Antitrust Analysis of Patent Settlements Between Rivals

BY CARL SHAPIRO

P ATENTS ARE PLAYING AN ever-increasing role in the competitive strategies of firms in many industries. As patent counts rise and patent litigation grows, settlements of patent litigation likewise become more numerous and more influential on competitive outcomes. Inevitably, patent settlements between rivals have become an important battleground in the perennial tension between intellectual property law and antitrust.

The danger to competition inherent in patent settlements between rivals should be self-evident. Suppose that Firm A asserts a narrow patent against its sole rival, Firm B. Firm B claims that Firm A's patent is invalid, insists that it does not infringe the patent, and argues further that it could easily invent around the patent if necessary. Then the two firms settle their dispute by agreeing to merge. What should we make of this merger on antitrust grounds? If the merger would be judged anticompetitive in the absence of the patent, there is no reason that the presence of the narrow patent should reverse that conclusion. Alternatively, suppose Firm A pays Firm B a substantial sum to withdraw from the market. Such an agreement would be blatantly anticompetitive in the absence of the patent. That conclusion, too, cannot automatically be reversed merely because of the extant patent dispute. Were all competition in the shadow of patent disputes treated as "illegitimate," i.e., not protected under antitrust law, rivals could simply initiate patent litigation and then use that litigation as cover for cartel-like agreements. Clearly, patent settlements between (actual and potential) rivals warrant careful antitrust scrutiny.

In recent work, I proposed a method for setting the antitrust limits on patent settlements between rivals.[1] In the Spring issue of ANTITRUST, Kevin McDonald has sharply criticized my analysis.[2] Here I briefly explain my approach and then respond to McDonald.[3]

Is the Settlement Better for Consumers than Ongoing Litigation?

My economic analysis explores in some depth the following simple antitrust rule: a patent settlement between rivals cannot lead to lower expected consumer surplus than would have arisen

Carl Shapiro is Transamerica Professor of Business Strategy, Haas School of Business, University of California at Berkeley, and Senior Consultant, Charles River Associates. The author thanks Joseph Farrell, Richard Gilbert, Michael Katz, Mark Lemley, Stephen Smith, Michael Sohn, and Dan Wall for helpful discussions on the antitrust treatment of patent settlements.

from ongoing litigation.[4] Effectively, antitrust gives consumers the right to the level of competition that would have prevailed, on average, had the two parties litigated the patent dispute to a resolution in the courts. So long as consumers' rights to this level of competition are respected, the two parties are permitted to negotiate more profitable arrangements that they each prefer to litigation.

My proposed approach balances the rights of patentees with the interests of consumers. Consumers cannot be deprived of the benefits they would have enjoyed from competition, had litigation continued. Yet the property rights of patent holders are fully respected. In particular, I take as given our intellectual property rights regime, with its necessary imperfections, such as the granting of patents that will later be found invalid and the chance that the holder of a valid patent may not be able to obtain an injunction to stop what turns out to be actual infringement.

My proposed standard for patent settlements also is consistent with how antitrust policy and law treat other forms of collaboration among competitors. A proposed merger, for example, is usually judged to be anticompetitive if consumers would be worse off under the proposed merger than in the absence of the merger. A similar standard is used for joint ventures and other collaboration between direct rivals in the FTC/DOJ Antitrust Guidelines for Collaboration Among Competitors. Likewise, under the FTC/DOJ Guidelines for the Licensing of Intellectual Property, licenses are generally regarded as anticompetitive if they restrict competition in comparison with what would have occurred in the absence of the license.

In all of these cases, antitrust evaluation of an agreement between competitors involves a comparison of consumer benefits under the proposed agreement with consumer benefits in the absence of the proposed agreement. My treatment of patent settlements follows precisely this template, where ongoing litigation is the alternative to the settlement agreement.[5] In all cases, one must make predictions as to the state of competition with or without the proposed agreement. For example, in merger cases one must routinely assess how market shares will likely shift and how competition will evolve as new products are introduced and regulatory approvals are gained or denied. Competition in the future is inherently uncertain, so effective antitrust enforcement necessarily requires some assessment of the likelihood of various future outcomes along with some balancing of the benefits and harms to competition of proposed agreements.

With patent settlements, the outcome of the patent litigation itself is central to an evaluation of future competition in the absence of the agreement. But this is no different in principle than evaluating a merger or joint venture between an incumbent monopolist and a would-be challenger in cases where other legal uncertainties are central to the future competitive significance of the challenger. For example, future legal uncertainties are a necessary part of merger analysis in cases where the challenger is seeking regulatory (e.g., FDA) approval to enter the market and in cases where the outcome of an international trade proceeding will determine whether the challenger is able to compete effectively within the United States. Suppose a merger between an

incumbent monopolist and its sole potential challenger would be judged an anticompetitive merger to monopoly if the challenger were already in the market, but at the time the merger is proposed the challenger has yet to gain regulatory approval to enter the market. If the challenger has a decent chance of gaining such approval, the merger would still be deemed anticompetitive. The same logic should apply to patent settlements: if the challenger has a decent chance of prevailing, a settlement that eliminates the prospect of competition from the challenger can be anticompetitive.

