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# Anticompetitive Patent Injunctions

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## Article

# Anticompetitive Patent Injunctions

Erik Hovenkamp\* & Thomas F. Cotter†

### INTRODUCTION

Patent rights reflect a deliberate tradeoff of “static” (short-term) for “dynamic” (long-term) efficiency.<sup>1</sup> Governments grant patents knowing full well that in doing so they may be conferring some degree of monopoly power<sup>2</sup> because, while this is economically detrimental in the short-run,<sup>3</sup> it may nevertheless promote overall efficiency by spurring innovation sufficient to

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1. See, e.g., Michael Abramowicz & John F. Duffy, *The Inducement Standard of Patentability*, 120 YALE L.J. 1590, 1597 (2011) (“Economic analysis of patent law frequently begins with the assertion that patents present a social tradeoff between providing incentives for innovation at the expense of accepting the deadweight loss associated with monopoly-like exclusive rights.”); Michael J. Burstein, *Exchanging Information Without Intellectual Property*, 91 TEX. L. REV. 227, 276 (2012) (“The classic economic analysis of intellectual property posits a tradeoff between static costs and dynamic benefits.”); Gideon Parchomovsky & Peter Siegelman, *Towards an Integrated Theory of Intellectual Property*, 88 VA. L. REV. 1455, 1500 (2002) (“Patent policy embodies a tradeoff between dynamic and static efficiency.”).

2. See Thomas F. Cotter, *The Procompetitive Interest in Intellectual Property Law*, 48 WM. & MARY L. REV. 483, 486–87 (2006). Courts no longer presume that patents confer market power because, in fact, most patents are never used or licensed and even those that are often compete with a range of potential substitutes. Some patents do confer market power, however, and it is the potential (even if, ex ante, unlikely) prospect of this outcome that is presumed to motivate firms to invest in R&D. See *id.* at 486.

3. See, e.g., ROGER D. BLAIR & THOMAS F. COTTER, INTELLECTUAL PROPERTY: ECONOMIC AND LEGAL DIMENSIONS OF RIGHTS AND REMEDIES 18 (2005).

offset the social costs of temporarily suppressed competition.<sup>4</sup> Of course, a promise of exclusive rights to an invention is vacuous without a mechanism for enforcement, and thus it is ultimately patent remedies that lay the groundwork for the incentive problem at the heart of patent policy. It is therefore curious that, in deciding whether to grant an injunction for the infringement of a patent (as opposed to awarding an ongoing royalty instead) courts focus on the immediate hardships an injunction might impose on the litigants and the public, but not on a consideration that is far more relevant to the patent system's goal of promoting dynamic welfare: namely, the extent to which the ability to exclude competitors was a necessary inducement for the plaintiff's decision to bring its products to market.<sup>5</sup> In this Article, we present a simple economic model showing that, under certain identifiable conditions, courts should deny injunctions because the exclusion of infringing competitors will reduce static consumer welfare without any corresponding dynamic efficiency gain.

Our analysis leads to two key insights that are relevant to a broad range of cases at the core of contemporary patent policy debates. The first is that it is sometimes possible to conclude that injunctive relief for patent infringement will result in an unambiguous social welfare loss, based upon inferences that reasonably can be drawn from the fact that a firm entered a product market unprotected by any expectation of being able to enjoin competitors using the technology in question.<sup>6</sup> The second is to develop a theory of a heretofore unexplored<sup>7</sup> business

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4. See CHRISTINA BOHANNAN & HERBERT HOVENKAMP, CREATION WITHOUT RESTRAINT: PROMOTING LIBERTY AND RIVALRY IN INNOVATION xi, 8–11, 14, 241–42 (2012) (noting that the long-term welfare gains from innovation are likely substantially higher than the short-term welfare gains derived from the elimination of anticompetitive market conditions); Josh Lerner, *The Patent System in a Time of Turmoil*, 2 WIPO J. 28, 32 (2010) (noting that, while there are some dissenters, most economists “would agree that some intellectual property protection is better than no intellectual property protection at all,” while recognizing that “this does not mean that very strong protection is better than a more moderate level of protection”).

5. See *infra* notes 29–33 and accompanying text.

6. In this regard, our analysis parallels that of Abramowicz and Duffy, who argue that in deciding whether an invention was patentably nonobvious the Patent Office and the courts should consider whether, absent the patent incentive, the invention “would not have been disclosed or devised for a substantial period of time.” See Abramowicz & Duffy, *supra* note 1, at 1599. Roughly speaking, our analysis asks whether, absent the ability to enjoin infringers, the patent owner would have entered the market anyway.

7. While unexplored in patent law, the underlying strategy has been ad-

model that is becoming increasingly common and that we refer to as the “diagonally integrated” nonpracticing entity (NPE),<sup>8</sup> which is a producer that acquires patents it does not practice, but which competes with some downstream firms that use (or could potentially use) those patented technologies. Such firms seek neither to use nor to license on reasonable terms the acquired patents, a strategy that largely serves to exclude these technologies from the marketplace. As a consequence, diagonally integrated NPEs impose much greater social welfare costs than do more conventional types of NPEs. These insights provide valuable implications concerning a number of widely scrutinized contemporary patent issues, including the consequences of making commitments to license standard-essential patents (SEPs) on fair, reasonable, and nondiscriminatory (FRAND) terms; patent privateering; and preemptive patenting.

To illustrate, consider the facts of a recent Federal Circuit decision, *Trebro Manufacturing, Inc. v. FireFly Equipment, L.L.C.*<sup>9</sup> The patents in suit relate to a type of agricultural vehi-

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dressed in antitrust. This disparity is not surprising given the courts’ inconsistent approaches to competition policy within and outside the patent context, which effectively leaves them with one silo for patent law and a second silo for antitrust. See, e.g., HERBERT HOVENKAMP, THE ANTITRUST ENTERPRISE 272 (2008) (“[S]trategic acquisition and nonuse of patents are unlawful monopolization if they restrain competition unreasonably.”); see also *Kobe, Inc. v. Dempsey Pump Co.*, 198 F.2d 416, 424 (10th Cir. 1952) (explaining that the dominant firm’s acquisition and nonuse of an important patent could violate Section 2 of the Sherman Act).

8. See *infra* note 24 and accompanying text.

9. 748 F.3d 1159 (Fed. Cir. 2014). A much older case that involved largely the same fact pattern as *Trebro* is *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405 (1908). As in *Trebro*, a firm with a large market share purchased a patent from a third party, did not use or license it, and sought injunctive relief against another firm that allegedly infringed the patent. See *id.* at 406. The Supreme Court held that the patent owner was under no duty to use the patent and that, because the defendant’s device infringed under patent law’s doctrine of equivalents, injunctive relief was appropriate. See *id.* at 422–30; see also BOHANNAN & HOVENKAMP, *supra* note 4, at 295–98 (discussing, among other things, the *Paper Bag* plaintiff’s acquisition of the patent from the inventor). Bohannan and Hovenkamp argue more broadly that courts generally should not grant injunctive relief to nonusing patent owners, but in addition they argue that “the *Paper Bag* rule is catastrophically negative” when the infringement is inadvertent, “when the shelf life of the patented invention is shorter than the term of the patent,” and “when the acquirer is a dominant firm, or monopolist, and the acquisition serves to maintain a monopoly in a market that would otherwise have been competitive.” BOHANNAN & HOVENKAMP, *supra* note 4, at 298. The authors also recommend that antitrust enforcers limit market-dominant firms to acquiring only nonexclusive patent licenses. See *id.* at 293; see also HERBERT HOVENKAMP ET AL.,

cle known as a “sod harvester,” and the market for these devices consists of only three firms: patent owner Trebro, Brouwer Turf Inc., and a new entrant, FireFly.<sup>10</sup> In 2013, a company affiliated with Brouwer sold Trebro the two patents in suit, in exchange for which Trebro canceled a debt owed by Brouwer and granted Brouwer a royalty-free, nonexclusive license to the two patents; Trebro itself, however, does not use the patented technology in any of the harvesters it sells.<sup>11</sup> Shortly after acquiring the patents Trebro filed suit against FireFly, alleging that FireFly’s “ProSlab 150” harvesters, which compete against Trebro’s unpatented “SC2010” model, infringe the patents.<sup>12</sup>

Before the matter proceeded to trial, Trebro moved for a preliminary injunction, which the district court denied on the ground that Trebro was unlikely to succeed on the merits and had not succeeded in proving irreparable harm.<sup>13</sup> With respect to this latter issue, the court concluded that an award of damages in the form of lost profits or a reasonable royalty would fully compensate Trebro if it were to prevail at trial.<sup>14</sup> On interlocutory appeal, the Federal Circuit vacated the district court’s order denying the injunction, first because in the appellate court’s view Trebro’s patent likely *was* valid and infringed,<sup>15</sup> and second because “[t]he district court clearly erred in finding as speculative the harm Trebro is likely to suffer if its direct

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IP AND ANTITRUST § 14.3c (2d ed. 2013) (suggesting nonexclusive patent licenses as a solution to “competitive objections to intellectual property acquisitions by dominant firms”). In *Trebro*, this would have meant that Brouwer Turf would have retained ownership of, and the right to sue for the infringement of, the patent. See BLAIR & COTTER, *supra* note 3, at 168 (licensors have standing to sue, while nonexclusive licensees do not). We have no quarrel with this reasoning, but our analysis provides an additional set of reasons for denying injunctions in cases like *Paper Bag* or *Trebro*, and as discussed in Part III also casts light on other recurring situations that do not necessarily involve acquisition of a patent from a third party or the patent owner’s market dominance. Finally, we would note that, as a doctrinal matter, although the Supreme Court’s decision in *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006), does not explicitly overrule *Paper Bag*, it greatly restricts the reach of that decision. See *infra* note 31 and accompanying text (discussing *eBay*).

10. See *Trebro*, 748 F.3d at 1164, 1170.

11. See *id.* at 1162, 1164, 1171.

12. See *id.*

13. See *id.* at 1164–65. Under the applicable law, the moving party “must establish that he is likely to succeed on the merits, that he is likely to suffer irreparable harm in the absence of preliminary relief, that the balance of equities tips in his favor, and that an injunction is in the public interest.” *Id.* at 1165 (quoting *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7, 20 (2008)).

14. See *id.*

15. *Id.* at 1166–70.

competitor is able to sell an infringing product in the small, niche sod harvester market.”<sup>16</sup> In the court’s view, FireFly’s allegedly infringing sales not only cost Trebro corresponding sales of its unpatented SC2010 harvesters, but (due to the durability of the products and the size of the market) also result in a loss of customers and substantial market share, which Trebro is unlikely to recover.<sup>17</sup> The fact that Trebro’s products themselves do not use Trebro’s ‘638 Patent does not detract from this harm.<sup>18</sup> The court then remanded for consideration of the remaining preliminary injunction factors (balance of harms and public interest), noting however that the “patent will have significantly less value if Trebro cannot use it to exclude an infringing product” and suggesting that because the market is small an injunction “may not have a broad-reaching effect.”<sup>19</sup>

As the court noted, *Trebro* is hardly the first case in which the Federal Circuit has stated that a patent owner whose own products do not embody its patented invention may obtain an injunction against a competitor whose products allegedly *do* embody that invention.<sup>20</sup> By contrast, in cases in which the patent owner makes *no* products—that is, in which the owner is a nonpracticing entity (NPE)<sup>21</sup>—U.S. courts since the Supreme Court’s decision in *eBay Inc. v. MercExchange, L.L.C.*<sup>22</sup> are likely to deny preliminary and permanent injunctive relief, on the ground (among others) that infringement does not threaten the NPE with “irreparable” harm.<sup>23</sup> This follows from the fact that,

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16. *Id.* at 1170.

17. *Id.* at 1170–71.

18. *Id.* at 1171.

19. *Id.* at 1171–72.

20. *See id.* at 1171 (citing *Presidio Components, Inc. v. Am. Tech. Ceramics Corp.*, 702 F.3d 1351, 1363 (Fed. Cir. 2012); *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 702–03 (Fed. Cir. 2008)).

21. The terms “patent assertion entity” (PAE), “patent monetization entity” (PME), and “patent troll” generally refer to NPEs that obtain patents from their original owners for the purpose of enforcing them against alleged infringers. For discussion of the many different types of NPEs in the contemporary marketplace, see, for example, Malte Köllner & Paul Weber, *Trolls and Their Consequences—An Evolving IP Ecosystem*, 3 MITTEILUNGEN DER DEUTSCHEN PATENTANWÄLTE 106 (2014); Raymond Millien, *Landscape 2013: Who Are the Players in the IP Marketplace?*, IPWATCHDOG (Jan. 23, 2013), <http://www.ipwatchdog.com/2013/01/23/ip-landscape/id=33356>.

22. 547 U.S. 388 (2006).

23. *See, e.g.*, Colleen V. Chien & Mark A. Lemley, *Patent Holdup, the ITC, and the Public Interest*, 98 CORNELL L. REV. 1, 8–11 (2013) (reporting that, from July 2006 to August 2011, prevailing PAEs obtained permanent injunctions in 26% of cases (5 of 19), compared with a 75% rate for all patentees, and

unlike Trebro and other practicing entities, NPEs generally have no interest in excluding competitors, since NPEs produce and sell no products themselves and typically are willing to license their patents for the right price.

Nevertheless, we argue that Trebro is best viewed as a *type* of NPE—more specifically, a “diagonally integrated” NPE that uses its idle patents to impair or exclude firms from competing against the products the diagonally integrated firm does produce<sup>24</sup>—and that entry of an injunction on the specific facts of *Trebro* undermines the public interest in competition, without any offsetting social benefit. More precisely, in Part I below we present a simple economic model showing that, where a firm (1) enters a product market without any protection against competing technologies; (2) makes and sells goods embodying unprotected technology *a*; and (3) acquires from a third party but does not use a patent covering a competing technology *b*, granting that firm an injunction against an infringer’s unauthorized use of technology *b* to market competing products creates an unambiguous static welfare loss that cannot be justified by any potential gains to dynamic efficiency.<sup>25</sup>

Significantly, two main points that emerge from our model have implications that extend far beyond the narrow facts of *Trebro*. The first is that, when it is possible to infer that a firm was willing to enter a market unprotected by a right to enjoin competitors, it is often appropriate to deny the firm injunctive relief against patent infringement. *Trebro* is an example of such a case, but as we explain in Part II the fact that a firm was willing to make an unprotected market entry also makes it appropriate to deny injunctive relief in two other classes of cas-

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that the rate is only 7% for PAEs in cases in which the injunction was contested). NPEs that are not PAEs, however, including individuals and universities, “have enjoyed higher-than-average injunction-grant rates” than other NPEs. *Id.* at 10. The U.S. International Trade Commission, however, provides a parallel forum for some patent infringement disputes, and may exclude infringing imports; it is not bound by the *eBay* rule. *See Spansion, Inc. v. Int’l Trade Comm’n*, 629 F.3d 1331, 1359 (Fed. Cir. 2010).

24. *See* Richard S. Higgins, *Diagonal Merger*, 12 REV. INDUS. ORG. 609, 610 (1997) (coining the term “diagonal merger”).

