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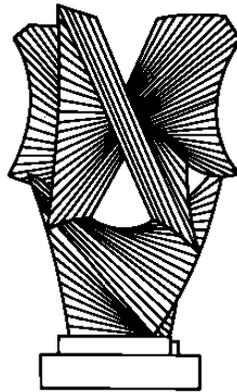
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Jonathan S. Masur

**THE LAW SCHOOL
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Patent Liability Rules as Search Rules

Jonathan S. Masur[†]

Patent law's infringement doctrines, commonly understood to be simply rules of liability, are in fact search rules as well. Patent liability rules determine not only who will be responsible for what conduct, but also when patent holders and potential infringers will benefit from locating (or remaining ignorant of) one another. They thus affect the conditions under which parties will have incentives to engage in search. The dynamics of patent search are actually quite complicated. Under normal circumstances, patent law's liability rules generate approximately optimal investments in search as both patent holders and possible infringers have incentives to locate one another. But when a direct infringer is insolvent or unreachable, the fact that contributory infringers can be held liable only when they have knowledge of the patent shifts search responsibilities toward patent holders. Search incentives are also affected by patent law's rules regarding past conduct and by the possibility of holdup problems based on alleged infringers' product-specific investments. This Article demonstrates that patent law's liability rules may be generating inefficient levels of search and corresponding social welfare losses and proposes a simple doctrinal corrective.

INTRODUCTION

The patent law doctrines of direct and contributory infringement are, first and foremost, doctrines of liability. The infringement doctrines allocate liability for the unlicensed use of a patented invention among the patent holder, the firm that produces the infringing product, and any other firms that supply significant components of that product.¹ This point is so obvious that it is rarely remarked upon. Yet perhaps because it is so obvious, it has served to obscure these rules' other significant function: they allocate search responsibilities (and search costs) among the same parties. The rules governing patent liability are also rules that govern patent search.

The explanation lies with the incentives that these rules create for parties to learn of patents (and infringing goods) earlier or later in time. Patent holders nearly always have incentives to locate infringers; once they know of the existence of infringing behavior, they can elect where and when to open licensing negotiations or file suit. When a producer of goods is directly liable for infringement, it too has incentives to locate (and license) patents *ex ante*. The producer is liable for infringing behavior that occurs even before the date a patent holder files suit, and so it would only be setting a trap for itself were it to begin producing without a license in place.

[†]Assistant Professor, The University of Chicago Law School. I thank Richard Epstein, Mark Lemley, Saul Levmore, Doug Lichtman, and participants at the Licensing of Intellectual Property symposium at The University of Chicago Law School for helpful comments. I also thank Joe Bingham for excellent research assistance.

¹ See 35 USC § 271(a), (c).

The equation changes, however, when the direct infringer of a patent is insolvent or otherwise unavailable for suit. A patent holder may still be able to sue suppliers of components for the final product or other related parties under the doctrine of contributory infringement. But these contributory infringers are not immediately liable. Rather, liability attaches only when the patent holder knows of both the existence of the patent and the producer's failure to obtain a license. It cannot be held liable for conduct that occurs before it learns of the patent.

This incentive to remain ignorant shifts the entire search burden to the patent holder, which cannot rely on possible (contributory) infringers to seek it out. And because the patent holder also cannot determine in advance when direct infringers will be insolvent or unavailable, it will end up conducting broader searches in the hope of locating the proper parties. Both patent holders and possible infringers will utilize mixed strategies, investing resources in search in some cases but not others. And in many cases infringers will engage in suboptimal levels of search, forcing patent holders to search at inefficient levels. The result is social waste, generated by the manner in which the doctrine of contributory infringement shields unknowing parties from liability.

Interestingly, this dynamic is present in few other areas of law. Patent law is distinctive in that the "harm"—patent infringement—frequently occurs without any discernable impact upon the aggrieved party, and in places that are physically distant from the patent holder. Furthermore, the plaintiffs and defendants in patent cases are often strangers, and the parties may not even be aware of one another's existence. By contrast, parties to a contract dispute are by definition familiar with one another. Similarly, the typical tort case does not involve any particular mystery regarding the identities of the plaintiff and defendant. The two have generally interacted in some immediate fashion, or the defendant is one of a finite number of potential actors. Contract and tort defendants also cannot shield themselves from liability through ignorance. But in intellectual property cases, the putative plaintiff and defendant may have no knowledge of either the harm or each other. For some defendants, this ignorance even serves as a complete defense. The need to expend resources on search thus rises to the fore.

This Article proceeds in two Parts. Part I describes the doctrine of contributory infringement as a legal outlier and analyzes the complex incentives for search that it creates. Part II proceeds normatively: it demonstrates that the search behaviors that arise as a result of patent law's liability rules will in some cases diminish social welfare, and it suggests a simple doctrinal solution.

I. CONTRIBUTORY INFRINGEMENT

The doctrine of contributory infringement functions best when it is least necessary. When a patent owner can sue the direct infringer, the doctrine will allow parties within a supply chain to allocate liability among themselves so as to minimize search and licensing costs. When the direct infringer is unavailable for suit, however, the doctrine channels search costs toward the patent holder, who likely can handle them least

efficiently. The result is social waste, driven by the ability of contracting parties to escape liability and allocate search costs to the owner of the patent.

A. Contributory Infringement Doctrine in Comparative Context

Whether measured against other patent doctrines, or even against other legal doctrines more generally, patent law's doctrine of contributory infringement is an outlier. The reason is the mens rea requirement it imposes. Before a party can be held liable as a contributory infringer of a patent, that party must have knowledge of two distinct facts: (1) the existence of the patent, and (2) whether the direct infringer—with whom the contributory infringer is likely in contractual privity—has obtained a license on the patent.² In other words, the putative contributory infringer must be aware of the full legal status of the patent and the relationship between the direct infringer and the patent holder.