To illustrate my approach, consider the case in which a patent holder sues its sole rival for patent infringement. The rival asserts in its defense that the patent is not valid and that it does not infringe the patent. If the patent is found valid and infringed, the patent holder will enjoy a monopoly and charge the monopoly price of $100 until the patent expires in two years. However, if the rival wins the patent lawsuit, duopoly rather than monopoly will prevail and the price will be $80.[6] Pending the resolution of the lawsuit, which is expected to take one year to be resolved, the rival has been competing and is expected to continue to do so (if not for the settlement). However, the rival's interim ability to compete is hindered by the patent claims asserted against it: the rival's costs are elevated by the prospect of liability for patent infringement, and some customers are wary of the rival's products because of the patent litigation, fearing either that the rival will be forced to exit the market, leaving them stranded, or that they themselves will bear some infringement liability. The resulting "limited" duopoly competition leads to a price of $90.

Now imagine that the two parties settle their dispute by agreeing to merge. Absent any synergies, the merger results in the monopoly price of $100. Clearly, this merger to monopoly harms consumers: they pay $100 for two years rather than paying $90 for one year and then either $100 or $80 for the remaining year of patent life, depending upon the outcome of the patent litigation. Suppose our best estimate is that the patent holder has a 50/50 chance of winning the patent litigation. Then we can measure the expected price to consumers under litigation: $90 for the first year and $90 in the second year (half a chance of $100 and half a chance of $80), so $90 per year. With these assumptions, the merger costs consumers $10 per year in comparison with ongoing litigation. Of course, the merger may well lead to a price lower than $100 if it generates synergies. If the merger generates synergies that lead to a price of $90 or less, it benefits consumers and would pass the proposed test. Note that in this same example, if the rival were already known not to infringe the patent, the duopoly price would be $80 for sure and a merger to monopoly would be anticompetitive unless it generated twice as many synergies. My earlier paper shows much more generally how the synergies required for a merger to benefit consumers are affected by the presence of a pending patent dispute between the merging parties.

A common theme throughout my analysis is the importance of patent strength:

I would like to highlight one key practical problem with the approach advocated and analyzed here: typically, to compare consumer sur-

plus under a settlement with consumer surplus from ongoing litigation requires an informed judgment as to the strength of patent(s) at issue. If the patent is very strong, i.e., very likely to be found valid and infringed and difficult to invent around, the challenger is unlikely to offer much independent competition to the patent holder if litigation proceeds forward. Alternatively, if the patent is very weak, ongoing litigation is likely to lead to greater competition and greater consumer benefits. Except in special cases where inferences about patent strength are possible based on the commercial decisions made by the two parties, there does not appear to be any way around the need directly to assess patent strength if one is trying to determine whether a settlement benefits consumers.[7]

As a general principle, the stronger the patent, the greater the latitude afforded to the settling parties under my proposed test. As an illustration, in the merger example above, suppose that the patent holder had a 75 percent chance of winning the patent litigation, rather than the 50 percent chance used above. Then the average price under litigation over the two years would be $95 rather than $90.[8] Therefore, to benefit consumers, the synergies would only need to lead to a price of $95, not the $90 calculated above. If the patent is virtually certain to prove valid, a settlement by which the challenger agrees not to compete using infringing products must pass my proposed test. In other words, under my proposed approach, an arbitrarily small chance that the challenger would prevail in the patent suit *cannot* form the basis for an antitrust challenge of such a settlement.

My more technical paper shows how this overall approach—comparing consumer benefits with and without the proposed settlement—can be applied to a wide range of settlements, including conventional patent licenses, cross-licenses, patent pools, mergers and joint ventures, and so-called "reverse payments" made from incumbent pharmaceutical manufacturers to would-be generic entrants. Here are some of my results: (1) there typically exist mutually profitable settlements that do not harm consumers; (2) the efficiencies necessary for a horizontal merger to benefit consumers are lowered when the merging parties are settling a patent dispute, especially if the patent is strong; (3) there is a reasonable presumption that consumers are harmed by naked "reverse payments" from the patent holder to the challenger; and (4) the creation of a patent pool to resolve litigation involving complementary patents can benefit consumers even if the pool results in the monopoly outcome. My theoretical discussion is illustrated by various cases, including settlements between Intel and Digital, Boston Scientific and CVIS, Gemstar and TV Guide, VisX and Summit, the members of the DVD patent pool, and Schering Plough and Upsher-Smith.

Application to "Reverse Payment" Cases

Much of the furor in antitrust circles over patent settlements involves the so-called "reverse payment" cases in which the patent holder makes a large cash payment to the challenger, who in turn agrees to not to enter the market until some specified date (if at all prior to expiration of the patent). My analysis indicates that the these "reverse payment" cases constitute one important category of cases in which the terms of the settlement

themselves tend to indicate that the patent was weak and thus that competition was diminished by the settlement.

To illustrate, suppose that an incumbent monopolist holding a patent with four years to run has sued its sole challenger for patent infringement. The two parties reach a settlement of their patent dispute just before the resolution of that litigation. The settlement involves a large cash payment from the patent holder to the challenger. In exchange for this payment, the challenger agrees not to enter the market for three years. So, under the settlement, consumers enjoy competition for 25 percent of the remaining patent term.