25. Note that we are not talking about a firm that makes an unprotected entry into the market for product *a* while it is working on, or seeking patent protection for, a technology that is embodied in product *a*. Market pressures often compel firms to begin commercializing their technology before they have succeeded in obtaining legal protection for that technology, and nothing in our analysis demonstrates that denying these firms injunctions would increase social welfare.

es that feature in contemporary patent policy debates, namely actions filed by patent “privateers”<sup>26</sup> and cases involving the alleged infringement of FRAND-encumbered SEPs.<sup>27</sup> Our analysis also sheds some light, albeit less conclusively, on the perennial question of whether courts should grant injunctive relief when the patentee allegedly has engaged in “preemptive” patenting—that is, patenting for the purpose of excluding competitors from using a technology the patent owner itself does not intend to use.<sup>28</sup>

Part III develops the second key point to emerge from the model, namely, that diagonally integrated NPEs can give rise to serious but, up until now largely unappreciated, social welfare costs. Circumstances formally identical to those found in *Trebro* are in fact becoming increasingly common, with practicing entities acquiring existing patents not for purposes of their own use, but rather for the purpose of exclusion or licensing. Our model shows that ownership by a diagonally integrated NPE generally results in higher licensing fees and more aggressive litigation in pursuit of injunctive relief than would be

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26. “Privateering” is the term used when a practicing entity assigns patents to a nonpracticing third party who then seeks to enforce the patents. The third-party “privateer” then distributes a portion of the resulting proceeds back to the assignor, in accordance with the terms of the assignment. *See infra* Part II.A.

As noted above, since the Supreme Court’s 2006 *eBay* decision, courts generally have been reluctant to grant injunctive relief to PAEs—and as we will see, privateers for the most part are a species of PAE. Nevertheless, our analysis provides some additional reasons why courts should resist granting privateers injunctive relief, which may prove useful in specific cases in this country as well as in jurisdictions outside the United States where the *eBay* rule has yet to take hold.

27. Standards setting organizations (SSOs) such as the European Telecommunications Standards Institute (ETSI) typically require members to disclose any patents that might read on a standard under consideration, to “declare” any patents that are essential to the practice of the chosen standard, and to commit to license those patents on “reasonable and nondiscriminatory” (RAND) or “fair, reasonable, and nondiscriminatory” (FRAND) terms. *See, e.g.*, RUDI BEKKERS & ANDREW UPDEGROVE, U.S. NAT’L ACADS. OF SCI., A STUDY OF IPR POLICIES AND PRACTICES OF A REPRESENTATIVE GROUP OF STANDARDS SETTING ORGANIZATIONS WORLDWIDE 48–99 (2012), [http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga\\_072197.pdf](http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_072197.pdf). In contemporary practice, RAND and FRAND are used interchangeably, though as of 2014 FRAND seems to be on its way toward becoming the more common usage. For discussion, see *infra* Part II.B.

28. *See* BLAIR & COTTER, *supra* note 3, at 248–50; Roger D. Blair & Thomas F. Cotter, *Rethinking Patent Damages*, 10 TEX. INTELL. PROP. L.J. 1, 77–78 (2001).



the case if the patents were owned by conventional “unintegrated” NPEs, which (again) typically are interested in licensing, not exclusion. Counterintuitively, conventional NPEs may pose less of a threat to short- and long-term consumer welfare than do their diagonally integrated counterparts. They also create welfare harms that would not arise if they were practicing entities with respect to the disputed patent. Diagonally integrated NPEs are thus distinct from both practicing entities and traditional, unintegrated NPEs.

### I. UNPROTECTED MARKET ENTRY

The principal ambition of the patent system is not to reward inventors, nor is it to extract compensation from those who reap the benefits of others’ ideas. Rather, its aim is to induce innovative activity that would not arise if new inventions were unprotected from the forces of open competition. The protections afforded by patents are merely the inducements we use to achieve this goal.<sup>29</sup> In this way, the protections provided by a particular patent are socially valuable only to the extent that they were necessary to induce the patentee’s innovative ef-

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29. To be sure, some scholars have proposed noneconomic theories of patent rights, premised for example on the inventor’s investment of labor in developing a new invention, or on the argument that property rights, including intellectual property rights, assist us in realizing greater personal autonomy. See, e.g., ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* (2011). In another work, however, one of us has expressed skepticism over the wisdom of taking such noneconomic rationales into account in formulating patent policy. See Thomas F. Cotter, *Legal Pragmatism and Intellectual Property Law*, in *INTELLECTUAL PROPERTY AND THE COMMON LAW* 211, 221–24 (Shyamkrishna Balganesh ed., 2013). There also are other proposed economic justifications, including Edmund Kitch’s prospect theory. See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 *J.L. & ECON.* 265, 267–71 (1977) (arguing that patents enable inventors to efficiently coordinate the development of an inventive “prospect”). Scholars are divided on the merits of the prospect theory. See THOMAS F. COTTER, *COMPARATIVE PATENT REMEDIES: A LEGAL AND ECONOMIC ANALYSIS* 27 (2013) (noting some of the relevant literature). But even if one believes that patents sometimes may serve Kitch’s prospect function, and that injunctive relief is vital to their ability to do so, see Kitch, *supra*, at 286–87, in the cases we discuss herein the social benefits of prospecting would have to be very substantial indeed in order to outweigh the social welfare losses resulting from the granting of injunctions; and this seems unlikely if, as in our examples, the patent owner clearly is *not* using the patent to coordinate follow-up improvements but rather merely to exclude competition or to extract royalties. In any event, the rationale described in the text above—that patents encourage the creation and disclosure of new inventions—remains the dominant justification for the patent system, and the one to which we will devote our attention.

forts.<sup>30</sup> Any protections provided in excess of this amount are unnecessary, and their exercise engenders a social loss. However, this point is often lost in the course of evaluating injunctive relief as a remedy for infringement. The courts instead focus myopically on ascertaining and comparing the hardships of the litigants and the public at large,<sup>31</sup> leading them to ignore the question most relevant to the patent system's ambitions: Did the plaintiff's decision to develop its patented technology hinge on its ability to exclude infringers<sup>32</sup> like the defendant?<sup>33</sup> This

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30. See Abramowicz & Duffy, *supra* note 1, at 1593–603 (arguing that an inducement framework should guide the analysis of whether an invention was nonobvious).

31. See *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391 (2006) (“[A] plaintiff seeking a permanent injunction . . . must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.”). The *eBay* factors do not explicitly require courts to consider the plaintiff's innovation incentive, though courts sometimes do refer to the public interest in “the enforcement of patent rights to promote the ‘encouragement of investment-based risk.’” *Apple, Inc. v. Samsung Elecs. Co.*, 909 F. Supp. 2d 1147, 1162 (N.D. Cal. 2012) (quoting *Sanofi-Synthelabo v. Apotex, Inc.*, 470 F.3d 1368, 1383 (Fed. Cir. 2006)), *aff'd in part, vacated in part on other grounds*, 735 F.3d 1352 (Fed. Cir. 2013). The Federal Circuit has cautioned, however, this interest “must also be weighed with other aspects of the public interest.” *Apple, Inc. v. Samsung Elecs. Co.*, 735 F.3d 1352, 1372 (Fed. Cir. 2013). In the text above, we propose that, in appropriate circumstances, courts *should* take into account, as part of the public interest analysis, whether an injunction is necessary to preserve innovation incentives.

32. Throughout this Article we restrict attention to unintentional infringements—independently invented technologies that happen to read on the patent in question. Permitting injunctions of willful infringements will more often be necessary, as this serves to mitigate the free-riding problem that would arise if intentional copying were not adequately deterred. That is, if intentional copiers are simply made to pay damages, they may choose to do so rather than developing their own ideas. Thus, injunctions of intentional infringers may be necessary to preserve the incentive to innovate among potential defendants. Concededly, though, there may be some difficulties in determining what “unintentional infringement” means or should mean in some contexts, for example where the defendant could have uncovered the patent by means of a reasonable pre-use search. See COTTER, *supra* note 29, at 62 n.47; Thomas F. Cotter, *The Comparative Law and Economics of Standard-Essential Patents and FRAND Royalties*, 22 TEX. INTELL. PROP. L.J. 311, 344 n.148 (2014). Be that as it may, some evidence suggests that intentional copying is much less common than unintentional infringement. See Christopher A. Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 N.C. L. REV. 1421, 1462–64 (2008).

33. Of course, the plaintiff is not always the inventor or the inventor's employer. If instead the plaintiff is a non-practicing entity (NPE) who ac-

Article demonstrates that there are some circumstances in which we can deduce that the answer is no. In these situations there is no policy justification for awarding an injunction, no matter the magnitude of the plaintiff's injury. Instead, as discussed below, the court should apply a liability rule<sup>34</sup> and award an ongoing royalty in place of injunctive relief.

The importance of identifying when injunctive relief is unwarranted stems from its particularly harmful impact on static (short-run) welfare, that is, the level of consumer or social welfare that is associated with the present state of the market, given the products currently available. To the extent that, in the short run, there are no readily available noninfringing alternatives that the defendant can substitute for the patented invention, this impact is threefold. First, an injunction dampens competition by effectively excluding the defendant from the relevant product market, thus enabling any remaining firms

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quired the patent, then this question centers on whether the original inventor's development decision idea hinged on his ability to sell to an NPE, and to do so at the higher price the patent would command when this NPE retains the right to enjoin infringers and thus extract some portion of the switching cost the defendant otherwise would incur ex post if it were to design around the patented technology. In a companion paper, one of us argues that, in principle, enabling the patent owner to extract the defendant's avoided switching costs results in a reward that is presumptively disproportionate to the invention's social value. See Norman V. Siebrasse & Thomas F. Cotter, *A New Framework for Determining Reasonable Royalties in Patent Litigation*, 68 FLA. L. REV. (forthcoming 2016) (manuscript at 10–11), <http://ssrn.com/abstract=2528616>. Nevertheless, even if the patentee's ultimate interest is (as it is for many NPEs) to license the invention to, rather than to exclude, the defendant, and the incentive to invent would not be impaired by preventing the patentee from extracting switching costs, injunctive relief may be optimal if a court's calculation of an ongoing royalty would generate adjudication and error costs that exceed the social cost of enabling the patent owner to extract the switching costs. See COTTER, *supra* note 29, at 53–55 (arguing that, even when the patent owner's ultimate interest resides in licensing its invention, protecting intellectual property rights by means of a property rule may economize on adjudication and error costs by capitalizing on the parties' presumptive advantage, in comparison with a court, in estimating patent value).

Alternatively, in some cases the product the plaintiff markets and which the injunction shields from competition is not covered by the patent in suit. This is what happened in *Trebro*, where the court held that an injunction might be proper to protect the plaintiff's competing but unpatented product. See *Trebro Mfg., Inc. v. FireFly Equip., L.L.C.*, 748 F.3d 1159, 1171 (Fed. Cir. 2014). In such situations, the relevant question is whether the inventor of the patented technology would have developed that technology absent the ability of the plaintiff to shield its unpatented product from competition by excluding users of the patented technology.

34. See *infra* note 41.

(including the plaintiff) to increase price and reduce output. (In a case like *Trebro*, where there are only three firms in the entire market and the defendant is a new entrant,<sup>35</sup> this effect could be quite significant.) Second, by eliminating a distinct product variety from the market, the injunction forces many consumers to settle for their second favorite product. Third, the defendant may be effectively barred from using not only the infringing technology, but also any of its own intellectual property that is incorporated into the infringing product, unless such complementary intellectual property can be deployed for other purposes. By contrast, an injunction in a dispute between neighboring landowners will typically not inhibit the defendant's ability to use and enjoy the undisputed portions of his own property, nor is the injunction likely to have a substantial impact on nonparties.

Despite their harmful effects on static welfare, injunctions nevertheless may be optimal in those cases where they serve to substantially promote dynamic (long-run) welfare, which takes into account not only the present state of the market, but also the innovative activities that lead to the introduction of new and improved products over time. This boils down to the fact that some potential inventors would not develop their new ideas unless they were assured that they could enjoin infringers. This is most likely to occur in situations where a technology is expensive to develop, but costs comparatively little to reproduce thereafter.<sup>36</sup> Under these circumstances injunctive relief is effi-

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35. See *Trebro*, 748 F.3d at 1164, 1170.

36. In such a case, the expected advantage of being the first in the market with a new invention may not be adequate to motivate the development of the invention in the first place. Conceivably, other mechanisms such as trade secret may suffice in some cases, though these often entail greater risk to the inventor and/or greater disadvantages to the public (less disclosure, for example). See COTTER, *supra* note 29, at 26–27. Of course, in some instances the inventor's ultimate interest lies not in excluding competition, as posited in the text above, but rather in licensing it to a more efficient manufacturer or distributor. In these cases, the principal social benefit of injunctive relief, to be balanced against the corresponding social costs, may be to conserve on adjudication and error costs. See *supra* note 33.

Note, however, that an inventor's interest in enjoining infringers does not necessarily imply that the inventor is a practicing entity. Small or university-based inventors, for example, may lack the ability (manufacturing capacity, know-how, etc.) to successfully bring a new product to market, in which case it is more efficient to license production to someone else. See COTTER, *supra* note 29, at 45 (arguing more generally that licensing is efficient when the inventor's marginal cost of producing or marketing the invention is higher than a prospective licensee's). In such cases, a right to enjoin infringers enables the

cient, because it is better to have a product market that is non-competitive than to have no market at all. This is the critical tradeoff that motivates the patent system.

If, however, the circumstances of a particular case indicate that the plaintiff would have entered the market even absent the possibility of enjoining infringers, then it is best not to award an injunction. This way we avoid the static problems of injunctive relief without compromising dynamic welfare. In fact, if an inventor did not view injunctive relief as an essential protection when he chose to develop his idea, then he should be denied an injunction even if he ultimately confronts unexpectedly injurious competition that, if anticipated, would have led him to reevaluate the essentiality of injunctive relief. Indeed, awarding injunctions to these unlucky plaintiffs would do nothing for dynamic welfare: it would not bring any more inventions to market than would have arrived otherwise because, by hypothesis, these inventors would have developed their products either way.<sup>37</sup> In truth, development of an untested product is always a gamble; the patent system seeks to persuade an inventor to place his bet, not to ensure that he wins.

Importantly, this incentive-based approach to injunctive relief would not deter any future inventors from developing their ideas. Indeed, it signals to a prospective innovator that he will be denied an injunction only if his idea is so promising that its development will be profitable even in lieu of the right to ex-

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inventor to determine which person or persons to license and which to exclude. Often the inventor will be better off licensing the patent to one or more selected users on an exclusive basis, rather than negotiating nonexclusive licenses with all prospective users. See BLAIR & COTTER, *supra* note 3, at 203–06. Thus, the fact that the inventor has chosen to license one or more persons to practice the invention is not sufficient, by itself, to compel the inference that the prospect of obtaining injunctive relief against some unauthorized users was immaterial to the decision to invent. Allowing the inventor to enjoin infringers who interfere with the inventor's interest in exclusive licensing therefore may preserve the patent incentive and thus promote long-run efficiency.

Finally, even in a case in which the inventor ultimately is willing to license an alleged infringer, the ability to threaten injunctive relief may enable the inventor to extract a higher royalty than otherwise would be the case. See *infra* notes 41–43 and accompanying text. As discussed in Part II, however, we are skeptical whether this consequence of a right to injunctive relief promotes dynamic efficiency.

37. The possibility that such actors might be risk averse does not undermine the optimality of this rule. This is because the rule is subjective: a specific plaintiff should be denied an injunction under this rule only if, given the way he viewed his own prospects, he would have developed his idea even without retaining the right to enjoin infringers.

clude infringers. In this way, the rule impacts only those inventors hoping to get what they want, and not simply what they need. As a result, the only real concern with such a rule is that it will often be impossible to implement. That is, in most patent disputes the court will be unable to ascertain the plaintiff's incentives at the time of invention. However, we show that there are a number of situations in which we can infer an inventor's non-reliance on injunctive relief from his actions and the circumstances under which his invention entered the market.

It is also worth noting that this approach to evaluating injunctive relief does not rely on the plaintiff's ability to foresee the infringement in question at the time of invention. That is, we do not assume the plaintiff affirmatively considered the possibility of confronting the specific infringement at issue. In reality an innovator will typically be unable to foresee all possible infringements that might arise; the same is true of her ability to foresee future noninfringing but competing technologies. Rather we ask whether, given whatever preconceptions the inventor had about the competing products she might face, the decision to develop the invention did not hinge on the ability to enjoin any such products that happen to read on her patent.<sup>38</sup> This is likely to be true whenever competitors can readily invent around the patent without materially compromising product quality, as in this case the inventor enters the market knowing she will likely face noninfringing competition that is just as harmful as true infringement.