This is an extraordinary requirement, one that is present few other places in the law. By and large, patent law is based upon strict liability. There is no mens rea requirement attached to literal infringement or infringement by equivalents.³ Patentability doctrines such as novelty and the statutory bars similarly involve no particular state of mind.⁴ Copyright's doctrine of contributory infringement is highly unsettled, but at least in some formulations constructive knowledge—a party “should have known” that infringement was occurring—will suffice.⁵

Even within the criminal law it is rare for liability to be imposed only in the presence of knowing—as opposed to negligent or reckless—conduct.⁶ In addition, the demand that the alleged infringer know of the existence of a patent and the nonexistence of a license

² See 35 USC § 271(c); *Aro Manufacturing Co v Convertible Top Replacement Co*, 377 US 476, 488 (1964) (“[Section] 271(c) does require a showing that the alleged contributory infringer knew that the combination for which his component was especially designed was both patented and infringing.”). This Article focuses on contributory infringement, rather than induced infringement, because the latter imposes an even greater mens rea requirement. See 35 USC § 271(b); Mark A. Lemley, *Inducing Patent Infringement*, 39 UC Davis L Rev 225, 237–38 (2005) (“In part to avoid these problems, courts interpreting the 1952 Patent Act have uniformly interpreted section 271(b) to require not just knowledge, and certainly not mere willful blindness, but also a ‘specific intent and action to induce infringement.’”) (citation omitted). The inducement doctrine is also in a state of some flux. At the time of this writing, the Supreme Court has granted certiorari in a case that will likely clarify exactly what degree of intent is necessary for liability. See *Global-Tech Appliances, Inc v SEB S.A.*, 131 S Ct 458 (2010).

³ A mens rea requirement is present only within the related doctrine of induced infringement, 35 USC § 271(b), and the doctrine of willful infringement, which awards treble damages against defendants who have engaged in particularly egregious conduct by continuing to infringe after they learn of the existence of the patent. 35 USC § 284.

⁴ See 35 USC §§ 101–02.

⁵ See, for example, *In re Aimster Copyright Litigation*, 334 F3d 643, 650 (7th Cir 2003) (holding that the owner of file-sharing software cannot escape liability for the copyright infringement of its users simply by encrypting the transferred data and thus avoiding direct knowledge of any infringements).

⁶ See, for example, MPC § 2.02(3) (ALI 1985) (stating that “recklessness” will suffice for culpability under most criminal statutes).

verges on requiring knowledge of the legal status of the act, a condition that has been roundly rejected in criminal (not to mention civil) law.⁷

The knowledge requirement in patent's doctrine of contributory infringement is usually defended on the ground that it would be unfair to hold the supplier of a part liable if that part were to eventually find its way into a larger, infringing product.⁸ Without actions by others, the contributory infringer has done nothing wrong.⁹ Thus, it seems appropriate to hold the contributory infringer liable only when it was somehow responsible for—or at least aware of—the actions of these others. On its own terms, this seems a reasonable defense of contributory infringement's knowledge requirement, and it most likely explains its existence. But contributory infringement is not merely a rule that assigns liability when infringement has occurred. It is also a rule that assigns search obligations among parties, requiring some to actively seek out their counterparts while permitting others to remain inactive. Accordingly, the contributory infringement rules have significant economic impact even when no suit is ever brought. They play a large role in selecting which parties will bear the transaction costs involved in locating and licensing intellectual property. And they impact the contractual relationships between patent holders, producers, and parts suppliers.

B. Liability-Driven Search

Consider a simple model involving four actors: a patent holder, a producer (*P*), a first supplier (*S1*), and a second supplier (*S2*). The patent holder owns a valuable patent but does not practice the invention; the producer either manufactures a good or engages in a process that might infringe the patent;¹⁰ the first supplier manufactures an important component of the producer's good and sells it to the producer; and the second supplier manufactures an important component of the first supplier's good and sells it to the first supplier. Assume that both the existence of the patent and the existence of the potentially infringing good are costly to discover (as is typically the case).

As an initial matter, consider a situation in which the producer is solvent and available for suit. Under these circumstances, the doctrine of contributory negligence is largely irrelevant: the patent holder will always have the opportunity to sue the direct infringer (the producer). The producer will thus have an incentive to search for all patents that its product might infringe. Moreover, the producer will have an incentive to conduct this search as early

⁷ See, for example, MPC § 2.02(9) (stating that knowledge of whether conduct constitutes an offense is itself never an element of a criminal offense).

⁸ See, for example, Matthew T. Nesbitt, Comment, *From Oil Lamps to Cell Phones: What the Trilateral Offices Can Teach Us about Detangling the Metaphysics of Contributory Infringement*, 21 Emory Intl L Rev 669, 686 (2007) (explaining that the knowledge requirement “was no doubt intended to prevent the almost unlimited liability that would result if a manufacturer produced a component covered by any claim of an enforceable patent”).

⁹ *Aro Manufacturing*, 377 US at 482–83 (“[I]f there is no *direct* infringement of a patent there can be no *contributory* infringement.”).

¹⁰ The term “producer” is meant very generally. The producer could be any entity from a private user who violates a method patent in the privacy of her own home to a major manufacturing company. The salient differences between these possible parties will become clear in the examples that follow.

in the process of developing and marketing a product as possible. If the producer begins to market the product and is located by the patent holder only later, it will be liable for all infringing conduct that occurred within six years of the date on which the patent holder files suit.¹¹ And if the producer knowingly infringes the patent without attempting to negotiate a license, it may be liable in addition for treble damages under the doctrine of willful infringement.¹²

If the producer does not search for potential patents early in the process, it runs the risk of having its infringing behavior discovered only after it has made capital investments in technology or materials specific to the patented product. The producer would run the risk of being subjected to the classic holdup problem: if a patent holder can obtain an injunction against an infringing producer, then it can drive a very hard bargain against the producer by threatening to shut down production and render worthless the producer's product-specific investments.¹³ The producer thus has an incentive to locate the patent holder before it makes irrevocable product-specific investments that the patent holder might later be able to exploit.