Are consumers better or worse off under the settlement than they would have been from ongoing litigation? As usual, this depends upon the patent strength: if the challenger would have won with at least a 25 percent chance, consumers are worse off under the settlement.[9] Therefore, under my principles, an antitrust challenge to such a settlement would require plaintiffs to show that there was at least a 25 percent chance that the challenger would have prevailed, had litigation been pursued. Short of proving the patent valid or not infringed, i.e., short of conducting a patent trial as part of its antitrust case, how can antitrust enforcers meet this burden?

Here is where the large cash payment component of the settlement can be used to make strong inferences. Suppose that the patent holder believed that it had a 90 percent chance of winning the patent case. Then litigating would give it a 90 percent chance of monopoly profits and a 10 percent chance of duopoly profits. In contrast, settling gave the patent holder monopoly profits only 75 percent of the time, and duopoly profits 25 percent of the time—clearly lower profits than under litigation, even before we account for the cash payment. What if the patent holder believed it had a 75 percent chance of winning? Then both settlement and litigation would give it monopoly profits 75 percent of the time, and duopoly profits 25 percent of the time. But litigation would still be preferred to the settlement because of the cash payment. Therefore, based on the fact that the patent holder preferred the settlement to litigation, we may reasonably infer that the patent holder placed *less* than a 75 percent chance on winning.[10] But this tells us precisely what we needed to know to determine whether consumers are better off or *worse* off under the settlement: if we credit the patent holder's own assessment of its chances in litigation, consumers are *worse off* under the settlement.[11] For example, suppose that the monopoly profits are $100 million per year, the patent holder's share of duopoly profits is $60 million per year, and the cash payment is $16 million. Then a risk neutral patent holder would only prefer the settlement to litigation if it believed its chances of winning the patent case were no larger than 65 percent.[12] The larger the cash payment, the weaker the patent holder must have regarded its own litigation prospects, and the more harm to consumers can be presumed to flow from the settlement.

In short, large "reverse payments" create an inference of consumer harm and thus allow antitrust enforcers to avoid the complex task of showing directly that the patent in question was weak. In practice, the government may still have difficulty proving that there was in fact a "reverse payment." No inference of patent weakness, and thus harm to consumers, can be made in the absence of such a payment. The mere presence of *some* payment from the patent holder to the challenger as part of a more complex commercial transaction is not sufficient. Indeed, a key issue in at least some of these "reverse payment" cases is whether the payment made by the patent holder to the challenger was in exchange for other valuable consideration. The FTC's case against Schering Plough failed on precisely this point: "The claims against Schering and Upsher-Smith rest on the allegation that the $60 million payment from Schering to Upsher-Smith was not a bona fide royalty payment under a license for Niacor SR and five other products." "The fact testimony at trial was unrebutted and credible in establishing that the licensing agreement was a bona fide arms-length transaction . . ."[13]

Antitrust Enforcement of Patent Settlements

The "reverse payment" cases are unusual in that a clear inference of patent weakness, and thus harm to competition, can be made directly based on the presence of a large payment from the patent holder to the challenger. In contrast, for many other categories of patent settlements, there does not appear to be any substitute for a more direct assessment of patent strength. The analysis in my previous paper supports the following procedure for antitrust enforcement agencies to evaluate patent settlements between rivals:

(1) If the settlement involves no consideration flowing from the patent holder to the challenger (and does not restrict competition outside the scope of the patent), the antitrust inquiry ends. We may reasonably infer that the terms of the settlement, e.g., the royalty rate paid or field-of-use restrictions applied, reflect the assessments of the parties regarding their prospects in the patent litigation. In comparison with the full "monopoly" outcome, consumers benefit from any discount to the royalty rate reflecting the patent holder's risk of losing the patent case. And the challenger has no incentive to accept an inflated royalty rate, or other limits on its ability to compete, except to the extent those limits reflect its own litigation risk, i.e., the underlying strength of the patent.

(2) If the settlement consists of a large net payment from the patent holder to the challenger, a strong economic inference can be drawn that the settlement is anticompetitive. Just as a patent holder's offer to discount its royalty rate reflects its risk of losing the patent case, a large "reverse payment" can be presumed to reflect the patent holder's assessment that its patent might be invalid or not infringed. Unlike a discounted royalty rate, however, a "reverse payment" does not benefit consumers. And the "reverse payment' provides the challenger an obvious incentive to accept restrictions on its ability to compete. Absent other evidence, there is a presumption that a large net payment from the patent holder to the challenger was made to induce the challenger to delay entry, to exit the market, or otherwise to limit its competitive efforts.

(3) For more complex settlement agreements—including mergers, joint ventures, cross-licenses, and patent pools—further

assessment of patent strength is needed to determine whether or not the settlement is anticompetitive under my test, which is based on expected consumer surplus. This assessment may well include a technical inquiry into the validity and scope of the patent, such as occurs in any patent dispute, but also can be informed by the commercial terms of the settlement itself as well as other statements made and actions taken by the parties. In general, there are many ways that the two parties can compromise without triggering any presumption that their settlement is anticompetitive. For precisely this reason, in many cases the antitrust enforcement agencies will need to make at least some assessment of patent strength to distinguish settlements that benefit from consumers from those that harm consumers.

Competition in the Shadow of Patent Litigation

My approach is squarely based on the view that consumers have a right to the benefits of competition that takes place in the shadow of patent litigation. In my view, competition in the shadow of patent litigation is entirely legitimate, i.e., worthy of protection using competition policy. But others may regard such competition as illegitimate, nothing more than a form of theft, and therefore unworthy of antitrust protection. The treatment of competition in the shadow of patent litigation is thus an important policy question to address.