To formalize our theory, we analyze a very simple economic model illustrating the relevant tradeoffs that determine the suitability of injunctive relief. The model surrounds the problem the courts face in deciding whether to employ a liability rule or a property rule in a given patent dispute. A liability rule does not enable a property holder to prevent others from violating her property rights; it merely entitles her to receive compensation for any such violations.<sup>39</sup> Under this rule, a firm may infringe a rival's patent without fear of being enjoined, but the

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38. Recall that this Article restricts attention to unintentional infringements, so this boils down to the question of whether the inventor was willing to compete with independently invented infringements, which are less likely to be perfect copies of the invention. *See supra* note 32 (noting this paper's focus on unintentional infringements).

39. *See* Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1092 (1972).

courts will force it to pay damages to the patent holder. Under a property rule, the patent holder is entitled to absolute control over its patented technology, and any firm that practices its patent without permission may be enjoined as a matter of course.<sup>40</sup> Importantly, an inventor will always prefer to have a property rule, because this maximizes the value of her property right. Even if she does not intend, ultimately, to use an injunction to exclude the defendant's product from the market, she can threaten to enforce the injunction in order to secure a larger licensing fee than a court might be inclined to award, under a liability rule regime, as an ongoing, postjudgment royalty.<sup>41</sup> Indeed, she can leverage the order to extract the largest amount that the defendant would willingly pay in order to continue operating.<sup>42</sup> We will refer to a royalty negotiated in the shadow of a threatened injunction as a "supracompensatory"

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40. *Id.*

41. This assumes that the damages awarded under a liability rule, for both past and future infringement, are not so high as to, in effect, replicate an award of injunctive relief. As for past infringement, when courts award damages in the form of reasonable royalties the standard framework calls for them to estimate the royalty the parties would have agreed to *ex ante*, before the infringement began. *See* *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1325 (Fed. Cir. 2009). In a case in which the patentee's interest would be served by excluding rather than licensing the infringer, however, there is no amount the parties really would have agreed to *ex ante*. The patentee would have demanded more than the infringer would have been willing to pay, and typically would seek an award of lost profits instead. *See* BLAIR & COTTER, *supra* note 3, at 55–58, 231, 251–52. As for future infringement, the Federal Circuit has instructed district courts post-*eBay* to "take into account the change in the parties' bargaining positions, and the resulting change in economic circumstances, resulting from the determination of liability" in determining the amount of an ongoing, postjudgment royalty. *Amado v. Microsoft Corp.*, 517 F.3d 1353, 1362 (Fed. Cir. 2008).

If, as we argue above, there are cases in which an award of injunctive relief unambiguously would reduce social welfare, courts in such cases should modify the manner in which they award damages for both past and future infringement to ensure that the damages they award do not simply replicate the effect of a right to exclude. In practical terms, this would mean awarding reasonable royalties (not lost profits) for past infringement and an ongoing royalty for future infringement, with both measures calculated so that the effect of paying the award does not effectively result in the infringer's exclusion from the market. We may address this issue in greater detail in future work.

42. This amount may reflect the defendant's sunk costs and its *ex post* costs of switching to an alternative technology, neither of which has any obvious bearing on the value of the technology. *See, e.g.*, Joseph Farrell et al., *Standard Setting, Patents, and Hold-Up*, 74 ANTITRUST L.J. 603, 619–21 (2007); Jay Pil Choi, *FRAND Royalties and Injunctions for Standard Essential Patents* 9–10 (CESifo Working Paper No. 5012, Oct. 2014), <http://ssrn.com/abstract=2512789>.

royalty; by definition it exceeds the royalty the parties would have negotiated prior to the defendant's having incurred costs in reliance on its use of the infringing technology.<sup>43</sup>

Consider a firm-inventor with an idea for a new patentable technology,  $a$ . The firm must incur a fixed cost of  $C(a)$  in order to develop the technology and bring it to market. Developing this technology is not the only activity in which it conceivably invests its resources. For example, it might alternatively neglect to develop any new ideas and simply focus on continuing to market the products it has already developed. Thus the firm will only develop the technology if it will yield a net profit that exceeds its "reservation value," denoted  $R$ , which is simply the value of the most profitable thing it could do other than developing technology  $a$ . If the firm decides to apply for a patent and bring the product to market, the profit it earns will depend on whether its property right is protected by a property rule or a liability rule. The firm's expected profit is equal to  $\Pi_L(a)$  under a liability rule and to  $\Pi_P(a)$  under a property rule, where  $\Pi_P(a) > \Pi_L(a)$ . Thus a patentee always prefers a property rule.<sup>44</sup> By contrast, courts should prefer a liability rule whenever that rule is sufficient to uphold the dynamic interests of the patent system, because monetary damages do not produce the static welfare injuries imposed by injunctive relief.<sup>45</sup> Thus the court will want to impose a property rule only if a liability rule would have been insufficient to induce the firm to bring its product to market. This possibility is stated in condition (C1).

$$(C1) \quad \Pi_P(a) - C(a) \geq R > \Pi_L(a) - C(a)$$

By contrast, the court prefers to limit the firm to a liability rule if this alone would have been sufficient to induce its devel-

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43. See Fiona M. Scott Morton & Carl Shapiro, *Strategic Patent Acquisitions*, 79 ANTITRUST L.J. 463, 471 & n.18 (2014).

44. See *supra* notes 40–42 and accompanying text.

45. Note, however, that awarding an ongoing royalty in lieu of an injunction may generate otherwise avoidable adjudication and error costs. See *supra* note 33. But when a patentee enforces an injunction to exclude a competitor but would have entered the market even in the absence of a right to injunctive relief, it is reasonable to assume that the social costs of exclusion (higher prices, lower output, and limited consumer choice) outweigh the social costs of crafting an appropriate ongoing royalty. In such a case, an ongoing royalty reduces deadweight loss and causes no harm to dynamic efficiency, so whatever costs are incurred to determine the royalty mostly fall only on the parties themselves.



opment. This is embodied in condition (C2).

$$(C2) \quad \Pi_P(a) - C(a) > \Pi_L(a) - C(a) \geq R$$

There is an obvious problem here. Every plaintiff has an incentive to claim its situation is described by (C1), but the variables that comprise the above conditions are almost certainly not measurable by the courts. Even if courts could reliably estimate the firm's profits and costs, there is almost surely no means of assessing the plaintiff's reservation value. Unless there is some alternative information that might shed light on the inventor's ex ante prospects, the courts lack any way to determine whether an injunction is necessary to promote the dynamic interests of the patent system. It is perhaps because this information is so often unobtainable that the courts have relegated themselves to a standard under which the plaintiff's incentives at the time of invention are typically not even considered.

Fortunately, these uncertainties are not always a roadblock. There are a number of circumstances in which courts may reliably infer that injunctive relief is unnecessary to promote dynamic welfare. To address the first such possibility, we present two definitions. First, we say a firm engages in *unprotected market entry* with respect to a technology  $b$  if it enters the relevant product market without any legal protection against competing products utilizing technology  $b$ , and without materially relying on the possibility of acquiring such protection in the future. This is precisely what Trebro did when it entered the sod harvester market without any protection from the competing technology embodied in the '638 patent.<sup>46</sup> Second, we say a firm is a *diagonally integrated non-practicing entity* (NPE) with respect to a technology  $b$  if it owns but does not practice the patent on  $b$ , but competes with products using technology  $b$  in a downstream product market<sup>47</sup> (detailed anal-

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46. See *Trebro Mfg., Inc. v. FireFly Equip., L.L.C.*, 748 F.3d 1159, 1162, 1170–71 (Fed. Cir. 2014).

47. The term “diagonal integration” refers to a situation in which a producer acquires control of an upstream input used by a rival firm, but which the producer does not utilize in its own product. Thus a diagonally integrated NPE is simply a firm who becomes diagonally integrated by acquiring a patent that is practiced (or could be practiced) by some rival producers, but not by the acquiring firm itself. Note that acquiring but not practicing a patent may be valuable even if rivals do not presently practice the patent, as this may serve as a barrier to entry. See HOVENKAMP ET AL., *supra* note 9, § 14.3 (discussing

ysis of diagonally integrated NPEs and their welfare effects is the subject of Part III). Trebro became a diagonally integrated NPE when it acquired the '638 patent despite not using that technology in its own sod harvester.<sup>48</sup>

Our primary conclusion is that a diagonally integrated NPE should never be entitled to enjoin an infringer of the diagonally integrated NPE's unpracticed patent, if the diagonally integrated NPE entered the market before acquiring that patent from an unrelated third party. This implies that Trebro should be denied an injunction, as it entered the sod harvester market long before it acquired its unpracticed '638 patent.<sup>49</sup> However, the Federal Circuit reached a different conclusion, determining that such an injunction might be warranted in order to protect Trebro's interest in its own competing (but un-infringed) product.<sup>50</sup> We show that this view is mistaken. Rather, injunctions in such circumstances are never warranted, because the plaintiff's unprotected market entry indicates that she was undeterred by the possibility of competing with then-noninfringing competitors like the defendant. Thus, an inabil-

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intellectual property acquisitions by dominant firms as a potentially exclusionary practice in violation of sections 2 or 7 of the Clayton Act). Indeed, one further implication of our analysis (extending beyond our specific focus on patent injunctions) may be that the enforcement agencies and the courts should be more receptive to arguments that certain patent acquisitions "may . . . substantially lessen competition" in violation of section 7 of the Clayton Act. Clayton Act, 15 U.S.C. § 18 (2012). For recent discussions of the possible violation of section 7 by PAEs, see Ilene Knable Gotts & Scott Sher, *The Particular Antitrust Concerns with Patent Acquisitions*, COMP. L. INT'L, Aug. 2012, at 19; John "Jay" Jurata, Jr. & Amisha R. Patel, *Taming the Trolls: Why Antitrust Is Not a Viable Solution for Stopping Patent Assertion Entities*, 21 GEO. MASON L. REV. 1251, 1259–65 (2014); Erica S. Mintzer & Suzanne Munck, *The Joint U.S. Department of Justice and Federal Trade Commission Workshop on Patent Assertion Entity Activities—"Follow the Money,"* 79 ANTITRUST L.J. 423, 438–40 (2014); Mark S. Popofsky & Michael D. Laufert, *Antitrust Attacks on Patent Assertion Entities*, 79 ANTITRUST L.J. 445, 453–55 (2014); Mark S. Popofsky & Michael D. Laufert, *Patent Assertion Entities and Antitrust: Operating Company Patent Transfers*, ANTITRUST SOURCE, Apr. 2013, at 11–12, [http://www.americanbar.org/content/dam/aba/publishing/antitrust\\_source/apr13\\_full\\_source.authcheckdam.pdf](http://www.americanbar.org/content/dam/aba/publishing/antitrust_source/apr13_full_source.authcheckdam.pdf); J. Robert Robertson & Logan M. Breed, *United States v. Widget Co., Newco, and Patent Aggregator Plus LLC: A Hypothetical Closing Argument*, 79 ANTITRUST L.J. 527, 531–34 (2014).

48. See *Trebro*, 748 F.3d at 1162, 1164, 1171.

49. Trebro's website indicates that it entered the sod harvester market in 1999. TREBRO INNOVATIVE SOLUTIONS: COMPANY, <http://www.trebro.com/> company (last visited Nov. 28, 2015). However, it did not acquire the '638 patent until 2013. *Trebro*, 748 F.3d at 1162.

50. *Trebro*, 748 F.3d at 1171.

ity to exclude these competitors would not have deterred such a firm from bringing its own technology to market. Finally, it is important to note that, by restricting attention to diagonally integrated NPEs, our conclusion does not apply to situations in which the plaintiff began practicing the disputed patent after acquiring it—even though she initially entered the market unprotected from that technology. In such a case an injunction might be necessary to protect the incentive to implement the newly acquired technology.

To verify this result, suppose that there is a second, distinct technology  $b$  that serves as an alternative to technology  $a$ . That is,  $a$  and  $b$  are substitute, mutually non-infringing technologies used as an input in the downstream product. There is a downstream firm that is considering developing its idea for technology  $a$ , but that now also considers the possibility of diagonally integrating by acquiring the patent on  $b$ , which was invented by someone else. Like the patent on  $a$ , the added value of acquiring the patent on  $b$  depends on whether it will be protected by a property rule or a liability rule. If the firm brings  $a$  to market, the incremental value of being diagonally integrated with respect to  $b$  is given by  $V_P(b)$  if the courts apply a property rule and  $V_L(b)$  if they apply a liability rule. This incremental value consists not only in the value of potentially licensing the patent on  $b$ , but also in the increased profitability of the firm's own downstream product. These profits increase because the patent on  $b$  allows the firm to suppress competition from competing firms who use  $b$  by raising their licensing costs or by restricting their access to  $b$ . Importantly, the potential to suppress competition in this way is much stronger if the courts apply a property rule, as the possibility of injunctive relief provides the ultimate leverage over rivals who utilize  $b$ . Finally, the price of the patent on  $b$  is given by  $P(b)$ , where  $V_P(b) > V_L(b) > P(b)$ .<sup>51</sup> In what follows we assume that the courts apply a property rule to the inventor's practiced patent on  $a$ , and instead focus on the rule applied to its unpracticed patent on  $b$ . In principle, it is possible that the firm's interest in  $b$  would have to be protected by a property rule in order to motivate it to bring  $a$  to market in the first place. This possibility is described by condition (C3).

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51. Here we assume that the patent on technology  $b$  is worth buying even if the inventor's interest therein is protected by a liability rule, but this need not be the case. However, this alternative need not be separately addressed, as our primary conclusion obtains either way.

$$(C3) \quad \Pi_P(a) - C(a) + V_P(b) - P(b) \geq R > \Pi_P(a) - C(a) + V_L(b) - P(b)$$

This says that the firm will develop its own idea for  $a$  only if (1) it can also become a diagonally integrated NPE with respect to  $b$ ; and (2) its interest in  $b$  will be protected by a property rule. In these cases we would expect that the firm would assure itself of some protection against  $b$  before committing to enter the market with technology  $a$ . By contrast, it may be that the firm would bring  $a$  to market even if its interest in  $b$  would be protected only by a liability rule. This is stated in condition (C4).

$$(C4) \quad \Pi_P(a) - C(a) + V_P(b) - P(b) > \Pi_P(a) - C(a) + V_L(b) - P(b) \geq R$$

If (C4) holds, then the court should not enjoin a product that infringes the plaintiff's unpracticed patent on  $b$ , because this is unnecessary to protect her incentive to develop  $a$ . Of course, as before, it often may be impossible to determine whether a plaintiff's situation is described by (C3) or by (C4). However, if the plaintiff previously engaged in unprotected market entry with respect to the disputed technology, then this is not so. In this case, the firm's willingness to bring  $a$  to market did not depend on having any protection against competing products using technology  $b$ . That is, the firm did not rely on its ability to diagonally integrate with respect to  $b$  when it chose to develop technology  $a$ . This is embodied in condition (C5).

$$(C5) \quad \Pi_P(a) - C(a) \geq R$$

This says that technology  $a$  is sufficiently profitable on its own to motivate its development, even in lieu of any protection against technology  $b$ . It follows that the firm's situation must be described by (C4). To see this, note that (C5) directly implies (C4). This establishes that, if a diagonally integrated NPE entered the market unprotected from its unpracticed technology, then it should never be entitled to enjoin an infringer of that technology's patent. Such an injunction would do nothing to promote dynamic welfare. The intuition for this is simple: the firm's decision to bring its own technology to market did not depend at all on the possibility of diagonal integration, and hence its entry decision could not have depended on what rule

might serve to protect such integration. Thus awarding an injunction to such a firm will engender all the static harms of injunctive relief without affording any offsetting dynamic benefits. Consequently the Federal Circuit's decision in *Trebro* is not only unnecessary, it is also likely to be harmful.<sup>52</sup>

Of course, this result concerns the decision to develop technology *a*, not technology *b*, whose development we have so far taken as given. Thus the reader may be concerned that our proposal would dampen the incentive to innovate those technologies that might be sold to firms hoping to diagonally integrate and enjoin rivals. Indeed, it is true that a rule barring injunctions against infringers of a diagonally integrated NPE's unpracticed patent will tend to reduce the amount this NPE would pay for the patent. However, this is not problematic, because no social benefit derives from the sale of a patent to a diagonally integrated NPE who, like *Trebro*, hopes to exclude those rivals that might use the patented technology. Such a transaction does not lead to any expanded use of the patented technology. Thus, developing a technology for this purpose is a little like building a factory in the hope that a rival manufacturer will acquire it and shut it down. Any spending on research and development motivated purely by this possibility is best regarded as deadweight loss. Consequently, there should not be any policy for encouraging these transactions.<sup>53</sup>

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52. Conceivably, there could be cases in which the plaintiff was *considering* the acquisition of *b* when it developed *a*. One could then imagine a subset of *these* cases in which the decision to develop *a* hinged on (1) the probability that the plaintiff would succeed in acquiring *b*; and (2) in the event it did so, its having the option of enforcing the *b* patent by means of an injunction. Even then, however, granting an injunction against the unauthorized use of *b* would be justified only if the social benefits from the development of *a* outweighed the cost of suppressing competition from *b*. In our view, allowing injunctions to issue based on (what strikes us as) the remote possibility that these conditions might be present would be letting the tail wag the dog. Allowing the injunction to issue based on *proof* of these conditions might be feasible, but could substantially increase adjudication costs.