Despite the producer's obvious incentives to search for patent holders, patent holders must simultaneously search for producers. If they did not, producers would have no reason ever to search for existing patents, as they would have no fear of being caught and sued. Accordingly, patent holders will utilize a type of mixed strategy, investing some resources in searching but limiting their search to allow producers to bear most of the expense.¹⁴

The producer's and patent holder's searches will thus proceed simultaneously. Importantly, however, there should be few wasted resources from these coincident searches. The two searches are independent of one another and do not cover the same territory: the producer is searching for patents, while the patent holder is searching for products.¹⁵ If either party locates the other, it will establish contact and attempt to negotiate a license, at which point both searches end.

¹¹ See 35 USC § 286.

¹² 35 USC § 284 (“[T]he court may increase the damages up to three times the amount found or assessed.”); *In re Seagate Technology, LLC*, 497 F3d 1360, 1371 (Fed Cir 2007) (setting forth the modern standard for determining when infringement has been willful).

¹³ See Oren Bar-Gill and Omri Ben-Shahar, *The Law of Duress and the Economics of Credible Threats*, 33 J Legal Stud 391, 412 (2004); Oliver Hart, *Firms, Contracts, and Financial Structure* 29–33 (Oxford 1995).

¹⁴ For an analysis of mixed strategies in law, see Douglas G. Baird, Robert H. Gertner, and Randal C. Picker, *Game Theory and the Law* 313 (Harvard 1994) (describing a mixed strategy equilibrium as one in which “one or more of the players adopts a *strategy* that randomizes among a number of pure *strategies*”).

¹⁵ This is in contrast to any number of other economic races, in which two parties compete along the same dimension to be the first to complete some activity. In many types of races, including patent races, the losing party's effort is entirely social waste. See, for example, John M. Golden, *Principles for Patent Remedies*, 88 Tex L Rev 505, 530–31 (2010); Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123 Harv L Rev 397, 440 (2009) (“Thus, the patent race literature proves that firms will make socially excessive (and often duplicative) investments if they capture all the total surplus created by their innovations.”).

Now, it is possible that one of the two parties—either the patent holder or the producer—is more efficient at engaging in search. If this is the case, then the system will generate some amount of inefficiency because the less efficient searcher will nonetheless be involved in the search to at least some small degree. The patent holder and producer cannot contract with one another for the search to be performed by the most efficient party because, by hypothesis, they have not located one another. The producer and the two suppliers can, however, allocate the costs of searching for a patent by contract. For instance, suppose that *P* is assembling circuit boards using chips built by *S1*, which in turn incorporate specially developed transistors produced by *S2*. Despite the fact that *P* is the end manufacturer, *S2* may have greater knowledge and expertise regarding the universe of patents in the industry. This could be the case if the vast majority of relevant patents covered transistors, rather than fully assembled circuit boards. Accordingly, *S2* might indemnify *S1* and *P* against the threat of patent infringement, effectively assuming the costs of searching and licensing any existing patents. The possibility of this type of efficient contracting is driven by *P*'s potential liability, which it must address in some fashion.

C. Search without Direct Infringement

Now, consider a situation in which the producer is judgment proof or otherwise unavailable for suit.¹⁶ Under these circumstances, the producer has no incentive to acquire information regarding the existence of the patent. For the producer, there is no downside to being sued for infringement, and thus no reason to expend resources searching for potential patents and negotiating (and paying for) licenses. Even if the producer knows of the existence of the patent, it may well be in its best interest not to contact the patent holder and attempt to negotiate a license. But contributory infringers (*S1* or *S2*) might nonetheless be solvent and potential targets for litigation.¹⁷

1. Producers and suppliers without product-specific investments.

How will the parties behave? Consider first the case in which the production of the good—here, a circuit board and its accompanying components—does not involve any specific investments by the producer and suppliers. For instance, *S2* may not need to develop or install any specialized equipment in order to manufacture the transistors that

¹⁶ There are a number of reasons why this might be the case. For instance, the producer might simply be insolvent or insufficiently capitalized to pay a judgment of infringement. The producer might be located in a jurisdiction that US law does not reach and thus may not be available for suit. Or, most likely, the “producer” may be an individual who violates a patent in the privacy of his own home and is not practically amenable to suit for infringement. See, for example, *Lucent Technologies v Gateway, Inc.*, 580 F3d 1301, 1320–22 (Fed Cir 2009) (involving a suit against Microsoft for contributory infringement of a patent for using a calendar function, in which the direct infringers were individual users who installed Microsoft programs and ran the calendar function).

¹⁷ It is not uncommon for a large company to supply a component of a larger invention to a smaller producer, creating situations in which the supplier continues as a going concern even after the producer has become insolvent.

will go into this circuit board; it may need only to calibrate its machinery slightly differently (at low cost).

Under these circumstances, the suppliers will understand that they can be shielded from liability by simply remaining unaware of the patent,¹⁸ and they will avoid expending any resources searching.¹⁹ This extends to the point of deliberate attempts to remain ignorant: the suppliers will actively endeavor to avoid learning of the patent from the producer, even if the producer already has knowledge of its existence.²⁰ The suppliers even have incentives to contract with the producer that this information *not* be shared, even if it were costless for the producer to share the information. For that matter, the producer may know of the patent ahead of time and thus might be liable as a willful infringer, but it would have no reason to fear liability itself and no reason to share the information with the supplier. The producer might even pirate technical information from a patent, share that information with a supplier without divulging its source, and then allow the supplier to build parts to the patent's specification without ever attempting to license the patent. In effect, the knowledge requirement acts as a shield that allows the producer and suppliers to draft a contract that maximizes their gains at the expense of the third-party patent holder.

From the perspective of the patent holder, the problems are twofold. First, the patent holder will understand the suppliers' incentives to remain ignorant of the patent and will be forced to expend resources searching for infringing products. Here, the patent holder must conduct the entire search; there is no corresponding party who will be simultaneously searching for patents. And it is quite likely that the patent holder is not the lowest-cost searcher. Patents are not necessarily easy or cheap to find. A patent may not contain the key words that a potential infringer would expect to find in a search, or it may concern an invention that appears largely unrelated to the technology at issue.²¹ It is for this reason that commercial firms are often caught unawares by suits for infringement based on patents that they would undoubtedly have preferred to have discovered and licensed.²²

¹⁸ See *Aro Manufacturing*, 377 US at 488.