To sharpen this discussion, let us go back to the "reverse payment" example above. In that example, if not for the settlement, competition in the shadow of litigation would take two forms. First, there would be "allegedly infringing competition" during the first year while the patent litigation would be pending, leading to a $90 price rather than the $100 monopoly price. Second, there was a 50 percent chance of even stronger "potential non-infringing competition" during the second year, leading to a price of $80, in the event that the challenger wins the patent case. How should antitrust treat settlements that eliminate these two forms of competition?

From my perspective as an antitrust economist, sound competition policy involves the protection of all competition not prohibited by other laws. Sound competition policy should not permit private parties to enter into agreements that harm consumers by eliminating otherwise lawful competition. In the context of patent settlements, sound competition policy should take as given the underlying intellectual property rights regime that Congress has put into place. That regime defines the conditions under which patent holders can legally prevent others accused of infringement from competing. If a patent holder can obtain a preliminary injunction to exclude an alleged infringer from the market, consumers do *not* have any right to competition in violation of that preliminary injunction. However, if a patent holder *cannot* obtain such an injunction, the allegedly infringing competition and the potential non-infringing competition are both worthy of antitrust protection.

In practice, companies defending their patent settlements will be tempted to dismiss competition in the shadow of patent litigation as "infringing" or "unlawful." Neither term is accurate. Furthermore, it may be very difficult for the firm defending the patent case to argue that its own competition was "infringing," especially if that firm had very recently been arguing forcefully, either in court, in securities filings, or with customers, that the patent asserted against it is invalid or not infringed and that it is bringing valuable competition to the market.[14]

What about the argument that competition in the shadow of patent litigation undermines the value of patents and thus discourages innovation, to the long-run detriment of consumers? My answer to this concern is simple: Congress should set the rules governing what type of competition is permitted in the shadow of patent litigation and then private firms should live within those rules. Competitors should not be permitted to enter into private agreements that eliminate competition otherwise permitted by Congress. In particular, if Congress judges that *allegedly* infringing competition undermines innovation sufficiently as to be contrary to the long-run interests of consumers, then Congress should pass new laws making its easier for patent holders to obtain preliminary injunctions to prevent such competition prior to a finding of validity and infringement. In other words, if Congress considers allegedly infringing competition to be akin to theft, then Congress should pass laws to prevent that type of competition, just as laws are in place to prohibit dealing in stolen goods.[15] Likewise, if Congress is concerned that patent holders are not protected sufficiently by the current patent damages regime, Congress should pass new laws to increase the penalties for patent infringement. Similarly, if Congress is concerned that generic firms may declare bankruptcy rather than pay the damages they owe to patent holders for infringement, Congress should pass new laws requiring firms accused of infringement to post bonds to insure that patent holders will receive the damages due to them.[16]

Reply to McDonald: Correcting the Record[17]

One mis-characterization runs throughout McDonald's article and robs most of his criticisms of meaningful content. McDonald speaks (at 69) of a "theory claimed to render patent validity irrelevant. This is an argument, advanced by Professor Carl Shapiro in one paper . . ." In fact, my work emphasizes the importance of patent strength, which includes validity, and the variable representing patent strength appears in one formula after another.

Further, I disagree with McDonald's assertion (at 69) that my approach "would replace one inquiry that is difficult but feasible (i.e., proving a patent valid or not) with an inquiry that is candidly unknowable (i.e., how a *particular* patent lawsuit would have turned out)." My analysis hinges on patent strength, which certainly includes an assessment of validity, but also, by necessity, considers infringement (also part of the particular patent lawsuit at issue) and the ability of the challenger to invent around the patent (which is part of patent litigation as well because the ability to invent around can greatly influence damages). Certainly the determination of patent strength is difficult, but not inherently more difficult than what happens in patent cases all the time. Hard or not, we need to try to assess patent strength if we are to distinguish the many procompetitive settlements from those that are anticompetitive. What McDonald really seems to dislike is the use of *economic* information to make *inferences* regarding

patent strength, especially when such inferences are strong, as in case of naked "reverse payments," and lead to an inference that the settlement is anticompetitive.

McDonald (at 71) is incorrect in his description of a basic foundation of my analysis. He interprets my analysis as being inconsistent with the presumption of validity afforded to patents by statute. "The theory of 'probabilistic' patent rights would render that statute largely meaningless." He also writes:

> Pesky rules about the presumption of patent validity or the failure of antitrust law to protect infringing entry need not detain us. The very possibility that the patent may be struck down becomes a consumer "benefit" that is lost when the parties settle. That loss alone constitutes the present harm to consumers when the settlements occurs. How liberating. How tidy. How wrong.

However, the presumption of validity is directly built into my analysis. The presumption of validity raises the probability that the patent will be held valid, primarily because of the burden of proof imposed on the party asserting non-validity. If the presumption is very strong in practice, then patents will be strong, too, and a wider range of settlements will be permissible. In fact, we have data on the outcome of patent litigation which tells us that many patents are declared invalid when challenged.[18]

Even if a patent is valid, the patent holder may have little or no ability to exclude a pesky rival. Put differently, a perfectly valid patent may be weak because the defendant in the patent case may be found not to have infringed, a very important issue neglected by McDonald in his article. Furthermore, a valid and infringed patent may be easy to invent around. A settlement that eliminates non-infringing competition, or competition based on inventing around a narrow patent, could well be anticompetitive. McDonald ignores these important cases, all of which are built into the notion of patent strength employed in my analysis. There is no presumption of infringement, nor any presumption that inventing around is commercially infeasible.