53. One might argue that, even if the assignee intends to use the patent only to exclude competitors, the public still gains something in terms of the disclosure embodied in the nonused patent. Nevertheless, allowing the assignee to enjoin its competitor from using the patent on *b* would promote social welfare only if the social value of the disclosure that otherwise would not occur outweighs the resulting deadweight loss. Although in theory this may be possible, it seems unlikely given that (1) many, perhaps most, inventions are invented or discovered independently by multiple inventors, *see* Mark A. Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709 (2012); (2) even if only one firm were to invent *b* during a given period of time, it is reasonable to assume that in only a subset of such cases would the firm be motivated to ob-

We close this section with two important points concerning the foregoing analysis. First, while the facts of *Trebro* may seem unusual, our results are in fact widely applicable, particularly in patent-rich industries where patents are frequently bought and sold. In recent years, firms in the telecommunications sector in particular have made strategic acquisitions of huge patent portfolios, presumably including large numbers of patents that the acquirers themselves do not use.<sup>54</sup> These pa-

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tain a patent only on the expectation that its future assignee would be able to use the patent to suppress competition against unpatented products; and (3) the social value of what is disclosed in the typical patent is often quite low, due to, among other things, patent law's failure to require working examples, see Sean B. Seymore, *The Teaching Function of Patents*, 85 NOTRE DAME L. REV. 621, 628–32 (2010).

54. See, e.g., Scott Morton & Shapiro, *supra* note 43, at 491–93 (discussing acquisitions by Apple, Google, and others); Press Release, U.S. Dep't of Justice, Office of Pub. Affairs, Statement of the Department of Justice's Antitrust Division on Its Decision To Close Its Investigations of Google Inc.'s Acquisition of Motorola Mobility Holdings Inc. and the Acquisitions of Certain Patents by Apple Inc., Microsoft Corp. and Research in Motion Ltd. (Feb. 13, 2012), <http://www.justice.gov/opa/pr/statement-department-justice-s-antitrust-division-its-decision-close-its-investigations> (discussing acquisitions by Google, Apple, and the Rockstar consortium (consisting of Apple, RIM, Microsoft, Ericsson, and Sony)); Chris Foresman, *Big Bidding: Apple, Microsoft, RIM Nab Nortel Patents for \$4.5 Billion*, ARSTECHNICA (July 1, 2011), <http://arstechnica.com/apple/2011/07/apple-ms-rim-nab-nortel-mobile-patents-for-45-billion>; Rhian Hunt, *Samsung Buys Patents To Use Against Apple (AAPL) in Latest Lawsuit*, PFHUB (Apr. 24, 2014), <http://www.pfhub.com/samsung-buys-patents-to-use-against-apple-aapl-in-latest-lawsuit-593>; Yoree Koh, *Twitter Acquires More than 900 Patents from IBM*, WALL ST. J.: DIGITS (Jan. 31, 2014), <http://blogs.wsj.com/digits/2014/01/31/twitter-acquires-ibm-patents>; Robert McMillan, *How Apple and Google Armed 4,000 Patent Warheads*, WIRED (May 21, 2012), <http://www.wired.com/2012/05/rockstar>; Cade Metz, *Microsoft Shuttles AOL Patent Portfolio to Facebook*, WIRED (Apr. 23, 2012), <http://www.wired.com/2012/04/microsoft-aol-facebook>; Phil Milford & Susan Decker, *Google Hands HTC Patents To Use Against Apple in Smartphone Wars*, BLOOMBERG NEWS (Sept. 7, 2011), <http://www.bloomberg.com/news/2011-09-07/htc-sues-apple-alleging-infringement-of-four-u-s-patents.html>; Craig Silverman, *LinkedIn Acquires Major Fact Checking Patents*, POYNTER.ORG (June 20, 2014), <http://www.poynter.org/latest-news/regret-the-error/256315/linkedin-acquires-the-far-reaching-portfolio-of-fact-checking-patents>; Bill Slawski, *Twitter's New Patent Trove (943 Patents) from IBM*, SEO BY THE SEA (Feb. 1, 2014), <http://www.seobythesea.com/2014/02/twitters-new-patent-trove-943-patents-ibm>; Tess Stynes, *Qualcomm Acquires Mobile Technology Patents from Hewlett-Packard*, WALL ST. J. (Jan. 23, 2014), <http://online.wsj.com/news/articles/SB10001424052702303448204579339160154556786>; Brian Womack, *Facebook Is Said To Buy 750 IBM Patents To Boost Defenses*, BLOOMBERG NEWS (Mar. 22, 2012), <http://www.bloomberg.com/news/2012-03-22/facebook-is-said-to-buy-750-ibm-patents-to-boost-defenses.html>; see also Colleen Chien, *From Arms Race to Marketplace: The Complex Patent Ecosystem and Its Implications for the Patent System*, 62 HASTINGS L.J. 297, 338, 340 (2010) (stating that a “prac-

tented technologies may be used by competitors, however, in which case the acquiring firms become diagonally integrated NPEs. If, prior to acquiring these patent portfolios, such firms entered the relevant product markets unprotected from the acquired technologies (as is likely the case in the majority of such acquisitions) then they are fundamentally no different from Trebro. Such patent acquisitions have not previously been viewed in this light, and thus our results provide an improved understanding of how they should factor into the discussion of patent remedies. Further, as Part III demonstrates, diagonal integration is not only widespread, it is also unusually harmful to competition and consumers; its effects are substantially worse than those that would arise if the patents were owned by a standard (unintegrated) NPE. This provides yet another reason for the courts to be particularly cautious when adjudicating cases filed by diagonally integrated patent holders.

Second, our analysis demonstrates that the post-*eBay* approach to injunctive relief focuses too narrowly on the marginal effects of enjoining the defendant and too little on the plaintiff's incentives at the time of invention. The prevailing method of assessing the merits of injunctive relief focuses on the time of infringement and involves balancing the interests of the parties and the public at large moving forward.<sup>55</sup> And, while this involves a number of important considerations, it ignores the question of whether the possibility of injunctive relief was actually a necessary quid pro quo for the plaintiff's invention. This question may be difficult or impossible to answer in many situations, but this does not mean the courts should universally decline to address it. Rather, the plaintiff's incentives at the time of invention should be the primary point of focus whenever they can be reliably ascertained.<sup>56</sup> It is this consideration

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tical consequence of the patent arms race," characterized by a high volume of low-cost, low-quality patents, "is that it has left operating companies with large numbers of unused patents"). Note that the Rockstar Consortium referred to in some of the materials above wound down in 2014 and assigned its entire portfolio to RPX, a defensive patent aggregator. See Andrew Chung, *RPX Buys Apple-Backed Rockstar Patents for \$900 Million*, REUTERS (Dec. 23, 2014), <http://www.reuters.com/article/2014/12/23/us-rpx-rockstar-ip-idUSKBN0K11AI20141223>.

55. See *supra* note 31 and accompanying text.

56. One theoretical exception to our general approach consists in what might be called "infringement stacking" by multiple defendants. In principle, it could be that multiple defendants are selling different infringing products (possibly infringing different components of the plaintiff's product), and that these products are jointly—but not individually—sufficient to undermine the

that truly gets at the heart of the patent system's interest in limiting its protections to those inventions that would not otherwise come to market.

The next Part applies the foregoing insights to other topics in patent law where judges and scholars similarly may give too little consideration to inventors' incentives at the development stage when assessing the appropriateness of injunctive relief.

## II. IMPLICATIONS OF UNPROTECTED MARKET ENTRY IN OTHER SETTINGS

One of the two key implications of our model is that it is sometimes possible to infer that injunctive relief will reduce social welfare, based upon the fact that the patent owner was willing to enter the market without an expectation of being able to enjoin its competitors. In this Part, we examine the implications of our unprotected market entry analysis to the question of whether courts should grant injunctive relief in cases brought by patent privateers, owners of FRAND-encumbered SEPs, or firms engaged in preemptive patenting.

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plaintiff's decision to develop its patented technology. If the plaintiff can demonstrate such widespread infringement, then the courts should award injunctions to the extent necessary to protect the plaintiff's decision to develop its product. Thus, when evaluating injunctive relief in a particular case, if possible an adjudicator should consider not only the harm imposed by the presently disputed infringement, but also those of other infringing products still being sold.



A. Patent Privateering<sup>57</sup>

In current usage, the term patent “privateer” most commonly refers to a patent assertion entity (PAE)<sup>58</sup> that acquires a patent or portfolio of patents from a practicing entity and then seeks to enforce those patents against alleged infringers. As part of the contract of assignment, the privateer agrees to share the proceeds of its enforcement efforts with the patent assignor.<sup>59</sup> Privateering appears to be on the rise in both the

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57. The term “patent privateering” was coined by Tom Ewing, who first drew an analogy between the practice described in the text above and the practice (long since abolished) under which sovereign states would authorize merchant vessels to plunder enemy vessels during time of war. See Joff Wild, *Universities and NPEs: A Match Made in Heaven*, IAM MAGAZINE: BLOG (Oct. 11, 2013), <http://www.iam-magazine.com/blog/detail.aspx?g=37a09238-0376-4bda-a2ff-9fd0bc6282ca> (citing Ewing’s use of the term as quoted in Joff Wild, *Acacia Turns Privateer as Businesses Decide if You Can’t Beat Them, Join Them*, IAM MAGAZINE: BLOG (Aug. 28, 2010), <http://www.iam-magazine.com/blog/detail.aspx?g=2db176e6-77b0-45a0-a999-87910c96394a&q>). Ewing has written more extensively on the topic than anyone else of which we are aware. See Tom Ewing, *Indirect Exploitation of Intellectual Property Rights by Corporations and Investors: IP Privateering and Modern Letters of Marque and Reprisal*, 4 HASTINGS SCI. & TECH. L.J. 1, 5 (2012) [hereinafter Ewing, *Indirect Exploitation*]; Tom Ewing, *Practical Considerations in the Indirect Deployment of Intellectual Property Rights by Corporations and Investors*, 4 HASTINGS SCI. & TECH. L.J. 109 (2012) [hereinafter Ewing, *Practical Considerations*]; Tom Ewing, *Patent Privateering Reloaded*, INTELL. ASSET MGMT., July–Aug. 2013, at 49 [hereinafter Ewing, *Reloaded*]; Tom Ewing, *Introducing the Patent Privateers*, INTELL. ASSET MGMT., Jan.–Feb. 2011, at 31 [hereinafter Ewing, *Introducing*]. Scott Morton & Shapiro use the term “hybrid PAE” to refer to PAEs that have “contractual relationships with downstream firms,” which would include some privateers, Scott Morton & Shapiro, *supra* note 43, at 489, while John Golden uses the term “patent privateer” in a sense somewhat different from that presented above in his paper, John Golden, *Patent Privateers: Private Enforcement’s Historical Survivors*, 26 HARV. J.L. & TECH. 545, 552 n.40 (2013). For other discussions, see, for example, Maurits Dolman, *Privateers and Trolls Join the Global Patent Wars; Can Competition Authorities Disarm Them?*, 37 COMPUTERRECHT 80 (2014); Susan Decker, *Patent Privateers Sail the Legal Waters Against Apple, Google*, BLOOMBERG BUS. (Jan. 10, 2013), <http://www.bloomberg.com/news/articles/2013-01-11/patent-privateers-sail-the-legal-waters-against-apple-google>; Florian Mueller, *Nokia and Ericsson Seek To Justify Their Privateering Ways, Defend Patent Transfers to NPEs*, FOSS PATENTS (May 21, 2015), <http://www.fosspatents.com/2015/05/nokia-and-ericsson-seek-to-justify.html>.

58. See Ewing, *Introducing*, *supra* note 57, at 34 (stating that “[a] privateer need not necessarily be an NPE,” but that “an operating company that acted as privateer would put itself at risk of a countersuit by the target”).

59. See *id.* Ewing also discusses other forms of privateering, which he broadly defines as occurring whenever “operating companies . . . authorise third parties to chase their competitors using IP rights,” *id.* at 31, but the form discussed in the text above is most relevant to our discussion.

United States<sup>60</sup> and may exist in some other countries as well.<sup>61</sup> Like other PAEs and unlike many practicing entities, privateers are largely immune from countersuit for patent infringement, since they do not make, use, or sell any products themselves. As a result, some commentators have expressed concern over the unforeseeable consequences of the massive increase in patent enforcement to which privateering could give rise,<sup>62</sup> while others have suggested that, at least in some instances, privateering could give rise to antitrust or other liability.<sup>63</sup> Privateering's defenders, on the other hand, characterize the practice as nothing more than an efficient division of labor, akin to outsourcing.<sup>64</sup>

We don't intend to resolve this debate here, but we do think that a straightforward application of our analysis suggests that courts should not grant injunctive relief in cases in which a privateer has acquired a patent from a firm that was not using the patent, and seeks to enforce that patent against an alleged infringer who sells products that compete against the assignor's unpatented products.<sup>65</sup> To be sure, privateers are

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60. See Ewing, *Reloaded*, *supra* note 57 (“[W]e . . . know that privateering is on the rise”). Ewing presents some preliminary empirical analysis of the incidence of privateering in the United States in Ewing, *Indirect Exploitation*, *supra* note 57, at 40–43.

61. See Köllner & Weber, *supra* note 21, at 110–11 (discussing ICom's activities in Germany).

62. See Ewing, *Indirect Exploitation*, *supra* note 57, at 89; see also Catherine Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity* 1 (MIT Sloan School Mgmt., Working Paper No. 5095-14, 2014), <http://ssrn.com/abstract=2457611> (reporting an inverted U-shape relation between levels of patent litigation and venture capital investment). In the copyright sphere, Shyamkrishna Balganesh has argued that much of copyright law evolved on the implicit understanding that rights would be underenforced. See Shyamkrishna Balganesh, *The Uneasy Case Against Copyright Trolls*, 86 S. CAL. L. REV. 723, 729 (2013).