¹⁹ Of course, a supplier might directly infringe another patent, and thus would be forced to search for that patent and arrange licensing deals. But that search and the search for patents that might be infringed by the finished product will frequently diverge. For instance, in the example described above, S2 would be concerned only with patent processes for manufacturing semiconductors, rather than product patents on circuit boards and related semiconductor devices.

²⁰ See, for example, Nesbitt, Comment, 21 *Emory Intl L Rev* at 708 (cited in note 8) (“[T]he U.S. approach to the knowledge requirement can have the unintended effect of encouraging manufacturers to remain ignorant about issued patents.”); Alfred P. Ewert and Irah H. Donner, *Will the New Information Superhighway Create “Super” Problems for Software Engineers? Contributory Infringement of Patented or Copyrighted Software-Related Applications*, 4 *Albany L J Sci & Tech* 155, 202 (1994) (“[A]t least in this instance, ignorance is ‘bliss.’”).

²¹ See, for example, *In re Schreiber*, 128 F3d 1473, 1474 (Fed Cir 1997) (holding that a patent on a conical top used to dispense oil for industrial use read on the invention of a cone-shaped top for slowly dispensing popcorn).

²² See, for example *NTP, Inc v Research In Motion, Ltd*, 418 F3d 1282, 1287 (Fed Cir 2005) (involving a suit against the manufacturer of the BlackBerry concerning a patent that it did not know existed).

Yet patents are at least electronically indexed and searchable.²³ Physical products, on the other hand, are rarely available in any type of searchable index.²⁴ Moreover, the features of a product that infringe a patent are often not apparent from the front of the product's packaging—this can be private information that is costly to discover from the product itself.²⁵ In many cases, the patent holder will be forced to examine and analyze the product in some detail to ascertain whether it infringes the patent.²⁶ Thus, even though it is undoubtedly difficult for a producer to locate relevant patents, as a comparative matter, it is likely easier for a producer to find relevant patents than for a patent holder to locate potentially infringing products. It is for this reason that patents are more commonly analyzed and cited by Patent and Trademark Office (PTO) examiners than any other type of prior art—the search costs are comparatively lower.²⁷

Consequently, forcing the patent holder to conduct the entire search will result in inefficient expenditures of resources that could be more efficiently deployed by a firm within the chain of production. By effectively reallocating search costs from producers to patent holders, the knowledge requirement built into the doctrine of contributory infringement will lead to wasteful behavior.

The prospect of an insolvent producer and shielded suppliers will also exert feedback effects even in cases in which the producer is not insolvent. If patent holders knew that all potential infringers were solvent, they would understand that these infringers had incentives to locate and license their patents. They could then reduce their own search activities accordingly. This would be efficient, if indeed it is the case that producers can search for patents at lower cost than patent holders can search for products. But when some producers are insolvent, the overall rate at which producers search for patents will decline. The less producers spend searching for patents, the more patent holders must

²³ See United States Patent and Trademark Office (PTO), *Search for Patents*, online at <http://www.uspto.gov/patents/process/search> (visited Oct 25, 2010) (providing a searchable database of patents, with images for patents filed after 1790 and full-text searching for patents filed after 1976).

²⁴ See Christopher A. Cotropia, Mark A. Lemley, and Bhaven N. Sampat, *Do Applicant Patent Citations Matter? Implications for the Presumption of Validity* *12 (unpublished manuscript, Aug 10, 2010), online at http://www.ssrn.com/abstract_id=1656568 (visited Oct 25, 2010).

²⁵ See, for example, *Dunlop Holdings v Ram Golf Corp*, 524 F.2d 33, 34, 35 n.7 (7th Cir. 1975) (involving a patent on a coating for golf balls, the formula for which could only be determined—with difficulty—by chemically analyzing the coating).

²⁶ To be certain, the producer may have to hire an attorney to examine a patent before understanding whether its product infringes. This can be quite costly. But a patent holder must examine a potentially infringing product *and* hire an attorney to assess its own patent before it can initiate an infringement suit. The fact that the patent holder owns the patent does not mean that it will instantly understand the metes and bounds of that property right and its applicability to a new technology.

²⁷ See Susan Walmsley Graf, Comment, *Improving Patent Quality through Identification of Relevant Prior Art: Approaches to Increase Information Flow to the Patent Office*, 11 Lewis & Clark L. Rev. 495, 503 (2007) (“[E]xaminer-cited prior art references are heavily weighted toward U.S. and foreign patents, as opposed to non-patent literature.”). See also Robert P. Merges, *As Many as Six Impossible Patents before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 Berkeley Tech L.J. 577, 589 (1999) (observing that US patents make up 60 percent of all references cited in software patents). Patents are available at lower cost than nearly any other type of technical information, particularly actual physical products.

adjust their mixed strategy to expend greater resources on searching, because the less they will be able to rely on producers' incentives to locate patents in the first instance.²⁸ And the more that patent holders are forced to conduct the search, the greater the inefficiency and waste.