In what appears to be a misunderstanding, McDonald goes on to state (at 71) that my approach ignores fundamental FDA rules. "The generic entrant who reads the Shapiro essay, enters the market, and is later found to have infringed the patent is certain to feel put upon. If any infringing competition during the lawsuit is 'considered entirely legitimate,' G [the generic drug maker] may ask, why do I have to pay trebled damages?" To be clear, by "legitimate" I never meant that the generic entrant is (or should be) shielded from liability for infringing an incumbent's patent, any more than describing a chemical company's competition as "legitimate" would imply that it should be shielded from liability for violations of environmental law. To the contrary, it is the prospect of such liability that typically deters generics from entering unless and until they have prevailed in court, a point I explicitly made in my paper. Along with the patent holder's right to seek a preliminary injunction to block entry, that is precisely the way the patent system is designed to work. Rather, I use the term "legitimate" purely in an antitrust sense: generic competition that benefits consumers is worthy of antitrust protection, and rivals should not be permitted to eliminate such competition through private agreement.

McDonald evidently believes that there is some inconsistency between my view that allegedly infringing competition is worthy of protection under the antitrust laws and the fact that consumers purchasing from such firms bear the risk of finding themselves be liable to the patentee for infringement.[19] But there is no such inconsistency. The alleged infringer takes a chance that it will be found liable for infringement; some of this risk may be borne by customers as well, at least if the patent holder does not offer to indemnify its customers. If the patent is strong, the prospect of such liability may well preclude interim competition. If so, the resulting monopoly price is the just reward of the patentee while the patent case is litigated. If the patent is weak, the challenger may well choose to bear the risk of liability for infringement. If the patent is then proven invalid or not infringed, that choice will work to its benefit, and to the benefit of consumers, and undermine a monopoly position that was not in fact warranted. If the patent is valid and infringed, the challenger will be liable, perhaps for treble damages, and the patent holder will be compensated as allowed under the patent system.[20] Either way, market forces, as influenced by the particulars of the intellectual property rights regime, will determine the outcome, just as they do in the presence of other risks.

McDonald continues his mischaracterization by writing (at 72): "For these authors, this possibility of consumer harm, even if tiny, justifies a conclusion that the settlement has, in fact, reduced competition." To the contrary, my results indicate that the settlement is very likely to be procompetitive if the probability is very high that the patent is both valid and infringed. As I noted above, to prove that a settlement is anticompetitive, the government must present evidence that the patent was relatively weak—the main contribution of my earlier paper being to show how weak a patent must be before one can conclude that a given settlement is anticompetitive. In the "reverse payment" cases, a large net payment from the patent holder to the challenger is *itself* evidence that the patent holder did not consider the probability it would lose the case to be "tiny." McDonald's mischaracterizations are further reflected in: "All patent settlements preclude a judicial resolution by definition, and all settlements therefore cause the consumer harm these authors posit." (at 72) The trouble is, I make no such assertion and reach no such conclusion. Many settlements can benefit consumers and I even report a theorem stating that under very general conditions there exist mutually attractive settlements that benefit consumers.

McDonald continues (at 72) by suggesting that my analysis is hopelessly over-reaching: "When a patentee grants any license, therefore, should the government be scrutinizing the royalty rate to ensure that consumers face a price low enough to preserve their 'property right' in the possibility that the patent is invalid?" Actually, my analysis indicates that straight licensing agreements under which the licensee pays royalties to the patent holder are presumptively procompetitive: the royalty rate can be presumed to reflect the underlying strength of the patent.[21] After all, why would the challenger agree to pay a high royalty rate if it was confident of winning the patent litigation? One reason might be that the patent holder is simultaneously making a lump sum payment

to the challenger, in which case the procompetitive presumption is absent. Absent such a "reverse payment," or some other consideration flowing from the patent holder to the challenger, however, a conventional licensing arrangement presumably reflects the strength of the underlying patent. Indeed, as anyone who negotiates licenses will tell you, "probabilistic" patent rights are the reality: licensing negotiations reflect the underlying strength of the patent, including validity, infringement, and inventing around.

McDonald further mischaracterizes my position (at 72–73):

Who says that a patentee that chooses to produce and market the invention by itself is allowed to charge whatever the market will bear, i.e., the monopoly price? Well, a lot of case law and economic literature says exactly that, but they will have to be re-thought. According to Shapiro, that patentee is reaping more rent than the strength of its "probabilistic" patent will justify, and thus appropriating the consumers' property right.

As described at length earlier in this article, my analysis of patent settlements does not at all resemble this description by McDonald. What a patentee can charge for its products depends directly on the strength of its patent: a very strong patent will indeed permit the patent holder to charge the monopoly price, but a weak patent will not deter rivals who will compete and push the price down towards a competitive level (either by competing without a license and taking their chances in court or by negotiating a license based on their prospects in the event of litigation). This is precisely how our patent system is designed to work: the patentee's reward is governed by the strength of its patent, which in turn reflects our legal system's best evaluation of the significance of the patentee's invention. In the real world, where issues of validity, enforceability, and infringement are invariably present, patents are just not as strong as the idealized "ironclad" patent that has been proven valid, enforceable, infringed, and impossible to invent around. This notion, whether labeled "probabilistic patents" or not, should not be controversial.