63. See Ewing, *Practical Considerations*, *supra* note 57, at 122–26, 138–50; Popofsky & Laufert, *Antitrust Attacks on Patent Assertion Entities*, *supra* note 47, at 455–58; Popofsky & Laufert, *Patent Assertion Entities and Antitrust*, *supra* note 47, at 10–12.

64. See Ewing, *Introducing*, *supra* note 57, at 37–38.

65. We cannot be so confident in cases in which, prior to the assignment, the assignor *was* practicing the patent. Although it may seem less likely that an assignment would be made at all under these circumstances, it's certainly not impossible. If the patent reads on a small component of a complex device, for example, the patent owner may be better off licensing the patent to competitors and benefiting from its widespread adoption than trying to exclude those competitors. Alternatively, the owner may want to avoid provoking a retaliatory patent infringement lawsuit. (If the assignee is a PAE and therefore

among the class of patent owners who generally are not interested in ultimately obtaining injunctions, since (as PAEs) they sell no products themselves and therefore do not benefit from actually excluding competitors. But they could use the threat of injunctive relief to negotiate licensing rates, or to settle pending litigation on terms that are likely to be higher than would be the case if injunctions were off the table—the reason being that an infringer who actually is enjoined must figure out some way to design around the patented technology, and thus would be willing to pay a licensing fee that reflects not only the value of that technology in comparison with alternatives but also the avoided design-around costs.<sup>66</sup> These higher royalties, however, would appear to be unnecessary to induce the assignor's entry into the relevant product market, where (on our assumed facts) the assignor was already selling (unpatented) products in that market, and not enforcing the patent subsequently assigned to the privateer, prior to that assignment.<sup>67</sup> (Indeed, in some in-

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makes no products, the defendant can't file a counterclaim for infringement, though of course the defendant could retaliate against the assignor if it were to discover the assignor's identity.) Or it may prefer to rely upon the privateer's expertise in litigating and negotiating a royalty even if this means giving up the right to exclude. For a more comprehensive discussion of the many possible reasons why operating companies and others may find privateering attractive, see Ewing, *Indirect Exploitation*, *supra* note 57, at 55–73; Ewing, *Introducing*, *supra* note 57, at 32–34.

66. See *supra* notes 41–42 and accompanying text.

67. Admittedly, this inference would be incorrect if the assignor entered the market for *a* conditional on its ability to assign the patent on *b* to a privateer and to benefit from the privateer's ability to extract a supracompensatory royalty in the shadow of an injunction. This chain of events nevertheless strikes us as attenuated, particularly if a substantial amount of time has passed in between the assignor's entry into *a* and its assignment of *b*, though perhaps one could permit the privateer who requests injunctive relief to present evidence of such facts. Similarly, one might imagine a case in which a firm developed both *a* and *b* before it was clear which technology (say *a*) was likely to better suit its needs. We argue below that if the firm retains its patent on *b* there should be no hard-and-fast rule against granting injunctive relief for the infringement of *b*, because the development of *b* may have hinged on the firm's expectation that it would be able to enjoin such uses. See *infra* Part II.C. If this is correct, though, why should the rule be any different if the patent owner sells the *b* patent to a privateer, rather than retaining it? The answer is that the assignment to the privateer assumes that the privateer ultimately will license the patent; the privateer will be able to derive more licensing revenue if it can credibly threaten an injunction, but as a nonpracticing entity the privateer has no ultimate interest in excluding users from the market. Enjoining the unauthorized use of *b* in order to preserve the incentive to develop *b* therefore makes sense only if there is evidence that that incentive depended on the prospect of deriving a supracompensatory licensing fee based on a privateer's subsequent ability to threaten injunctive relief. Whether the

stances, the firm that assigns the patent to the privateer may have acquired that patent *after* entering the market, in which case the fact pattern is, for all intents and purposes, identical to that of *Trebro*.<sup>68</sup> The assignor's pre-assignment behavior therefore provides us with evidence from which it is reasonable to infer that condition (C5) is satisfied, and therefore that the privateer should not be able to enjoin the infringement of *b*.<sup>69</sup>

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benefit of permitting such (possibly self-serving) evidence in either case outweighs the likely cost is a judgment call.

The argument in the text above might also seem to suggest that courts should deny injunctive relief even if the assignor didn't assign the patent to a privateer, but rather decided to enforce the patent itself after having tolerated its infringement for a period of time. Such a rule, however, would require courts to determine after what period of time it is reasonable to infer that (C5) is satisfied, a fact that might be extremely difficult to ascertain. What the privateering example adds to the mix is that the assignor clearly contemplates third-party use of the patented technology, which (coupled with the assignor's unprotected entry) makes it reasonable to infer that injunctive relief is unnecessary to induce the assignor's entry in the market for *a*. Conceivably, though, the equitable doctrines of laches or estoppel might preclude a suit for injunctive relief or damages in a case in which the patent owner unreasonably delays enforcing its patent. *See, e.g.,* *Petrella v. Metro-Goldwyn-Mayer, Inc.*, 134 S. Ct. 1962, 1974 n.15 (2014); *SCA Hygiene Prods. Aktiebolag v. First Quality Baby Prods., L.L.C.*, 767 F.3d 1339, 1344–45 (Fed. Cir. 2014), *rehearing en banc granted*, 2014 WL 7460970 (Fed. Cir. Dec. 30, 2014).

68. *See* Ewing, *Introducing*, *supra* note 57, at 33 (positing an example in which “an incumbent’s market position is being etched away by an upstart competitor employing a replacement technology,” but neither firm “holds IP rights that it could effectively use against the other”; in such a case, to employ a patent against the upstart, the incumbent would have to obtain the patent from a third party, but may prefer to outsource its enforcement for various reasons).

69. As in our example derived from the facts of *Trebro* in Part I, one might ask whether denying the privateer the ability to threaten an injunction might reduce the incentive to invent *b*. Perhaps firms would invest more in developing or acquiring patents if they expected to be able to sell some of those patents to privateers in exchange for some portion of the royalties the privateer is able to extract. According to Ewing, however, some transfers to privateers are motivated less by the assignor's expectation of a share of the royalties than by the desire to impede competition. *See* Ewing, *Indirect Exploitation*, *supra* note 57, at 32–36, 55–58; Ewing, *Introducing*, *supra* note 57, at 32–36. Moreover, some empirical evidence suggests that (in general) only a small percentage of PAE licensing revenue make its way back to inventors. *See* James E. Bessen & Michael J. Meurer, *The Direct Costs from NPE Disputes*, 99 CORNELL L. REV. 388, 410–11 (2014) (asserting that, at most, 20% of defendants' payments to NPEs go to patentees); Michael Risch, *Patent Troll Myths*, 42 SETON HALL L. REV. 457, 461 (2012) (“[T]he evidence does not support a theory that NPEs incentivize investment by providing a market for patents,” although they do “provide a better way for individual inventors to enforce their patents than bringing lawsuits themselves.”); *cf.* David L. Schwartz & Jay P. Kesan, Essay, *Analyzing the Role of Non-Practicing Entities in the Patent Sys-*

And if it cannot *actually* obtain an injunction, it cannot credibly *threaten* to do so either.

Concededly, U.S. courts post-*eBay* are likely to deny privateers and other PAEs injunctions anyway.<sup>70</sup> Nevertheless, our analysis provides some additional reasons not to do so, and might be particularly helpful in non-U.S. jurisdictions that are still determining when, if ever, to award prevailing patent owners prospective damages in lieu of injunctive relief.<sup>71</sup> Alternatively, as discussed below,<sup>72</sup> if we are right in concluding that injunctive relief would always or almost always reduce social welfare in an identifiable class of cases, perhaps it would be appropriate for competition law to develop a response, at least as a second-best solution in jurisdictions that adhere to a pre-*eBay* view of the prevailing patentee's right to obtain a permanent injunction.

#### B. FRAND-ENCUMBERED SEPS

A rationale similar to that sketched out above also might apply to cases involving FRAND-encumbered SEPs. As noted earlier, SSOs often require their members to disclose any relevant patents before the standard under consideration is adopted, to declare any patents that are essential to the standard once the standard is chosen, and to commit to licensing those patents on FRAND terms (or else to exit the SSO).<sup>73</sup> Initially, one might wonder why an SEP owner that makes products

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*tem*, 99 CORNELL L. REV. 426, 443–44 (2014) (faulting Bessen & Meurer's estimate above, on the ground that it is based largely on three large firms—InterDigital, Tessera, and Rambus—that conduct much of their own R&D in-house); Bessen & Meurer, *supra*, at 419 (responding to Schwartz & Kesan). Conceivably, though, if a court were concerned about this possibility, it could allow the privateer to elicit contrary evidence in support of an injunction, subject to the caveats noted *supra* note 67.

Finally, note that the incentive we are discussing here is premised on the privateer's ability to extract what we have termed a supracompensatory royalty, based in part on the infringer's avoided switching costs. *See supra* text accompanying notes 41–42. In the following section, we argue that the patent incentive does not depend upon the ability to extract these costs. *See infra* notes 94–95 and accompanying text.

70. *See supra* note 23 and accompanying text.

71. At present, most of the world's major patent litigation systems award injunctive relief to the prevailing patent owner more or less automatically, and do not follow *eBay*. For discussion, see COTTER, *supra* note 29, at 176–84, 245–48, 305–07.

72. *See infra* notes 96–99 and accompanying text.

73. *See supra* note 27.

(say, a smartphone manufacturer) and that competes with other firms that make rival products and therefore might benefit from a FRAND license covering the SEP would ever commit to such licensing.<sup>74</sup> Wouldn't the owner be better off using its patent to exclude rather than license competitors? The answer is, not necessarily.

One reason firms join SSOs and thus commit to FRAND licensing is that membership in an SSO guarantees that the firm will be able to participate in the standard-setting process (and thus, perhaps, influence that process in a manner that benefits them). Moreover, it is in the collective interest of the SSO membership to ensure that each member will have access to all of the members' patents that are needed to practice the standard. Smartphone Company A therefore may find it beneficial to commit to FRAND license its SEPs to Smartphone Company B, in return for the latter's commitment to do likewise.<sup>75</sup> In short, firms participate in SSOs because they conclude it is in their interest to do so, even though they may be giving something up in the process.

In several recent cases in both the United States and abroad, the question has arisen whether a firm that makes a FRAND commitment generally gives up the right to injunctive relief, or whether it is still appropriate to request an injunction if the firm and the alleged infringer are unable to agree on what a FRAND royalty would be.<sup>76</sup> At first blush, our analysis would appear to support the view that courts generally should deny injunctions to owners of FRAND-encumbered SEPs, be-

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74. Relatedly, one also might wonder why SEP owners who sell the components used in products such as smartphones so frequently commit to FRAND, instead of keeping open the option of exclusive licensing (an option that firms in other industries sometimes find to their advantage). For discussion of the various patented technologies that can be found in the typical smartphone, and who owns those technologies, see Ann Armstrong et al., *The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones* (2014), [https://www.wilmerhale.com/uploaded/Files/Shared\\_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf](https://www.wilmerhale.com/uploaded/Files/Shared_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf).

75. Since many SSOs require FRAND licensing even to nonmembers, one might imagine there would be cases in which a firm would be better off exiting an SSO, or never joining it in the first place, and enjoying the benefits of members' FRAND commitments without having to reciprocate. For a theoretical discussion of firms' incentives to join or exit SSOs, see Anne Layne-Farrar et al., *Payments and Participation: The Incentives To Join Cooperative Standard Setting Efforts*, 23 J. ECON. & MGMT. STRATEGY 24 (2014).

76. See *infra* notes 79–82, 96–99 and accompanying text.

cause the owner's decision to commit to FRAND licensing (instead of exiting) indicates that it viewed the benefits of widespread licensing on FRAND terms as outweighing the benefits of excluding downstream users. In other words, to the extent a firm joins or remains in an SSO and therefore commits to FRAND licensing, it cannot seriously argue that its incentive to innovate depended on its ability to exclude, since it knew going in that it would have to license its SEPs. Thus, as in the cases we discussed in Parts I and II.A, the patentee in this example arguably has revealed that its incentive to innovate did not depend upon its ability to exclude downstream users. If this is correct, an injunction would appear to generate social harm in the form of deadweight loss, with no corresponding social benefit.

This analysis nevertheless falls short of proving that SEP owners should rarely or never be allowed to obtain injunctions. SSOs themselves generally do not define what a FRAND commitment means, and before the standard is adopted firms themselves rarely disclose the terms on which they intend to license their patents.<sup>77</sup> The principal reason that SSOs do not require more detail up front is one of cost: given the large numbers of SEPs that may read on a given standard, the inherent difficulty in valuing new technology, and the time it would take to work out the relevant terms and conditions pre-adoption, the most efficient procedure may be simply to require firms to commit to FRAND and work out the details later.<sup>78</sup> As a consequence, however, there may be disputes over whether the terms

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77. There are some exceptions. A few SSOs require royalty-free licensing, see Jay P. Kesan & Carol M. Hayes, *FRAND's Forever: Standards, Patent Transfers, and Licensing Commitments*, 89 IND. L.J. 231, 244 n.81 (2014), while others require members to announce their maximum terms in advance, see Jorge L. Contreras, *Technical Standards and Ex Ante Disclosure: Results and Analysis of an Empirical Study*, 53 JURIMETRICS J. 163, 173–75 (2013). Most SSOs do not impose these requirements, however.

78. See Doug Lichtman, *Understanding the RAND Commitment*, 47 HOUS. L. REV. 1023, 1027–29 (2010) (stating that among the reasons firms “might prefer the ambiguous RAND commitment over a more conventional, explicit pricing term” are that “intricate negotiations over patent validity and patent value would take an enormous amount of time”; that “standard-setting is a process run by engineers, not lawyers”; that “many new technologies flop”; and that “RAND allows implementing firms to wait for additional information before they commit to a specific royalty structure”). Potentially, there could also be antitrust problems if the SSO itself set license terms. For discussion, see Thomas F. Cotter, *Reflections on the Antitrust Modernization Commission's Report and Recommendations Relating to the Antitrust/IP Interface*, 53 ANTITRUST BULL. 745, 786–94 (2008); Lichtman, *supra*, at 1046 n.65.

a particular SEP owner is demanding (or that a prospective user is willing to accept) fall within the FRAND range. In such cases, SEP owners would like to reserve the right to obtain injunctive relief, since this option provides them with greater leverage in negotiating a rate. Users, on the other hand, prefer that if the parties cannot agree, the SEP owner sues for infringement, and the patent is found to be valid and infringed, the court itself will determine the FRAND royalty and award the owner damages based on that royalty for the user's past and future use of the SEP. To date, a handful of federal courts have sided with the users' position on this issue,<sup>79</sup> as have the federal antitrust agencies and the United States Patent and Trademark Office.<sup>80</sup> The United States International Trade Commission, on the other hand, so far has taken the opposite view,<sup>81</sup> as have some courts in other countries.<sup>82</sup>

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79. The Federal Circuit recently affirmed Judge Posner's decision that Motorola would not be entitled to an injunction for Apple's alleged infringement of a Motorola SEP, albeit without creating a per se rule against such injunctions. *See Apple, Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1322 (Fed. Cir. 2014); *see also* *Microsoft Corp. v. Motorola, Inc.*, No. C10-1823JLR, 2012 WL 5993202, at \*6–7 (W.D. Wash. Nov. 30, 2012) (concluding that Motorola would not have been entitled to a permanent injunction against Microsoft's alleged infringement of Motorola's FRAND-encumbered SEPs). In at least two other cases, SEP owners chose not to request injunctive relief and the trier of fact determined the amount of damages. *See In re Innovatio IP Ventures, L.L.C. Patent Litig.*, MDL Docket No. 2303, Case No. 11 C 9308, 2013 WL 5593609 (N.D. Ill. Oct. 3, 2013); *Ericsson Inc. v. D-Link Sys.*, Case No. 6:10-CV-473, 2013 WL 4046225 (E.D. Tex. Aug. 6, 2013).