This is not the only potential problem. Even if the patent holder succeeds in discovering the existence of the product, as well as the producer's relationship with one or both suppliers, the patent holder cannot collect damages on sales that have already occurred. In the event that the patent holder manages to learn of the product's existence, it will immediately notify the producer and suppliers of its patent and the likelihood of infringement. This notification imbues the suppliers with the necessary knowledge to satisfy the requirements of contributory infringement.²⁹ But it is prospective only: the suppliers' conduct before they received notice is unreachable.³⁰ The patent holder will never recoup the lost royalties or profits from those pre-notice activities. By contracting to preserve the suppliers' ignorance regarding potential contributory infringement, the producer and suppliers maximize their joint surplus at the patent holder's expense.³¹

2. Producers and suppliers who have made specific investments.

Now consider the possibility that the producers or suppliers involved in the production of a product might have made investments specific to that product in the course of bringing it to market. For instance, *SI* may have had to purchase new chip fabrication machines to construct integrated circuits to the specifications laid out by *P*. These new machines might be expensive, and they might be useful only in the production of chips built to the specifications that *P* has outlined—specifications that may infringe an existing patent. Product-specific investments present economic risk to suppliers who would otherwise be shielded from contributory liability by their lack of knowledge. Recall that if a patent holder can locate a supplier that has made significant product-specific investments, it can drive a hard bargain in licensing negotiations by threatening to block the supplier's activities and destroy the value of those investments.³²

If it is *P* that must make the product-specific investments, then there will likely be little effect. *P* is already insolvent or unreachable, and the threat of having its product-

²⁸ See Baird, Gertner, and Picker, *Game Theory* at 31–38 (cited in note 14).

²⁹ See, for example *Aro Manufacturing*, 377 US at 488–89; *Trell v Marlee Electronics Corp*, 912 F2d 1443, 1448 (Fed Cir 1990); *Armstrong v Motorola*, 374 F2d 764, 773 (7th Cir 1967).

³⁰ *Trell*, 912 F2d at 1447 (“[T]he knowledge requirement of section 271(c) limit[s] an alleged contributory infringer’s liability to sales made after it receive[s] a letter from the patentholder informing it of the existence of the patent.”). See also *Aro Manufacturing*, 377 US at 491 (“Aro cannot be held liable in the absence of a showing that at the time it had already acquired the requisite knowledge that the Ford car tops were patented and infringing.”).

³¹ In Part II, I consider whether this transfer of wealth from patent holders to producers and suppliers has negative dynamic effects on welfare as well. For the moment, it suffices to note that producers and other commercial firms will be able to use ignorance as a substitute for licensing relevant patents, to the detriment of patent holders.

³² See text accompanying note 13.

specific investments rendered worthless is likely not significant. If instead it is *SI* or *S2* that must make the product-specific investments, then the situation is different. Even if *SI* cannot be sued for infringement without first being notified by the patent holder of the existence of a patent, and even if *SI* cannot be sued for conduct that predates this notification, *SI* may very well have something to lose in the event that a patent exists: the value of these product-specific investments. If the patent holder can locate *SI*, then it can extract significant concessions—perhaps including the equivalent of damages for past conduct—in exchange for allowing *SI* to continue to produce the good, preserving the value of its investments.

The potential bargaining between the patent holder and *SI* over a license on the patent is not straightforward, but a simple numerical example should suffice to illustrate the holdup problem that *SI* would face in the event that it made product-specific investments. Suppose that there are two potential components that *SI* could devote its resources to producing: *A* and *B*. If *SI* produces *A*, it can earn yearly profits of \$1,000 for each of the next five years; if *SI* produces *B*, it can earn yearly profits of \$900 for each of the next five years. In either case, *SI* will be forced to make an upfront investment of \$2,000 to produce the good.³³ Suppose *SI* invests \$2,000 to produce *A* and then is contacted by a patent holder who owns a patent on the finished product of which *A* is a component. It is worth \$2,500 to *SI* to be allowed to continue producing *A*, and thus the patent holder may be able to extract up to that amount to license the patent.³⁴ This represents a significant fraction of the total profits (\$3,000) that *SI* stood to realize when it made the initial investment in producing *A*.

Contrast this with the bargaining power available to the patent holder if the production of *A* and *B* does not involve any upfront product-specific investments or if *SI* has not yet made those investments. In that case, it is worth only \$500 to *SI* to be able to produce *A* rather than *B*.³⁵ (This is obviously a much smaller percentage of the value created by *SI*'s production of *A* or *B*.) Thus, if *SI* can locate the patent holder before it is forced to choose between producing goods *A* and *B*, it can lower its potential liability substantially.³⁶

³³ This upfront investment would typically involve the purchase of specialized machinery, or even the hiring of particular employees skilled in the relevant tasks.

³⁴ This value is based on the alternatives available to *SI*. *SI* could switch to producing *B*, but this would require another investment of \$2,000 and would yield net profits of \$2,500 ($\$900 \times 5 - \$2,000$). If *SI* were allowed to continue producing *A*, it could earn \$5,000; the \$2,000 it has invested in new machinery is a sunk cost. The net value to *SI* of being able to continue producing *A* is thus $\$5,000 - \$2,500 = \$2,500$.

³⁵ *SI* stands to earn \$5,000 over five years from producing *A* and \$4,500 over the same time period from producing *B*. Because *SI* has not yet made an *A*-specific upfront investment, the patent holder cannot extract the value of that investment from *SI* in licensing negotiations.

³⁶ This analysis assumes that there are no uses for *A* that would not be covered by the patent. If there were, *SI* would be doubly protected against holdup by the patent's owner. If *SI* can sell good *A* to another producer whose end product will not violate a patent, then *SI* can simply transfer its sales when confronted by the patent holder and need not negotiate a license. In addition, if this were the case, *A* might qualify as

SI will accordingly be willing to invest in searching for patents (on the finished products of which *A* and *B* would form components) before agreeing to produce either of the two. But its interest in conducting this search is far from limitless. *SI* is only willing to search for holders of patents that might involve *A* and *B* up to the difference in value between finding those patents ahead of time and failing to find them—here, somewhere between \$0 and \$2,000.³⁷ And *SI* must discount the value of conducting the search by the chances that patent holders never discover that it is producing products that contribute to infringement.

At the same time, however, suppliers who must make product-specific investments are precisely the firms that patent holders will be most interested in locating. The reason is the same: patent holders will be able to extract the greatest licensing fees from these firms precisely because they have already made product-specific investments that they are at risk of losing. The more difficult question is whether patent holders will be able to determine *ex ante* whether suppliers will be forced to make product-specific investments—or whether their patents are the type that give rise to product-specific investments more generally.

