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# ESSAYS ON COMPETITION POLICY, ANTITRUST, AND INTELLECTUAL PROPERTY

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**ABSTRACT**—My dissertation comprises four of eleven papers I have written on competition policy and the patent system while studying at Northwestern. Here I provide a brief summary of these four articles. Chapter 1 relies on an inference-based empirical approach to discern whether pharmaceutical companies are striking anticompetitive settlements in a new adjudicative forum within the Patent Office. Chapter 2 demonstrates that, due to antitrust limitations on how competing firms transact commercial rights, patent disputes defy some longstanding tenants of classical law and economics. Chapter 3 addresses the (previously unrecognized) antitrust implications of agreements that restrain the right to challenge patents as invalid. Finally, Chapter 4 addresses the aggressively litigious behavior of some patent assertion entities (“patent trolls”), which some have deemed irrational. Using a novel dynamic programming model, I argue that such behavior is in fact a calculated reputation-building strategy that enables these firms to monetize low-quality patents by giving credibility to their settlement demands.

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## CHAPTER 1: REVERSE SETTLEMENT AND HOLDUP AT THE PATENT OFFICE

(Coauthored with Jorge Lemus<sup>2</sup>)

Over the last decade or two, the antitrust community has been captivated by a particular kind of patent settlement that – until recently – was ubiquitous within pharmaceutical markets. These deals are known as “pay-for-delay” or “reverse payment” settlements. Setting aside the complex statutory web that helps to facilitate this practice, it can be aptly summarized as follows: a patent holder has a monopoly in a particular drug market, but a generic drug maker is challenging its patent as invalid, meaning that it is unenforceable (because it should not have been granted in the first place). If successful, this challenge will effectively terminate the patent, allowing any pharmaceutical firm to begin marketing a generic version of the drug. That would significantly erode total profits.

In a reverse payment settlement, the firms agree that (1) the generic challenger will stop challenging the patent and stay off the market for some number of years (but no later than the date of patent expiration); and (2) the brand-name firm will share the monopoly rents by making a large payment to the challenger. This is the “reverse payment,” so named because a patentee in a conventional settlement is *receiving* payments from the other party, often in exchange for a license. Note that, if the patent is indeed invalid, then a reverse payment settlement acts to preserve an undeserved monopoly in a market that ought to be free. Debate on the practice came to a head in 2013, when the Supreme Court held that such settlements may violate the antitrust laws.<sup>3</sup>

Reverse payment settlements have been widely researched over the last decade, but always within the context of federal court litigation. But this is not the only place where parties might settle a dispute over a patent’s validity. The Patent Office recently inaugurated a new adjudicative form – the Patent Trial and Appeal Board (PTAB) –

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<sup>3</sup> *F.T.C. v. Actavis*.

within which any party can challenge any patent as invalid. Aside from being cheaper and faster than district court litigation, this has different procedural rules and other features that distinguish it from conventional courts. Given the scrutiny pharmaceutical firms were facing, we sought to determine whether they might be reaching reverse payment settlements within the PTAB, and to discern whether such firms might take advantage of the forum's distinctive rules. Our analysis supports an affirmative answer on both counts.

Of the PTAB's distinct procedural rules, an empirically convenient one surrounds the "institution decision." Once a PTAB judge has read the challenger's petition (the argument for invalidation) and the patentee's response, she will decide whether to "institute" the proceeding. It does so if and only if she thinks the disputed patent claims are "reasonably likely" to be invalid. In that case, the trial will proceed until either final judgment or settlement. If the judge declines to institute the trial, then it is terminated immediately, and thus there is no need for settlement. The reason this will be convenient is that, if a settlement occurs after institution, we know the parties are expecting that the patent will likely be invalidated if they do not settle.

