approves an anticompetitive settlement, society is reliant on third parties to correct the error through direct antitrust litigation.

However, if a court enters a settlement agreement as a consent decree, this approval creates a potential complication for third parties hoping to bring an antitrust action.[236] Under antitrust's *Noerr-Penning* doctrine, firms cannot face antitrust liability for "petitioning" government decision makers (e.g. legislators, executive-branch officials, or judges) to take action that suppresses competition, nor for the "incidental effects" of such petitioning.[237] This is so even if the petitioning firm's singular purpose was to undermine competition.[238] The doctrine's stated justification is that the antitrust laws are not intended to police "political activity,"[239] and that all members of a representative democracy have a right to "make their wishes known to their representatives."[240] The Bill of Rights precludes the antitrust laws from limiting or extinguishing these rights simply because they are exercised for selfish reasons.[241] The problem faced by third parties hoping to

[236] In what follows, an "approved settlement" means one that the court agrees to enter as a consent judgment (whether or not the court reviewed it on antitrust grounds). If the settlement were not entered as a consent judgment, then it is just an ordinary private contract, and there would be no argument for applying *Noerr-Pennington*. *See, e.g., In re* Nexium (Esomeprazole) Antitrust Litig., 968 F. Supp. 2d 367, 395 (2013) ("[c]ourts are largely uniform in their view that private settlement agreements entered into during the pendency of litigation that are neither presented to nor approved by the judge presiding over the dispute fall outside the ambit of Noerr–Pennington immunity.")
[237] *See* Eastern Railroad Presidents Conference v. Noerr Motor Freight, Inc., 365 U.S. 127, 135 (1961) ("no violation of the Act can be predicated upon mere attempts to influence the passage or enforcement of laws");
[238] United Mine Workers v. Pennington, 381 U.S. 657, 670 (1965) ("efforts to influence public officials do not violate the antitrust laws even though intended to eliminate competition").
[239] *Noerr*, 365 U.S. at 137 (noting that antitrust law regulates business activity, not political activity).
[240] *Id*. at 137.
[241] *Id*. at 138 ("[t]he right of petition is one of the freedoms protected by the Bill of Rights, and we cannot, of course, lightly impute to Congress an intent to invade these freedoms.")

challenge an approved patent settlement is that the courts have occasionally relied on *Noerr-Pennington* to immunize settlements from collateral attack.[242]

The question of how *Noerr-Pennington* applies to consent decrees in private litigation is relatively novel.[243] Most *Noerr-Pennington* cases have involved petitioning of legislative- or executive-branch officials – not judges. For example, in the eponymous *Noerr*, the defendants were railroad companies that jointly undertook a public relations campaign designed to shift public opinion and legislation against the trucking industry, which was the railroads' principal competition in the market for commercial freight.[244] The plaintiffs – representatives of the trucking industry – argued that this campaign was an unlawful attempt to monopolize the freight market by manipulating public opinion. The plaintiffs argued, among other things, that the defendants' campaign induced the Governor of Pennsylvania to veto the "Fair Trucking" bill, which would have permitted trucks to carry heavier loads. But the Court held that it would be improper to impose antitrust liability, since the firms have a protected right to engage in such political activity.

If a potentially-anticompetitive settlement is entered as a consent decree, the parties can (and do) argue that the court's approval endows their settlement with *Noerr-Pennington* immunity,

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[242] A.D. Bedell Wholesale Co., . v. Philip Morris, Inc., 263 F.3d 239-44 (3d Cir. 2001), cert. denied, 534 U.S. 1081 (2002) (holding that a large-scale tort settlement between several states and cigarette manufacturers was protected by *Noerr-Pennington* immunity, notwithstanding that it appeared to facilitate a cartel in the cigarette market by penalizing firms who expand their output.)

[243] *Nexium*, 985 F. Supp. 2d at 395 (noting that "[t]here is little guidance … on the question of whether a judge's entry of a consent judgment falls squarely within the scope of Noerr–Pennington.")

[244] *Noerr*, 365 U.S. at 129 (defining a protected "incidental effect" of petitioning as one that is "inevitable whenever an attempt is made to influence [the government].")

shielding it from collateral attack. For example, pharmaceutical firms have recently advanced this argument to shield their reverse payment settlements (which were entered as consent decrees) from collateral attack by the FTC.[245] But the courts who have confronted this issue, which have been largely aligned, have refused to endorse the firms' argument for categorical immunity, instead adopting a more qualified standard. They have held that that a settlement embodied in a consent decree does not enjoy *Noerr-Pennington* immunity if it was approved with little or no review of its compliance of the antitrust laws.[246] On the other hand, they have suggested that the settlement may enjoy such immunity if it was carefully scrutinized by the court – which may or may not play a role in shaping its provisions – so as to make the terms of settlement sufficiently "attributable to the [reviewing court's] deliberation."[247] In a nutshell, the courts want to know if the consent decree legitimately reflects the patent court's deliberation of the antitrust issues, or if it is simply a private contract in judicial clothing.

But even this more demanding standard for immunity is fatally flawed. As I demonstrate below, *Noerr-Pennington* should never immunize a settlement agreement from collateral attack,

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[245] *See, e.g. Id.* at 376 (discussing the defendants' argument that their deal is protected by *Noerr-Pennington*). The court later rejected the argument, but only because the settlement was not thoroughly reviewed for antitrust compliance. *Id*. at 395-96. For further discussion, *See* Thomas Dillickrath & William Lavery, *Letting the Cat Out of the Box: Noerr-Pennington Immunity and Consent Decrees*, 1 ANTITRUST CHRONICLE (Jan., 2014).

[246] *Nexium*, 968 F. Supp. 2d at 397 (rejecting the application of *Noerr* to summarily approved settlements, because this would "provide litigants with an avenue wholly impervious to antitrust scrutiny simply by seeking out a court's rubber-stamped approval"); *Id*. at 395-96 (emphasizing that, if the consent decree was not carefully reviewed by the court, then it is much more like a private contract than a judgment on the merits, and thus it should not enjoy *Noerr-Pennington* protection); *In re* Ciprofloxacin Hydrochloride Antitrust Litigation, 261 F.Supp.2d 188, 213 (E.D.N.Y. 2003) (holding that the defendants' agreement did not enjoy *Noerr-Pennington* immunity, because the patent judge "played no role other than signing the Consent Judgment.")

[247] *Nexium*, 968 F. Supp. 2d at 398. *See also In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014) (suggesting that immunity may be justified if the parties "work with" the judge "to develop a judgment and order" that the judge signs); MedImmune, Inc. v. Genentech, Inc., No. 03–2567, 2003 WL 25550611 at *6 (C.D.Cal. Dec.23, 2003) ("[n]o law supports [the] contention that *Noerr-Pennington* immunity does not attach to petitioning if the petitioner's desired result could have been accomplished through means not involving petitioning,"), *rev'd on other grounds*, 549 U.S. 118 (2007).

even if it is carefully reviewed and entered as a consent decree.[248] The reason is twofold. First, the relevant "political activity" that might warrant immunity is the parties' efforts to have their proposed agreement approved and entered as a consent judgment, not the agreement itself. Second, by effectively facilitating universal nonparty preclusion[249] (as to the antitrust issue), the courts' present standard violates basic principles of res judicata.

1. CONSENT JUDGMENT AS A PROTECTED "PETITION?"

As a threshold matter, it is worth noting that the courts' focus on the thoroughness of settlement review is not analogous to any judicial inquiry undertaken within more conventional applications of *Noerr-Pennington*. For example, in *Noerr*, the court did not ask whether the Governor of Pennsylvania carefully scrutinized the railroad companies' arguments against the trucking industry before vetoing the Fair Trucking bill. This is because the Governor's decision-making process is wholly independent from the defendants' petitioning activity – their campaign to turn public opinion against the trucking industry. The same argument suggests that the applicability of *Noerr-Pennington* to patent settlements should not hinge on thoroughness of settlement review. Rather, the question should be whether their settlement agreement is the kind of petitioning activity protected by *Noerr-Pennington*.

[248] By contrast, an approved settlement may preclude the *parties* from later attacking the settlement agreement on antitrust grounds (for example, if one of them hopes to get out of the agreement by arguing that it violates the antitrust laws.) This may be justified by res judicata.

[249] The relevant nonparties are prospective antitrust plaintiffs.

To that end, what exactly is the "petitioning act" in a patent settlement? The function of a reverse payment agreement is to exclude the defendant's product from the market, not to influence the government, so clearly the agreement itself is not a petitioning act. Rather, the petitioning act is the parties' request that their settlement agreement be entered as a consent decree. If the court does review the settlement on antitrust grounds, the petitioning act may further subsume the parties' efforts in negotiating with the judge over what restraints can be lawfully included within the agreement. We probably do not need *Noerr-Pennington* to conclude that such activity is not an antitrust violation, although it supports that conclusion nevertheless. But this is not the pertinent antitrust question. A collateral attack on the settlement does not challenge the parties' pursuit of judicial approval; it targets the agreement itself.[250]

As already noted, in addition to the petitioning conduct itself, *Noerr-Pennington* immunizes the "incidental effects" of such petitioning.[251] According to the Supreme Court, this protects the "inevitable" effects that arise "whenever an attempt is made to influence [the government],"[252] and whose exposure to antitrust liability would therefore be "tantamount to outlawing [the petition itself]." The underlying policy is thus that incidental effects are immunized only if the denial of such protection would necessarily (but indirectly) invite liability whenever the firm engages in the relevant petitioning activity.

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[250] In an amicus brief, the FTC makes essentially the same point, arguing that *Noerr-Pennington* never immunizes "advocacy, not commercial activity." Supplemental Brief of Amicus Curiae Federal Trade Commission Supporting Plaintiffs-Appellants, *In re* Effexor XR Antitrust Litig., 2014 WL 4988410, at *1 (D.N.J. Oct. 6, 2014).
[251] *Noerr*, 365 U.S. at 139.
[252] *Id.* at 129.

Applying this to anticompetitive patent settlements, it is clear that the parties' agreement is not a protected incidental effect of their efforts to petition the court for a consent decree. Even if the courts do not permit a reviewed patent settlement to block collateral attack on *Noerr-Pennington* grounds, this does not hinder the parties' ability to engage in the relevant petitioning conduct. They are still perfectly entitled to ask a court to answer the antitrust question so as to block a potential antitrust action by a nonparty: they may bring a declaratory judgment action against the prospective antitrust plaintiff. Indeed, this is the usual way that litigants "petition" the courts to shield themselves from prospective litigation.

In effect, the courts' *Noerr* standard permits settlement review to act as a sort of "ex parte declaratory judgment" on the antitrust issue. But there is no such thing. And there is no reason to believe that *Noerr-Pennington* entitles firms to circumvent ordinary rules of federal procedure and jurisdiction when petitioning a court to answer a question of law. A declaratory judgment on the antitrust issue would have a preclusive effect on the prospective antitrust plaintiff – the same preclusive effect that the parties are presently trying to achieve through the patent court's settlement approval. The difference, of course, is that a declaratory judgment action has a number of procedural requirements that are not satisfied by the patent court's settlement review, no matter how thorough. Among other things, the target of the declaratory judgment action is entitled to participate in the adjudication, and to rely on discovery and evidence in support of its case. But under the prevailing *Noerr* standard, firms can rely on settlement review to block prospective antitrust plaintiffs without having to offer them any such procedural safeguards – an opportunity that most litigants could only dream of. As such, my proposed denial of *Noerr-Pennington*

immunity does not undermine the firms' freedom to petition a court to forestall potential antitrust liability; it simply compels them to follow the same procedures as everyone else.

2. IGNORING RES JUDICATA

The previous section argues simply that an anticompetitive agreement is not the kind of "petitioning activity" that *Noerr-Pennington* protects, and it cannot be transformed into protectable activity simply because it is reviewed and memorialized in a consent decree. But its final paragraphs hint at a separate and more serious problem with the courts' recent applications of *Noerr-Pennington* to patent settlement. In practical effect, the standard eschews traditional limitations on nonparty preclusion, and it thus applies *Noerr-Pennington* in violation of longstanding principles of res judicata. This important point has been universally missed by courts and commenters.[253] Indeed, the courts appear not even to have recognized that a precarious boundary exists between res judicata and *Noerr*'s application to consent judgments.

Res judicata[254] precludes the parties to a prior litigation from relitigating claims or issues that were (or could have been) addressed in that suit.[255] Under a few very special circumstances (that are largely inapplicable here), it facilitates preclusion of nonparties.[256] However, "the basic

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[253] One court does discuss claim and issue preclusion with respect to the *patent questions*. It notes that the parties' settlement does not bar collateral attack on the patent's validity. But it never recognizes that the settlement is (or should be) similarly incapable of blocking a third party antitrust claim, even if it is carefully reviewed before being approved. *In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014).

[254] I will use the term "res judicata" to refer not only to claim and issue preclusion, but also to the various doctrines that limit nonparty preclusion.

[255] Allen v. McCurry, 449 U.S. 90, 94, 101 S.Ct. 411 (1980). *See also* WRIGHT ET AL., *supra*, at § 4401.

[256] *See* Taylor v. Sturgell, 553 U.S. 880, 893-95 (2008) (listing special exceptions allowing for nonparty preclusion). *See also* WRIGHT ET AL., *supra*, at §4448. The Supreme Court has acknowledged that "in certain limited circumstances" a nonparty may be precluded if her interests were "adequately represented" by one of the parties to the prior adjudication. *Taylor*, 553 U.S. at 894. But this exception generally does not serve to create nonparty

premise of preclusion is that parties to a prior action are bound and nonparties are not bound."[257] By default, consent judgments generally effect claim preclusion, but not issue preclusion.[258]

The courts' objective is to distinguish between summarily approved settlements and those in which judicial review was sufficiently thorough to evince the court's "assent to the substantive terms found [in the settlement]."[259] The former settlements do not trigger *Noerr*, but the latter might, in which case they are shielded from collateral antitrust attack.[260] Thus, under the prevailing standard, the availability of collateral attack depends on whether the patent court carefully considered and dealt with the relevant antitrust issues before approving the settlement. It is only a slight paraphrasing to ask whether the antitrust issues were "actually litigated" in the prior adjudication. This, of course, is the language of issue preclusion, which forestalls relitigation of issues that were "actually litigated" in a prior adjudication. The courts' *Noerr* standard performs an almost-identical function: it precludes relitigation of antitrust issues that were already addressed by a patent court. The critical difference is that this standard does so without honoring the strict

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preclusion as between public and private enforcers. This reflects the antitrust courts' "[r]efusal to permit government litigation to cut off intensely individual rights." WRIGHT ET AL., *supra*, at §4458.1. *See also* Sam Fox Publishing Co. v. U.S., 366 U.S. 683, 689 (1961) ("a person whose private interests coincide with the public interest in government antitrust litigation is nonetheless not bound by the eventuality of such litigation.")

[257] WRIGHT ET AL., *supra*, at § 4449.

[258] *Id.* at §4443 ("[i]n most circumstances, it is recognized that consent agreements ordinarily are intended to preclude any further litigation on the claim presented but are not intended to preclude further litigation on any of the issues presented. Thus consent judgments ordinarily support claim preclusion but not issue preclusion.") However, the parties are free to create or waive either form of preclusion by agreement, and the courts will generally look to the intent of the parties in discerning the settlement's preclusive effects. *Id.*

[259] *Nexium*, 968 F. Supp. 2d at 398. *See also In re* Androgel Antitrust Litig., No. 1:09-cv-955, 2014 WL 1600331, at *6 (N.D. Ga. Apr. 21, 2014).

[260] *See, e.g. Nexium* 968 F. Supp. 2d at 398 (suggesting that immunity may be justified if the parties "work with" the judge "to develop a judgment and order" that the judge then signs); MedImmune, Inc. v. Genentech, Inc., No. 03–2567, 2003 WL 25550611 at *6 (C.D.Cal. Dec.23, 2003) (holding that the defendants' settlement enjoys immunity in part because the judge agreed to issue an order that the parties could not achieve by private contracting alone, but emphasizing that such a circumstance is an essential requirement of such immunity, because "[n]o law supports [the] contention that *Noerr-Pennington* immunity does not attach to petitioning if the petitioner's desired result could have been accomplished through means not involving petitioning.")

limitations on res judicata's preclusive effects, namely the rule that a judgment generally does not bind nonparties. Indeed, if settlement review is sufficiently thorough to trigger *Noerr*, then the standard effectively provides *universal* preclusion of nonparties.

As already noted, the *Noerr-Pennington* case law deals principally with petitions of legislators or other rule-makers. But a court wields much narrower power in applying the law than a legislature does in creating it. Legislation applies to everyone in the relevant jurisdiction, but most judicial opinions bind only the parties.[261] This reflects the intuitive proposition that a court generally should not disturb the rights or obligations of persons whose interests are not represented in the adjudication. Limitations on nonparty preclusion are used to effect this policy. And there is nothing in the case law suggesting that the antitrust courts should deviate from it. Accordingly, the most logical conclusion is that *Noerr-Pennington* should work within res judicata's boundaries, not around them.