More generally, it is important to bear in mind that our patent system relies on the self-interest of challengers to test the validity or breadth of issued patents. If anything, we should worry that such challenges are not frequent or sustained enough, given the unfortunate tendency of the Patent and Trademark Office to issue patents without a good understanding of prior art, given the obvious private incentives to use patent settlements to stifle competition, and given the positive externalities on other firms and on consumers when a patent is proven to have been issued in error.

Lest one fear for patent holders seeking valiantly to stop others from stealing their inventions, our patent system provides various ways for patent holders to try to exclude rivals who are alleged to infringe while a patent case is litigated. Preliminary injunctions can be obtained in some cases. Customers can be warned that certain products are alleged to be infringing. And, of course, the prospect of damages for infringement, in some cases treble damages for willful infringement, can deter rivals who are likely to be found to have infringed. All of these tactics are part of the competitive process. But competition and consumers would be greatly harmed if competitors were permitted to use the cover of patent litigation to enter into agreements that stifle competition.

Errors by the Courts: Implications for Antitrust Treatment of Settlements

McDonald reserves the last part of his article for a discussion of errors by the courts in patent cases. He is especially concerned about "false positives," which in his lexicon occur when the court incorrectly strikes down patents as invalid. In contrast, he uses "false negatives" to refer to situations where the court incorrectly upholds patents that should not have been issued.

As institutions run by humans, courts make errors and cannot be perfect. On the issue of how the imperfection of the courts affects the analysis of patent settlements, McDonald makes claims that are demonstrably false. He states: "introducing false positives into these theories causes them to crumple." (at 69) "Nor will Shapiro's analysis brook the introduction of false positives." (at 74) Finally, "false positives render the model itself useless." (at 74)

To begin with, these assertions are mistaken because McDonald's understanding of probability appears confused. For example, he writes: "one can 'average' the expected value of two uncertain outcomes in litigation—one can *do* the arithmetic—but one cannot make the answer meaningful. One cannot conclude that such a number represents what would have occurred 'had the two parties litigated.'" (at 74, citing me) There is nothing at all wrong with the notion of *expected* consumer surplus; along with expected profits, it is commonly used in various branches of economics and is standard fare for Ph.D. students in economics. For example, a standard exercise in microeconomic theory is to show that risk-neutral consumers benefit from price volatility: a consumer is better off facing a price of $1 with probability one-half and $3 with probability one-half than facing a price of $2 for sure. Expected value (possibly with some adjustment for risk aversion), i.e., averaging, is essential for assessing costs and benefits when facing uncertainty.

McDonald continues (at 74): "This is especially true when the outcomes being modeled are, as in our example, binary (either P wins and there is no generic entry, or G wins and the patent is gone). Simply put, you can take an average of the probability that a coin will land 'heads' and the probability that it will land 'tails,' but you cannot make the coin land on its side." While these statements may amuse (and likely appall) countless teachers of probability and statistics who routinely use coin flips to illustrate probability and expected value, they have no part in any coherent analysis involving the treatment of uncertainty. Probability and statistics are used all the time in the law, very often when discrete outcomes are involved. For example, the general theory of deterrence is based on the expected cost to those who would violate the law, accounting for the probability that a given violation will be detected (a discrete event) and punished.

Another fundamental problem with McDonald's discussion of "false positives" and "false negatives" is that he relies on the notion of "the patent's objective validity" (at 69) and calls for "an

objective inquiry into the patent's validity." (at 72) How are we ever to know how often, and when, the courts make errors in patent cases unless there is some superior, objective way of assessing patent validity? Is not the best "objective" method available for assessing patent validity (and infringement, for that matter) the use of the federal courts themselves? Certainly, McDonald offers no clearly superior method. His discusses (at 74–75) four "cases," depending upon whether the patentee wins or loses the litigation and, separately, whether the patent is valid or invalid. But there is no workable notion of validity distinct from the determination of the court; as a result, McDonald's four "cases" do not correspond to meaningful states of the world. In their reply to McDonald in this issue, Leffler and Leffler are very clear, and, I believe, fully rebut McDonald on this point.

Finally, and decisively, the fact that courts are imperfect provides no basis to depart from my approach to settlements, so long as one is prepared to accept the framework of patent rights established by Congress, including the use of the (imperfect) courts to enforce those rights. Implicit in McDonald's emphasis on "false positives" is a rejection of the tradeoffs that Congress made in establishing the patent system. By defending settlements that reduce consumer surplus on the grounds that they promote innovation, McDonald is necessarily arguing that Congress did not provide enough of a reward to innovators under the current system. While McDonald is free to lobby Congress to strengthen patent protection, he provides no coherent basis for weakening the antitrust laws by permitting patent settlements that stifle competition.

In the end, McDonald does not offer a coherent or workable alternative to my approach. He advocates "measuring the patent," on the view that the inquiry is over "if the patent is valid and the exclusion of competition is no broader than that inherent in the patent." (at 75). This latter inquiry necessarily involves issues of infringement and inventing around as well as validity, i.e., the very concept that is central to my analysis, namely patent strength.