Virtually all private settlements are strictly confidential, making direct empirical observation impossible. We thus attempt to infer whether pharmaceutical firms are striking reverse payment settlements in the PTAB based on observable circumstances during and after settlement. To do so, we use the PTAB database to accumulate trial-level data, including identifiers for firms, patents, whether settlement occurred, and whether the trial was instituted prior to settlement. We also make use of the Federal Drug Administration's (FDA's) "Orange Book." This database specifies what drugs are authorized for sale, and it tells us which firms have approval to sell a brand-name or generic version of a given drug, and when such approval was obtained. It also lists the patents covering a given drug. We then join the PTAB with the Orange Book data.

Our inference procedure looks for PTAB trials with at least the following three properties: (1) the patentee is a pharmaceutical firm authorized to sell a brand-name drug,

while the challenger is a generic drug maker that is challenging the patents on the brand-name drug; (2) the trial settled; and (3) the challenger did *not* start marketing a generic version of the drug after the settlement (or within a year thereafter). The third condition is critical because it allows us to rule out the possibility that the settlement was just a licensing deal, which would allow the generic firm to start making sales and would not arouse antitrust concerns. A settlement that meets these criteria is therefore consistent with reverse payment.

But these three conditions do not necessarily rule out the possibility that the challenger simply gave up after deciding it was very unlikely to win on final judgment. That too would result in no generic sales after settlement. To rule this out, we rely on the institution decision. If the firms settled *after* the trial was instituted, we can be sure the challenger did not simply give up. Indeed, a party is not likely to abandon its case right after the judge tells him that he is likely to prevail in the end. If the settlement occurs before institution, the inference conditions still carry weight, just not quite as much.

We aggregate related trials (those with common parties and all patents relating to the same drug) into groups, which we call “consolidated settlement agreements” (CSAs). Because the PTAB is fairly new, there are just 19 CSAs in the data. But 16 of them (84%) meet the three conditions for our baseline inference of reverse payment. Of these 16 settlements, 7 occurred after institution. Based on these findings, we conclude that firms are very likely striking some delayed entry settlements within the PTAB, and we offer a number of proposals for policing inter-competitor settlements within the forum, both within pharmaceuticals and more broadly.

## **CHAPTER 2: COMPETITION, INALIENABILITY, AND THE ECONOMIC ANALYSIS OF LAW**

Patent disputes – even those between competitors – are still in some sense private disputes over property rights. Property disputes (usually over “real property” like land) have been widely studied in economics and law. In this article I argue that, as a result of

antitrust limitations on private transactions, some longstanding arguments on the economics of property disputes do not generally obtain in patent disputes, at least when the parties are competing firms.

In the first half of the 20<sup>th</sup> century, there was a small revolution in legal thought, as scholars began to apply economic analysis to the study of law. This resulted in a new field of research – known as law and economics – that touches on many different legal subjects. In its early development, law and economics focused heavily on property rights and the efficiency with which they are allocated. Nobel laureate Ronald Coase famously argued that if “transaction costs” – the costs of private contracting – are sufficiently low, then the initial assignment of property rights (by the government) will not affect how such rights are ultimately allocated through private exchange. This proposition, which has come to be known as the Coase Theorem, clarifies the proper role of legal rules and why they matter. It suggests we should not perceive a property dispute as involving a wrongdoer harming a victim, but rather as involving two parties with incompatible preferences that, for one reason or another, are not capable of sorting out an efficient resolution through private contracting.

Coase – and most other authors in classical law and economics – work under the assumption that all relevant rights are entirely “alienable,” meaning that there are no legal restrictions on their transactability, i.e. the parties can exchange them or suppress them however they like through private contracting. But the world does not always work this way; some kinds of property rights are subject to *inalienability rules*: legal rules that prohibit a particular property right from being transacted, at least under circumstances. For example, a person may not sell her kidney to a needy patient (although she is entitled to donate it). And in fact antitrust creates many such rules by imposing restrictions on how competing firms can transact commercial rights. For example, Apple cannot buy Samsung. And a domestic firm cannot pay a foreign rival to give up its right to commence operations in the United States.