Even if one rejects the preceding section's argument that a consent decree does not transform anticompetitive commercial activity into protectable "political activity," the courts' present application of *Noerr-Pennington*'s is still untenable. The doctrine is designed to ensure that a particular class of actors – namely profit-seeking firms – are not deprived of political freedoms that are supposed to be enjoyed by everyone.[262] It is thus intended not to give firms *more* protection than everyone else, but simply to ensure they are on equal footing. Hence, the doctrine

[261] Certainly there are exceptions, such as Supreme Court opinions that strike down laws as unconstitutional, or which refine the manner in a particular law is to be applied.
[262] *Noerr*, 365 U.S. at 129

would defy its own objectives if, in its effort to protect firms' political rights, it stripped other parties of the very same rights. But that is precisely how the courts are applying it here. If the settlement's approval triggers *Noerr*, nonparties are deprived of their right to petition the antitrust courts to condemn the agreement – a right that is supposed to be protected by principles of res judicata. This is a perverse result, as it provides stronger preclusive power to a consent decree than is ordinarily provided by a fully-litigated judgment.

Further, it is self-evident that *Noerr-Pennington* protection should never surpass the boundaries of the government decision-maker's authority. That is, it should not be used to immunize petitions for something that the relevant member of government is not in a position to authorize. Here the distinction between the authority of a legislature and that of a court is critical. If a state legislature holds that some ordinarily-unlawful conduct is now permissible, this binds everyone in the state. So *Noerr* should shield the petitioning firm from antitrust liability for any competitive harm it inflicts by engaging in that conduct within that state. But it should not preclude liability for any injuries the firm inflicts while engaging in the same conduct within other states, which is just like saying a court's settlement approval should not bar antitrust attack by nonparty antitrust claimants. That is because a court's jurisdiction to bind is much more limited than a legislature's, and usually does not extend beyond the parties to an adjudication. If the settlement's antitrust compliance is evaluated in a patent suit, then all potential antitrust claimants are nonparties, and none of them may be precluded without defying basic principles of res judicata.[263]

[263] Although it will rarely be relevant, the patent court's settlement approval may still have a preclusive effect (with respect to the *antitrust* issue) on the parties themselves. That means that a party cannot later attempt to get out of the agreement by arguing that it violates the antitrust laws.

On the other hand, if the settlement is reviewed in a declaratory judgment action, then a judgment that it is not unlawful (which could itself be a consent decree) precludes only those prospective antitrust plaintiffs who are named as defendants in the declaratory action.

This further clarifies why there is no good reason to inquire into the thoroughness of settlement review in deciding whether a collateral attack may proceed, such as the *Nexium* court's query as to whether the patent court's review evinces its "assent to the substantive terms [in the settlement]."[264] A court has no authority to "assent" to any settlement or order that categorically precludes nonparties. This is hardly an abridgment of firms' right to petition the courts; all other participants in the judicial system face exactly the same constraints on nonparty preclusion.

A final point is that, while not relevant to collateral attack, the thoroughness of the patent court's settlement review is still relevant in one important way. A consent decree can have a preclusive effect on the parties themselves, and this can make the agreement enforceable as between those parties, even if a third party could conceivably enjoin the agreement through a collateral attack. But this should require that the antitrust issue was "actually litigated" or "actually decided." If the settlement was rubber-stamped, then one may reasonably conclude that the antitrust issue was not decided, and in that case it may be inappropriate to preclude either party from later raising those issues as a defense to a breach of contract claim. But if the patent court appears to have genuinely reviewed the settlement to ensure its permissibility under the antitrust laws, then the parties should be precluded from later challenging the enforceability of their

[264] *Nexium*, 968 F. Supp. 2d at 398.

agreement.[265] As this reflects, it may be appropriate to treat the settlement's approval as a declaratory judgment that resolves the antitrust issue as between the patent litigants.

V. INALIENABILITY AND SETTLEMENT IN OTHER AREAS OF LAW

This paper focuses on antitrust inalienability in patent disputes, but analogous issues may arise in other areas of law. It is beyond the scope of this paper to address them comprehensively, but it is worth mentioning a few examples to illustrate that the underlying issues arise more broadly. It is also useful to point out that some of this paper's central arguments may apply in other contexts.

In some cases, policymakers have already recognized the underlying inalienability issue and the problems it can create in private settlements. For example, if a married couple wishes to divorce, the parties may be largely free to allocate their property however they like by mutual agreement. However, if the parties have children, a court will carefully review how the settlement resolves custody of the children. This reflects that a parent's custodial rights over her children are generally not alienable, and that the courts have recognized an obligation to prevent such rights from being exchanged or divided in ways that undermine the children's welfare.[266]

The inalienability issues are particularly salient when the dispute centers on fundamental constitutional rights, such as the right to vote. For example, suppose a state implements a

[265] Naturally, this requires that all relevant provisions of the settlement were expressly disclosed to the reviewing court.

[266] I am grateful to Kimberly Yuracko for pointing out this example to me.

requirement that all residents must obtain a state-issued photo identification card in order to vote. A class of minorities or low income persons, who may be much more likely to lack such identification, may challenge this law as an unlawful abridgement of their right to vote. This very dispute recently arose in Texas, which had enacted photo ID requirements for voting in political elections. The Fifth Circuit condemned the law, which it described as "unconstitutionally burdening the right to vote," among other things.[267] However, suppose that the parties had instead reached a settlement prior to judgment, with the state agreeing simply to pay the plaintiff class in exchange for dismissing the complaint (and preserving the ID requirement). That settlement may operate as an agreement in which one party pays another to give up her right to vote. Such a contract would of course be unlawful, since the right to vote is inalienable. As such, a court is very unlikely to approve (and would likely declare unlawful) any settlement that serves essentially to transact a party's right to vote.

My proposals about settlement review and preclusion may be appropriately applied in other contexts. If the parties' settlement is carefully reviewed (to evaluate its compliance with the relevant inalienability rule), then it may be appropriate for the court's approval to have a preclusive effect on the parties themselves. This makes it easier for the parties to enforce their agreement against one another (provided it has not been successfully attacked by a third party), since it prevents either party from invoking the relevant inalienability as a defense for its failure to perform. However, in lieu of such review, each party should be entitled to invoke the inalienability rule to render the settlement agreement unenforceable. Finally, whether or not the settlement was

[267] Veasey v. Abbott, 830 F.3d 216, 225 (2016).

carefully reviewed, its approval should have no preclusive effect on third parties, since they were not afforded an opportunity to argue the case for condemning the settlement agreement. To forestall a collateral attack, the parties must bring a declaratory judgment action against the prospective challenger.

VI. CONCLUSION

Most influential theories about private disputes, including the Coase theorem, assume implicitly that there are no legal restraints on alienability. However, the parties to a patent dispute are often competing firms with market power, and their private dealings may thus be constrained by the antitrust laws. Antitrust precludes contracts that allocate commercial rights in ways that unreasonably subvert competition between the parties. But unlike a typical inalienability rule, this has no bearing on how a court might delimit commercial rights, namely through a patent judgment. This creates an asymmetry between (1) the allocations of rights that the parties can effect through contract; and (2) those a court can effect through its judgment.

The result is that, in contrast to traditional Coasean intuition, a court's delimitation of patent rights can influence how such rights are ultimately allocated, even if the parties can bargain. A corollary is that the parties may (rationally) litigate to judgment even if they have common expectations about litigation, and even if they are perfectly capable of entering into a lawful settlement ex ante.

Patent disputes arising in antitrust's shadow are thus critically distinct from conventional private disputes, even if no antitrust issues are being litigated. Unfortunately, the courts are inclined to view them as more or less ordinary private conflicts. This ignores antitrust's unseen role in distorting the parties' incentives. They may litigate to judgment only because their mutually-preferred settlement would be unlawful and unenforceable, not because they are beset by transaction costs. Alternatively, the parties may settle not to avoid litigation costs, but rather to preclude a procompetitive judgment that they could not lawfully bargain around ex post (e.g. patent invalidation).

Accordingly, appropriate policies toward settlement and litigation differ from those typically espoused in private law. Courts should maintain a generally cautious attitude toward settlement, as the impetus for settlement may be inimical to patent policy. I discuss a number of grounds on which these settlements should be evaluated. By the same token, litigation to judgment should not be viewed as necessarily undesirable. Indeed, it may be the only way to achieve the socially efficient specification of rights, whether or not the parties can bargain.

3. CHALLENGE RESTRAINTS AND THE SCOPE OF THE PATENT*

I. INTRODUCTION

Patent rights are not the only important legal entitlements conferred by the Patent Act. It also vests "challenge rights" in third parties, permitting them to challenge granted patents as invalid or uninfringed, and potentially clearing a path for privileged competition. These classes of rights perform opposite policy functions, with patent rights providing an inducement for invention and challenge rights providing a check against unwarranted or overbroad patent enforcement. And, unlike patent rights, the Patent Act never suggests that challenge rights are alienable – i.e. that they may be transacted or suppressed through contract. It follows that challenge restraints – contractual provisions that bar or penalize the exercise of a party's challenge rights – are not within "the scope of the patent." This suggests not that they are categorically unlawful, but simply that they do not enjoy safe harbor from antitrust attack.

Challenge restraints are used within a variety of different patent agreements – ranging from ordinary licensing deals to "reverse settlements" – with varying competitive effects. However, the courts have failed to recognize challenge restraints as a distinct antitrust issue. This brief article explains why they ought to be viewed as such. The analysis also helps to clarify the proper ambit of antitrust intervention in patent agreements.

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Patents are often described as providing "the right to exclude." But this characterization obscures the more specific authorizations actually conferred by the Patent Act. As a result, it is sometimes embraced to the detriment of sound patent policy, particularly when used as a basis for delineating the boundary between patent law and antitrust. An important example is the courts' troubled history of applying the "scope of the patent" test, which serves to provide safe harbor to competitive restraints that are authorized by patent law – or, alternatively, to deny safe harbor for (and potentially condemn[268]) restraints that are not so authorized.[269]

For example, any commercial restraints (e.g. royalty obligations) applied after patent expiration are outside the scope of the patent, and are virtually always held unlawful.[270] Consistent with this, some courts have focused principally on patent *term* as the relevant limit on patent scope. But it is clear that patent term alone is not the only important limit. For example, the courts have held that a tie of a patented product and an unpatented one may be outside the scope of the patent.[271] Similarly, a patentee is not entitled to exclude noninfringing products – for example, by paying a rival not to "invent around" its patent. The most logical and useful interpretation of the scope of

[268] Such condemnation, if it occurs, need not come from antitrust; it may be supported by a holding of "patent misuse," which is prohibited by the Patent Act. *See* 35 U.S.C. § 271(d).
[269] *See, e.g.,* Carbice Corp. of Am. v. Am. Patents Dev. Corp., 283 U.S. 27, 33 (1931) (condemning a tie of a patented product and an unpatented product on the ground that this arrangement goes "beyond the scope of the patentee's monopoly"); Coupe v. Royer, 155 U.S. 565, 576 (1895); Motion Pictures Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917). For a detailed account of the use (and abuse) of the scope of the patent test, *See* Herbert Hovenkamp, *The Rule of Reason and the scope of the Patent,* 52 SAN DIEGO L. REV. 515 (2015).
[270] *See* Kimble v. Marvel Enterp., Inc., 135 S. Ct. 1697 (2015) (condemning post-expiration royalty obligations). The *Kimble* decision is unnecessarily restrictive. For example, if a licensee has little cash on hand, the parties may agree that the licensee will pay a smaller royalty but for a longer term that extends beyond expiration. This may not be meaningfully different from, say, a financing agreement for a car.
[271] *See Carbice Corp*., 283 U.S. at 33.

the patent test is that it looks to the entirety of the Patent Act's authorizations to ascertain what restraints the patentee is permitted to impose with its patent.[272]

This appears to have been the Supreme Court's interpretation in *Line Material*, which queried whether anything "in the patent statute specifically gives a right" to engage in the disputed conduct.[273] But not all courts have embraced this interpretation. So disfigured are some conceptions of the scope of the patent test that it is sometimes cited as a basis for antitrust immunity, when in fact it provides the clearest basis for *denying* safe harbor.[274] The most salient example is the dissenting opinion in the Supreme Court's recent *Actavis* decision, which echoed several lower court opinions. In *Actavis*, the majority held that "reverse payment"[275] patent settlements may violate the antitrust laws.[276] The dissent's view is that, because a patent provides the right to exclude, a patentee must be entitled to pay a rival to stop challenging its patent and stay off the market, so long as this exclusion does not extend beyond the patent term. It thus concluded that reverse payment settlements are within the scope of the patent.

The majority's treatment of the scope of the patent doctrine is more ambivalent. At one point, the opinion states that reverse payment's anticompetitive effects "may fall within the scope

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[272] *See* Hovenkamp, *supra*, at 534.
[273] United States v. Line Material Co., 333 U.S. 287, 310–11 (1948) ("remarking that "[n]othing in the patent statute specifically gives a right to fix the price at which a licensee may vend the patented article.")
[274] A number of other scholars have similarly criticized the modern application of the scope of the patent test. *See, e.g.*, Michael A. Carrier, *Why the "Scope of the Patent" Test Cannot Solve the Drug Patent Settlement Problem*, 16 STAN. TECH. L. REV. 1 (2012); Hovenkamp, supra.
[275] In a reverse payment settlement, a monopolist-patentee pays a potential market entrant not to challenge its patent, and to stay off the market for some material period of time (but no longer than the date of patent expiration). They almost always occur in pharmaceutical markets, with a branded drug monopolist paying a generic manufacturer not to challenge the patents covering its drug.
[276] *FTC v. Actavis, Inc.*, 133 S. Ct. 2223 (2013).

of the exclusionary potential of Solvay's patent, [but] this does not immunize the agreement from antitrust attack." This might be read to suggest that the dissent is correct in asserting that reverse payment is within the scope of the patent, but that antitrust may nevertheless condemn such agreements. By contrast, the Court later came much closer to the ideal application of the scope of the patent test, remarking that "[t]he dissent does not identify any patent statute" that authorizes reverse payment settlements. Here the majority seems to embrace the more logical position that the scope of the patent test should hinge on whether the relevant restraint is authorized (expressly or impliedly) by any particular provision within Patent Act, as opposed to being merely consistent with colloquial generalizations about what patents do.

The majority's decision is correct. But it is also very narrow, and the antitrust analysis is fairly nonspecific. The Court shed little light on what particular aspects of the defendants' settlement – as distinguished from the entirety of the agreement – are critical to the antitrust claim.[277] Investigation of these more foundational issues could have helped to clarify the proper role of antitrust in other kinds of patent agreements, and to delimit the often-obscure boundary between antitrust and patent law.

This brief article lays the foundation for a more comprehensive theory of antitrust's proper role in policing patent agreements. It hinges on the distinction between ordinary patent rights and

[277] For example, the court did not articulate whether a *noncash* payment – for example, a promise by the patentee not to launch its own "authorized generic" drug – can support an antitrust claim, although lower courts have answered that question in the affirmative. *See* SmithKline Beecham Corp. v. King Drug Co. of Florence, 791 F.3d 388 (3d Cir. 2015) (holding that a no authorized generic agreement may violate the antitrust laws under *Actavis*); *See also,* Aaron S. Edlin et al., *The Actavis Inference: Theory and Practice*, 67 RUTGERS L. REV. 585, 600 (2015).

challenge rights – the (statutory[278]) rights of third parties to challenge patents as invalid or uninfringed. These two classes of rights serve very different policy functions. And, importantly, they receive different treatment by the Patent Act, most notably with respect to their alienability. The result is that *challenge restraints* – contractual restrictions on the exercise of a party's challenge rights – are plainly not within the scope of the patent. Accordingly, such agreements are not entitled to safe harbor, but rather exist within antitrust's domain.[279]

Of course, this does not suggest that all challenge restraints should be condemned, regardless of context. Rather, it means that antitrust should operate as it normally does: by evaluating the reasonableness of the restraint in light of any countervailing procompetitive effects, and taking into account any salient policy concerns, including those underpinning the patent system.

II. CHALLENGE RIGHTS

The *Actavis* dissenters, along with many jurists, appear to focus exclusively on the *patent rights* held by the patentee when engaging the scope of the patent doctrine. But these are not the only important rights conferred by the Patent Act. It also confers challenge rights to third parties who would like to market their products without the hovering threat of infringement liability. Section 282 of the Act permits an accused infringer to argue "noninfringement" or "invalidity of

[278] 35 U.S.C. § 282(b).

[279] Two recent and insightful articles also address the antitrust implications of agreements that prevent someone from challenging a patent, although their focus is specifically on "no-challenge clauses" in conventional patent licensing agreements (generally between non-competitors), which is just one of many possible contexts in which such restrictions might be utilized. *See* Alan D. Miller & Michal S. Gal, *Licensee Patent Challenges*, 32 Yale J. Reg. 121 (2015); Thomas K. Cheng., *Antitrust Treatment of the No Challenge Clause*, 5 NYU J. I.P. & Ent. L. 437 (2016).

the patent" as a defense to infringement liability, and the Declaratory Judgment Act ensures that these challenges can also be raised offensively.[280] Additionally, Section 311 permits a party to challenge a patent's validity in the Patent Trial and Appeal Board. As such, a patent challenge is a *privileged* competitive act. However, a serious problem – which persists both in patent scholarship and the case law – is that patent challenge rights have not been recognized as distinct legal entitlements that are important in their own right. This is particularly problematic in light of the very disparate policy roles played by these two classes of rights.

The patent system seeks to elicit a desirable tradeoff between competition and the rate of innovation. In facilitating this balance, patent rights and challenge rights perform countervailing functions. Patent rights are the reward used to encourage innovation: they permit patentees to sue (and potentially enjoin) infringers; to collect damages for past infringement; and to license or assign the right to use the patented invention. By contrast, challenge rights provide a check against potential over-enforcement of patent rights, helping to clear the way for privileged competition. Accordingly, challenge rights promote the interests of competition policy, while patent rights are directed principally at encouraging invention. As such, patentees – who internalize profits, but not consumer surplus – always want patent rights to be as strong as possible, but challenge rights to be as weak as possible. By contrast, society at large is best served by an equitable balance between the two.