Answering this question requires extremely detailed knowledge of the technology and markets involved. For instance, suppose an inventor holds a patent on a type of integrated circuit. The inventor may know that a supplier must install a large, expensive silicon etching machine in order to produce that type of integrated circuit.³⁸ But it is a step further for the inventor to know whether a supplier can make use of these machines only in the production of one type of integrated circuit or whether they can be readily adapted to a variety of different components.

All else being equal, capital-intensive technologies will likely require greater production-specific investments. Inventors holding patents over those types of technologies will invest greater resources in search. For the most part, though, patent holders will likely be ignorant regarding the vulnerability of potential litigation targets. Suppliers themselves will possess better information regarding their own need for production-specific investments, and so they are more likely to adjust their expenditures on search accordingly. The result is a new mixed-strategy equilibrium. Patent holders will maintain a baseline level of investment in search, with holders of patents in capital-

“a staple article or commodity of commerce suitable for substantial noninfringing use” and thus not be subject to suit for contributory infringement. 35 USC § 271(c).

³⁷ The difference between locating the patent holder before *SI* makes an initial product-specific investment and locating the patent holder only afterward is \$2,500 – \$500 = \$2,000. Of course, it is unlikely that the patent holder would be able to extract the entire surplus in licensing fees. More likely, it will settle for some amount up to a maximum of \$2,000. See Richard A. Posner, *An Economic Approach to Legal Procedure and Judicial Administration*, 2 J Legal Stud 399, 417–29 (1973) (describing the manner in which parties to a civil lawsuit will opt to divide the surplus from settlement); William M. Landes, *An Economic Analysis of the Courts*, 14 J L & Econ 61, 101–06 (1971) (same).

³⁸ See, for example, Applied Materials, *Applied Materials Fact Sheet* (Aug 2010), online at <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjYyMTM1M3xDaGlsZEIEP> TQwNTEzOHxUeXBIPTI=&t=1 (visited Oct 25, 2010) (“Founded in 1967, Applied Materials creates and commercializes the nanomanufacturing technology that helps produce virtually every semiconductor chip and flat panel display in the world.”).

intensive industries expending slightly greater resources. Suppliers who must make product-specific investments will engage in relatively high levels of search; suppliers who need not make any product-specific investments will not search at all.

These strategies also create a potential mismatch between the incentives faced by (insolvent) producers and suppliers. As noted above, when a producer is unavailable for suit and a supplier need not make any product-specific investments, neither party has any interest in locating an infringed patent. Neither has anything to lose from being held liable, and they can safely engage in production and sales unless (or until) a patent holder locates them. If the supplier must make product-specific investments, however, it may have a great deal to lose in the event that the patent holder is able to locate it (or the producer).

Under these circumstances, *SI* runs an economic risk if it begins manufacturing a component for *P* without first ensuring that no relevant patent exists. In light of this risk, *SI* could take one of two actions: (1) it could engage in a search for relevant patents at some cost, and presumably pass that cost along to *P* in the form of a higher price for the components it supplies; or (2) it could simply price those components at a premium to reflect the litigation risk involved.³⁹ For its part, however, *P* will prefer that *SI* remain ignorant of any potential patents. If *SI* does not believe there is any liability risk, then it will sell to *P* at a lower price. This issue is further complicated by the fact that the patents, if they exist, will be patents on *P*'s product, not *SI*'s component. *P* might thus be better positioned to determine what risk *SI* might face. But *SI* cannot rely on *P* to indemnify it—*P* is insolvent. Nor can *SI* fully rely on *P* to search for relevant patents, given that *P* has every incentive to deceive *SI* in order to secure a lower price. Consequently, *SI* will be forced to engage in some amount of searching for patents covering the products manufactured by its business partners, an activity for which it may be ill suited. Again, the search responsibilities will not necessarily wind up in the hands of the most efficient party.

The fact that contributory infringers cannot be held liable for patent infringement absent knowledge of the patent distorts the incentives for search facing both infringers and patent holders. Suppliers who must make significant product-specific investments will engage in some amount of search; suppliers who need not will reduce their search activities effectively to zero. Patent holders and suppliers will thus both engage in mixed strategies, searching in some cases but not in others. The result will be inefficiently high levels of search on the part of patent holders (and in some cases suppliers) as they attempt to compensate for the protection provided by the knowledge requirement and the risk created by product-specific investments.

³⁹ Whether *SI* chooses to engage in search will depend on whether search is efficient—whether *SI* will be able to save itself money by attempting to find existing patents, which would allow it to lower the price on the components it manufactures for *P*. See note 37 and accompanying text.

II. POLICY CONSIDERATIONS AND DOCTRINAL ALTERNATIVES

A. Discovered and Undiscovered Patents

The previous Part established that patent law's liability rules allocate search costs in inefficient and possibly pernicious ways. The question that remains is the extent to which these misallocations of search costs lead to greater social harms, perhaps because of reduced incentives to innovate. In order to gain some purchase on this question, it is useful to consider the circumstances under which a patent holder might come to possess a patent that covers another party's commercial product. These circumstances can be usefully divided into two major categories.

1. Contemporaneous independent invention.

The first involves those situations in which the patent holder and the producer have independently and contemporaneously invented the same technology—or at least technology similar enough that the patent reads on the commercial product. Here, search costs are high on both sides: neither party is aware of the existence of the other. As the above Part explains, the problems created by this arrangement are twofold. The first issue is that patent holders will expend excessive resources in less efficient search. This problem is unavoidable.

The second issue is that patent holders may not succeed in locating producers at all, leading to reduced returns on their innovation. In some sense, then, the patent holder will remain undercompensated for its research efforts.⁴⁰ Yet it is not clear that this presents a problem from the perspective of social welfare. Here, a commercial firm has independently developed the patented technology without the incentive of a property right. As a matter of dynamic efficiency, the existence of the patent was unnecessary to the technological advancement.⁴¹ From the perspective of patents as rewards or incentives for innovation, then, the case for investing resources in ensuring that the patent holder is fully compensated is weak.⁴² This is in addition to the obvious fact that the

⁴⁰ It is almost a shibboleth among patent-related articles to recite that there is no way of knowing whether the patent law currently sets incentives to innovate at socially optimal levels. See, for example, Julie E. Cohen and Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 Cal L Rev 1, 5 n 5 (2001) (“The extent to which the patent system is actually necessary to induce innovation that would not otherwise occur is an unanswered, and perhaps unanswerable, empirical question.”). The point here is merely that the patent holder will receive less compensation than it would normally be entitled to, given the contours of its patent and the commercial value of the invention. What to make of this fact as a normative matter is the subject of the analysis that follows.