This antitrust inalienability distinguishes patent disputes from the more ordinary property disputes examined in classical law and economics. The parties to patent disputes are often competing firms, and their settlements necessarily involve the exchange of commercial rights. This creates some constraints on how the parties can navigate the dispute, even if transaction costs are zero. For example, the parties may be unable to “contract out of” a final judgment (a court’s verdict) that fails to maximize their joint profits. For example, if the patent is invalidated, this is bad for total profits, and the firms have a joint-interest in bargaining out of this result, with the patentee paying the rival to just stay out of the market anyway. But that agreement would be transparently illegal. Similarly, although of course a court is authorized to exclude the defendant (by issuing an injunction), the parties are limited in their ability to achieve the same result through private settlement. This is an immediate result of antitrust restrictions on reverse payment settlements.

These antitrust limitations create an asymmetry between (1) how the parties can allocate the relevant rights through private contracting; and (2) how a court can allocate them through a judgment. Such asymmetry does not exist in conventional property disputes, and it gives rise to some possibilities that were seemingly ruled out by classical law and economics. First, even if the parties suffer no transaction costs, a court’s judgment can influence how commercial rights are ultimately allocated. This effectively says that the Coase Theorem – as typically stated – does not hold up in the presence of inalienability rules. But the better interpretation is that it highlights an important assumption needed for the Coase theorem to hold, which is that the relevant rights are entirely alienable. Additionally, I show that the firms may rationally litigate to judgement, even if they suffer no bargaining problems. This is possible because it may be that the firms’ preferred settlement is unlawful and unenforceable, and that there is no lawful alternative that they mutually prefer to litigation. Finally I show that even if the parties settle, the allocation of rights prescribed by their settlement can vary based only on their beliefs about what a court would rule on final judgment.

Aside from highlighting an important omitted assumption within the classical law and economics literature, these results demonstrate that patent disputes create a novel set of issues that distinguish them from more conventional property disputes. As my article argues, this leads to different normative conclusions about the proper role of the court, and about the efficiency of settlement as an alternative to full-fledged litigation.

### **CHAPTER 3: CHALLENGE RESTRAINTS AND THE SCOPE OF THE PATENT**

An invention is patentable only if it is novel and non-obvious, among other requirements. The patent system must institute a mechanism for filtering out unpatentable inventions from those that legitimately warrant protection. We usually think of patent examination as the sole method by which the patent system attempts to accomplish this. But in fact it provides a second mechanism: it allows patents to be challenged as invalid after they are granted. That is, it vests “challenge rights” in private parties. We know that many litigated patents (approximately half) are ultimately held invalid, and thus challenge rights play a critical role in preventing overbroad or unwarranted barriers to competition.

Assuming a challenger hopes to use the patented invention moving forward, a patent challenge is a competitive act. If successful, it will make the relevant market more competitive by allowing for unrestrained use of the invention by all interested parties. But of course, competitive acts are usually bad for total profits, and thus firms generally have a joint-interest in avoiding them, provided they are legally entitled to do so. As such, it is not surprising that firms’ patent dealings often subsume agreements in which one party is barred from (or penalized for) exercising its challenge rights against the other party. I call these *challenge restraints*.

Challenge restraints are inherently agreements that suppress competitive activity, making them clear candidates for antitrust oversight. Despite this, no court has ever recognized such restraints as potentially raising antitrust concerns. This cannot be

because patent law immunizes challenge restraints from antitrust. Indeed, while the Patent Act expressly provides that *patent rights* are alienable (for example, a patent may be sold or licensed), it never suggests that challenge rights are similarly alienable. Thus, challenge restraints fall within antitrust's domain. This suggests not that they should be categorically condemned – many of them are benign or even procompetitive. Rather, it suggests only that they do not enjoy safe harbor from antitrust scrutiny, ensuring that they can be condemned when they unreasonably subvert competition.