III. PATENT CHALLENGE RESTRAINTS

[280] 28 U.S.C. §2201-2202.

Challenge restraints – agreements that bar or penalize the exercise of a party's challenge rights – may arise in a variety of different patent agreements, and within different commercial relationships.[281] Reverse payment settlement is an obvious example, as the drug monopolist is paying the generic firm to stop challenging its patents, and to abstain from challenging them again in the future. But they may also take the form of "no challenge clauses" in ordinary patent licensing agreements between non-competitors, with the licensee agreeing not to challenge the validity of the licensed patent (or to suffer a penalty upon filing a challenge). Alternatively, rivals may agree not to challenge each other's patents, but without any party being excluded from the market. For example, in *U.S. v. Singer Mfg.*, the Supreme Court condemned an agreement in which competing sewing machine manufacturers agreed not to challenge each other's patents and to refuse to license Japanese rivals.[282]

Importantly, reciprocal promises not to challenge are not necessarily equivalent to cross-licensing. The agreement might also prevent the parties from *practicing* each other's patents, in which case it looks more like market division.[283] This could be accomplished by imposing reciprocal challenge restraints, but withholding any exchange of licensing rights. In such an agreement – and in reverse payment – the challenge restraint is "naked" in the sense that it is not accompanied by a technology transfer to the restrained party, which will tend to make it more difficult to justify under the rule of reason.

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[281] *See* Miller & Gal, supra.
[282] United States v. Singer Mfg. Co., 374 U.S. 174 (1963).
[283] Alternatively, it could be that the patents are overlapping (ostensibly implying that at least one of them is invalid), or that they cover substitute technologies, in which case there may not be the two-way technology transfer that characterizes cross-licensing.

The nature of the restraint may also vary. It can take the form of a waiver, which is generally the strongest restraint. Alternatively, it could consist in an economic inducement that discourages the exercise of challenge rights. For example, some licensing agreements stipulate that the license is terminated immediately if the licensee challenges the patent.[284] The nature of the restraint may be germane to antitrust analysis under the rule of reason. For instance, even if the parties are competitors with market power, it might be perfectly reasonable for them to agree simply that the potential challenger will have to reimburse the patentee's litigation expenses if it files *and loses* a patent challenge.

A. Antitrust Evaluation of Challenge Restraints

Consistent with the *Actavis* and *Singer* examples, the courts have occasionally adjudicated antitrust claims surrounding patent agreements that happen to involve challenge restraints. But they have failed to recognize challenge restraints as a distinct antitrust issue that is common to many of the patent agreements that have been attacked as anticompetitive. Further, some challenge restraints – namely those arising in ordinary licensing agreements between noncompeting firms – have never been recognized by the courts as a potential antitrust issue. In *Lear*, a non-antitrust case, the Supreme Court held that, as a default, licensees have the right to challenge the licensed patent.[285] This led to the widespread inclusion of challenge restraints within ordinary licensing

[284] *See* Miller & Gal, supra.
[285] Lear, Inc. v. Adkins, 395 U.S. 653, 670-71 (1969) (holding that there is no doctrine of "licensee estoppel" that automatically bars a licensee from challenging the licensor's patent.

deals. Thomas Cheng, who discusses these licensee no-challenge clauses, notes that, "[i]n the U.S., no court seems to have ruled on the legality of no challenge clauses under antitrust law."[286]

But it is easy to see that challenge restraints are exactly the kind of thing that antitrust is intended to police. A patent challenge is a privileged competitive act. And if a party has a right to perform a competitive act against a rival – for example, to expand its business into the rival's territory – the antitrust laws generally prohibit the firms from entering into an agreement that restraints that act, at least unless there is a procompetitive justification for it. Even if the agreement is vertical rather than horizontal, the restraint may be unlawful if the parties have market power and the restraint lacks a satisfactory justification. Thus, the only question is whether patent law create an exception that precludes application of the same antitrust standards to challenge restraints. The answer is no. The Patent Act explicitly states that *patent rights* are generally alienable. It provides that they may be licensed or assigned, for instance. But the Act never provides that *challenge rights* are similarly alienable – not even impliedly.[287] Indeed, agreements that suppress challenge rights may often belie the very policies that motivated the conferral of those rights. Challenge rights are an instrument of competition policy. They serve essentially the same interests that underpin the scope of the patent doctrine: to prevent patentees from effecting unearned or overreaching restraints on commerce. It is thus ironic that some regard the suppression of challenge rights as falling within the scope of the patent.

[286] Cheng, supra, at 447. However, the author notes that some courts have addressed the enforceability of such no challenge clauses under patent law.
[287] *Accord*, Miller & Gal, supra ("patent law … does not grant [patentees] the right to be free from challenges.")

When evaluating a patent agreement involving a challenge restraint, antitrust's proper role is to ask whether the restraint is reasonably justified in light of any procompetitive effects created by the agreement, taking into account any relevant policy concerns. It is beyond the scope of this article to present a comprehensive discussion of how antitrust ought to view different kinds of challenge restraints. But a few simple observations may prove helpful in future research efforts.

Licensing is the most obvious procompetitive efficiency that might justify a challenge restraint. In an ordinary "vertical" licensing agreement (i.e. one in which the parties are in a purely vertical relationship[288]), a challenge restraint may be reasonably justified on the ground that it eliminates a potential holdup problem. If both parties know that the licensee could use the threat of litigation opportunistically – for example, if the patentee's business falls upon hard times – then their relationship may be detached, contentious, or otherwise unstable. The prospect of a lingering litigation threat might even deter the patentee from seeking out a licensee in the first place. If the parties bargain ex ante – i.e. before the prospective licensee has committed itself to the patented technology – then the patentee knows that the licensee will likely have a stronger incentive to challenge the patent later on, after it has committed itself. At the margin, a patent challenge has larger expected value for the licensee if the fixed costs of implementing the patented technology are already sunk. This makes contracting precarious, because the patentee cannot be sure whether the royalty rate imposed ex ante will hold up ex post, when the licensee may have a heightened incentive to challenge the patent. A challenge restraint could eliminate this holdup problem and facilitate commitment to the relationship.

[288] This implies the firms are not competitors in any relevant product market. If the parties are competitors in products, then their relationship is not purely vertical, since they are horizontally related in the product market.

Viewed in this light, vertical challenge restraints may operate essentially as a special case of exclusive dealing.[289] After all, the agreement commits the licensee to buy the rights to use the patented invention from the patentee, and not acquire them by other means. The only difference here, which appears largely immaterial to the antitrust inquiry, is that "other means" refers to litigation of a patent challenge, as opposed to switching to a different upstream provider.[290] This is an important point that has been missed in recent scholarship on no-challenge clauses in licensing agreements.[291] It implies that vertical challenge restraints are merely a novel embodiment of a well-understood antitrust issue, suggesting we can use longstanding antitrust machinery to evaluate them.

As with exclusive dealing, market power should be an important element of the antitrust claim. If there is no inter-party competition (which is true in any purely vertical relationship), challenge restraints should probably be viewed as competitively benign if the parties lack market power. A separate but related issue, which is unique to *patent* agreements, is that they generally will not raise antitrust concerns if the relevant patents are impotent to influence the relevant

[289] Exclusive dealing refers to a (usually purely vertical) agreement that restrains a party's right to transact with firms in competition with the other party. For example, a wholesaler and retailer might agree that the retailer is barred from buying any competing versions of the wholesaler's good.

[290] On the other hand, the worst interpretation of a vertical challenge restraint would be that it acts like a vertical agreement prohibiting the downstream firm from integrating into the upstream market. That would be market division, since it prevents inter-party competition in the upstream market. But a vertical challenge restraint would not prevent inter-party competition in the upstream market (a market for licensing rights), since a successful patent challenge would not transform the licensee into a competing licensor; it just eliminates the royalty obligation.

[291] *See* Miller & Gal; Cheng, supra. Neither article discusses the instructive similarities between vertical no-challenge clauses and exclusive dealing, nor the related point that such restraints might eliminate a holdup problem. However, they do acknowledge the relevance of market power to a potential antitrust claim.

product market. If the agreement seems capable of impacting market structure, then it should be evaluated under the rule of reason, as with exclusive dealing and other vertical restraints.

An important aspect of the market structure analysis relates to the challenge rights of third parties. A challenge restraint does not preclude nonparty firms from challenging the relevant patents, just as an exclusive dealing agreement does not prevent third parties from contracting with alternative upstream providers. If the market is sufficiently competitive such that restraining just one producer is unlikely to threaten the product market, then there may be no viable antitrust claim. However, there may be context-specific factors such that unrestrained third party producers have a limited incentive to challenge. A clear example is the Hatch-Waxman Act's provision of 180-day exclusivity to first-filling generics, which diminishes the incentive to challenge among later-filers.[292] Alternatively, in non-pharmaceutical markets – namely those in which products are differentiated – it may be that there are only a small number of producers in the market that actually have an interest in challenging the patent in question. For example, if a patented invention is directed at diesel car engines, then only car manufacturers that produce a large number of diesel cars have a strong interest in acquiring the patent rights. These are fundamentally antitrust questions.

One important feature of pharmaceutical markets is that products tend to be highly undifferentiated; generic drugs and their branded counterparts are essentially fungible. This makes competition very intense, suggesting that a single challenge restraint would not be very valuable

[292] This is a result of some badly drafted provisions of the Hatch-Waxman Act. *See, e.g.*, C. Scott Hemphill & Mark A. Lemley, *Earning Exclusivity: Generic Drug Incentives and the Hatch-Waxman Act*, 77 ANTITRUST L.J. 947 (2011).

if third parties were not also somehow discouraged from challenging. However, if products are differentiated, then a single challenge restraint can be profitable even if third party firms are not discouraged from bringing their own challenges. Those third party challenges would likely result in licensing agreements – the usual settlement format in most non-pharmaceutical markets. But, because products are differentiated, this does not necessarily extinguish market profits. And the original challenge restraint remains valuable, since it still serves to preclude a competing use by at least one important firm, helping to soften competition. For example, an equilibrium might involve firms entering into licensing deals with their least similar competitors (in which case licensing might enhance their joint profits), but entering into challenge restraining agreements with their closest rivals (in which case licensing might erode joint profits).

Naked challenge restraints in horizontal agreements are much harder to justify. Reverse payment settlement is a good example of this. The value of settling litigation might be regarded as a justification for a reverse payment settlement. (This could also justify a challenge restraint in a vertical licensing relationship.[293]) But, of course, this explanation is unsatisfactory if the payment is large and the exclusion period is long. Such characteristics suggest that the payment's role is not really to effect a settlement, but rather to forestall a patent challenge that might leave the market much more competitive. That is, the challenge restraint is being used to facilitate delay, not merely to end litigation. Another point is that, if the parties are genuinely in agreement that the patent is valid and infringed, and if litigation costs are genuinely large enough such that their

[293] If vertically related parties want to settle and begin a licensing relationship, then a challenge restrain may be helpful by eliminating the lingering threat of litigation and thereby making the relationship more stable and productive, as was already discussed above.

avoidance constitutes a cognizable procompetitive efficiency, then litigation costs alone should be large enough to deter a repeat challenge by the defendant. That would suggest that the settlement need not include a restraint on ex post challenge rights in order to produce a stable resolution to the dispute. Note that this is not an argument about the likelihood of invalidity. Rather, the question is whether such a strong challenge restraint is reasonably necessary to effect a settlement.

The avoidance of litigation costs is not the only thing that could in principle justify a reverse settlement. A number of scholars have noted that, while a reverse payment's consumer injury is probabilistic, it offers at least at least one certain benefit to consumers: pre-expiration entry by the generic firm.[294] Most reverse settlements involve a delay period that ends *prior* to patent expiration, but a final judgment could result in an injunction that keeps the generic firm off the market for the full remainder of the patent term. However, in a recent article, my coauthor and I argue that the delay period that the firms will actually choose will be longer than that which leaves consumers indifferent between settlement and litigation to judgment.[295] In fact, we show this is so even in a "pure delay" settlement where the patentee gives no payment or other consideration to the generic firm (which would involve a less lengthy delay than a paid agreement). Intuitively, by preserving patent validity – which acts like an entry barrier by forcing third party generics to challenge prior to entry – the settlement will slow the rate of third party entry (relative to invalidation) for the remainder of the patent term. This increases total profits in the product market, and the patentee takes its share of these rents by demanding a longer delay period than that

[294] Daniel A. Crane, Actavis, the Reverse Payment Fallacy, and the Continuing Need for Regulatory Solutions, 15 Minn. J. L. & Tech. 51, 55 (2014).
[295] Erik Hovenkamp & Jorge Lemus, *Reverse Settlement and Holdup at the Patent Office*, (submitted for publication). Available at https://papers.ssrn.com/abstract=2814532.

which would leave consumers indifferent between settlement and full litigation. Thus, in practice, reverse settlements' accommodation of pre-expiration entry will generally be insufficient to generate a net-benefit for consumers (relative to continued litigation).

Naked challenge restraints need not achieve exclusion at the *product-level*, as occurs in a typical reverse settlement. For example, suppose two car manufacturers each offer some patented features that are not offered by the other. The firms might have a joint interest in agreeing that they will neither challenge nor practice one another's patents, thus softening competition at the feature-level. Like reverse payment, this is essentially a form of market division, and it may warrant antitrust intervention. But in this case the agreement does not exclude an entire product from the marketplace.

The prospect of third party challenges is less consequential in horizontal agreements involving naked challenge restraints. Third party competition is often less important in evaluating horizontal agreements that impose naked restraints on inter-party competition. For example, if two firms agree to stay out of each other's territory, they cannot hope justify their market division agreement by pointing out that it does not stop any third parties from entering either firm's territory. Similarly, even if third parties can still challenge the relevant patent, a naked challenge restraint imposed between rivals may still warrant antitrust intervention to the extent that there is no reasonable justification for it.

IV. ACQUIRING A MORE DURABLE PATENT MONOPOLY

A patent provides a temporary monopoly over the patented technology. However, patents are probabilistic.[296] Until a patent is actually litigated to judgment, its validity – and hence its capacity to achieve exclusion through the litigation process – remains uncertain. The result is that a patent monopoly may not be very *durable*.[297] That is, the patent may not be of sufficient quality to permit the patentee to act like a true monopolist, which can set whatever terms it likes, since there are no competitive pressures to compel a more generous offering. Challenge rights entitle rivals or prospective licensees to target the patent's potential vulnerabilities. Since the patentee strongly prefers not to have its patent invalidated, it may be obliged to put up with some competition – to accept royalties when what it really wants is an injunction – or to set a lower royalty rate than it would prefer. After all, if the patentee refuses to make any such concessions, it might end up with nothing.

This result – that lower quality patents are less durable and thus impose smaller restraints in commerce – performs a socially valuable function. Patent validity is binary; every claim is either valid or invalid. But patent *quality* is non-binary, since patentability criteria like novelty and nonobviousness exist along a spectrum. But because lower quality patents are less durable, the patent system can nevertheless ensure that commercial restraints are somewhat proportionate with patent quality. Importantly, however, it is challenge rights that ultimately facilitate this proportionality. If patents could not be challenged as invalid, then bad patents would be no less durable than good ones, and their exclusionary effects would be just as strong.

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[296] *See* Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, 19 J. ECON. PERSP. 75 (2005).

[297] *C.f.* Aaron S. Edlin et al., supra (noting that, when the "delay" period of a reverse settlement concludes, the resulting duopoly between the generic firm and the patentee is often not "durable" after the generic firm's 180 exclusivity period runs, because third party generic firms will then challenge the patent).

This sheds further light on why challenge restraints are not within the scope of the patent. The courts occasionally emphasize the enlargement of the patent monopoly – i.e. the magnification of the patent's exclusionary power – as a hallmark of restraints beyond the scope of the patent. For example, this language is used in justification of the prohibition on post-expiration royalty obligations.[298] But an alternative way to enlarge the patent monopoly is to increase its durability by entering into horizontal agreements that restrain the challenge rights of some prominent rivals. This makes the market less contestable, allowing the patentee to behave less competitively than it could afford to do if armed with the patent alone. As such, even under the less formal "enlargement of the patent monopoly" interpretation, challenge restraints plainly go beyond the scope of the patent.

V. THE TWO MODES OF EXCLUSION

There are two ways a patentee can exclude a rival that plans to sell a potentially-infringing product. The first is through infringement litigation. This, of course, is not certain to succeed, since it is not certain that the patent will be held valid and infringed, nor that such a holding would be remedied through an injunction order. The second possible mode of exclusion is to enter into an agreement under which patentee provides some consideration (but not a license) to the rival in exchange for a restraint on the rival's challenge rights. This is, in my view, the most helpful way to characterize a reverse settlement. And, unlike infringement litigation, this approach is *certain*

[298] *See, e.g.*, Brulotte v. Thys Co., 379 U.S. 29, 33 (1964) (condemning post-expiration royalty agreement on the ground that it amounts to "an effort to enlarge the monopoly of the patent.")

to achieve exclusion of the rival (at least in lieu of antitrust intervention), regardless of whether the patent is valid and infringed.