Conclusion

Inevitably, antitrust enforcers must make some tough decisions about whether or not real-world patent settlements harm competition and should be challenged on antitrust grounds. Typically, the effect on competition of a patent settlement hinges on the strength of the patent or patents that are being litigated.

Given the critical importance of patent strength, economic analysis can help with the antitrust analysis of patent settlements between rivals in two ways: (1) by providing an estimate of how weak the patent must be for a given settlement agreement to be anticompetitive; and (2) by identifying and analyzing pertinent *commercial* information—including the terms of the settlement itself, as in the "reverse payment" cases—that tells us what the parties themselves believed about patent strength prior to settling their dispute. ■

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[1] Carl Shapiro, *Antitrust Limits to Patent Settlements*, 34 RAND J. ECON. 391 (2003), *available at* http://faculty.haas.berkeley.edu/shapiro/settle.pdf. This article was written in 2001 and revised in 2002. *See also* Joseph F. Brodley & Maureen A. O'Rourke, *Patent Settlement Agreements*, ANTITRUST, Summer 2002, at 53; Herbert Hovenkamp, Mark Janis & Mark Lemley, *Anticompetitive Settlement of Intellectual Property Disputes*, MINN. L. REV. (forthcoming 2003) (UC Berkeley Public Law Research Paper No. 113), *available at* http://ssrn.com/abstract=380841 at 36.

[2] Kevin D. McDonald, *Hatch-Waxman Patent Settlements and Antitrust: On "Probabilistic" Patent Rights and False Positives*, ANTITRUST, Spring 2003, at 68.

[3] McDonald also attacks a related paper, Keith Leffler & Cristofer Leffler, *Want to Pay a Competitor to Exit the Market? Settle a Patent Infringement Case*, ABA ANTITRUST SECTION ECONOMICS COMMITTEE NEWSLETTER, Spring 2002. Leffler and Leffler offer their own response in this issue, *The Probabilistic Nature of Patent Rights: In Response to Kevin McDonald*, ANTITRUST, Summer 2003, at 77.

[4] My approach also can be applied to commercial agreements struck *before* litigation has commenced. In such cases, it would be more accurate to talk about consumer surplus from ongoing competition and/or litigation.

[5] An alternative antitrust rule, less favorable to settling parties, would look not only at the effects on consumers of their overall agreement, but also at the effects of specific *provisions* in the agreement. Under a full-blown "less restrictive alternative" approach, a settlement agreement would be declared anticompetitive if an *alternative* agreement could have been fashioned, perhaps by removing or modifying certain provisions in the original agreement, to accomplish the same legitimate ends while leading to higher consumer surplus. For example, a patent pool might be challenged because a royalty-free cross license would lead to greater *ex post* consumer surplus.

[6] More generally, the outcome of the patent litigation will determine the rival's incremental cost of inventing around the patent, which could range from zero (patent invalid or rival already not infringing) to prohibitive (rival must exit the market, leading to the monopoly price). Each such cost level for the rival would then lead to a duopoly price level (or perhaps entry by other firms if the patent is found invalid). The higher the incremental cost imposed on the rival, the higher the price paid by consumers. This more general case involves the same logic used in the text, but with more than two possible price outcomes. My more technical paper shows in principle how to account for many possible outcomes of the patent litigation.

[7] Shapiro, *supra* note 1, at 397 (footnote omitted).

[8] The expected price during the second year would be $95 (75% chance of $100, 25% chance of $80). The price during the first year depends upon how the rival would compete given a 75% chance of losing the patent case; for simplicity, assume that cutting in half the rival's chance of winning (from 50% to 25%) cuts in half the rival's competitive effect during the first year (leading to a $5 discount below the monopoly price rather than a $10 discount).

[9] Without discounting, assuming that the patent case would be resolved immediately, and if market conditions are not otherwise changing greatly, we can just compare the probability of the challenger winning under litigation with the percentage of time the challenger competes in the market under the settlement. The calculations are more complex if these assumptions are not met, or if a non-validity finding would draw more rivals into the market. My earlier paper offers a more complete analysis.

[10] As I explain in my earlier paper, *see supra* note 1, for this purpose cash payments should be calculated net of the patent holder's avoided litigation costs. Risk aversion could explain the preference for settlement, but risk aversion on the part of a large, publicly-traded company that maximizes shareholder value requires proof, especially for bets that are small relative to the firm's market capitalization. In some cases, asymmetric information can offer an alternative theoretical explanation. Because alternative theoretical explanations exist and may prove convincing in specific cases, my approach involves an inference (presumption) that a large "reverse payment" is anticompetitive rather than a per se rule against such payments.

[11] No such inference may be made regarding the challenger's views on patent strength. The challenger may consider its case very weak and simply be delighted to negotiate a settlement in which it receives a large cash payment as well as the right to compete for 25% of the remaining patent lifetime.

[12] Call the patent holder's assessment of its own probability of winning p. By settling, the patent holder's profits are $100 million for three years then $60 million for one year, or $360 million, less the $16 million cash payment, for a total of $344 million. The patent holder's expected profits from litigating are $400 million ($100 million per year for four years) with probability p, and $240 million ($60 million per year for four years) with probability $(1-p)$, which adds up to $240 million + $160 million$*p$. Settlement gives higher expected profits if and only if this expression is less than $344 million, which simplifies to $p < 0.65$.