80. *See* *Matter of Motorola Mobility L.L.C. and Google Inc.*, Docket No. C-4410, File No. 121-0120, 2013 WL 3944149 (F.T.C. July 24, 2013); U.S. DEPT OF JUSTICE & U.S. PATENT & TRADEMARK OFFICE, POLICY STATEMENT ON REMEDIES FOR STANDARDS-ESSENTIAL PATENTS SUBJECT TO VOLUNTARY F/RAND COMMITMENTS (Jan. 8, 2013), <http://www.justice.gov/sites/default/files/atr/legacy/2014/09/18/290994.pdf>.

81. *See* *Certain Elec. Comm'n Devices, Portable Music and Data Processing Devices, and Tablet Computers*, Inv. No. 337-TA-794, at 41–64, 107–14 (July 5, 2013) (Commission Opinion). U.S. Trade Representative Michael Froman subsequently exercised his authority to disapprove the exclusion order, however. *See* *Letter from Ambassador Michael B.G. Froman to Honorable Irving A. Williamson, Chairman, U.S. Int'l Trade Comm'n* (Aug. 3, 2013) [https://ustr.gov/sites/default/files/08032013%20Letter\\_1.pdf](https://ustr.gov/sites/default/files/08032013%20Letter_1.pdf). Nevertheless, in another more recent ITC investigation, Administrative Law Judge Essex concluded that InterDigital did not breach its FRAND obligation by seeking an exclusion order against several alleged infringers. *See* *Certain Wireless Devices with 3G and/or 4G Capabilities and Components Thereof*, Inv. No. 337-TA-868 (June 26, 2014) (Initial Determination).

82. For discussion through 2013, *see* Cotter, *supra* note 32. As noted below, however, there are some foreign cases denying SEP owners injunctions on the basis of antitrust or other bodies of law. *See infra* notes 96–99 and accom-



We think the following observations are relevant to the correct resolution of these issues. First, as already noted, in cases in which the SEP owner made a FRAND commitment, it is reasonable to assume that the owner's incentive to invent did not depend on the expectation of ultimately enforcing injunctions against end users, since the owner voluntarily chose to remain in the SSO and to commit to FRAND licensing. An appropriate royalty therefore should suffice to preserve this incentive.<sup>83</sup> Second, however, like the privateers we discussed in the preceding section, SEP owners nevertheless may value being able to threaten an injunction in the event accused infringers are unwilling to meet their demands. Third, SEP owners are different from privateers in some ways that might make it more challenging to predict the impact of injunctive relief on inventor behavior. In the privateering example, we could state with confidence that the privateer's interest in threatening an injunction to obtain supracompensatory royalties for *b* did not motivate the assignor to enter the market for *a*, because (on our assumed facts) prior to the assignment the assignor was not using the *b* patent to shield *a* from competition.<sup>84</sup> We also suggested that the privateer's conduct may have little bearing on the incentive to invent *b*, particularly if (as may often be the case) inventors reap only a small share of the privateer's booty.<sup>85</sup> In the present context, however, the analysis centers on just one patent, *a*, and perhaps the patent owner credibly *could* argue that the additional leverage a threatened injunction provides increases its own incentive to invest in the inventions like *a*, by increasing the expected royalties to be derived from others' use of *a*.<sup>86</sup>

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panying text.

83. Note that, while we stated above that our analysis would be limited to cases involving inadvertent infringement, it may be appropriate to dispense with this requirement in the present context, at least in cases in which the alleged infringer is willing to negotiate a license but the parties cannot reach agreement on its terms. Detailed discussion of this matter is beyond the scope of this Article, but the question of whether courts should require evidence that a defendant is a "willing licensee"—and if so, precisely what this means—before dispensing with injunctive relief is, at present, very much a live issue in both the United States and Europe.

84. See *supra* notes 65–69 and accompanying text.

85. See *supra* note 69.

86. See Bernhard Ganglmair et al., *Patent Hold-Up and Antitrust: How a Well-Intentioned Rule Could Retard Innovation*, 60 J. INDUS. ECON. 249, 261–62 (2012) (arguing that limiting the patentee to FRAND damages may negatively affect the incentive to innovate). There is also the possibility that if the

We can't rule out this possibility, but we remain skeptical for two reasons. First, given that the SEP owner's willingness to innovate depends, ultimately, on receiving adequate monetary compensation and not on exclusion, an appropriate royalty should be sufficient to induce  $\alpha$ 's invention. In this regard, federal law authorizes courts to award not only compensatory damages,<sup>87</sup> but also prejudgment interest<sup>88</sup> (which may be compounded)<sup>89</sup> plus (in an appropriate case) attorneys' fees<sup>90</sup> and enhanced damages for willful infringement.<sup>91</sup> Thus, while SEP owners may foresee even higher royalties if they can bargain in the shadow of an injunction, courts appear to have adequate tools to award them the FRAND royalty they could have expected *ex ante*. Absent some reason to believe that courts systematically are likely to err in favor of defendants,<sup>92</sup> there is no

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consequences of joining an SSO are more onerous than the consequences of remaining outside, some firms will have an incentive to remain outside, thus reducing some of the social benefits of having SSOs in the first place. *See* Layne-Farrar et al., *supra* note 75, at 25. Although the issue is beyond the scope of this Article, this possibility might lead one to conclude that courts should apply the same damages and injunction rules to SEPs regardless of whether the SEP is FRAND-encumbered.

87. *See* 35 U.S.C. § 284 (2012) ("Upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court.").

88. *See* *General Motors Corp. v. Devex Corp.*, 461 U.S. 648, 657 (1983); *see also* PATENT DAMAGES HANDBOOK COMM., COMPENSATORY DAMAGES ISSUES IN PATENT INFRINGEMENT CASES: A HANDBOOK FOR FEDERAL DISTRICT COURT JUDGES 3 (2010), [https://www.law.berkeley.edu/files/bclt\\_PatentDamages\\_Ed.pdf](https://www.law.berkeley.edu/files/bclt_PatentDamages_Ed.pdf) ("[T]he court may award pre-judgment interest under 35 U.S.C. § 284 on the compensatory portion of the damages award, pre-judgment interest on any award of attorney fees, and post-judgment interest under Fed. R. Civ. P. 37 on the entire award.").

89. *See* *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1555 (Fed. Cir. 1995) (en banc) (stating that, while "an award of compound rather than simple interest assures that the patent owner is fully compensated," . . . the determination whether to award simple or compound interest is a matter largely within the discretion of the district court" (citations omitted)).

90. *See* 35 U.S.C. § 285 (stating that "[t]he court in exceptional cases may award reasonable attorney fees to the prevailing party"); *Octane Fitness, L.L.C. v. Icon Health & Fitness, Inc.*, 134 S. Ct. 1749, 1756 (2014) ("[C]ourts may determine whether a case is 'exceptional' in the case-by-case exercise of their discretion, considering the totality of the circumstances.").

91. *See* 35 U.S.C. § 284 ("[T]he court may increase the damages up to three times the amount found or assessed."); *Cohesive Techs., Inc. v. Waters Corp.*, 543 F.3d 1351, 1374 (Fed. Cir. 2008) (stating that enhanced damages are available only for "willful" infringement).

92. *Compare* Einer Elhauge, *Do Patent Holdup and Royalty Stacking*

obvious reason to conclude that a damages remedy would confound the patentee's investment-backed expectations.<sup>93</sup>

Our second ground for skepticism arises from the fact that the leverage a threatened injunction provides is due to the implementer's having incurred sunk costs in implementing the patented technology and to the costs of switching to a noninfringing technology.<sup>94</sup> Ex post, the infringer would be willing to pay a royalty that would reflect these costs. As one of us argues in a companion piece, however, there is no obvious reason to conclude that innovation incentives depend on the SEP owner's ability to extract these costs, which bear no relationship to the value of the patented technology over alternatives.<sup>95</sup> If this reasoning is correct, it may provide an adequate ground for denying SEP owners injunctive relief independent of our unprotected market entry analysis. Nevertheless, we think the latter provides an additional reason for doubting the efficiency of injunctions in SEP cases, and therefore strengthens the anti-injunction position.

As noted above, courts outside the United States by and large have not embraced the *eBay* standard, and continue to award prevailing patent owners injunctions as a matter of

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*Lead to Systematically Excessive Royalties?*, 4 J. COMPETITION L. & ECON. 535, 557–58 (2008) (arguing that damages are likely to be undercompensatory due to factors such as hindsight bias, difficulties that patent owners may face in communicating value to juries, damages estimation techniques that shortchange accuracy for administrative ease, and selection bias), *with Cotter*, *supra* note 32, at 345 (critiquing Elhauge).

93. One occasionally hears the argument that, if the court simply awards the FRAND royalty, there is no incentive on the part of alleged infringers to negotiate. On this view, patentees bear all the risk of litigation (including a finding of noninfringement or invalidity) and therefore may be willing to settle for an undercompensatory royalty. This argument ignores the potential downside facing the defendant, however, including not only its own attorneys' fees but the other consequences noted in the text above. It also arguably downplays the significance of the fact that (as a general matter) in patent cases litigated to judgment, patent owners win only about 30% of the time. *See* John R. Allison et al., *Understanding the Realities of Modern Patent Litigation*, 92 TEX. L. REV. 1769, 1787–88 (2014). Approximately 40% of all litigated patents are invalidated, *see id.* at 1787, and by some estimates over 50% of all patents declared essential aren't, *see* FAIRFIELD RES. INT'L, INC., REVIEW OF PATENTS DECLARED AS ESSENTIAL TO LTE AND SAE (4G WIRELESS STANDARDS) THROUGH JUNE 30, 2009 2 (2010), <http://www.frlicense.com/LTE%20Final%20Report.pdf>; FAIRFIELD RES. INT'L, INC., REVIEW OF PATENTS DECLARED AS ESSENTIAL TO WCDMA THROUGH DECEMBER, 2008 2 (2009), <http://www.frlicense.com/wcdma1.pdf>.

94. *See supra* notes 42–43 and accompanying text.

95. *See* Siebrasse & Cotter, *supra* note 33.

course. Courts in some countries nevertheless sometimes have found exceptions to this rule in other bodies of law. The European Commission, for example, recently concluded that owners of FRAND-encumbered SEPs may be liable under European competition law's "abuse of dominant position" doctrine, if they persist in seeking injunctive relief against willing licensees.<sup>96</sup> (The Court of Justice of the European Union will be addressing this issue in a different case sometime in the near future.)<sup>97</sup> Similarly, courts in Japan<sup>98</sup> and the Netherlands<sup>99</sup> have held that SEP owners may be barred from obtaining injunctions under the civil law doctrine of "abuse of right" if they refuse to honor their FRAND commitments. Without expressing a view on the merits of these cases—or the comparative advantages or

96. See European Commission Press Release IP/14/490, Antitrust: Commission Accepts Legally Binding Commitments by Samsung Electronics on Standard Essential Patent Injunctions (Apr. 29, 2014), [http://europa.eu/rapid/press-release\\_IP-14-490\\_en.htm](http://europa.eu/rapid/press-release_IP-14-490_en.htm); European Commission Press Release IP/14/489, Antitrust: Commission Finds that Motorola Mobility Infringed EU Competition Rules by Misusing Standard Essential Patents (Apr. 29, 2014), [http://europa.eu/rapid/press-release\\_IP-14-489\\_en.htm](http://europa.eu/rapid/press-release_IP-14-489_en.htm); European Commission Memorandum, Antitrust Decisions on Standard Essential Patents (SEPs)—Motorola Mobility and Samsung Electronics—Frequently Asked Questions (Apr. 29, 2014), [http://europa.eu/rapid/press-release\\_MEMO-14-322\\_en.htm](http://europa.eu/rapid/press-release_MEMO-14-322_en.htm).

97. More specifically, a German court referred to the Court of Justice of the European Union a series of questions relating to whether it is an abuse of dominant position for the owner of a FRAND-encumbered SEP to seek and enforce an injunction when the infringer has expressed its willingness to negotiate a FRAND license. See Request for a Preliminary Ruling from the Landgericht Düsseldorf (Germany), Case C-170/13, Huawei Technologies Co. Ltd v. ZTE Corp., ZTE Deutschland GmbH, (Apr. 5, 2013), <http://curia.europa.eu/juris> (type "C-170/13" into "Case Number" field; then follow "list of documents" hyperlink; then view document titled "Application (OJ)").

98. See Chiteki Zaisan Kōtō Saibansho [Intellectual Prop. High Ct.] May 16, 2014, no. 10043, SAIBANSHO SAIBANREI JŌHŌ [SAIBANSHO WEB], [http://www.ip.courts.go.jp/eng/vcms\\_lf/25ne10043full.pdf](http://www.ip.courts.go.jp/eng/vcms_lf/25ne10043full.pdf); Chiteki Zaisan Kōtō Saibansho [Intellectual Prop. High Ct.] May 16, 2014, no. 10007, SAIBANSHO SAIBANREI JŌHŌ [SAIBANSHO WEB], [http://www.ip.courts.go.jp/eng/vcms\\_lf/25\\_ra\\_10007zenbun.pdf](http://www.ip.courts.go.jp/eng/vcms_lf/25_ra_10007zenbun.pdf); Chiteki Zaisan Kōtō Saibansho [Intellectual Prop. High Ct.] May 16, 2014, no. 10008, SAIBANSHO SAIBANREI JŌHŌ [SAIBANSHO WEB], [http://www.ip.courts.go.jp/eng/vcms\\_lf/25\\_ra\\_10008zenbun.pdf](http://www.ip.courts.go.jp/eng/vcms_lf/25_ra_10008zenbun.pdf).

99. See Rechtbank's-Gravenhage 14 mars 2012, HA ZA 11-2212, HA ZA 11-2213, HA ZA 11-2215 (Samsung Elecs. Co./Apple Inc.), <http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:RBSGR:2012:BV8871>. For discussion in English, see Michael Fröhlich & Gertjan Kuipers, *FRAND and Injunctive Relief*, AIPPI E-NEWS, NO. 25 (July 2012), [https://www.aippi.org/enews/2012/edition25/Michael\\_Frohlich.html](https://www.aippi.org/enews/2012/edition25/Michael_Frohlich.html); Florian Mueller, *Samsung Suffers Second and Even More Important FRAND Defeat to Apple in the Netherlands*, FOSS PATENTS (Mar. 14, 2012), <http://www.fosspatents.com/2012/03/samsung-suffers-second-and-even-more.html>.

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disadvantages of these other bodies of law to resolve them—we note only that, as a matter of policy, they may be correct in denying injunctions in a setting in which the anticompetitive effect of that remedy likely outweighs any benefit to dynamic efficiency. Perhaps our analysis could play a role as these countries continue to grapple with cases involving PAEs and SEPs.

### C. PREEMPTIVE PATENTING

In Part I, we showed that when (as in *Trebro*) a firm that sells products covered by technology *a* acquires from a third party a patent on technology *b*, courts should not enjoin inadvertent infringers from using the *b* patent, but instead should award only a reasonable royalty. On these facts, injunctive relief causes an unambiguous social welfare loss.<sup>100</sup> A natural extension of our analysis would be to consider whether courts should award injunctions when the firm selling products covered by technology *a* itself invents and patents technology *b*. Initially, one might think that, if our preceding analysis is correct, it shouldn't matter whether the firm acquired *b* from a third party or developed it in-house; the welfare consequences of injunctive relief should be the same. As discussed below, however, although we suspect that this may be right, we cannot be quite as confident as in our preceding examples that injunctions necessarily disserve the public interest.