As such, the latter strategy can be used to achieve exclusion beyond the scope of the patent, and not only because it may facilitate exclusion based on an invalid patent. It could also be used to achieve exclusion of noninfringing competition. For example, suppose that two duopolists, *A* and *B,* know that *B*'s product almost certainly does not infringe *A*'s patent. Suppose further that, as is true in most markets, monopoly provides larger total profits than duopoly. Then, despite the parties' actual beliefs about the infringement claim, the firms can mutually benefit from an agreement (which might be stylized as a settlement) in which *A* pays *B* to give up its challenge rights. This leaves *B* defenseless against a future patent infringement claim, eliminating any incentive it might have had to try and enter the market. In fact, the agreement could accomplish this indirectly by relying on claim preclusion as an indirect restraint on *B'*s challenge rights. The settlement could simply memorialize the parties' joint agreement that the patent is valid, and that it would be infringed by *B*'s product; it might even stipulate that *B* is enjoined from making sales.[299] The default rule is that this settlement will have a claim-preclusive effect – the practical effect of which is to extinguish *B's* right to challenge the patent – provided that it culminates in a dismissal with prejudice, or that it is entered as a consent decree.[300] The result is a robust legal barrier that keeps *B*'s noninfringing product off the market.

[299] In a recent paper on reverse settlements, my coauthor and I discuss a settlement (which was entered as a consent decree) that stated precisely these things. *See* Hovenkamp and Lemus, supra.

[300] *Pactiv Corp. v. Dow Chemical Co*., 449 F.3d 1227, 1231 (Fed. Cir. 2006) (holding that a settlement of litigation triggers res judicata, barring the defendant from later challenging the patent, unless the parties' settlement expressly reserves the defendant's right to challenge the patent in the future).

This clarifies why it is problematic to characterize a patent as simply conferring "the right to exclude." Indeed, there are two distinct ways to achieve exclusion, but only one of them is authorized by the Patent Act. The other way – contractual restraints on challenge rights – is not so authorized, and may be used to the detriment of patent policy objectives.

VI. REMOVING THE VALIDITY QUESTION FROM THE ANTITRUST ANALYSIS

A reverse settlement harms consumers only if the patent is either invalid or uninfringed. (In what follows, I will focus on the former prong.) But a reverse settlement typically occurs before – and thus precludes – a final judgment on patent validity as between those two parties. As a consequence, antitrust intervention occurs at a time when the patent's validity remains uncertain. The *Actavis* dissenters regarded this manner of intervention as conclusory and inappropriate.[301] Their unease is echoed by a number of scholars. For example, one recent article argues that the decision is jurisprudentially unsound because it makes an implicit legal determination about patent strength based only on the parties' beliefs about how a court would rule on the validity issue.[302]

But the more common critique of antitrust intervention in reverse settlement cases seems to be that, because the patent's validity remains uncertain, the antitrust plaintiff has not made a showing that consumers are likely to suffer a but-for injury.[303] For example, in discussing the

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[301] *Actavis,* 133 S.Ct. at 2241 (disputing the majority's arguments that antitrust intervention does not compel adjudication of patent validity). A large number of scholars support the majority's contention that the patent need not be litigated to judgment. *See, e.g.*, Edlin et al, supra.

[302] Joshua Fischman, *The Circular Logic of Actavis*, 66 AM. U. L. REV. 91 (2016) (arguing that the *Actavis* decision "relies on the prediction theory of law – the widely disparaged conception of law as consisting merely of predictions about what courts will do.")

[303] *See, e.g.*, Marc G. Schildkraut, *Patent-Splitting Settlements and the Reverse Payment Fallacy*, 71 ANTITRUST L. J. 1033, 1055-56 (2004) (advocating the need for a "traditional standard of proof" such that "any time the antitrust

uncertain impact a patent judgment would have had on competition, one commenter writes that "the uncertain competition analysis is difficult to reconcile with standard analyses under the antitrust laws."[304] The problem with this argument is that it presumes – incorrectly – that antitrust enforcement requires proof that the defendants' agreement caused a but-for injury to consumers, as distinguished from a showing that the agreement restrains competition without justification. Antitrust violations are not like torts; they do not include harm as an element of the offense.[305] They are more similar to, say, traffic violations: they are directed at conduct itself. The exception is that *private* antitrust enforcement operates more like conventional tort law (at least in damages actions), because a private plaintiff must prove that the antitrust violation caused it to suffer an injury.

As this suggests, the question of whether an antitrust plaintiff must prove a consumer injury depends entirely on the nature of the enforcement. It does not hinge on the nature of the restraint, nor on the distinction between per se rules and the rule of reason. Under the Sherman Act, the Department of Justice is given broad authority "to prevent and restrain violations of this Act."[306] Similarly, the Federal Trade Commission is empowered to prevent parties from "using unfair methods of competition in or affecting commerce and unfair or deceptive acts or practices in or affecting commerce."[307] These provisions authorize public enforcement based simply on a

plaintiff fails to establish that the alleged infringer would have prevailed in the patent litigation, the court should dismiss the antitrust case.")

[304] *Id*.

[305] For example, Section 1 of the Sherman Act, which delimits the scope of antitrust intervention in collusive arrangements, focuses entirely on anticompetitive *conduct*, not consumer harm. 15 U.S.C. §1 (prohibiting every "contract, combination, … or conspiracy in restraint of trade").

[306] 15 U.S.C. §25.

[307] 15 U.S.C. §45(a).

showing of anticompetitive conduct, i.e. that which unreasonably restraints competition. In contrast, a private plaintiff seeking damages must prove not only conduct "forbidden by the antitrust laws," but also "damages *by him sustained*."[308] Similarly, to obtain an injunction, he must prove "threatened loss or damage by a violation of the antitrust law."[309] The courts have interpreted these provisions to mean that a private plaintiff must prove the violation caused him to suffer an injury in order to receive damages, but that injunctive relief may be available even if he fails sufficiently to quantify the injury.[310]

As a result of these enforcement standards, antitrust courts frequently condemn agreements without inquiring into their (often speculative) likelihood of injuring consumers. In broad outline, if an agreement restrains some competitive activity, and if the defendants fail to offer a satisfactory justification for it, then an antitrust court may condemn the agreement on these findings alone. The most conspicuous example of this is the absence of a market power requirement for price-fixing claims. If two firms fix prices, they injure consumers only if they command sufficient market power to influence the market. But the courts do not require evidence to that effect in order to find a violation.

However, the more instructive analogue is naked market division in territories. Suppose that two car dealers, *A* and *B*, currently operate in neighboring states, but stumble into one another

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[308] 15 U.S.C. §15 (emphasis added).
[309] 15 U.S.C. §26.
[310] *See, e.g., Blue Cross & Blue Shield United of Wis. v. Marshfield Clinic*, 152 F.3d 588 (7th Cir. 1998), cert. denied, 525 U.S. 1071 (1999). Even if a private plaintiff asserts *and proves* a per se antitrust violation, it still cannot obtain damages without proving it suffered an injury. *See, e.g.*, Campos v. Ticketmaster, 140 F.3d 1166, 1172 (8th Cir. 1998), cert. denied, 525 U.S. 1102 (1999).

at a trade association gathering. Dealer *A* offers *B* $25K if it agrees never to expand into *A*'s state, despite the fact that *A* does not know whether *B* would otherwise have expanded in its direction. And *B* accepts the offer, despite not knowing whether it would otherwise have wanted to expand into *A*'s territory. This market division agreement is plainly unlawful. And yet the probability of consumer harm is completely uncertain. We do not know whether *B* would have moved into *A*'s territory but for the agreement, which is just like saying that we do not know whether a patent would have been invalidated but for a reverse settlement. The point is that this uncertainty is not germane to the antitrust claim. There is no procompetitive justification for the restraint on *B*'s right to enter *A*'s territory, and hence antitrust intervention does not require a showing that consumers are likely to suffer a but-for injury.

The same logic applies to challenge restraints. A patent challenge is a privileged competitive act, just like expansion into a rival's territory. Thus, if an agreement between competitors serves to restrain a party's challenge rights, there must be a good reason for it. If there is not, then the court need not concern itself with the patent's uncertain validity. It is enough that the agreement creates an unjustified barrier to *possible* competition.

VII. CONCLUSION

This short article demonstrates that patent challenge restraints are not within the scope of the patent. This clarifies a specific – but broadly applicable – basis for applying the antitrust law to a wide range of patent agreements. Of course, this is not to suggest that patent policy concerns should not enter into the analysis. Antitrust very regularly takes patent and innovation policy

concerns into account when appraising the reasonableness of private conduct. Nor indeed does this suggest that all patent challenge restraints are antitrust violations. That challenge restraints are not authorized by the Patent Act merely suggests that they do not enjoy safe harbor. Whether such a restraint violates the antitrust laws thus depends on its reasonableness, as determined based on the nature and context of the agreement, and taking into account any applicable innovation policy concerns.

4. PREDATORY PATENT LITIGATION

I. INTRODUCTION

Patent assertion entities (PAEs) – pejoratively known as "patent trolls" – are firms whose business operations consist primarily in the assertion, litigation, and licensing of patents.[311] Despite their legal expertise and substantial resources, some of the most active and litigious PAEs make their way by asserting bad patents, i.e. patents that are likely invalid and ought not to have been granted in the first place. These PAEs frequently initiate infringement lawsuits on which they ostensibly have no chance of turning a profit, even if their (typically modest) licensing demands are ultimately achieved through settlement. On its face, this appears irrational or overzealous, but in fact this is not so. Rather, it is part of a calculated reputation building strategy of *predatory*

[311] Such firms typically do not sell any goods or services that rely on their patents, and are therefore frequently referred to as "non-practicing entities" (NPEs).

patent litigation under which a PAE follows through on its seemingly irrational litigation threats in order to develop a litigious reputation that persuades future targets to accept licensing demands they would ordinarily reject based on a belief that the litigation threat is non-credible. Like other predatory business practices, this involves taking a loss in the short run, which is subsequently recouped through supra-competitive pricing.

As a general matter, the social desirability of PAEs is a very contentious subject.[312] Proponents of these firms contend that they enhance welfare by providing a vehicle for small inventors to monetize their ideas, and by improving liquidity in the market for patents and licensing rights. See McDonough (2006); Risch (2012). By contrast, opponents argue that PAEs inhibit innovation and market entry by effectively subjecting firms and inventors to licensing "shakedowns" when they attempt to bring a new or improved product to market. See Scott Morton and Shapiro (2013); Lemley and Melamed (2013).

Because some PAEs appear to assert primarily low-quality patents, some critical scholars argue that PAEs unnecessarily inflate social costs by clogging the court system with low merit suits. See Bessen, Meurer, and Ford (2011). One thing most scholars can agree on is that PAE activity has grown much more prevalent over time. Feldman (2013) finds that the percentage of patent litigation initiated by PAEs has increased from approximately 25% in 2007 to approximately 60% in 2012. The frequency with which PAEs assert their patents is likewise increasing. Feldman (2013) also presents the results of a survey of venture capital firms, which

[312] For an excellent overview of the arguments for and against the PAE business model, see Hagiu & Yoffie (2012).

focuses on how PAEs affect their business operations and investment strategies. 70% of respondents presently retained portfolio companies that had received licensing demand letters, and the large majority of these letters were sent by PAEs. 79% of respondents reported that the frequency of such letters had increased over the last 5 years.

Despite being very experienced in patent litigation, many of the most litigious PAEs perform relatively poorly in court. Allison, Lemley & Walker (2011) show that in cases involving the most litigated patents (those litigated 8 or more times), NPEs win less than 10 percent of cases that reach judgment. Further, these suits make up a large majority of PAE litigation. Chien (2012) finds that in PAE litigation occurring during 2011-2012, 61 percent of defendants were sued by PAEs who had litigated on the same patents 8 or more times. Recent empirical evidence also suggests that, even when PAEs win, their damages tend to be slightly smaller than those of producing firms.[313] And, as illustrated by some PAE lawsuits discussed below, there are many examples of situations in which PAEs have initiated lawsuits based on alleged infringement of patents so overreaching in scope that they are ostensibly certain to be held invalid if the case reaches final judgment.

In light of this, it might appear that these litigious PAEs are often mistaken to pursue litigation so fervently. As Allison, Lemley and Walker (2011) write, “it appears that NPEs are not as worried about losing as they should be." However, this article argues that many of the most litigious PAEs’ are in fact engaging in a profitable strategy of predatory patent litigation, and that

[313]See Mazzeo, Hillel & Zyontz (2013).

this is actually the most effective way to monetize bad patents. Most of the litigious PAEs relying on bad patents tend to operate by sending out many licensing demand letters at a time, each of which accuses the recipient of infringing and threatens litigation. In these letters the PAEs commonly attempt to highlight their willingness to litigate aggressively. They can give credibility to their threats by referencing previous situations in which they have litigated, and their targets can search through public records to discern how aggressively the PAE has litigated in the past. If the infringement claim is strong, then the PAE's threat would be inherently credible. But if its patents are weak, it relies on evidence of aggressive litigation to give credibility to its threats. Once such credibility is established, the PAE can persuade its targets to accept demands they would otherwise reject. The intuition is straightforward: if the PAE would not lose something valuable by giving up after a threat is rejected, why would it ever choose to litigate a claim that is virtually certain to lose?

One good example of predatory patent litigation involves a PAE named Innovatio IP Ventures.[314] In 2011, Innovatio purchased a number of patents from Broadcom Corporation. Claiming that these patents covered the provision of Wi-Fi internet access through a wireless router, Innovatio began asserting its patents against a large number of small businesses – primarily small coffee shops, restaurants and grocers – that offered Wi-Fi access to customers. Its licensing demands were generally modest and, unlike defendants in most patent lawsuits, these small targets would be very limited in their ability to pay damages. Given the exorbitant costs of patent

[314]I have not found any scholarly articles providing a detailed account of Innovatio's conduct, but it has been covered thoroughly by technology media outlets. See Masnick (*Techdirt*, Oct. 3, 2011) or Rizzolo (*Essential Patent Blog*, Jan. 3, 2013).

litigation, even if Innovatio's patents were valid, it would likely still lose money on such a lawsuit – even if the case did not reach final judgment. Furthermore, if the patents were valid, then presumably it could earn far more profits by suing the router manufacturers themselves, or other large firms that use wireless routing technology. Thus its modest settlement demands and focus on small targets strongly suggest that it did not expect to win money on the merits. And yet, despite the likelihood of losing money on litigation, Innovatio filed many lawsuits against those targets that refused to pay.[315]

As a second example, in 2013 a PAE called Lumen View Technology demanded a license fee from a technology startup for using a matching process on its website that served to match customers with products and sellers – a fairly simplistic process allegedly covered by Lumen View's patent, which described the process as a "System and Method for Facilitating Bilateral and Multilateral Decision-Making." In light of recent developments in patent eligibility law, this patent was obviously invalid. Lumen View asserted its patent via a demand letter stating that the defendant should "be advised that [Lumen View] is prepared for full scale litigation to protect its rights," and even threatening to make the discovery phase of litigation as expensive as possible.[316]

When the defendant refused to pay, Lumen View aggressively litigated, despite the virtual certainty of losing. The district court ultimately held that the patent was blatantly invalid,

[315]Eventually, wireless router manufacturer Cisco stepped in, offering Innovatio a multi-million dollar settlement to immediately stop filing suits against customers using its routers to provide Wi-Fi internet access. The settlement value was approximately $2.7 million, which is likely significantly less than the costs Cisco would incur in litigation.

[316] A full copy of Lumen View's letter is available on the website TrollingEffects.org at URL https://trollingeffects.org/demand/lumen-view-technology-2013-05-30

remarking that “[t]here is no inventive idea here" and that the patented matchmaking process was “a fundamental process that has occurred all through human history."[317]

As the Lumen View case illustrates, some of the most litigious PAEs are not dissuaded by the likelihood of losing or the possibility that their patents will be held invalid. This is in part because they can generally acquire more suitable patents from operating companies – a practice known a “patent privateering." It is also a consequence of the fact that, because PAEs generally do not produce anything protected by their patents, and because they cannot be counter-sued for infringement, they stand to lose less in court than a producing firm. Indeed, in a recent suit filed by a PAE called Eon-Net, the court noted that “while Eon-Net risked [losing] licensing revenues ... [it] did not face any business risk resulting from the loss of patent protection over a product or process. Its patents protected only settlement receipts, not its own products."[318]

This article develops a stylized recursive model of patent assertion, litigation and reputation building by a PAE with low quality patents. The model has a unique Markov perfect equilibrium that generally involves predatory patent litigation. The PAE gains a strong reputation for aggressive litigation by following through on a litigation threat despite expecting to lose money on the suit. The equilibrium exhibits interesting dynamics, with the PAE intermittently forfeiting and rebuilding a litigious reputation over time. Given that a large majority of patent disputes result in licensing settlements, and that virtually all licensing contracts are covered by confidentiality

[317] See *Lumen View Tech. LLC v. Findthebest.com, Inc.*, (S.D.N.Y., 2013).
[318] See *Eon-Net LP v. Flagstar Bancorp*, (Fed. Cir. 2011).

agreements, this theoretical investigation allows one to address questions that would be difficult or impossible to answer empirically.[319]

The dynamic game involves a PAE who asserts patents against a firm in every period. The PAE typically expects to lose money on litigation, although this expected payoff varies from claim to claim. In each period, the PAE identifies a target firm arguably infringing one of its patents and demands a license fee. The defendant can then accept or reject. Following a rejection, the PAE can either litigate or give up. The latter choice affects the PAE's reputation: some fraction of potential defendants are "impressionable" in the sense that they form beliefs about what the PAE will do based on its prior litigiousness or passiveness. The prevalence of impressionable defendants gives the PAE a strict incentive to litigate some claims with negative expected value, because giving up will have an adverse impact on subsequent negotiations with impressionable defendants. This makes the PAE's litigation threats credible: even fully rational target firms have a strict incentive to pay license fees for some bad patents, because they know the PAE has a vested interest in demonstrating its litigiousness. This framework differs from conventional reputation models in a number of respects, and it enables particularly tractable analysis while still capturing the economic intuition for reputation building. This tractability allows for simple closed form solutions describing the equilibrium strategies.