Challenge restraints come in many varieties, and within different kinds of commercial relationships. They can be “vertical” (non-competing parties) or “horizontal” (competing parties). Vertical challenge restraints arise in pure licensing relationships, meaning that the patentee and licensee do not compete in any product market. Horizontal challenge restraints are those arising between direct competitors. A special case is a “naked” challenge restraint, which is one that provides no technology transfer (i.e. no licensing rights) to the restrained party. In this case there is essentially no procompetitive aspect to the agreement. Antitrust is generally much more concerned with horizontal restraints (and particularly naked ones) than with vertical ones, and the same should be true here.

Additionally, the nature of the restraint can vary. It can be a waiver, meaning that the relevant party simply “gives up” its challenge rights. This is the strongest form of restraint. On the other hand, the restraint could alternatively be an economic inducement that merely *discourages* patent challenges. A common example in licensing agreements is a “terminate upon challenge” clause. This clause revokes a licensee's rights to use the patented invention at the moment it files a challenge. Whether a challenge restraint is reasonable in a given case will hinge not only on the nature of the parties' relationship, but also on the strength of the restraint.

A reverse payment settlement that excludes a challenger until the date of patent expiration is a naked challenge restraint. First, a reverse payment deal serves to terminate a patent challenge, so clearly it is a challenge restraint. Second, the challenger does not

get any appreciable licensing rights during the patent term, so the restraint is naked. In fact, if there is a significant payment, then even if the challenger enters several years before expiration, the challenge restraint is still naked, at least in part, because the delay in entry was artificially extended by the payment. That is, the parties could have reached a settlement with no payment and a shorter delay period. This suggests that the reverse payment deal should be unlawful.

By contrast, vertical challenge restraints present far smaller antitrust concerns. First, the general view in contemporary antitrust is that a vertical contract poses no threat to competition if the parties lack market power. Second, whether or not there is market power, a vertical challenge restraint can be procompetitive by eliminating holdup problems. A patentee does not want its licensee to be able to threaten a challenge at any moment; it prefers to resolve such possibilities in the original contract. Indeed, the patentee knows that at the ex-post stage – after the licensee has committed its production to the patented technology – its incentive to challenge becomes stronger at the margin, since the cost of implementing the technology is now sunk. Thus the licensee may have a credible threat to challenge later on. This makes contracting precarious, at least if challenge restraints are universally prohibited, because the patentee cannot be sure that the royalty rate set ex ante will hold up ex post. Further, it may be in the licensee's interest to enter into a challenge restraint, because the patentee will provide a discounted royalty for this (the patentee values the restraint, after all.)

In this way, vertical challenge restraints look a lot like ordinary exclusive dealing: a supplier offers a discounted rate to buyer for the latter's agreement not to acquire the relevant input from an alternative source. The difference here, which is largely irrelevant to the antitrust issue, is that the alternative option is a patent challenge rather than a competing supplier. For these reasons, I argue that vertical challenge restraints should generally be regarded as simply a special case of exclusive dealing. And, just as most instances of exclusive dealing are no longer thought to violate the antitrust laws, I think most vertical challenge restraints are unlikely to warrant antitrust intervention.

## CHAPTER 4: PREDATORY PATENT LITIGATION

Patent assertion entities (PAEs), pejoratively known as “patent trolls,” are firms that own and assert patents, but do not engage in any commercial activity that reads on those patents. That is, PAEs make money by licensing patents, and often this begins with the PAE threatening to sue an alleged infringer if it does not make sufficient payments to settle the dispute. In my view, if these infringement claims are reasonably meritorious, then there is little justification for disparaging this practice. However, many PAEs rely principally on low quality patents, particularly those whose claim-boundaries are so broad as to make the patent obviously invalid. And they tend to target their infringement claims at small businesses and startups, which will find it very difficult to finance the high costs of patent litigation, which usually run into the millions of dollars. The PAEs reassure their targets that they can avoid such costs by paying a comparatively modest license fee – for example \$100K.