⁴¹ See Keith N. Hylton and Sungjoon Cho, *The Economics of Injunctive and Reverse Settlements*, 12 Am L & Econ Rev 181, 198 (2010) (“[I]t is believed that there is a dynamic efficiency cost associated with patent infringement. If patents are infringed easily with no punishment to infringers, innovators will have weak incentives to invent new products and processes.”).

⁴² See Craig Allen Nard, *Deference, Defiance, and the Useful Arts*, 56 Ohio St L J 1415, 1419 n 13 (1995) (“The most traditional economic theory relating to patent law is the ‘reward theory,’ which holds that there will be little or no innovative activity in the absence of patent protection because ideas are easily appropriated once they are made available to the public.”).

public will receive the benefit of competition if other firms are able to enter the market, minimizing the deadweight loss created by monopoly pricing.

At the same time, this means that the patent holder and the producer have likely wasted resources in simultaneous development of the invention. It might be better, from the perspective of social welfare, if the producer had simply expended resources in locating the patent holder and licensing the invention, rather than undertaking the research and development necessary to create it on its own. If this is the case, then it is necessary that producers be forced to compensate patent holders, in order that they have the proper incentives to search rather than innovate.

This idea is based on the prospect⁴³ and rent dissipation⁴⁴ theories of patents. Those theories posit that early patent grantees will have proper incentives to develop follow-on innovations, organizing a technological field to achieve the greatest possible invention with the lowest available duplicative effort.⁴⁵ These theories have been called into significant question, however, with critics arguing that interfirm competition is the best driver of rapid innovation⁴⁶ and disputing that patents could ever eliminate rent dissipation.⁴⁷ The soundness of these various theories of patent economics is still hotly contested. Suffice it to say that there are theoretical conditions under which the failure to compensate a patent holder under conditions of contemporaneous invention could lead to inefficiency and social loss, but the empirical validity of those conditions remains questionable.

2. Theft and copying.

The same cannot be said for the second category of situations: those in which the producer actually knows of the existence of the patent.⁴⁸ The patent holder may have actually contacted the producer and offered to license the patent; or the producer may have found the patent on the market and decided simply to copy the technology rather than license it. In either event, the case for enforcement of the patent laws is at its apex: an inventor has created a useful invention that another firm decided to commercialize,

⁴³ See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J L & Econ 265, 265–71 (1977).

⁴⁴ See Mark F. Grady and Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 Va L Rev 305, 316–22 (1992) (developing “the idea that the benefit to society of an invention is dissipated when there are redundant development efforts”).

⁴⁵ See Kitch, 20 J L & Econ at 278 (cited in note 43).

⁴⁶ See Robert P. Merges and Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 Colum L Rev 839, 843–44 (1990).

⁴⁷ See Donald G. McFetridge and Douglas A. Smith, *Patents, Prospects, and Economic Surplus: A Comment*, 23 J L & Econ 197, 202 (1980) (presenting an economic model suggesting that efficiency gains realized from the granting of a patent are “dissipated in the rivalry for the patent itself”).

⁴⁸ Again, the producer must be insolvent and the suppliers must themselves be unaware of the patent for any real issue to arise. If the producer is solvent, it is directly infringing; if the suppliers know of the patent, they are liable for contributory infringement as of the moment they take action. In either case, the situation reduces to the easiest case, in which both parties have strong interests in locating one another.

and it is important that inventors in this position be able to extract value from their inventions in order to maintain the incentives to continue innovating.⁴⁹

If the patent holder has reached out to the producer, search costs should be negligible on both sides. The two parties have already located one another. But if the producer has effectively misappropriated the patent holder's invention without the patent holder realizing it, then the patent holder may face substantial search costs in attempting to locate the producer (much less the supplier). Recall that even though the producer is willfully infringing, it has little incentive to license the patent from the inventor,⁵⁰ and neither *P* nor *SI* has any incentive for *P* to inform *SI* of the existence of the patent (unless *SI* must make significant product-specific investments).⁵¹

Accordingly, there will be some cases in which the knowledge element of contributory infringement—and its shift of search costs to patent holders—will lead to undercompensation of patent holders who almost certainly deserve remuneration.⁵² At minimum, the threat of nonpaying commercial firms will drive patent holders with genuinely valuable patent rights toward greater levels of search. And there is little doubt that these searches will be socially wasteful, compared with the alternative: the producer knows of the patent holder and could contact it at negligible cost, but instead the patent holder must expend needless resources searching for the producer.

B. A Negligence Standard

The doctrine of contributory infringement mediates a great number of patent-related interactions, and thus one should proceed with caution before significantly tampering with it. Nonetheless, the inefficient and socially wasteful ways in which it allocates search make contemplation of an alternative worthwhile. Consider, then, an alternative doctrine of contributory infringement that replaces the knowledge requirement with a negligence standard: a firm is liable for contributory infringement if it knew or reasonably should have known that it manufactured a component of a patented device.⁵³

This minor doctrinal change would have a significant impact on the behavior of suppliers, producers, and patent holders. Suppliers who might be contributory infringers would no longer be able to shield themselves from liability by remaining ignorant of potential patent liability.⁵⁴ Suppliers who do business with insolvent producers would

⁴⁹ See Hylton and Cho, 12 *Am L & Econ Rev* at 198 (cited in note 41); Katherine J. Strandburg, *Users as Innovators: Implications for Patent Doctrine*, 79 *U Colo L Rev* 467, 471 (2008) (“In the standard analysis, incentives for inventing, disclosing, and disseminating new technologies arise from the potential for recouping innovative investments through commercial sales.”).