[319] Without data on settlement terms, one cannot observe the positive reputation effects created by predatory litigation. Furthermore, even if it were possible to determine the terms of a defendant's settlement, there is ostensibly no good way of saying whether a PAE expected to lose money on a given lawsuit.

Additionally, the model can be easily applied to consider some potential strategies for deterring predatory patent litigation. One commonly-endorsed policy is a fee shifting rule, which would require a losing litigant to pay the other side's attorney fees if its claim or defense is not reasonably meritorious. This would typically force a predatory PAE to pay a defendant's fees if it loses the case. I show that a fee shifting rule will weakly reduce the extent of predatory litigation, i.e. it will reduce the set low-quality claims a PAE is willing to litigate. However, it will generally not eliminate the problem entirely. Furthermore, predatory litigation is likely to remain quite lucrative if a PAE can direct its ire at small firms or startups (as they commonly do), because litigation can be crippling for these firms even if attorney's fees are ultimately reimbursed. Patent litigation is not only costly, it is also a long process that requires a lot of time and attention. This may impose some "ancillary" harms on a small firm: it may force it to divert management's attention away from business operations, scale back production, take out loans, fire employees, or even file for bankruptcy. Importantly, none of these ancillary harms are reimbursed under a fee shifting rule, and thus they can still be extracted by a PAE under a fee shifting rule.

Feldman (2013) provides survey evidence of these sorts of ancillary harms. There is also ample anecdotal evidence throughout the literature. Feldman also finds that venture capitalists are often quite wary of investing in firms that have been targeted by PAEs, with 100% of respondents averring as much. I propose that small targets could better defend themselves through a Litigation Cost-Sharing Agreement. This is a coalition of similar firms that agree to finance any member's defense costs as the arise, provided the suit is deemed sufficiently frivolous by an independent arbitrator or attorney. This would substantially reduce the ancillary harms associated with

litigation. If properly constrained to bad lawsuits, this would not undermine meritorious lawsuits and would not arouse antitrust concerns.

Importantly, this article is focused specifically on PAEs that engage in predatory patent litigation. It does not make categorical claims about the universe of all PAE activity. Many PAEs do not engage in predatory patent litigation at all, instead focusing on acquiring high value patents that can be asserted against a few big players. As Lemley and Melamed (2013) write, “these trolls think they have a patent that reads on a significant area of technology, and it is very important to them that their patent is held valid and infringed." This strategy may involve “lottery ticket" suits that are likely to lose but still have positive expected value, because the damages awarded would be enormous. This is very different from the predatory strategy addressed in this paper, which targets mostly small firms that cannot afford to pay significant damages even if a PAE wins its lawsuit. Such conduct is unambiguously welfare-reducing. It is unnecessary to monetize good patents, and therefore will not undermine the incentive to develop technologies that legitimately warrant patent protection. Further, the sort of “wait and sue" approach relied on by predatory PAEs does nothing to disseminate patented inventions. Any potential users who lack the ability to acquire the technology on their own will be left empty-handed, because predatory PAEs generally make no attempts to seek out such parties. Rather, they focus primarily on extracting fees from independent inventors, which is never the most (socially) efficient way for a patent to be licensed.

In contrast to this article, most theoretical scholarship on PAE activity assumes that patents are strong and litigation has positive expected value. For example, Lemus and Temnyalov (2014) develop a theoretical model of PAEs and patent privateering with strong patents, finding that these

PAEs may increase or decrease investment in R&D. One exception is Choi & Gerlach (2015), which addresses infringement claims of unknown quality. The PAE's first case, considered by itself, has negative expected value in light of the present uncertainty. But if the infringement claim proves to be strong, then subsequent litigation will have highly positive expected value, based on the information externalitiy created by the successful outcome in the first lawsuit. Thus the first case may still be worth litigating, based on the continuation value. However, it is worth mentioning that this likely does not apply to patents that yield negative expected litigation payoffs because they are "bad" in the sense that they are likely invalid, because a court cannot rely on a prior judge's finding of validity in reaching its own decision on the validity issue. Rather, the validity question must be considered afresh whenever a defendant elects to raise it.[320] See Allison, Lemley, & Walker (2011). Thus there is a critical difference between this article and Choi & Gerlach (2015), which is that it addresses a PAE whose expected litigation payoffs would remain negative even after an unexpected success.

The remainder of the paper is organized as follows: Section 2 develops and solves a recursive model of reputation building by a PAE with low quality patents. Section 3 provides an example of a simple closed form solution to the model, and applies the model to consider potential deterrence strategies. Finally, section 4 highlights the basic welfare implications of predatory patent litigation and offers some closing remarks.

II. MODEL

[320] In most cases, a jury is not even allowed to *consider* a prior court's decision on the validity question.

This section begins by presenting simple repeated game involving patent assertion (threats to sue) and litigation by a PAE (player 1) against a firm (player 2) that has allegedly infringed one of the PAE's patents. The model is then extended to enable reputation building. Time is discrete and indexed by $t = 0,1,2,\ldots$. Player 1 operates in every period, while player 2 is a short run player, i.e. a sequence of agents that each play against player 1 in a single period. The PAE has a portfolio of patents. In each period it can assert a patent and, if its settlement demands are not accepted, it can bring a suit seeking damages. However, the quality levels of these possible infringement claims – which are assumed to uniquely determine the parties' expected litigation payoffs – vary among periods. A higher quality level is strictly better for player 1, and strictly worse for player 2.

The model relies on "litigation injuries" – the net loss a player expects to suffer as a result of a lawsuit[321] – as the relevant measure of litigation payoffs, because our focus is on PAEs that frequently bring dubious infringement claims, and both parties will typically lose money in such cases. Indeed, because litigation is costly regardless of outcome, a defendant always loses money, and a plaintiff expects to net a positive return only if its claim is of sufficiently high quality. Further, to streamline the dynamic model, the stage game employs a reduced form approach quality and payoffs. Player 2's expected litigation injury, denoted z, is a random variable that also serves as a proxy for quality, with higher values of z corresponding to lower quality levels.[322] Given the assumption that litigation injuries are strictly monotonic in quality, z captures all

[321] For example, if litigation costs are c for each player, and if expected damages (adjusted by player 1's winning probability) are d,then litigation injuries might be defined as $c - d$ and $c + d$ for players 1 and 2, respectively.

[322] A more explicit approach would be to treat quality as some random variable, q, and then model litigation injuries as strictly monotonic functions of q. But this would be superfluous, because knowing either player's payoff is enough to pin down q, and therefore also pins down the other player's payoff.

variability in quality, and every realization pins down a unique litigation injuryfor player 2, which is given by $y(z)$, where y is a positive-valued and strictly decreasing function.

The stage game begins with an independent draw of z according to the distribution Φ. Player 1 then asserts its claim against player 2 and issues a take-it-or-leave-it license fee offer, $f > 0$.[323] Player 2 can then accept the offer or reject it. Following a rejection, player 1 chooses whether to litigate the claim or give up. Figure 1 depicts the stage game, with payoffs given in parentheses.

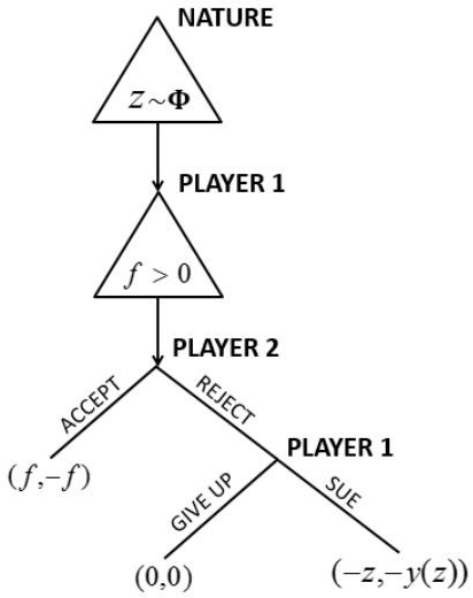

FIGURE 4.1: STAGE GAME

Here Φ is assumed to be continuous and strictly increasing on support $[\underline{z}, \overline{z}]$, where $\overline{z} > \max\{\underline{z}, 0\}$, implying that player 1 expects to lose money on a positive measure of possible

[323] f is assumed to be positive because, intuitively, a settlement for zero dollars should be viewed as the PAE giving up rather than succeeding, and this distinction is important when modeling reputation effects.

lawsuits. Throughout this section, I refer to litigation with $z > 0$ as "predatory." We allow for (but do not require) the possibility that some possible lawsuits have nonnegative expected value, i.e. that $\underline{z} \leq 0$. Φ is assumed to be continuously differentiable on the interior $(\underline{z}, \overline{z})$, and therefore admits a positive-valued probability density function, ϕ. This is assumed not to have divergent limiting behavior, so that $\lim_{z \to \underline{z}} \phi(z)$ and $\lim_{z \to \overline{z}} \phi(z)$ exist and are finite. Finally, a date-t realization of $z$is denoted z_t.

Clearly litigation is subgame perfect in the stage game only if $z \leq 0$, in which case the subgame perfect Nash equilibrium (SPNE) involves player 1 offering $f = y(z)$; player 2 accepting any $f \leq y(z)$ and otherwise rejecting; and player 1 always litigating following a rejection. As for the repeated game, the Folk Theorem tells us that virtually any payoffs may arise in a SPNE. Some SPNEs have the flavor of reputation, but they lack any intuitive explanation for why player 1 should have a tough reputation in the first place.[324] In their seminal reputation article, Fudenberg and Levine (1989) resolve this problem by assuming that players place positive probability on a type of the long run player that always chooses to play aggressively, which serves to limit the vast set of equilibria to those in which player 1 earns relatively large payoffs. Consequently, their model merely provides a theoretical explanation for why player 1 might have a tough reputation; its equilibria do not involve actual reputation building, and thus do exhibit any nontrivial equilibrium dynamics.

[324] For example, if player 1 is sufficiently patient, the following is a SPNE of the dynamic game: (1) players play stage game SPNE strategies when $z \leq 0$; (2) when $z > 0$, player 1 always offers $f = y(z) - \varepsilon$ for some small $\varepsilon > 0$ and always litigates following a rejection; and (3) when $z > 0$ player 2 accepts if and only if $f \leq y(z) - \varepsilon$, unless player 1 has previously deviated from the strategy in (2), in which case player 2 rejects everything. This feels a little like a reputation scenario, but player 1 is simply endowed with this tough reputation; he does nothing to earn it, and if he loses it he can never get it back.

A. Reputation Building

To allow for reputation effects, the game is modified as follows: player 2 takes on one of two possible types, the realization of which is privately observed by him at the beginning of the period. In particular, in each period player 2 is a "normal type" (the same type he maintains in the unperturbed game) with probability $1-p$, and an "impressionable type" with probability p, where $p \in (0,1)$. An impressionable type is one that is intimidated when player 1's engages in predatory litigation, and emboldened when player 1 instead gives up. More specifically, this is a behavioral type[325] that focuses on the aggressiveness (or non-aggressiveness) of player 1's recent conduct in periods with $z > 0$ when forming beliefs about how he will behave in such periods in the future. Importantly, when litigation is rational in the static sense ($z \leq 0$), player 1 cannot develop a reputation for predatory litigation, because even the impressionable type understands that litigation is the sensible thing for any patent holder to do in such cases.

This model's framework differs from most existing reputation models in that it is the short run player and not the repeat-player who can take on one of several possible types. In Fudenberg & Levine (1989), for example, reputation derives from uncertainty about some characteristics of the long run player, and its sustainability therefore depends on the player's ability to keep his true circumstances private.[326] In these models, secrecy is the name of the game. By contrast, reputation

[325] The inclusion of a behavioral type is not a particularly serious departure from conventional reputation models. In most such models, reputation derives fromthe fact that there is a positive probability that the long run player is a "tough" type, which is really just a behavioral type that always plays aggressively. The difference is that here the behavioral type is certain to appear, albeit intermittently.

[326] Some models are more stylized and involve actual reputation dynamics along the equilibrium path. See, e.g., Tadelis (1999).

in this model is a little like the price of stock. It does not matter that some rational agents know that it is artificially high; as long as *some* agents believe (perhaps mistakenly) that the stock merits the high price, it is rational for *all* agents to view the stock as valuable, at least until public perceptions shift. Accordingly, this article's take on reputation is less about uncertainty surrounding a particular player, and more about optimal decision making in the presence of some impressionable actors.

Player 1's reputation is an elucidation of the way he is presently viewed by the impressionable type. Unlike conventional reputation models, which involve Bayesian updating over a continuum of beliefs, this framework utilizes a simpler, discretized structure intended to capture the same intuition while enabling a higher degree of tractability. Depending on its current perception of the plaintiff's litigiousness, the impressionable type attaches one of two possible reputations to player 1: strong (S) or weak (W). If player 1 has a strong reputation, then the impressionable type believes he will definitely follow through on a threat of litigation, even if he would incur a significant loss. By contrast, if player 1 has a weak reputation, then the impressionable type believes player 1 will litigate only if he expects to turn a nonnegative profit on the suit ($z \leq 0$), and that he will otherwise give up. The reputation with which player 1 enters period t is denoted $R_t \in \{S, W\}$.

The process by which player 1's reputation evolves is designed to capture the underlying economic intuition for reputation building, namely that it occurs when someone's conduct surprises a player and leads him to adjust his beliefs about a rival. Thus player 1 enjoys a reputation effect whenever someone's conduct surprises the impressionable type, which happens when either:

(i) player 1 had a weak reputation and was unexpectedly litigious, or unexpectedly intimidated player 2 into paying to settle a low quality claim, or (ii) player 1 had a strong reputation and unexpectedly gave up. There are no reputation effects when there are no surprises, and thus reputation is unchanged when player 1 litigates (or when player 2 accepts) in periods with $z \leq 0$, because under these circumstances litigation is rational, no matter how "tough" player 1 is perceived to be.[327] Player 1 could surprise the impressionable type in these periods only by giving up, but such a decision would never be optimal. This results in the following reputation transition process: First, if $R_t = S$, then

$$R_{t+1} = \begin{cases} S & \text{if player 2 accepted or player 1 litigated} \\ W & \text{otherwise} \end{cases}$$

Second, if $R_t = W$, then

$$R_{t+1} = \begin{cases} S & \text{if } z_t > 0 \text{ and player 2 accepted or player 1 litigated} \\ W & \text{otherwise} \end{cases}$$

Note that this specification allows player 1 to garner a positive reputation effect simply by convincing player 2 to accept an offer in a period where player 1 expects to lose money in court. As this indicates, *both* players can act in ways that generate reputation effects by surprising

[327] In principal we could allow player 1 to generate a positive reputation effect when $R_t = W$ and $z_t \leq 0$ by demanding an unreasonably this decision appears irrationally aggressive, just like predatory litigation. (I am not aware of any situations in which this has actually occurred in practice, and thus opted for the specification given in the text.) Adjusting the model to allow for such effects leads to two differences in the equilibrium results: (1) predatory litigation occurs under a smaller set of circumstances; and (2) litigation occurs in some periods with $z_t \leq 0$. A detailed overview of this extension (with proofs) is available from the author upon request.

impressionable types. In particular, a normal type of player 2 can surprise the impressionable type by unexpectedly accepting an offer – i.e. by accepting an offer that an impressionable type would have rejected. The interpretation is that the impressionable type assumes that the accepting party knew something about player 1 that he did not know himself – namely that player 1 was prepared to litigate a low-quality claim – and updates his beliefs concerning player 1 accordingly.

B. Recursive Formulation and Equilibrium Results

The repeated game with reputation building is solved using the dynamic programming approach. We restrict focus to stationary Markov strategies, or those that depend only on the current state of the world. A state is given by a pair $\omega = (R, z) \in \Omega$, where $\Omega = \{S, W\} \times [\underline{z}, \overline{z}]$. A stationary Markov strategy for player 1 consists in the functions $f: \Omega \to (0, \infty)$ and $\lambda: \Omega \to [0,1]$, with values denoted f_ω and λ_ω, respectively. Here f_ω denotes player 1's license fee offer in state ω, while λ_ω gives the probability that player 1 will litigate following a rejection in state ω.[328] A stationary Markov strategy for player 2 is a function $\alpha: \Omega \times (0, \infty)^{\Omega} \to [0,1]$, with values denoted $\alpha_\omega(f)$, which denotes the probability that player 2 will accept the offer f_ω in state ω. Given the way the impressionable type of player 2 is defined, he always plays the strategy $\overline{\alpha}$, which is defined by

$$\overline{\alpha}_\omega(f) = \begin{cases} \mathbf{1}_{\{f_\omega \leq y(z(\omega))\}} & \text{if } R(\omega) = S \text{ or } z(\omega) \leq 0 \\ 0 & \text{if } R(\omega) = W \text{ and } z(\omega) > 0 \end{cases} \tag{1}$$

[328] We need not consider the possibility that f is randomized, because player 2's best response to it will depend only on the realization of f, not on its mixture.

where $\mathbf{1}_{\{\cdot\}}$ denotes the indicator function, and where $R(\omega)$ and $z(\omega)$ denote the R and z components of ω, respectively.