The fact pattern we are discussing in this section bears some resemblance to a phenomenon, known as “preemptive patenting,” that is said to occur when a firm obtains a patent that it does not intend to use itself or license, because the invention would compete with some other product the firm already produces and the firm expects that, on net, its aggregate profits would go down if it produced both products.<sup>101</sup> Theoretical

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100. See *supra* notes 52–53 and accompanying text.

101. See BLAIR & COTTER, *supra* note 3, at 248–50; Blair & Cotter, *supra* note 28. Preemptive patenting is distinct from so-called predatory innovation, which is said to occur when social or consumer welfare decreases as a result of a firm's acquisition or extension of monopoly power through the *introduction* of new products against which its rivals cannot effectively compete. In theory, predatory innovation could be viewed as an attempt to monopolize, in violation of section 2 of the Sherman Act. Because innovation typically enhances long-run social welfare, however, even when it results in a firm's temporary acquisition of monopoly power, in practice courts have been quite reluctant to embrace predatory innovation theories as a basis for antitrust liability. For an overview of the economic literature and case law, see, for example, CHRISTOPHER R. LESLIE, ANTITRUST LAW AND INTELLECTUAL PROPERTY RIGHTS: CAS-

analysis of the phenomenon typically begins with a model in which two firms, an incumbent and an upstart, are engaged in a race to patent a new technology.<sup>102</sup> If the incumbent wins the race, it may suppress the new technology if the expected profits from sales of products incorporating that technology are lower than the expected profits it will lose from sales of products incorporating the old technology. When preemptive patenting occurs, consumers lose out in the short run, because the patent shields the old product from competition without increasing output; the effect is the same as in *Trebro*. Moreover, while the patent incentive may have spurred the incumbent to invent and disclose the new technology, if the firm that lost the race would have succeeded in independently inventing the new technology the only long-run benefit of awarding the patent to the incumbent is the marginal benefit of its earlier disclosure, which could be negligible. Nevertheless, the leading economic models suggest that preemptive patenting is a rational business strategy only if (1) before the race begins, the incumbent's product has few if any commercial substitutes; (2) the incumbent races with only one (or at most, a small number) of potential competitors; and (3) the expected outcome of the inventive process is relatively certain.<sup>103</sup> Economists by and large have expressed doubts as to whether the combination of these three conditions is common enough for preemptive patenting to hap-

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ES AND MATERIALS 227–31 (2011).

102. See, e.g., Drew Fudenberg et al., *Preemption, Leapfrogging and Competition in Patent Races*, 22 EUR. ECON. REV. 3, 5–8 (1983); Richard J. Gilbert, *Patents, Sleeping Patents, and Entry Deterrence*, in STRATEGY, PREDATION, AND ANTITRUST ANALYSIS 205, 212–22 (Steven C. Salop ed., 1981); Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514, 515–17 (1982); Jennifer F. Reinganum, *Uncertain Innovation and the Persistence of Monopoly*, 73 AM. ECON. REV. 741, 741–43 (1983); Stephen W. Salant, *Preemptive Patenting and the Persistence of Monopoly: Comment*, 74 AM. ECON. REV. 247, 247–50 (1984); John Vickers, *Pre-Emptive Patenting, Joint Ventures, and the Persistence of Oligopoly*, 3 INT'L J. INDUS. ORG. 261, 262–63 (1985).

103. See Gilbert & Newbery, *supra* note 102, at 522–25; Richard S. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569, 578 (1995); Reinganum, *supra* note 102, at 745–46; see also Fudenberg et al., *supra* note 102, at 10–21 (arguing that upstarts can leapfrog over incumbents when the inventive process is stochastic and occurs in multiple stages, or when firms' knowledge of their competitors' R&D is imperfect); Salant, *supra* note 102 (arguing that preemptive patenting will not occur as long as transaction costs are sufficiently low for the incumbent and the upstart to negotiate licenses or assignments).

pen very often.<sup>104</sup>

Of course, even if preemptive patenting is uncommon, if and when it does occur it is likely to reduce social welfare. Moreover, the fact pattern we are considering in this section—where a firm that makes and sells products using technology *a* invents and patents technology *b*, but then neither uses nor licenses its *b* patent—isn't necessarily limited to cases in which the firm set out *intending* to preempt other firms from using *b*, and thus arguably incorporates a larger swath of cases than those involving preemptive patenting as such. In other words, even if firms rarely set out intending to preempt their rivals by patenting technology that will thereafter lie idle, one might argue nevertheless that denying the firm an injunction for the infringement of *b* increases social welfare, because the prospect of injunctive relief was unnecessary to induce the firm's entry into the market for *a*. The effect is the same, regardless of intent.

The problem with the preceding argument, as we see it, is that we can't be as confident as in the *Trebro* fact pattern that denial of an injunction will have no impact on the incentive to invent *b*.<sup>105</sup> When the firm decides to invest in the development of *b*, it may have no idea whether *b* is likely to be commercially successful or what all of its potential uses may be. Indeed, even after the patent issues, these matters may remain unclear; the

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104. See F. M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 452 (2d ed. 1980) (concluding that preemptive patenting is less widespread than is commonly believed); Gilbert, *supra* note 102, at 211, 239–57, 269 (describing preemptive patenting as “exceptional”); Gilbert & Newbery, *supra* note 102, at 514 (same); Reinganum, *supra* note 102, at 746. Some authors have argued, however, that the empirical evidence points to several historical examples of “technology suppression,” which may or may not involve preemptive patenting. See Kurt M. Saunders, *Patent Nonuse and the Role of Public Interest*, 15 HARV. J.L. & TECH. 389, 391–96 (2002); Kurt M. Saunders & Linda Levine, *Better, Faster, Cheaper—Later: What Happens When Technologies Are Suppressed*, 11 MICH. TELECOMM. & TECH. L. REV. 23, 37–41 (2004); see also Dominique Guellec et al., *Pre-Emptive Patenting: Securing Market Exclusion and Freedom of Operation*, 21 ECON. INNOV. & NEW TECH. 1, 20 (2012) (reporting results of an investigation of patent filings in the European Patent Office suggesting that competitors sometimes file low-quality applications to block patenting by others).

105. We noted the potential impact on the incentive to invent and patent *b* in the *Trebro* example, where the firm acquires the patent on *b* from a third party. In theory, third parties might be marginally less motivated to invent and patent *b* because potential assignees like *Trebro* will pay less to acquire the patent on *b* if they could demand only a reasonable royalty for the use of *b*. Even if this somewhat attenuated causal chain obtains in some instances, however, this reduction in the third party's incentive to invent and patent *b* isn't necessarily a bad thing. See *supra* note 53 and accompanying text.

patent may sit idle while the firm decides whether to retool its plant to enable it to use *b*, or while it searches for an appropriate licensee.<sup>106</sup> A no-injunction rule nevertheless effectively commits the firm, in advance, to license its *b* patent to competitors on a nonexclusive basis, and on these facts we cannot rule out the possibility that if faced with this choice the firm will opt to forgo *b*.<sup>107</sup>

To be sure, we don't know whether these (or other) scenarios play out very often; and even if they do, perhaps the social cost of enjoining the use of *b* is large enough that, on balance, the cost of a few false positives (denying an injunction when it actually would be welfare-enhancing) outweighs the cost of the false negatives (granting injunctions when doing so would actually enable preemptive patenting) resulting from a rule that permits injunctive relief.<sup>108</sup> All we can say with certainty, however, is that our unprotected market analysis provides some reason to question whether injunctions serve the public interest in cases in which a firm uses patent *a* and refuses to use or license patent *b*. It doesn't prove the case one way or the other, though, and courts still need to exercise appropriate judgment based on the facts before them.

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106. Recall from above that, in some circumstances, a firm may foresee higher profits through exclusive licensing. *See supra* note 36.

107. Of course, if others are likely to independently invent *b* anyway, the potential social welfare loss from reducing the patentee's ex ante incentive to invent and patent *b* is somewhat reduced as well. Moreover, not inventing and patenting *b* leaves the firm vulnerable to someone else doing so instead, in which case the firm doesn't even get the benefit of a reasonable royalty. On somewhat altered facts, however, if the firm had yet to disclose and market *a* when it developed *b*, it might be less motivated to disclose and market *a* absent the ability to foreclose competitors from using *b*, if it believed those competitors would soon develop *b* on their own. *Cf.* Michael L. Katz, *Intellectual Property Rights and Antitrust Policy: Four Principles for a Complex World*, 1 J. TELECOMM. & HIGH TECH. L. 325, 343 n.42 (2002) ("One might also argue that even purely preemptive patenting is beneficial if it increases the degree to which the original innovator can earn a return on the innovations of which it does make use. This line of argument, however, suggests that patent scope should be increased, not that firms should make real expenditures solely to protect rents and quasi-rents.")

108. Conceivably, a court deciding whether to grant an injunction against a defendant's use of *b* could inquire into the facts surrounding the patentee's decision to invent, or into whether the conditions the economists argue must be present for preemptive patenting to occur are in fact present. In crafting patent remedies, however, there is always a tradeoff between administrability and accuracy, and whether it would be worth making such detailed factual inquiries in the sort of case under consideration here strikes us as doubtful.



### III. DIAGONALLY INTEGRATED NON-PRACTICING ENTITIES

The second key insight that flows from the analysis we presented in Part I is that diagonally integrated NPEs pose greater risks to short- and long-term social welfare than do conventional NPEs. Using a term coined by Richard Higgins, we consider a firm to be diagonally integrated if it produces a “downstream” product while also controlling an “upstream” input that is used (or could be used) by downstream rivals, but which the firm does not use in its own downstream product.<sup>109</sup> For example, if an electricity provider acquired a major solar panel manufacturer but continued to offer only electricity generated by its power station, then it would become diagonally integrated with respect to the solar panel technology. Thus, the electricity provider does not actually sell the solar panels to consumers, but the acquisition is nevertheless profitable because it allows the provider to suppress competition with firms that install residential solar panels by raising their costs of acquiring the solar panels, or potentially by refusing to sell them solar panels. This is an invaluable opportunity, as a firm will benefit substantially from an increase in its rival’s costs.<sup>110</sup>

When diagonal integration involves acquiring the patent to an input technology used exclusively by downstream rivals, then the firm becomes a *diagonally integrated NPE*. By definition it is an NPE with respect to the acquired patent, because only its rivals practice that patent, but it is also diagonally integrated because it competes with those rivals in the downstream market. At first glance it may seem that diagonal integration is unlikely to be a widespread phenomenon, but in fact diagonally integrated NPEs are common, particularly in patent-rich technology markets. As noted above, large technology firms frequently acquire large patent portfolios without intending to practice all of the patents therein.<sup>111</sup> These unpracticed patents nevertheless may improve the acquiring firm’s market position, as the firm may assert them against competitors whose products are covered by those patents. In this way, the patent system creates many opportunities for diagonal integra-

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109. See Higgins, *supra* note 24, at 610–12 (introducing the concept of “diagonal integration”).

110. Steven C. Salop & David T. Scheffman, *Cost-Raising Strategies*, 36 J. INDUS. ECON. 19, 20–21 (1987) (explaining why firms benefit by taking measures that increase rivals’ costs).

111. See *supra* note 54 and accompanying text.

tion. When achieved through patent acquisition, diagonal integration will also tend to be more difficult to circumvent. Indeed, if an input technology is patent protected, then it will tend to face less competition, and thus its users may be limited in their ability to switch to an alternative provider. This enables a diagonally integrated NPE to place more pressure on competitors whose products read on the acquired patents.

Trebro became a diagonally integrated NPE when it acquired the '638 patent but neglected to use that technology in its own products.<sup>112</sup> In this light, the principal impact of *Trebro* was to declare that a court may award a plaintiff-manufacturer injunctive relief for the infringement of a patented technology with respect to which the firm is diagonally integrated.<sup>113</sup> However, as we shall demonstrate, diagonal integration leads to the worst possible effects on competition and consumers with respect to the unpracticed patent.<sup>114</sup> The results are even more adverse than those that would arise if the unpracticed patent were held by a standard (unintegrated) NPE. It is therefore troublesome that the *Trebro* opinion completely neglected to explore the competition policy implications of its decision.

Diagonal integration has the flavor of vertical integration, but in fact it produces very different results.<sup>115</sup> A vertically integrated firm is one that sells both an upstream input and a downstream product that utilizes that input. For example, Apple is vertically integrated with respect to computer hardware and software, as it produces not only physical computers but also the OS X operating systems used therein. Microsoft has historically not been vertically integrated in this way, because until recently it focused almost exclusively on software, which it developed and sold to independent PC manufacturers. The prevailing economic attitude toward vertical integration, often dubbed the "Post-Chicago" approach, is that it typically produces some procompetitive efficiencies while also creating some potential for anticompetitive conduct.<sup>116</sup> The principal procompet-

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112. See *Trebro Mfg. v. FireFly Equip., L.L.C.*, 748 F.3d 1159, 1164 (Fed. Cir. 2014) ("[N]one of Trebro's currently available sod harvesters practice the '638 patent.>").

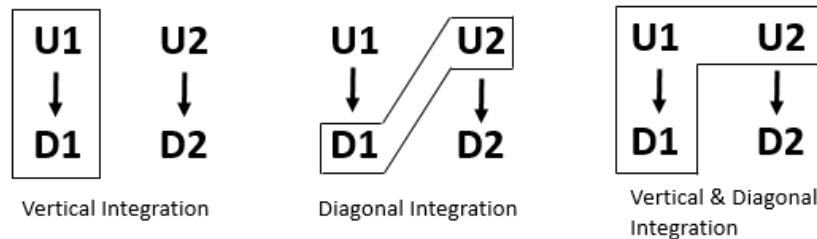
113. *Id.* at 1171 (holding that a plaintiff who does not practice a patent may be entitled to an injunction if it produces a competing product).

114. The appendix develops an economic model that formally proves this claim.

115. See appendix for a welfare comparison.

116. See Michael H. Riordan & Steven C. Salop, *Evaluating Vertical Mergers: A Post-Chicago Approach*, 63 *ANTITRUST L.J.* 513, 519–20 (1995).

itive effects involve the elimination of double marginalization<sup>117</sup> and the improved compatibility and design of the integrated articles.<sup>118</sup> These efficiencies must be weighed against potential anticompetitive effects, which include the possibilities of foreclosing rivals or increasing the price they must pay for upstream inputs.<sup>119</sup> The prevailing attitude is that, on balance, most instances of vertical integration are welfare-enhancing.<sup>120</sup> The below figures illustrate the differences between possible downstream-upstream integration arrangements.



In these figures there are two upstream technologies, U1 and U2, which are used in the downstream products D1 and D2, respectively. The “fenced in” area in each diagram designates the set of upstream and downstream products controlled by the integrated firm. The right hand diagram, which describes a vertically and diagonally integrated firm, is illustrative of the circumstances in *Trebro*, and perhaps of most instances in which diagonal integration is achieved through patent acquisition. This means that the integrated firm is a

117. Double marginalization, also known as royalty stacking or double markup, refers to a pricing situation in which two or more firms in a supply chain (including the final product seller) independently apply markups to their own contributions to the final product. For example, a wholesaler will apply a positive markup to its sales to a retailer, and the retailer will in turn apply its own markup to the product when selling it to consumers. All else being constant, double marginalization is always surplus reducing for both firms and consumers. That is, if a vertically integrated firm applied a single markup to the final product, the net result would be a lower price and higher total profits, thus increasing both consumer and producer surplus. *See id.* at 526–27.

118. *See id.*

119. *See id.* at 527–29; *see also* Janusz A. Ordover et al., *Equilibrium Vertical Foreclosure*, 80 AM. ECON. REV. 127, 140 (1990).