⁵⁰ See Part II.B.

⁵¹ See Part II.C.2.

⁵² On this normative point, see note 40.

⁵³ Consider MPC § 2.02(2)(d) (“A person acts negligently . . . when he should be aware of a substantial . . . risk.”).

⁵⁴ It is worth noting that this would not immediately impose liability on every supplier that furnishes part of an infringing device. In addition to the mens rea requirement, it would be necessary that the part “be

have to fear bearing the full cost of a suit for infringement, and thus would have incentives to search for patents covering not just their own products but the products of the producers with whom they have contracted. In light of these increased incentives for suppliers to engage in search, patent holders would be able to reduce their own expenditures on search accordingly. Because search by patent holders is likely less efficient than search by commercial firms, this would likely reduce the amount of social waste generated as producers and consumers of intellectual property attempt to locate one another.

In addition, suppliers would be unable to escape liability for infringing activities that took place when they were ignorant of the patent. Patent holders would accordingly recoup a greater percentage of the rents generated by their intellectual property. This is not unequivocally a positive development; it would likely mean higher prices for consumers and concomitant deadweight losses.⁵⁵ But as the previous Part demonstrates, there are at least a variety of situations in which there will be negative welfare effects if contributory infringers are able to escape liability.

Moreover, in some cases producers and suppliers in contractual privity could then allocate the costs of search up and down the supply chain to the most efficient searcher. This allocation would be possible even if the producer—the likely direct infringer—were insolvent. For instance, consider the hypothetical supply chain from the previous Part: a producer (*P*) that manufactures circuit boards, a supplier (*SI*) that produces computer chips, and a second supplier (*S2*) that develops logic gates for the chips. Suppose that *S2* is the only solvent party. If the producer's circuit boards infringe a patent, *S2* may be held liable regardless of whether it knows of the existence of the patent. But *S2* may have little information about circuit board manufacturers or the state of patent rights. Accordingly, it might contract for *P* to engage in a search for applicable patents, adjusting the price of the components it provides to *P* accordingly. Of course, this is subject to the caveat noted in the previous Part: *P* may not wish to find relevant patents, because they will raise the price charged by *S2*, and so *S2* may not be able to rely fully on *P*'s work.

Parties will also be able to allocate the costs of liability up and down the supply chain. For instance, when *P* is solvent, *SI* could arrange for *P* to indemnify it against all liability for infringement, or just against liability arising from *P*'s products (rather than *SI*'s). The party who bears the risk will in many cases be the same party who can most efficiently search for existing patents. Matters become slightly more complex when one or more parties are insolvent. If *P* is insolvent or unreachable by suit, then *SI* will

especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use." 35 USC § 271(c) (defining a contributory infringer).

⁵⁵ See Amelia Smith Rinehart, *Contracting Patents: A Modern Patent Exhaustion Doctrine*, 23 Harv J L & Tech 483, 486–87 (2010) ("Strong property rights, in the form of draconian patent enforcement or broad patent grants, may increase the deadweight loss to society resulting from the grant of exclusive rights.").

effectively be indemnifying *P* against liability for infringement, a fact that will alter the contract price at which *SI* sells to *P*. This last fact may complicate negotiations between *P* and *SI*. If *SI* is subject to liability for contributory infringement without knowledge of a patent, then it may need to scrutinize *P*'s finances to determine whether *P* can satisfy a damages verdict or whether *SI* will be stuck with the entirety of the liability.⁵⁶ Thus, eliminating the stringent mens rea requirement associated with contributory infringement may in some cases increase contracting costs among parties within a supply chain. At the same time, however, it will eliminate the ability of firms within that supply chain to extract rents via contract and force those parties to license patents they might otherwise have ignored.

Reducing the knowledge requirement for contributory infringement to merely a negligence standard will of course lead to many more suits for infringement and greatly heightened vigilance on the part of commercial firms of all stripes. Accordingly, the preceding analysis should be understood not as a comprehensive case for switching to a negligence regime, but as a suggestion that such a move may have salutary effects on the division of search responsibilities. In addition, it is worth noting that § 271's safe harbor for "staple article[s] or commodit[ies] of commerce"⁵⁷ will protect many potential contributory infringers who would be implicated by a shift from knowledge to negligence. If it is possible to set liability appropriately via means other than the mens rea requirement, then adjusting that requirement to allocate search efficiently becomes all the more attractive.

CONCLUSION

Patent law's infringement doctrines function not only as rules of liability, but as rules of search as well. Whether commercial firms must invest resources in searching for existing patents, or whether patent holders must themselves shoulder the burden of searching for putative infringers, is determined by the incentives that these parties face to strike licensing agreements (or enter into litigation) earlier, rather than later. Under normal circumstances, patent law's liability rules generate approximately optimal investments in search. But when a direct infringer is insolvent or unreachable, the fact that contributory infringers can be held liable only when they have knowledge of the

⁵⁶ A similar problem arises through the doctrine of joint and several liability. When multiple tortfeasors are each partially responsible for some harm, any single one of those tortfeasors can be held liable for the full amount of damages. See, for example, *American Motorcycle Association v Superior Court*, 578 P2d 899, 901 (Cal 1978) (preserving the doctrine of joint and several liability even under a regime of comparative negligence). That single tortfeasor can force the others to indemnify it to the extent that they are responsible, *id* at 901–02, but this right of partial indemnification is worthless if one or more of the other tortfeasors is judgment proof. This creates an incentive for potential tortfeasors to examine the finances of parties with whom they might be involved in a joint action. For instance, a surgeon would likely want to invest in learning whether the anesthesiologist working alongside her carries sufficient malpractice insurance.

⁵⁷ 35 USC § 271(c).

patent shifts search responsibilities toward patent holders. The result is inefficient levels of search and corresponding social welfare losses.

Readers with comments may address them to:

Professor Jonathan Masur
University of Chicago Law School
1111 East 60th Street
Chicago, IL 60637
jmasur@uchicago.edu

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