Given that there are no positive reputation effects when $z \leq 0$, the players will play the stage game SPNE strategies in any such period in equilibrium. Thus we can impose $f_\omega = y(z(\omega))$, $\lambda_\omega = 1$ and $\alpha_\omega(f) = \mathbf{1}_{\{f \leq y(z(\omega))\}}$ whenever $z(\omega) \leq 0$. We solve the game by identifying stationary Markov perfect equilibrium (MPE) strategies using a recursive framework. Let $V_\omega(\alpha|\alpha^+)$ denote player 1's maximized expected present discounted value of entering a period with state ω, giventhat: (1) the normal type of player 2, if realized in the present period, will play strategy α; (2) the normal type of player 2, when realized in any subsequent period, will play strategy α^+; and (3) the impressionable type of player 2 will play strategy $\overline{\alpha}$ in any period in which his type is realized. Hence $V_\omega(\alpha|\alpha^+)$ is the expected present discounted value of best-responding to these strategies over time. Letting $a_\omega(f,\lambda,\alpha) \equiv p\overline{\alpha}_\omega(f) + (1-p)\alpha_\omega(f)$ denote the probability that player 2 will accept, given the current state and players' strategies, $V_\omega(\alpha|\alpha^+)$ can be defined via the following Bellman equation:

$$\begin{aligned} V_\omega(\alpha|\alpha^+) \;=\; & \mathbf{1}_{\{z(\omega)\leq 0\}}(y(z(\omega)) + \delta V_{R(\omega)}) \\ & + \mathbf{1}_{\{z(\omega)>0\}} \max_{f,\lambda}\{\, a_\omega(f,\lambda,\alpha)(f_\omega + \delta V_S) \\ & + [1 - a_\omega(f,\lambda,\alpha)](\lambda_\omega(-z(\omega) + \delta V_S) \\ & + (1-\lambda_\omega)\delta V_W)\} \end{aligned} \tag{2}$$

where $V_R \equiv \mathbb{E}_\Phi[V_{(R,z)}(\alpha^+|\alpha^+)]$ denotes the expected value of entering the next period with reputation R for each $R = S, W$, and where $\delta \in (0,1)$ denotes player 1's inter-temporal discount factor. As for the normal type of player 2, his problem is to minimize his expected loss. Thus, his best response function is given by:

$$\alpha_\omega(f, \lambda) = \mathbf{1}_{\{f_\omega \leq \lambda_\omega y(z(\omega))\}} \tag{3}$$

It is easy to use (2) and (3) to define a stationary MPE in the dynamic game. This is given in Definition 1, below.

Definition 1: *A stationary Markov perfect equilibrium of the dynamic game is a profile of stationary Markov strategies* $(f^*, \lambda^*, \alpha^*)$ *such that, for every state* $\omega \in \Omega$*:* (i) *if* $z(\omega) > 0$*, then* f^* *and* λ^* *solve themaximization problem in* (2) *conditional on* $\alpha = \alpha^+ = \alpha^*$*;* (ii) *if* $z(\omega) \leq 0$*, then* $f^*_\omega = y(z(\omega))$ *and* $\lambda^*_\omega = 1$*; and* (iii) α^* *is consistent with* (3) *conditional on* $(f, \lambda) = (f^*, \lambda^*)$.

By inspection of (2) and (3), it is easy to characterize the basic form of equilibrium strategies. Player 1's strategy balances the expected cost of predatory litigation against the discounted incremental value of entering the next period with a strong reputation rather than a weak one. Remark 1 provides a detailed overview of the form of equilibrium strategies.

Remark 1: In any stationary Markov perfect equilibrium, strategies must take the following form:

• Player 1 chooses a litigation threshold $\hat{z} > 0$ and litigates for sure when $z \leq \hat{z}$ and otherwise gives up. More specifically, player 1 sets $\hat{z} = \delta(V_S - V_W) > 0$ and $\lambda_\omega^* = \mathbf{1}_{\{z(\omega) \leq \hat{z}\}}$ for all ω.[329] Additionally, player 1 offers $f_\omega^* = y(z(\omega))$ for all ω.[330]

• Given f^* and λ^*, the normal type's strategy collapses to $\alpha_\omega^* = \lambda_\omega^*$ for all ω, while the impressionable type's strategy collapses to $\overline{\alpha}_\omega = \mathbf{1}_{\{R(\omega)=S \text{ or } z(\omega) \leq 0\}}$ for all ω.

The strategies in Remark 1 generally yield nontrivial dynamics, with player 1 intermittently forfeiting his reputation (when z is sufficiently larger than zero) and rebuilding it (when z is sufficiently low but still positive) over time. When player 1's reputation is weak, he rebuilds it in periods with $z \in (0, \hat{z}]$ by either engaging in predatory patent litigation against an impressionable type (earning a payoff of $-z < 0$), or by having his offer accepted by a normal type (earning payoff $y(z)$). To fully characterize the dynamics, let $\theta_t \in \{\theta_0, \theta_I\}$ denote the realization of player 2's type in period t, where θ_0 and θ_I denote the normal and impressionable types, respectively. Also let $u_{1,t}$ denote the payoff earned by player 1 in period t. Table 1 below describes the equilibrium dynamics by giving the outcome vector $(u_{2,t}, R_{t+1})$ as a function of R_t, z_t and θ_t.

[329] It will be easy to verify that this definition of $\hat{z}$ is indeed positive, reflecting the fact that it is strictly more valuable to have a strong reputation than a weak one.
[330] It is easy to see that this offer is strictly best whenever player 1 actually cares about what offer he makes.

θ_t	$R_t = S$		$R_t = W$		
	$z_t \leq \hat{z}$	$z_t > \hat{z}$	$z_t \leq 0$	$0 < z_t \leq \hat{z}$	$z_t > \hat{z}$
θ^0	$(y(z_t), S)$	$(0, W)$	$(y(z_t), W)$	$(y(z_t), S)$	$(0, W)$
θ^I	$(y(z_t), S)$	$(y(z_t), S)$	$(y(z_t), W)$	$(-z_t, S)$	$(0, W)$

TABLE 4.1: EQUILIBRIUM DYNAMICS

The strategies in Remark 1 can be defined for arbitrary thresholds $\hat{z} > 0$, including those not in the support of Φ.[331] Given any threshold $\hat{z} > 0$, imposing these strategies on the players yields a dynamic program describing the dynamics of the predatory litigation strategy corresponding to $\hat{z}$. Letting $V_\omega^{\hat{z}}$ denote the value function describing the present discounted value of entering a period with state ω, given threshold $\hat{z}$, this program is characterized by the following system of Bellman equations:

$$V_{(S,z)}^{\hat{z}} = \mathbf{1}_{\{z \leq \hat{z}\}}[y(z) + \delta V_S^{\hat{z}}] + \mathbf{1}_{\{z > \hat{z}\}}[p(y(z) + \delta V_S^{\hat{z}}) + (1-p)\delta V_W^{\hat{z}}]$$

$$V_{(W,z)}^{\hat{z}} = \mathbf{1}_{\{z \leq 0\}}[y(z) + \delta V_W^{\hat{z}}] + \mathbf{1}_{\{0 < z \leq \hat{z}\}}[-pz + (1-p)y(z) + \delta V_S^{\hat{z}}] + \mathbf{1}_{\{z > \hat{z}\}}\delta V_W^{\hat{z}} \tag{4}$$

where $V_R^{\hat{z}} = \mathbb{E}_\Phi[V_{(R,z)}^{\hat{z}}]$ for each $R = S, W$. This program describes the dynamics of an equilibrium if and only if the imposed strategies form a MPE. As indicated by Remark 1, this is so when $\hat{z} = \delta(V_S^{\hat{z}} - V_W^{\hat{z}})$. To determine when this condition is satisfied it is necessary to define the expectations

[331] Thresholds $\hat{z} > \overline{z}$ ($\hat{z} < \underline{z}$) correspond to strategies in which player 1 will always (never) litigate following a rejection, given the possible realizations of z.

$V_S^{\hat{z}}$ and $V_W^{\hat{z}}$ expressly. Taking expectations over (4) and grouping terms yields the following Bellman equations:

$$V_S^{\hat{z}} = Y(\underline{z}, \hat{z}) + pY(\hat{z}, \overline{z}) + \delta V_S^{\hat{z}} - \delta(1-p)(1-\Phi(\hat{z}))[V_S^{\hat{z}} - V_W^{\hat{z}}]$$

$$V_W^{\hat{z}} = Y(\underline{z}, 0) + (1-p)Y(0, \hat{z}) - pZ(0, \hat{z}) + \delta V_W^{\hat{z}} + \delta(\Phi(\hat{z}) - \Phi(0))[V_S^{\hat{z}} - V_W^{\hat{z}}] \tag{5}$$

$$\text{where} \quad Y(a,b) \equiv \int_a^b y\,(z)\phi(z)dz, \quad Z(a,b) \equiv \int_a^b z\,\phi(z)dz$$

Thus $pZ(0, \hat{z})$ gives player 1's unconditional expected cost of predatory litigation in a period with $R = W$. Using (5) it is easy to define the function $\pi(\hat{z}) \equiv \delta(V_S^{\hat{z}} - V_W^{\hat{z}})$ explicitly. We refer to $\pi(\hat{z})$ as player 1's *reputation premium*, given threshold $\hat{z}$. Subtracting $V_W^{\hat{z}}$ from $V_S^{\hat{z}}$ and rearranging yields

$$\pi(\hat{z}) = \delta p\left(\frac{Y(0, \overline{z}) + Z(0, \hat{z})}{1 - \delta[p(1-\Phi(\hat{z})) + \Phi(0)]}\right) \tag{6}$$

A stationary MPE is characterized by a fixed point $\hat{z}^* = \pi(\hat{z}^*)$. Importantly, an equilibrium may not involve an interior point $\hat{z}^* \in (\underline{z}, \overline{z})$. For example, it may be that player 1 is willing to pay more than any possible realization of z inorder to maintain a strong reputation, implying $\hat{z}^* \geq \overline{z}$, in which case player 1 would never give up in equilibrium. As such, it will be necessary to extend the domain of π to include all of $\mathbb{R}$. Clearly π is constant when evaluated outside the interior set

$(\underline{z}, \overline{z})$, with $\pi(\hat{z}) = \pi(\underline{z})$ for all $\hat{z} \leq \underline{z}$ and $\pi(\hat{z}) = \pi(\overline{z})$ for all $\hat{z} \geq \overline{z}$. Note also that π is continuous on $\mathbb{R}$, and continuously differentiable everywhere but $\underline{z}$ and $\overline{z}$, which are kink points. Finally, $\pi(\hat{z}) > 0$ for all $\hat{z}$, implying that it is always strictly more valuable to have a strong reputation than a weak one. This reflects the fact that a non-predatory strategy ($\hat{z} = 0$) is never subgame perfect in the dynamic game.

An equilibrium involves predatory litigation if there is a positive probability measure of realizations $z > 0$ at which player 1 strictly prefers to litigate. This is so whenever the equilibrium threshold satisfies $\hat{z}^* > \max\{\underline{z}, 0\}$. In fact, all that is required for this to obtain is that $\underline{z}/\mathbb{E}[y(z)]$ is not too much larger than zero. This is embodied in assumption (A1) below.

$$\frac{\underline{z}}{\mathbb{E}[y(z)]} < \frac{\delta p}{1 - \delta p} \tag{A1}$$

Intuitively, (A1) says that, for predatory litigation to be profitable, there must be some possible predatory suits whose costs are sufficiently low in relation to a defendant's expected litigation injury. Clearly (A1) holds whenever $\underline{z} \leq 0$. When $\underline{z} > 0$, (A1) simply says that $\underline{z} < \pi(\underline{z})$, implying that predatory litigation is strictly optimal in a right-neighborhood of $\underline{z}$. Finally, in establishing the equilibrium result, the following condition will prove invaluable in describing the shape of π.

$$sign\left\{\frac{\partial \pi(z)}{\partial z}\right\} = sign\{\hat{z} - \pi(\hat{z})\} \tag{$\star$}$$

for all $\hat{z} \in (\underline{z}, \overline{z})$. Among other things, condition $(\star)$ establishes that the restriction $\pi|_{(\underline{z},\overline{z})}$ can change from decreasing to increasing (or vice versa) only at a fixed point. Thus, if $\pi|_{(\underline{z},\overline{z})}$ has a fixed point $\hat{z}^*$, then it has a U-shape with a minimum point at $\hat{z}^*$. With this, Proposition 1 establishes this article's primary equilibrium result. Figure 2 below illustrates the equilibrium result for the interior case $\hat{z}^* \in (\underline{z}, \overline{z})$ with $\underline{z} < 0$.

Proposition 1: *There exists a unique stationary Markov perfect equilibrium of the dynamic game, and it involves predatory litigation if and only if* (A1) *holds.*

Proof: Appendix.

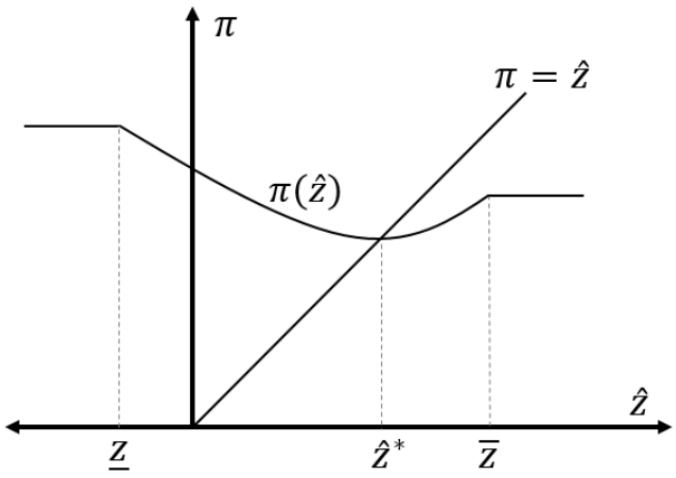

FIGURE 4.2: INTERIOR EQUILIBRIUM

The comparative statics are intuitive. π shifts upward in response to an increase in either $Y(0, \overline{z})$, δ, or p, implying that $\hat{z}^*$ is increasing in each of these parameters. This is not surprising,

because a strong reputation is relatively more valuable when either: (a) player 2's litigation injuries are larger, enabling player 1 to extract larger settlements; (b) player 1 is more patient, implying player 1 is willing to incur a larger loss for a stronger reputation; or (c) there are more impressionable agents, in which case player 1 will lose a strong reputation less frequently.

III. EXAMPLE AND APPLICATIONS

The equilibrium condition embodied in (6) is relatively simple, and can engender closed form solutions through simple specifications of the model's terms. Example 1 gives a closed form solution based on an assumption that z is uniformly distributed. The subsections that follow extend the model to address some potential mechanisms for deterring predatory patent litigation.

Example. Suppose z is uniformly distributed on $[\underline{z}, \overline{z}]$, with $\underline{z} \geq 0$ and $\overline{z} - \underline{z} = 1$. Thus $Y(0, \overline{z}) = \mathbb{E}[y(z)]$, and $Z(0, \hat{z}) = (\hat{z}^2 - \underline{z}^2)/2$ for all $\hat{z} \in [\underline{z}, \overline{z}]$. The reputation premium is therefore given by

$$\pi(\hat{z}) = \delta p \frac{\mathbb{E}[y(z)] + \frac{1}{2}(\hat{z}^2 - \underline{z}^2)}{1 - \delta p(\overline{z} - \hat{z})}$$

Solving the equilibrium condition $\pi(\hat{z}) = \hat{z}$ yields a quadratic equation with at most one nonnegative solution, $\hat{z}^*$, which is given by

$$\hat{z}^* = \left[\left(\frac{1-\delta p\overline{z}}{\delta p}\right)^2 + 2\mathbb{E}[y(z)] - \underline{z}^2\right]^{1/2} - \frac{1-\delta p\overline{z}}{\delta p}$$

This can easily be used to determine when an interior equilibrium exists, i.e. when $\hat{z}^* \in (\underline{z}, \hat{z})$. For example, if $\underline{z} = 0$ and $\overline{z} = 1$, then it is easy to verify that an interior equilibrium exists whenever $\mathbb{E}[y(z)] < (2-\delta p)/2\delta p$.

A. Fee Shifting

One measure often proposed to combat frivolous patent litigation is the expanded use of fee shifting, which is rule under which a losing party may be made to pay the prevailing party's attorney's fees after trial. While §85 of the Patent Act expressly permits fee shifting in "exceptional cases," this provision was historically interpreted narrowly, and as a consequence it was very rarely invoked.[332] However, a recent Supreme Court decision relaxed the standard for shifting fees, holding that "an 'exceptional case' is simply one that stands out from the others with respect to the substantive strength of a party's litigating position."[333] Additionally, some recently proposed bills, such as the Innovation Act, would create a new statutory basis for expanded fee shifting.[334]

These measures would provide broader discretion for the courts to shift attorney's fees when a litigant's position seems particularly weak. It is fairly straightforward to show that fee

[332] The previous approach was to deem a case "exceptional" only if it is "objectively baseless" or involves "material inappropriate conduct." *See Brooks Furniture Mfg., Inc. v. Dutailier Intâ€™l, Inc.*, 393 F. 3d 1378 (Fed. Cir. 2005).
[333] See *Octane Fitness, LLC v. Icon Health & Fitness, Inc.*, 572 US __ (2014)
[334] The proposed Innovation Act is codified in H.R. 3309.

shifting will tend to mitigate predatory litigation. The effect is twofold. First, the equilibrium predatory litigation threshold $\hat{z}^*$ declines. Second, even when a threat of predatory litigation remains credible, the license fee a PAE can extract is smaller. To verify these results, suppose that z and $y(z)$ can be decomposed as follows:

$$z = c_p - w_z m, \quad y(z) = c_d + w_z m \tag{9}$$

This simple specification assumes that the quality of a claim is captured entirely by the probability of winning (i.e. expected damages and litigation costs are constant over lawsuits). Here w_z denotes the probability of winning a suit characterized by z; this probability is strictly falling in z and satisfies $c_p - w_{\bar{z}} m > 0$. Further, $c_p > 0$ and $c_d > 0$ denote the expected attorney's fees for a plaintiff and defendant in a patent suit, respectively. Finally, $m > 0$ denotes the expected damages award a plaintiff will receive, conditional on winning. Under a fee shifting rule that always forces a loser (which could be either party) to pay the other party's fees, player 1's expected litigation injury becomes $z + \sigma_z$ for every realization of z, where $\sigma_z \equiv (1 - w_z)c_d - w_z c_p$ denotes the net expected fee shifting payment that player 1 will have to make to player 2. Thus player 2's expected litigation injury becomes $y(z) - \sigma_z$. We assume that fee shifting benefits the defendant in expectation whenever a claim is of low quality – specifically, $\sigma_z > 0$ whenever $z > 0$.