[13] Schering Plough Corp., FTC Docket No. 9297, Initial Decision at 106–07 (June 27, 2002), *available at* http://www.ftc.gov/os/2002/07/scheringinitialdecisionp2.pdf. I served as an economic expert on behalf of American Home Products in this matter, applying the methods described here and in my earlier paper.

[14] From an antitrust perspective, this difficulty is akin to the tensions facing a company that seeks to downplay its own competitive significance for antitrust purposes, especially when that same company has recently touted its own products, prospects, and competitive significance to investors, customers, or other audiences.

[15] A far more radical change in antitrust law would be required to dismiss potential non-infringing competition as unworthy of antitrust protection, since antitrust often involves protecting future competition that may or may not materialize. The fact that some competition is less than certain hardly means it is speculative or unimportant.

[16] For example, James Langenfeld & Wenqing Li, *Intellectual Property and Agreements to Settle Patent Disputes: The Case of Settlement Agreements with Payments from Branded to Generic Drug Manufacturers*, 70 ANTITRUST L.J. 777 (2003), argue that "settlement agreements can protect patent holders' intellectual property rights, especially where a generic manufacturer may not be able to fully compensate a patent holder for an infringement." *Id.* at 778.

[17] Due to limitations of space, I cannot respond to each of McDonald's arguments, and I make no effort to respond to points where he is attacking the Leffler and Leffler article rather than my work. On the general issue of how economists view property rights, and why "probabilistic patents" reflect sound and settled principles of economics rather than some new-fangled approach to intellectual property rights cooked up for this situation, I refer readers to the response by Leffler and Leffler. *See supra* note 3.

[18] John Allison & Mark Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AM. INTELL. PROP. L. ASS'N 185 (1998) look at all written, final validity decisions by either district courts or the Federal Circuit from 1989 through 1996 (299 patents litigated in 239 cases). They find that 46% of these litigated patents were declared invalid. Kimberly Moore, *Judges, Juries, and Patent Cases—An Empirical Look Inside the Black Box*, 98 MICH. L. REV. 365 (2000), studies all patent cases that went to trial in the U.S. from 1983 through 1999. Of the 1209 patent trial decisions in her data set, the patentee won 58% of the cases and the alleged infringer prevailed in 42% of the cases. Here, the patent holder was considered to "win" if the patentee won at least one claim in its entirety (including validity and infringement). Jean Lanjouw & Mark Schankerman, *Characteristics of Patent Litigation: A Window on Competition*, 32 RAND J. ECON. 129 (2001), explore how patent litigation rates vary with the characteristics of patents and their owners.

[19] *See* McDonald, supra note 2, at 71–72: "In Shapiro's view, therefore, a patentee would be liable to consumers for a settlement that precluded this interim, infringing competition at the same time that the consumers in his 'but for' world would be liable to the patentee, in the same amount, for infringement of the patent. Hmmm."

[20] If such compensation is considered inadequate, Congress should modify the rules governing injunctions or damages in patent infringement cases.

[21] In fact, by McDonald's reasoning, a licensee would be guilty of theft when it negotiates a royalty rate that is less than the full rate that would be charged for a patent that had already been tested and held up in court.

The Probabilistic Nature of Patent Rights: In Response to Kevin McDonald

BY KEITH LEFFLER AND CRISTOFER LEFFLER

PATENTS ARE PROPERTY.[1] A patent grants to its "owner" a set of "rights" that are qualitatively no different than any other property rights[2]—they are probabilistic. Whether I have the "right" to drive my car depends on it being available when I desire to use it. While the probability may be very high that my decisions will control the use of most things that I "own," the probability is not certain.[3] This standard economic proposition has secured its place in economic analysis for decades.[4]

Patent rights are even more uncertain than rights to tangible property.[5] A patent owner can never be certain that it will be able to enforce its "right" to exclude others from use of the patented invention. For instance, a patent owner cannot seize allegedly infringing goods; infringement may occur without the knowledge of the patent holder; the costs of eliciting government efforts to exclude an alleged infringer may not justify the effort; and—most importantly—attempts by the patent holder to enforce its "rights" through the coercive power of the government may result in a finding of invalidity or non-infringement.[6]

The fact that patent rights are uncertain, probabilistic rights formed the foundation of prior analysis that we have published.[7] In our previous research we began with the premise that (1) the "rights" of a patent holder are those substantive and procedural rights that Congress has dictated and (2) the "right to exclude" others from a market and collect monopoly rents is an uncertain right that can be represented by a probability that a patent will be found to be valid.

Given the probabilistic nature of patent rights, we analyzed the welfare consequences of private parties agreeing to settle a patent dispute by agreeing to continue a monopoly and share the monopoly rents. Such a settlement typically occurs by the patent holder (1) paying the alleged infringer to stipulate to the patent's validity and (2) agreeing not to enter the market. For the remainder of this article we refer to such settlements as "lump sum patent settlements."

Keith Leffler is an associate professor in the Department of Economics at the University of Washington specializing in antitrust economics. Cristofer Leffler drafted this article while an associate at Townsend and Townsend and Crew, LLP. He is currently a staff attorney in the Northwest Regional Office of the Federal Trade Commission. The views expressed herein are the views of the authors and do not necessarily reflect the views of their employers.