120. *See* Riordan & Salop, *supra* note 116, at 519 (“Because many vertical mergers create vertical integration efficiencies between purchasers and sellers, many if not most vertical mergers are either procompetitive or competitively neutral.”).

practicing entity with respect to its own technologies (meaning it is vertically integrated with respect to them), and also diagonally integrated with respect to some later-acquired patented technology.

The appendix develops a simple economic model of diagonal integration that is designed to fit the facts of *Trebro*. It measures the impact of a firm like *Trebro* becoming diagonally integrated, relative to the case in which the acquired patent is instead controlled by an unintegrated NPE. It establishes the general result that diagonal integration generates all the costs of vertical integration but none of the benefits. It leads the integrated firm to increase its rival's costs or deny it access to the upstream input, but it does not produce any cost efficiencies or improved input-output compatibility. In fact, it actually makes the double marginalization problem worse by inducing a higher royalty rate for the upstream input. Thus a diagonally integrated NPE would charge a higher royalty for the unpracticed patent than would an unintegrated NPE. The intuition for this is straightforward. A standard NPE has no direct stake in the downstream market, and thus cares only about the licensing revenue it receives. By contrast, a diagonally integrated NPE cares not only about licensing revenue, but also the value of raising its rival's costs, which positively impacts its own downstream profits.<sup>121</sup> This additional consideration leads the diagonally integrated NPE to set a higher royalty rate than the unintegrated NPE. Patent ownership by a standard NPE is in turn worse than an arrangement in which the upstream patent is owned by the producer that utilizes it. In this case that producer is a practicing entity, which is simply a patent holder that is vertically integrated in the downstream market. This would achieve the highest possible welfare level with respect to the patent in question by eliminating the separate upstream markup.<sup>122</sup>

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121. See Ordoover et al., *supra* note 119, at 127–28; see also Scott Morton & Shapiro, *supra* note 43, at 489–90 (“[T]he hybrid PAE has a greater incentive to raise the costs of target firms than does the pure PAE.”).

122. In this respect, then, it is fair to say that the competitive effects of diagonal integration differ from the effects that would flow merely from a practicing entity's market dominance. The practicing entity may be able to charge a supracompetitive price for its patented product, but the law tolerates this result to induce the dynamic efficiency benefits on which the patent incentive is premised. A diagonally integrated NPE as we have defined it, however, imposes welfare losses by raising its rivals' costs without achieving any of the procompetitive benefits of vertical integration.

To summarize our model's results, when a firm like Trebro becomes a diagonally integrated NPE, the following changes arise<sup>123</sup>:

- the royalty demanded for licensing to the downstream rival increases, potentially to a level at which it is compelled to exit the market (this is equivalent to enjoining the rival);
- the prices of both downstream products increase, so that the double marginalization problem actually grows worse;
- the integrated firm's output increases, but by less than the downstream rival's output falls, so that total output falls overall;
- total welfare falls, as does consumer welfare.

Importantly, the magnitudes of all of these effects are higher when the downstream products are closer substitutes (i.e., when downstream competition is more rigorous). At one extreme, if the products are perfect substitutes then the downstream rival is excluded from the market and welfare is at its lowest. Additionally, if we make the reasonable assumption that the downstream rival has some fixed costs to cover, then it will be excluded by the diagonally integrated NPE even when the products are close but imperfect substitutes. At the other extreme, if they are independent products then the above effects shrink to zero, and the diagonally integrated NPE acts exactly the same as an unintegrated NPE. This is not surprising, because when the downstream products are independent (meaning they do not compete), then the integrated firm does not benefit from raising the other firm's cost, and is thus focused purely on licensing revenue, just like the unintegrated NPE.

For these reasons, it is clear that diagonal integration poses a serious threat to competition and welfare. The decision in *Trebro* thus establishes a dangerous precedent, potentially enabling diagonally integrated NPEs to fully leverage their structural advantage over downstream rivals. That is, by neglecting to limit the availability of injunctive relief for diagonally inte-

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123. These are the changes in equilibrium variables relative to the case in which the unpracticed patent is held by a standard unintegrated NPE. See the appendix for a diagram describing this shift. If the basis for comparison were instead the case in which the downstream rival owned the patent on its own input, then the same effects would arise, but the magnitude of each effect would be even greater.

grated NPEs claiming infringement of their unpracticed patents, the *Trebro* decision provides the ultimate leverage needed to maximize the anticompetitive potential of diagonal integration. Given the acute economic hazards posed by this result, it is particularly concerning that the Federal Circuit neglected to even consider the competition policy implications of its decision. In our view, such considerations render the Federal Circuit's position untenable. A better rule would be to limit most diagonally integrated NPEs to legal remedies, which would limit their ability to charge exorbitant royalties, thereby blunting the anticompetitive potential of diagonal integration. And, as our earlier arguments demonstrate, such a rule would frequently promote static welfare without materially undermining the incentive to innovate.

### CONCLUSION

The modern approach to assessing whether an injunction is warranted in a given case involves a myopic focus on the comparative hardships of the parties and the public at large, as measured at the time of infringement. This Article proposes a different approach: we argue that the courts could better appraise the merits of injunctive relief by looking to the time of invention and asking whether the right to exclude was actually a necessary quid pro quo for the inventor's decision to develop its innovative ideas. This approach aligns judicial decision making with the patent system's objective of providing only those protections that are actually necessary to induce an innovation's development. In many cases it will be impossible to make this determination, but we demonstrate that there are a number of situations in which it can be inferred from the inventor's actions and the circumstances under which his product entered the market. One such situation involves a plaintiff who is a diagonally integrated NPE (an NPE who competes with products reading on its unpracticed patent in a downstream market) with respect to the disputed patent, and which entered the downstream product market unprotected from competitors using the patented article.

Our approach suggests that the Federal Circuit erred in *Trebro* by concluding that a plaintiff may be entitled to enjoin an infringer of its unpracticed patent if it competes with the disputed technology in a downstream market. This is true even if, like the plaintiff in *Trebro*, it entered the downstream market unprotected from competing products using that technolo-

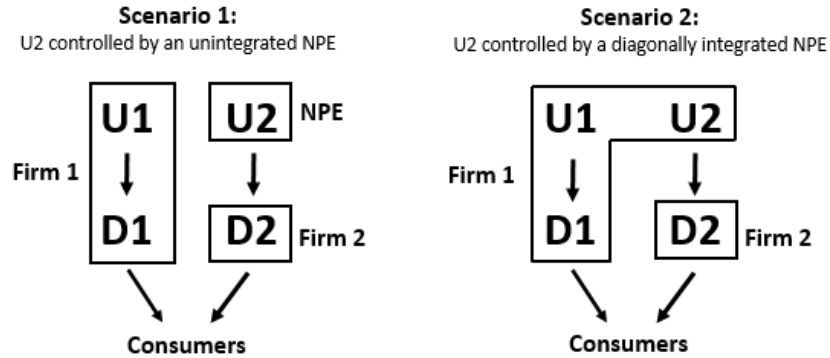
gy. The approach also sheds some light on a number of important patent topics, including FRAND-encumbered patents, preemptive patenting, and patent privateering. We also provide detailed analysis of diagonally integrated NPEs—a business model that is becoming increasingly common in markets where patents are regularly bought and sold. Large firms in these industries will commonly acquire large portfolios encompassing many competing technologies that the acquiring firms do not intend to use in their own products. We demonstrate that diagonally integrated NPEs are more harmful to welfare than standard (unintegrated) NPEs. Such a firm’s welfare effects are similarly more adverse than those that would arise if it were a practicing entity with respect to the patented article.

#### APPENDIX: A SIMPLE MODEL OF DIAGONALLY INTEGRATED NON-PRACTICING ENTITIES

In this Section, we present a simple model of diagonally integrated non-practicing entities (NPEs) and their effects on competition and welfare. A diagonally integrated NPE is a firm who competes in a downstream market, and which holds a patent for an upstream input technology practiced by a downstream rival, but which it does not practice itself. To model this, we posit a two-tier vertical market structure with differentiated products. There is an upstream market that contains two distinct technological inputs, U1 and U2, which are subject to patent protection. These input technologies are used by producers in the downstream market, which contains two (differentiated) competing products, D1 and D2. U1 is an essential input in D1 (but unused by D2), and so on for U2 and D2. The upstream firms do not sell physical things, but rather licenses to use their patented input technologies, and thus there are no production costs associated with upstream sales. The only cost of producing a downstream product is that of acquiring the right to use its essential input, which is sold on a per-unit basis via a running royalty set by the upstream patent holder.

There are two downstream firms, Firm 1 and Firm 2, which sell products D1 and D2, respectively. We assume throughout that Firm 1 holds the patent over U1, so that it is vertically integrated with respect to U1 (i.e., it is a practicing entity with respect to U1.) By contrast, Firm 2 does not hold the patent over U2, but rather must acquire the rights to use it

from a patent holder (we later consider the case in which Firm 2 owns the patent on U2.) We compare two scenarios. In scenario 1, the patent on U2 is owned by a standard unintegrated NPE. In scenario 2, Firm 1 becomes a diagonally integrated NPE by acquiring the patent for technology U2, while continuing to produce only D1. These scenarios are depicted in the diagrams below.



To model downstream competition, we posit a quadratic two-product utility function representing the preferences of a representative consumer. We assume that the downstream products are symmetrically differentiated imperfect substitutes. This utility function is defined by

$$u(q_1, q_2) = a(q_1 + q_2) - 1/2b(q_1^2 + q_2^2 + 2sq_1q_2)$$

where  $q_i$  denotes the quantity of downstream good  $i$ ,  $a$  and  $b$  are positive scalars, and  $s \in [0,1]$  denotes the degree of substitutability between D1 and D2. The values  $s = 1$  and  $s = 0$  correspond to the extreme cases of perfect substitutes and independent products, respectively. The representative consumer maximizes consumer surplus, given by  $u(q_1, q_2) - p_1q_1 - p_2q_2$  where  $p_i$  denotes the price of downstream product  $i$ . The first order conditions for  $q_1$  and  $q_2$  yield the inverse demand functions associated with D1 and D2, respectively.

$$p_1 = a - bq_1 - sbq_2, p_2 = a - bq_2 - sbq_1$$

Firms 1 and 2 engage in Cournot competition with differentiated products. Note that Firm 1's production costs are zero,



since it owns the patent rights to U1 and thus will not charge itself a royalty. Firm 2 pays a constant marginal cost of  $r$  per unit, which denotes the royalty rate charged by the patent holder of U2. Firm 1's downstream profits are thus given by  $\Pi_1 = q_1(a - bq_1 - sbq_2)$ , while Firm 2's profits are given by  $\Pi_2 = q_2(a - bq_2 - sbq_1 - r)$ . Taking the first order condition for each  $\Pi_i$  with respect to  $q_i$  and solving for  $q_i$  yields firm  $i$ 's best response function. Assuming  $r$  is sufficiently low to ensure nonnegative output by Firm 2, the best responses of Firms 1 and 2 are  $BR_1(q_2) = a/2b - sq_2/2$  and  $BR_2(q_1) = (a - r)/2b - sq_1/2$ , respectively. These generate the following unique Nash-Cournot equilibrium output levels

$$q_1(r, s) = \frac{(2 - s)a + sr}{b(4 - s^2)}, \quad q_2(r, s) = \frac{(2 - s)a - 2r}{b(4 - s^2)}$$

Using each firm's profit-maximization first order condition, it is easy to verify that the corresponding equilibrium prices and profits are given by

$$p_1(r, s) = bq_1(r, s), \quad p_2(r, s) = bq_2(r, s) + r$$

$$\Pi_1(r, s) = bq_1(r, s)^2, \quad \Pi_2(r, s) = bq_2(r, s)^2$$

This fully characterizes the downstream equilibrium as a function of  $r$ . Unsurprisingly, a higher  $r$  benefits Firm 1 and injures Firm 2. Firm 1's output and profits are strictly increasing in  $r$ , while the opposite is true for Firm 2. Both prices are increasing in  $r$ , with  $p_2(r, s) > p_1(r, s)$  for all  $r > 0$ . By contrast, both firms are strictly better off when the products are more differentiated: output, price, and profits of each firm are strictly falling in  $s$ .<sup>1</sup>

In scenario 1, the patent on U2 is owned by an unintegrated NPE. This NPE's objective is simply to maximize its total licensing receipts. Thus the NPE maximizes  $rq_2(r, s)$ . This yields a unique profit-maximizing royalty rate,  $r^*(s)$ , defined by

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1. To see that outputs are decreasing in  $s$ , note that a higher  $s$  makes each best response function decrease more rapidly, which causes the equilibrium output profile to shift inward toward the origin.

$$r^*(s) = \frac{(2-s)a}{4}$$

Given that this royalty is positive and that downstream competition is imperfectly competitive, there is a double marginalization problem in scenario 1. If instead Firm 2 owned the patent on U2 (meaning it is vertically integrated, just like Firm 1) then the royalty rate would be zero and the downstream price would fall, leading to an unambiguous welfare improvement. This is a well-established result of vertical integration, as noted in Section IV. In scenario 2, Firm 1 owns the patent on U2, making it a diagonally integrated NPE. Unlike the unintegrated NPE, Firm 1 now cares not only about the revenue derived from licensing to Firm 2, but also about raising its rival's costs, which increases its own downstream profits. Thus Firm 1 chooses  $r$  to maximize  $\Pi_1(r,s) + rq_2(r,s)$ , leading to a unique equilibrium royalty rate of  $r^{**}(s)$ , defined by

$$r^{**}(s) = \left( \frac{8 + 4s - 2s^2}{8 - 3s^2} \right) r^*(s)$$

$r^{**}(s)$  exceeds  $r^*(s)$  for all positive  $s$ . Thus diagonal integration leads to a higher royalty rate whenever the downstream products compete. Intuitively, Firm 1's licensing demand is as low as the unintegrated NPE's only when the products are independent, in which case there is no independent value to increasing its rival's costs. The increase in the royalty rate,  $r^{**}(s) - r^*(s)$ , is strictly increasing and convex in  $s$ . Thus, the more rigorous the downstream competition, the higher the increase in the royalty rate. In the extreme case of perfect substitutes ( $s = 1$ ), Firm 1 actually excludes Firm 2 from the market completely by setting a royalty at which Firm 2 optimally produces zero units. If we made the additional assumption that Firm 2 has some fixed costs to cover, then there would be some interval of substitutability levels ( $s_0, 1$ ) within which Firm 2 would not operate in scenario 2.<sup>2</sup>

That  $r$  increases upon diagonal integration implies the

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2. In particular, this would be the interval of substitutability levels at which any royalty rate  $r$  that Firm 2 could afford to pay would lead Firm 1's downstream profits to fall by more than  $rq_2(r,s)$ .

prices of both downstream products increase as well. Thus, in contrast to standard vertical integration, diagonal integration actually makes the double marginalization problem worse. Like the royalty rate, the increase in the price of each downstream good grows larger as  $s$  increases. Additionally, Firm 1's output expands, but by less than Firm 2's output falls, creating a net reduction in total output. Finally, it is easy to verify that total welfare and consumer welfare both fall. Note that, for any output profile  $(q_1, q_2)$ , total welfare is given by  $u(q_1, q_2)$ , because all costs faced by producers are simply transfers made to an upstream patent holder. Letting  $W(r, s) = u(q_1(r, s), q_2(r, s))$  denote equilibrium total welfare, it is easy to verify that  $\partial W / \partial r = p_1(\partial q_1 / \partial r) + p_2(\partial q_2 / \partial r)$ . Given that  $p_2 > p_1$  and  $\partial q_2 / \partial r < -\partial q_1 / \partial r < 0$  in equilibrium, it follows that  $\partial W / \partial r < 0$ . Thus total welfare falls upon diagonal integration. Finally, note that consumer welfare must also fall, because both downstream prices increase.