That licensing settlements fall in periods with $z > 0$ is obvious, because player 1 can now demand only $y(z) - \sigma_z$. To show that $\hat{z}^*$ falls under a fee shifting rule, it suffices to show that the

reputation premium function shifts downward. To see this, define $Y_\sigma(a,b) = \int_a^b (y(z) - \sigma_z)\phi(z)dz$ and $Z_\sigma(a,b) = \int_a^b (z + \sigma_z)\phi(z)dz$ for all a, b. Clearly $Y_\sigma(a,b) < Y(a,b)$ and $Z_\sigma(a,b) > Z(a,b)$ for all $a, b \geq 0$ such that $\Phi(b) > \Phi(a)$. However, because g_z is just a transfer, it follows that $Y_\sigma(a,b) + Z_\sigma(a,b) = Y(a,b) + Z(a,b)$ for all a, b. Letting π_σ denote the reputation premium function under a fee shifting rule, this implies

$$\begin{aligned}
\pi_\sigma(\hat{z}) &= \delta p\left(\frac{Y_\sigma(0,\overline{z}) + Z_\sigma(0,\hat{z})}{1 - \delta[p(1 - \Phi(\hat{z})) + \Phi(0)]}\right) \\
&= \delta p\left(\frac{Y(0,\hat{z}) + Z(0,\hat{z}) + Y_\sigma(\hat{z},\overline{z})}{1 - \delta[p(1 - \Phi(\hat{z})) + \Phi(0)]}\right) \\
&< \delta p \frac{Y(0,\hat{z}) + Z(0,\hat{z}) + Y(\hat{z},\overline{z})}{1 - \delta[p(1 - \Phi(\hat{z})) + \Phi(0)]} \\
&= \pi(\hat{z})
\end{aligned}$$

for all $\hat{z}$ such that $\overline{z} > \hat{z} > \max\{\underline{z}, 0\}$. Thus the last section's results imply that π_σ has a lower fixed point than π (strictly lower if π's fixed point is interior), and thus the equilibrium predatory litigation threshold $\hat{z}^*$ is lower under a fee shifting rule. However, fee shifting will not necessarily *eliminate* predatory litigation. By analogy to condition (A1), the equilibrium will still involve predatory patent litigation if $\underline{z}/\mathbb{E}[y(z) - \sigma_z]$ is not too much larger than zero.

Notwithstanding this result, there is reason to doubt that fee shifting will render predatory patent litigation unprofitable. In particular, a PAE may still be able to garner significant licensing settlements, even if the probability of winning the suit is quite low. The reason is that litigation

may be very harmful to a business – particularly a small firm or startup – even if its attorney's fees are ultimately recouped post-suit. Litigation may frequently impose some *ancillary harms* – costs associated with diverting time and resources toward litigation and away from the business. For example, litigation costs may force a company to divert management's attention away from business operations, scale back production, take out loans, fire employees, lose out on investors who are wary of the impending lawsuit, or even file for bankruptcy. Feldman (2013) provides survey evidence describing many such effects of PAE litigation on small businesses.

Consequently, the specification of $y(z)$ given in (7) probably does not capture the full story, because it suggests that an equilibrium licensing settlement under fee shifting ($y(z) - \sigma_z$) is close to zero when player 1's probability of winning a suitis very small. Instead, suppose that player 2's litigation injury is given by $y(z) = c_d + \eta(c_d/W) + w_z m$, where $\eta(c_d/W)$ denotes the ancillary harm imposed by litigation. Here W denotes the wealth of the firm, and η is a strictly increasing function with $\eta(0) = 0$.

Intuitively, this reflects that an ancillary litigation injury is large if litigation costs are high in relation to the wealth of the firm, but are probably low if the firm has plenty of money to finance litigation without compromising its business operations. Importantly, a fee shifting rule will not reimburse ancillary litigation costs, and thus $y(z) - \sigma_z \geq \eta(c_p/W)$ for all z. Thus, a PAE can work around a fee shifting rule by simply targeting small or vulnerable firms for whom litigation imposes significant costs in excess of attorney's fees. However, as the next section demonstrates, potential PAE targets could overcome this problem by working together.

B. Litigation Cost-Sharing Agreements

Although fee shifting is unlikely to adequately deter predatory patent litigation, potential defendants can likely accomplish this through collective action. In particular, potential defendants can form a *litigation cost-sharing agreement* (LCSA), which I define as a contractual arrangement such that, when a member is sued for patent infringement, all members jointly pay its attorney's fees as they arise, provided that (1) the infringement claim exhibits some pre-specified characteristics aimed at identifying predatory suits, or it is deemed to be of sufficiently low merit by an impartial attorney or arbitrator hired by the LCSA;[335] but where (2) the sued member must reimburse some or all of the other members' fee contributions if it settles or loses the case. Under an LCSA, a plaintiff is much less threatened by a predatory suit, because it internalizes only a small fraction of the litigation costs. This prevents a PAE from extracting the large ancillary harms that a small defendant would incur if it had to finance litigation on its own. For example, if the LCSA has $M \geq 2$ members, then the ancillary harm imposed by litigation falls from $\eta(c_d/W)$ to $\eta(c_d/MW)$, which significantly reduces the advantage of suing a small defendant.

One potential concern is that LCSAs might arouse antitrust scrutiny. Plaintiffs might allege that an LCSA constitutes a group boycott, i.e. a concerted refusal to pay license fees. However, as defined, an LCSA includes safeguards intended to limit its scope to predatory litigation, and this will likely allay antitrust concerns. As Hovenkamp, Janis and Lemley (2010) note, agreements

[335] The requirement that the suit must be of sufficiently low quality prevents a potentially serious moral hazard problem, namely that members might start willfully infringing strong patents because they will not have to fully pay their litigation costs.

formed in anticipation of litigation are generally lawful if formed in good faith – i.e. if the parties have an objectively reasonable anticipation of defeating the claim.

IV. WELFARE IMPLICATIONS AND CONCLUDING REMARKS

This article demonstrates that a PAE may earn substantial profits even if its infringement claims generally have very little merit and are unlikely to yield a profit if litigated. By nevertheless litigating these claims, the PAE gains a reputation for following through on its threats, allowing it to secure higher license fees from other potential defendants. This explains why some PAEs seem to be quite successful, despite asserting mostly bad patents and pursuing seemingly hopeless litigation. It also explains why it may often be rational for a targeted firm to pay off a PAE, even if its infringement claim seems unwinnable.

The arguments generally used to defend the PAE business model do not hold up when licensing is achieved through predatory patent litigation. These arguments typically surround a PAE's potential to create a more efficient market, both by encouraging innovation by small inventors who lack the means to assert their own rights, and by increasing liquidity in the market for patents and licensing rights. But predatory PAE conduct does not create such efficiencies. First, predatory patent litigation is unnecessary to monetize strong patents; it creates no heightened incentive to develop inventions that legitimately merit legal protection. If a patent should not have been granted, then welfare is highest when no potential users are made to pay license fees, as this promotes competition without raising costs, and reduces the risks faced by entrepreneurs. That such patents might be licensed or enforced more actively in the hands of a PAE does not suggest

society is better off. Indeed, making a market more liquid or active is not a victory for consumers if none of them should actually have to pay for what they are getting.

Additionally, by its nature, predatory patent litigation typically involves no promulgation of new ideas. A predatory PAE does not seek out *potential* users for arm's length licensing transactions. Rather, predatory patent litigation involves a wait and sue approach to patent ownership: the PAE sits on its rights, looks for firms that have independently invented technologies arguably within the claims of its patents, and then aggressively asserts its patents. This is starkly different from the sort of trade that occurs in a conventional market. Each "buyer" creates something for himself, only to discover that some other party claims the rights to it. As noted in Hovenkamp (2015), even if the patent is strong, this is clearly never the best way for licensing to occur. The licensee could have benefitted from the knowledge embodied in the patent, as it could have avoided redundant development costs or potentially devised a better technology by taking advantage of the patentee's insights. Further, the wait and sue approach creates a serious allocation problem, as the parties who end up licensing are the ones who proved least dependent on the patentee's discovery, given that they reached the same or similar conclusions on their own. If there are other potential users who are incapable of independent invention, the wait and sue approach deprives them of any potential benefits of using the patented technology.

A further problem with predatory patent litigation is that it undermines the connection between patent quality and patent value. Ideally, most bad patents would not be worth buying or asserting, and thus the market would render them benign. This would insure the public against many errors or oversights by the Patent Office. But predatory patent litigation creates a market for

low quality patents that would preferably lay dormant. This exacerbates the “patent thicket" problem, which Shapiro (2000) described as “a dense web of overlapping intellectual property rights" that frustrates entrepreneurs’ attempts to bring their ideas to market. This makes the competitive environment more risky and expensive for producers and innovators, and thereby thwarts the patent system’s principal objective of promoting the development of new ideas.

To combat predatory patent litigation, a fee shifting rule will help, but it is unlikely to solve the problem. The practice will likely remain profitable when a PAE’s patents can be targeted against small firms or startups for whom litigation will be crippling even when attorney’s fees are later recouped. Potential targets of predatory litigation could better protect themselves by forming a litigation cost-sharing agreement in which all participants contribute to one member’s costs of defending against a low quality infringement claim. This lessens the ancillary harms imposed by costly litigation. And, if properly limited in scope, it will not discourage meritorious infringement claims or arouse antitrust concerns.

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APPENDICES

I. APPENDIX FOR CHAPTER 1

TABLE A1.1: CONSOLIDATED SETTLEMENT AGREEMENTS

(CSAs in bold are those in which we infer reverse settlement)

CSA* (Settlement date; proprietary drug) * Bold font reflects inference of potential reverse settlement	**Settled Post-Institution?** (Institution date)	**Parallel district court litigation?**[336]	**Petitioner filed ANDA?**	**Petitioner in Orange Book?**	**Anticipated Entry Date listed in AAFTG?**
Apotex Corp. v. Alcon Pharmaceuticals Ltd. (11/15/2013; Moxeza & Vigamox)	Yes (3/19/2013)	Yes	Yes	No	March 2020
Ranbaxy vs Vertex Pharmaceuticals (11/15/2013; Lexiva)	Yes (3/5/2013)	Yes	Yes	No	No
Apotex Corp. v. Alcon Research, Ltd. (7/21/2014; Travatan Z)	Yes (1/2/2014)	No	Yes	Yes	Oct. 2029
Impax Laboratories v. Meda Pharmaceuticals (7/29/2014; Astepro)	Yes (7/29/2014)	Yes	Yes	Yes (but as Perigo[337])	No
PACK Pharmaceuticals v. Alza Corporation (9/8/2014; Glucotrol XL)	No	Yes	Yes	No	No
CSA* (Settlement date; proprietary drug) * Bold font reflects inference of potential reverse settlement	**Settled Post-Institution?** (Institution date)	**Parallel district court litigation?**[338]	**Petitioner filed ANDA?**	**Petitioner in Orange Book?**	**Anticipated Entry Date listed in AAFTG?**
Metrics, Inc. v. Senju Pharmaceutical Co. Ltd. (7/8/2015; Prolensa)	Yes (2/19/2015)	Yes	Yes	No	No
Antares Pharma, Inc. v. Medac (4/30/2015; Rasuvo)	Yes (1/6/2015)	Yes	Yes	Maybe (Otrexup)	No
Agila Specialities Inc. v. Cubist Pharmaceuticals (4/28/2015; Cubicin)	No	Yes, but before PTAB	Yes	No	No

[336] This column addresses specifically parallel litigation between *the same parties*, i.e. it does not address for infringement litigation in which the defendant is someone other than the PTAB petitioner.
[337] Perigo is listed, and it appears to be in a parent-subsidiary relationship with the petitioner.
[338] This column addresses specifically parallel litigation between *the same parties*, i.e. it does not address for infringement litigation in which the defendant is someone other than the PTAB petitioner.

Ranbaxy, Inc. v. Adamas Pharmaceuticals (5/15/2015; Namenda Xr &Namzaric)	No	Yes	Yes	No	No
Agila Specialities Inc. v. Cephalon, Inc. (11/16/2015; Treanda)	Yes (7/20/2015)	Yes	Yes	No	No
Mylan Pharmaceuticals v. Warner Chilcott (8/20/2015; Loestrin & Minastrin)	No	Yes	Yes	No	Feb. 2029 (Loestrin); Mar. 2017 (Minastrin)
Dr. Reddy's Laboratories v. Fresenius Kabi USA (4/2/2015; Diprivan)	No	Yes	Yes	No	No
Apotex Corp. v. Allergan, Inc. (12/16/2015; Restasis)	No	Yes	Yes	No	No
Dr. Reddy's Laboratories v. Helsinn Healthcare (10/14/2015; Aloxi)	No	Yes	Yes	Yes	Sept. 2018
Accord Healthcare Inc. v. Helsinn Healthcare (8/31/2016; Aloxi)	No	Yes	Yes	No	No
Ranbaxy, Inc. v. Jazz Pharmaceutical, Inc. (5/23/2016; Xyrem)	Yes (4/12/2016) in one IPR; not in the other IPR	Yes	Yes	No	No
Par Pharmaceutical, Inc. v. Novartis AG (4/1/2016; Afinitor)	No	Yes	Yes	No	No
Mylan Pharmaceuticals Baxter International (11/19/2015; Esmolol and Brevibloc)	No	Yes	Yes	Yes	No
Mylan Pharmaceuticals v. Senju Pharmaceutical (8/31/2016; Bepreve)	No	No	Unknown	No	No

TABLE A12: REGRESSION ANALYSIS

	(1) Linear	(2) Probit
Settlement		
Time to Expiration	0.001*	0.004
	(1.99)	(1.34)
Instituted	-0.169*	-0.864*
	(-2.33)	(-2.14)
Number of Words	-0.003	-0.013
	(-1.20)	(-0.81)
Number of Figures	-0.010**	-0.086**
	(-3.32)	(-2.89)
Number of Claims	0.003***	0.014***
	(3.84)	(3.68)
Number of References	-0.000	-0.001
	(-1.04)	(-1.30)
Cited By	-0.001**	-0.023*
	(-2.78)	(-2.16)
Constant	1.049***	-1.052
	(8.12)	(-1.33)
Observations	155	152
Year Fixed Effect	Yes	Yes

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

II. APPENDIX FOR CHAPTER 2

A. GENERALIZED MODEL

This section analyzes a more general model of negotiation and litigation in the presence of antitrust inalienability. This allows for a very broad understanding of precisely how antitrust alienability serves to distort private behavior and the allocation of rights. The setup is the same as

in the numerical example: there is one patent holder (P), and a potential entrant (D) who wants to enter the market, but cannot do so without either obtaining a license or establishing that the patent is invalidor uninfringed. The only difference here is that we do not assign specific numerical values to the relevant variables. By allowing these parameter values to vary, we can compare a range of different possible outcomes.

$\pi^m > 0$ denotes the monopoly profit level, while $\pi^d > 0$ denotes the (per-firm) duopoly profit. We assume that monopoly profits exceed total profits under duopoly, so that $\pi^m = 2\pi^d + \mu$, where $\mu > 0$ denotes the monopoly rents that would be destroyed by duopoly competition. c denotes the cost of litigation faced by each party, while f and r denote a license fee offer and reverse payment offer, respectively. The probability that P will win in litigation is $w \in [0,1]$. We assume that $c < \pi^d$, which ensures that D may earn a positive expected payoff from litigation, provided that w is not too large. As in the numerical example, an ex-ante reverse payment is deemed lawful if and only if is weakly lower than P's litigation costs, i.e. if and only if $r \leq c$.