These PAEs are unlikely to earn a positive return on patent litigation, should their targets refuse to settle. First, their low-quality patents are by definition quite unlikely to be deemed enforceable by a judge. Second, these PAEs often assert low-quality patents against small businesses and startups that will have great difficulty financing the high costs of patent litigation, which usually runs into the millions of dollars. It would thus seem that, if the PAE’s settlement demand is rejected, then it should cut its losses and give up. That is, it should not follow through on its litigation threat, given that such efforts have negative expected value. And yet many of these PAEs aggressively litigate when their settlement demands are rejected, despite the apparent inevitability of losing. This has led a number of scholars to suggest that these PAEs are irrationally aggressive.

I argue that these PAEs are in fact entirely rational, and that they are engaged in a calculated reputation-building strategy that I call *predatory patent litigation*. A typical target of the PAE can see that litigation is very unlikely to give the PAE a positive return. It is therefore sensible to expect that the target would rebuff the PAEs demands based on

the expectation that they are non-credible – i.e. that the PAE will not follow through on its threats. But if the PAE establishes a history of following through, then its demands become credible, and it becomes similarly rational for targets to pay up.

I develop a novel dynamic programming model of patent assertion and litigation by a PAE with low quality patents (in the sense that litigation usually has negative expected value). Reputation is tricky to model in economic theory. We are ultimately interested in situations in which someone strategically builds a “tough” reputation, as opposed to someone who is “naturally tough” and hence always behaves as such because it is simply in his nature. But if an agent is not *intrinsically* tough, and if other agents know this, then reputation is akin to fiat money: if everyone thinks it is meaningless, then it is in fact meaningless. As a matter of game theory, this means that there must be equilibria that do not exhibit reputation-like outcomes. To resolve this, it is necessary to create some “behavioral agents” (or at least the possibility of behavioral agents). These are actors with bounded rationality.

In my model, the PAE targets a new defendant in each period  $t=1,2,3,\dots$ , and the expected value it gets from suing is stochastic and i.i.d. across periods. The distribution is assumed to give negative value with positive probability, while positive-value claims may or may not have positive probability. In each period the target can be a normal (fully rational) type, or else an “impressionable type,” which is one that forms beliefs about the PAE’s threat-credibility based on what happened the last time it was threatening to bring a negative-value claim. If the PAE’s demand was rejected yesterday and the PAE sued, then today it will have a strong reputation, meaning that the impressionable type thinks its threat is credible. But if the PAE gave up yesterday, then it enters today with a weak reputation and the impressionable type will reject its settlement demand. The PAE places value on persuading the impressionable types that it is tough, and the rational targets know this. As such, it becomes rational to accommodate the PAEs demands even for fully rational targets who know that the PAE’s reputation is essentially hot air.

The exception is that the PAE will not follow through on its threat in periods where litigation has highly negative expected value. More thoroughly, the PAE picks a threshold amount of money that it is willing to lose in order to maintain (or build) a strong reputation, and it will follow through on its litigation threat only when its expected loss is no larger than this threshold. I prove that this arises in the unique equilibrium.<sup>4</sup> I further prove that the threshold is positive for all parameter values – implying the PAE is always willing to incur some nonzero loss – and this ensures that predatory patent litigation arises as the PAE’s unique equilibrium strategy. The implication is that, if you want to monetize bad patents, then predatory patent litigation is seemingly your only option.

The remainder of the paper addresses some potential ways of deterring predatory patent litigation. A commonly proposed mechanism is “fee shifting,” which means that the loser reimburses the winner’s attorney fees. But I show that, although it will help (by lowering the threshold), fee shifting will not make the problem go away. Intuitively, predatory patent litigation does not make money in litigation; it makes money through settlements. So making litigation most costly in all cases does not mean the practice becomes non-viable; it just shrinks the set of cases in which the PAE will follow through on its threats. I argue that concerted action among potential challengers would be a better tool. For example, they could jointly finance a firm that challenges the patents of any PAE that sues any member of their arrangement, and refuse to settle the challenge unless the PAE gives a free license to all members.

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<sup>4</sup> I restrict focus to equilibria in Markov strategies.