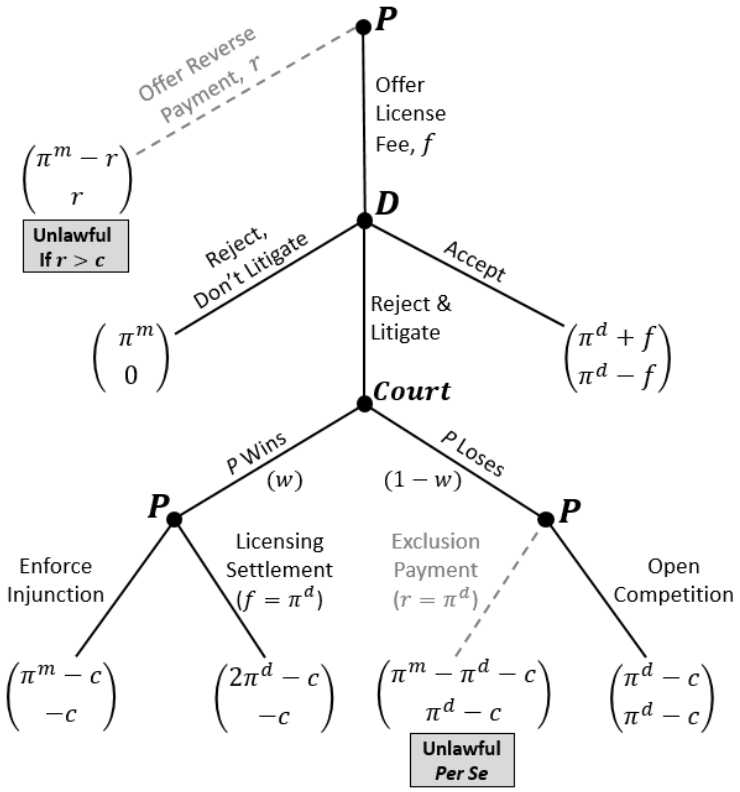

FIGURE A2.1: GAME TREE

Figure 1 shows the game tree for this extended form game; this is just an explicit rendering of the game underpinning the numerical example. Payoffs are given in the parentheses, with *P*'s payoff on top and *D*'s payoff on bottom. Agreements that may violate the antitrust laws are distinguished with grayed text and dotted lines. The game allows for the parties to negotiate around a given litigation outcome – e.g. to agree to license after*P* wins and *D* is enjoined – with the exception that, if *P* loses, then they cannot bargain around this through a reverse payment that keeps *D* out of the market, as this would be per se illegal. (For the sake of completeness, the tree still shows what the optimal such agreement would be.)

Note that, if P wanted to agree on licensing after winning in court, $f = \pi^d$ would be its uniquely best fee to offer (since D would not pay more), so this amount is simply imposed by default. Note that I have omitted D's accept/reject decision for the case where P offers an ex ante reverse payment, which helps to keep the game tree somewhat simpler.

Solving the game for a subgame perfect Nash equilibrium (SPNE) is straightforward. We begin by ignoring the possibility of a lawful ex ante reverse payment, and come back to this later. Note that, if P wins, it always does better by enforcing the injunction; similarly, since an exclusionary agreement is unlawful if P loses, a loss by P will always result in open competition between the parties.

With this, it is easy to compute expected payoffs from litigation. They are $\pi^d - c + w(\pi^d + \mu)$ for P, and $(1-w)\pi^d - c$ for D. This implies that D gets a positive expected value from litigation if and only if $w < \widetilde{w}$, where $\widetilde{w} \equiv (\pi^d - c)/\pi^d$. Intuitively, if P's probability of winning is not too high, then D has a good chance of earning payoff $\pi^d - c$ by litigating. Since competition erodes joint profits, it is obvious that P would never agree to ex ante licensing if it did not expect D to litigate. Thus, if $w \geq \widetilde{w}$, P will offer an unacceptable amount (e.g. $f = \infty$) and D will optimally abstain from litigation, ending the game.

Suppose that $w < \widetilde{w}$. Then we know that D will litigate if no ex ante agreement is reached. Let f_w denote the largest license fee offer that D would accept in this case. Solving $\pi^d - f_w = (1-w)\pi^d - c$ yields the solution $f_w = w\pi^d + c$. It is easy to verify that P prefers licensing (with

fee f_w) to litigation if and only if $w \leq \widehat{w} \equiv 2c/\mu$. Intuitively, if $w \leq \widehat{w}$, then $w\mu \leq 2c$, which says that total litigation costs ($2c$) exceed the expected monopoly rents that will be preserved by litigation ($w\mu$). By contrast, litigation provides larger joint profits than licensing when $w > \widehat{w}$.

Of course, it is easy to see that the parties' ideal choice would always be to strike a reverse payment settlement in advance of litigation. If litigation gives D a positive expected payoff (i.e. if $w < \widetilde{w}$), then the lowest reverse payment D would accept is $r_w \equiv (1-w)\pi^d - c$. This gives D the same payoff it expects to get from litigation, while still preserving the monopoly rent μ; if not for the antitrust laws, the parties would always settle ex ante with a reverse payment of r_w. However, in light of the antitrust laws, such a settlement is lawful if and only if $r_w < c$, which is true if and only if $w \geq w^r$, where $w^r \equiv (\pi^d - 2c)/\pi^d$. (Note that $w^r < \widetilde{w}$ for all parameter values.) The intuition is that, if w is sufficiently large, then D's expected payoff from litigation will be smaller than c, in which case the parties can mutually agree to a lawful reverse payment.

Note that, while we know $w^r < \widetilde{w}$, we cannot say anything about the magnitude of $\widehat{w}$ relative to $\widetilde{w}$ or w^r. This comparison is critical to determining how the equilibrium plays out. In particular, the SPNE path will take one of four forms, depending on the parameter values. These are given below.

Equilibrium Possibility #1 (Status Quo). If $w \geq \widetilde{w}$, then P refuses to offer anything (including a reverse payment), and D chooses not to litigate, resulting in final payoffs of π^m and 0 for P and

D, respectively. Thus the parties remain at the status quo: P has an exclusive right to use the patented invention, and it does not pay any money to D.

Equilibrium Possibility #2 (Lawful Reverse Payment). If $w^r \leq w < \widetilde{w}$, then P offers reverse payment r_w in advance of litigation, which is lawful ($r_w \leq c$). D accepts this, and the settlement generates final payoffs of $\pi^m - r_w$ and r_w for P and D, respectively.

Equilibrium Possibility #3 (Litigation). If $\widehat{w} < w < w^r < \widetilde{w}$, then there is no ex ante settlement that is both lawful and mutually-beneficial. Thus the parties will litigate. If P wins, it will enforce the injunction; if P loses, they cannot lawfully reach an agreement that excludes D, and thus the parties will compete. Expected final payoffs are thus $\pi^d - c + w(\pi^d + \mu)$ for P and $(1 - w)\pi^d - c$ for D.

Equilibrium Possibility #4 (Licensing). If $w \leq \min\{\widehat{w}, w^r\} < \widetilde{w}$, then the parties will reach an ex ante licensing settlement at fee f_w, resulting in final payoffs of $\pi^d + f_w$ and $\pi^d - f_w$ for P and D, respectively.

Importantly, in a traditional Coasean framework, i.e. without legal restraints on alienability, there would never be four distinct kinds of equilibria. The parties would always settle ex ante, or else the equilibrium would be to remain at the status quo, and thus litigation will never occur and the final allocation will always be that which maximizes the joint welfare of the parties.

Further, any litigation outcome deviating from that allocation would be bargained-around, so that all possible resolutions of the game lead to the same allocation.

B. Royalty-Based Competition Under Bertrand Competition

The foregoing analysis has assumed that licensing is financed through lump sum fees, which do not distort prices or output. But royalties (fees based on output or revenue) raise prices by distorting marginal costs or revenues. This can raise joint profits, and thus in principle a royalty deal could be sufficiently profitable (for each firm) to be a viable settlement format. But this is not so. As this section shows, unless the firms collude on price (which is unlawful and unstable), the generic firm will end up without any profits in equilibrium. As such, the firms will never adopt a royalty-based licensing settlement. The assumption that drives this result is that competition is Bertrand, meaning that the firms' products are fungible and the lower-pricing firm can capture the market by setting a lower price than its rival. This is a realistic assumption to make about high-stakes drug markets, since a branded drug and generic equivalent are essentially identical. And, if the branded drug is expensive, the generic firm can likely capture the market by offering a better price. This will tend to induce a price war that culminates in prices at or near marginal cost, which is a hallmark of Bertrand competition. These results explain why drug patent settlements between drug monopolists and generic challengers almost never implement ordinary licensing deals that do not involve any delay period or constraints on competitive behavior.

There are two competing firms, 1 and 2. Firm 1 is a patent holder is a patent holder who licenses to firm 2. The agreement stipulates some royalty α. We will consider two kinds of

royalties – a per-unit fee and a percentage of revenues. The results hold in both cases, and for all values of α, so we need not model the choice of the royalty. Competition is Bertrand: the lower-pricing firm captures the market, and demand is split equally between the firms if they set equal prices. Each firm has a constant marginal production cost of $k \geq 0$. Let $Q(p)$ denote market demand as a function of price p, where Q is a decreasing function such that $Q(p) > 0$ if and only if $p \in [0, p^0)$ for some $p^0 > k$. We know from ordinary Bertrand duopoly models with constant, asymmetric marginal costs that the equilibrium prices will be symmetric and equal to the cost-level of the less efficient firm, analogous to limit pricing. To establish that point here, however, we must rule out the possibility that the equilibrium involves firm 1 sitting out of the market and charging royalties, which would allow both firms to make money without having to compete.

First, let $\alpha > 0$ be a per-unit royalty such that $\alpha + k < p^0$. Fix some $p < p^0$ and suppose that $p_1 = p_2 = p$, where p_i is the price chosen by firm i. Then firm 2's profits are equal to $\pi_2 = (1/2)Q(p)[p - k - \alpha]$. By cutting price slightly below p, firm 2's profits can be arbitrarily close to $Q(p)[p - k - \alpha]$. Thus firm 2 will cut price if and only if $p > k + \alpha$. Suppose instead that firm 1 sits out of the market and simply collects royalties. Then $p_1 > p_2$, where we assume $p_2 < p^0$. Firm 1's payoff is simply its royalty receipts, so $\pi_1 = \alpha Q(p_2)$. If it decides instead to enter and capture the market by setting its price slightly below p_2, its payoff approaches $Q(p_2)[p_2 - k]$, which is an improvement if and only if $p_2 > k + \alpha$. As such, we know that at least one firm has an incentive to cut price whenever the market price exceeds $k + \alpha$. Thus the Nash equilibrium is $p_1^* = p_2^* = k + \alpha$. This gives firm 1 a positive profit, but firm 2's profit is zero.

Now suppose that firm 1's licensing receipts are equal to a fraction α of firm 2's revenues, where $0 < \alpha < 1$. Consider the case $p_1 = p_2 = p$ for some $p < p^0$. Firm 2's payoff is $\pi_2 = (1/2)Q(p)[(1-\alpha)p - k]$. By cutting price slightly, its payoff would approach $Q(p)[(1-\alpha)p - k]$, which is an improvement if and only if $p > k/(1-\alpha)$. For the second case, suppose that firm 1 sits out, so $p_2 < p_1$ and $p_2 < p^0$. Then firm 1's payoff is $\alpha p_2 Q(p_2)$. If it cuts its price to make it slightly lower than p_2, it can earn a payoff that is arbitrarily close to $Q(p_2)[p_2 - k]$, which is an improvement if $p_2 > k/(1-\alpha)$. Thus, whenever the market price is above $k/(1-\alpha)$, someone wants to cut price. Therefore, the Nash Equilibrium is $p_1^* = p_2^* = k/(1-\alpha)$. As before, firm 1 earns a positive profit, but firm 2 does not.

These results show that firm 2 would never agree to a royalty-based licensing settlement unless the firms could somehow collude to keep prices high which, like reverse settlement, is subject to antitrust restrictions. It is thus not surprising that, in practice, drug monopolists and generic challengers do not enter into ordinary licensing settlements. Of course, we know that brands often charge slightly more than generics, reflecting some degree of brand loyalty. For example, Bayer might cost $4 dollars a bottle, while generic aspirin costs $2. But the focus in this section is on patented drugs whose monopoly price is very high. For example, suppose that a patented cancer drug costs $4000 per dose. Then patients will have a strong interest in finding a less expensive alternative. If a generic set a price of $2,000 per dose for an equivalent drug, it would surely capture the market.

III. APPENDIX FOR CHAPTER 4

Proposition 1: *There exists a unique stationary Markov perfect equilibrium of the dynamic game, and it involves predatory litigation if and only if* (A1) *holds.*

Proof: We begin by detailing a few properties of π. It is clearly continuous, and it is constant when evaluated outside the interior set $(\underline{z}, \overline{z})$. Additionally, $(\star)$ implies that the restriction $\pi|_{(\underline{z},\overline{z})}$ is strictly decreasing(increasing) when strictly above (below) the 45-degree line. Thus, if $\pi|_{(\underline{z},\overline{z})}$ has a fixed point $\hat{z}^*$, then it has a U-shape with a minimum point at $\hat{z}^*$. Additionally, it is easy to establish that π cannot cross (or simply touch) the 45-degree line at any $\hat{z} \in \mathbb{R}$. To verify this, first note the obvious fact that a differentiable function can cross (or simply touch) the 45-degree line from below at a given point only if the slope at that point is weakly greater than 1. Thus $\mathbb{P}i$ cannot cross the 45-degree line from below on $(-\infty, \underline{z})$ or $(\overline{z}, \infty)$, since it is differentiable with slope 0 over these ranges. This also rules out the possibility that π crosses from below at any point in the interior set $(\underline{z}, \overline{z})$,because $(\star)$ establishes that π has slope zero at any such intersections. Additionally, π cannot hit the 45-degree line from below at $\underline{z}$, as it is continuous and initially lies above the 45-line (because $\pi(\hat{z}) > \hat{z}$ for all negative $\hat{z}$). The final possibility is that π hits the 45-degree line from below at $\overline{z}$. To rule this out, it is easy to verify that $\partial\pi(\hat{z})/\partial\hat{z} < H \cdot |\hat{z} - \pi(\hat{z})|$ for all $\hat{z} \in (\underline{z}, \hat{z})$, where

$$H \equiv \frac{\delta p}{1-\delta} \sup_z \phi\,(z) > 0$$

The assumptions on ϕ ensure that H is well defined and finite. Thus there exists $\Delta > 0$ such that $\partial\pi(\hat{z})/\partial\hat{z} < 1$ whenever $\hat{z} - \pi(\hat{z}) < \Delta$. If in fact π hits the 45-degree line from below

at $\overline{z}$, then continuity implies that there exists $\varepsilon > 0$ such that $\hat{z} - \pi(\hat{z}) \in (0, \Delta)$ for all $\hat{z} \in (\overline{z} - \varepsilon, \overline{z})$. But then the difference $\hat{z} - \pi(\hat{z})$ is positive and strictly increasing over $(\overline{z} - \varepsilon_1, \overline{z})$, and thus π is actually divergingfrom the 45-degree line from below (although still increasing) over this range. Thus, as $\hat{z}$ approaches $\overline{z}$, π must converge to a point strictly below the 45-degree line, which contradicts $\pi(\overline{z}) = \overline{z}$. Thus π cannot cross or touch the 45-degree line from below at any point in $\mathbb{R}$.

Establishing existence of a stationary MPE is trivial, because $\pi(\hat{z}) \in (0, M]$ for all $\hat{z}$, where $M \equiv \max_{\hat{z} \in [\underline{z}, \hat{z}]} \pi(\hat{z}) \in (0, \infty)$. Thus π must hit the 45-degree line at some point in $(0, M]$. As such, there must exist a stationary MPE characterized by some $\hat{z}^* > 0$, regardless of whether (A1) holds. To establish uniqueness, there are two cases to consider. For case 1, suppose that (A1) holds. This implies that $\pi(\underline{z}) > \underline{z}$, because the righthand side of (A1) is equal to $\pi(\underline{z})$ when $\underline{z} \geq 0$, and the positivity of π ensures that $\pi(l) > \underline{z}$ whenever $\underline{z} \leq 0$. Given this, consider the two possibilities $\pi(\overline{z}) < \overline{z}$ and $\pi(\overline{z}) \geq \overline{z}$. If $\pi(\overline{z}) < \overline{z}$, then $\pi(\underline{z}) > \underline{z}$ implies π must cross the 45-degree line from above at some $\hat{z}^* \in (\underline{z}, \overline{z})$. There can be onlyone such fixed point, because π cannot cross the 45-degree line from below, which also implies that there is no fixed point larger than $\hat{z}^*$. Additionally there are no fixed points lower than $\underline{z}$, because $\pi(\hat{z}) = \pi(\underline{z}) > \underline{z} \geq \hat{z}$ for all $\hat{z} \leq \underline{z}$. Thus $\hat{z}$ is unique, and satisfies $\hat{z} > \max\{\underline{z}, 0\}$. Alternatively, if $\pi(\overline{z}) \geq \overline{z}$, then it must be that $\pi|_{[-\infty, \hat{z})}$ lies strictly above the 45-degree line, given that π cannot cross or touch the 45-degree line from below. Thus there are no fixed points strictly lower than $\overline{z}$. Additionally, there must be a unique fixed point $\hat{z}^* \in [\overline{z}, \infty)$, because π is constant (and initially (weakly) above the 45-degree line) over this range. Thus there is again a unique fixed point with $\hat{z}^* \max\{\underline{z}, 0\}$.

For case 2, suppose that (A1) fails. Then $\underline{z} > 0$ and π lies weakly below the 45-degree line at $\underline{z}$. Given that $\pi(\hat{z}) = \pi(\underline{z}) > 0 \geq \hat{z}$ for all $\hat{z} \leq 0$, this implies that π must intersect the 45-degree line at a point $\hat{z}^* \in (-\infty, \underline{z}]$. This is the only fixed point in that range, because π is constant over that interval. Additionally, there can be no fixed points strictly larger than $\underline{z}$, because π cannot cross the 45-degree line from below.

Thus, there is always a unique stationary MPE. However, note that in case 2, the equilibrium had $\hat{z}^* \not> \max\{\underline{z}, 0\}$, and thus there is no predatory litigation in equilibrium. By contrast, in case 1 we found that the equilibrium necessarily involved predatory litigation. Hence the equilibrium involves predatory litigation if and only if (A1) holds, as desired. *Q.E.D.*