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What's Wrong with the Patent System? Fuzzy Boundaries and the Patent Tax

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What's Wrong with the Patent System?
Fuzzy Boundaries and the Patent Tax

by James Bessen and
Michael J. Meurer

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The annual number of patent lawsuits filed in the U.S. has roughly tripled from 1970 to 2004. The number of suits was more or less steady in the 1970s, climbed slowly in the 1980s, and exploded in the 1990s. Why? The usual answers point to (1) the growth of the “new economy” and the concomitant explosion of patenting, (2) the failure of the Patent Office to reject patents on old or obvious inventions, or (3) the rise of the patent troll. There is an element of truth in all these answers, but even collectively they do a poor job explaining the patent litigation explosion. The comprehensive empirical research, presented in our forthcoming book [1], identifies fuzzy boundaries of the patent property right as likely the main cause of the explosion. Our research also shows that as the problem of fuzzy boundaries has grown worse, the patent system has turned from a source of net subsidy to R&D to a net tax. Patents now discourage investment in innovation.

The burden of litigation and the harm caused by fuzzy boundaries falls unevenly across fields of technology. Technologies that rely heavily on software are vexed by elevated patent litigation costs. This bodes poorly for cyberinfrastructure which will depend heavily on software innovation, and will probably attract significant unwanted attention from patent owners.

We provide evidence below that software patents have more severe boundary problems and generate

greater litigation costs than most other patents. Software patents tend to perform badly because the associated property rights are often expressed quite abstractly. The problem of mapping words to technology is difficult for any kind of technology, but it is especially difficult for software inventions because of the abstract nature of the technology. The problem has been made worse because when the courts have considered software inventions they have relaxed patent law doctrines that work to limit abstraction in other areas of technology. As a result, patent-based property rights to software inventions are not tethered to a specific device or to a specific physical or chemical process. Ironically, verbal descriptions corresponding to precise mathematical representations may be ambiguous; this is because of the inherent abstraction of the mathematical representations.



The patent litigation explosion in context

Writers who have commented on the patent litigation explosion have one of two attitudes. Optimists find it is the natural outgrowth of an increasingly innovative economy filled with patent owners who enforce their rights more aggressively. Pessimists find it is a troubling indicator of the decline in the performance of the patent system.

The optimists argue that the litigation explosion is caused by an explosion of patenting. They further argue that the patent explosion occurred because inventors are making more inventions. If patent enforcement is simply proportional to the amount of invention and the number of patents, then an increase in patent litigation may not be troubling.

No such luck. [Figure 1](#) shows that the probability that a patent is in a lawsuit within four years of the grant date rose rapidly during the 1990s [2]. Thus, although the growth in patenting may contribute to the growth in litigation, the patent litigation explosion is outstripping the explosion in patent grants [3]. This probability roughly doubled over our sample period.

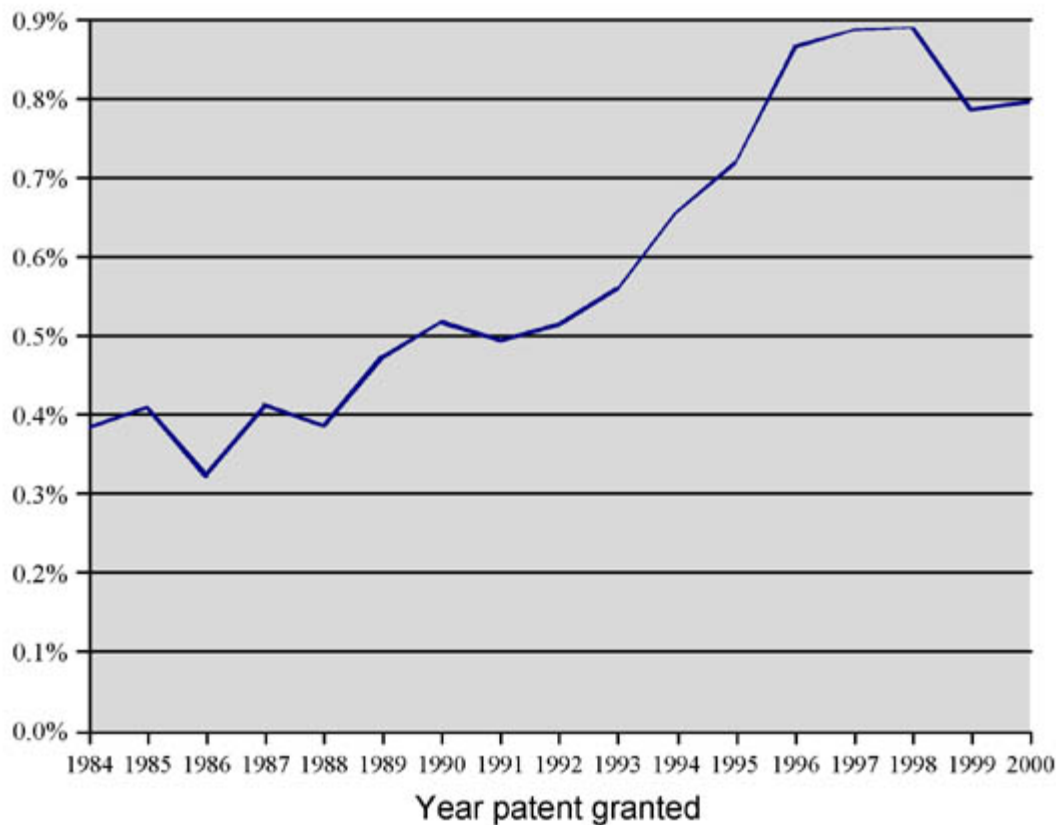


Figure 1: Probability that a patent is in a lawsuit within four years of the grant date.

The real picture is even more troubling. Lawsuit per patent is not the most useful measure of patent litigation trends. A better measure is lawsuit per dollar of R&D expenditure [4]. We find that the probability that a publicly traded firm was a defendant in patent litigation divided by R&D spending by publicly traded firms increased by more than 70 percent from 1984 to 1999.

Lawsuit per dollar of R&D is a better measure of the trend on the assumption that R&D spending is a better measure of invention (and innovation) than patenting. Both are correlated with invention. You need to spend on R&D to invent, and invention is a precondition for patenting. We think that R&D spending is a better denominator because there is evidence that the propensity to patent given invention has been climbing in recent years, thus the ratio of litigation to patents understates the deterioration of the patent system.

The patent tax

The phrase *litigation explosion* tends to agitate managers who in other settings have complained about the hidden tax created by high rates of tort, securities, and antitrust litigation. The tripling of patent litigation between 1970 and 2004 suggests that managers have something else to worry about. But evidence of a litigation explosion is only indirect evidence of a growing patent tax.

In our book we measure the effect of litigation on the incentive to innovate more directly. We compare the costs of litigation to innovators with the profits innovators receive from patents. [Figure 2](#) conveys the basic calculation we make for U.S. public firms. The heavy solid line shows the annual aggregate costs to these

firms of defending against patent litigation. This estimate includes not only direct legal costs of litigation, but also business costs such as loss of market share or the costs of management distraction (we are able to estimate these costs by exploring investors' reactions to lawsuits). The thin solid line shows an estimate of the incremental annual profit flow derived from U.S. patents; the dashed line, an estimate of the incremental annual profit flow from all patents worldwide associated with inventions patented in the U.S.

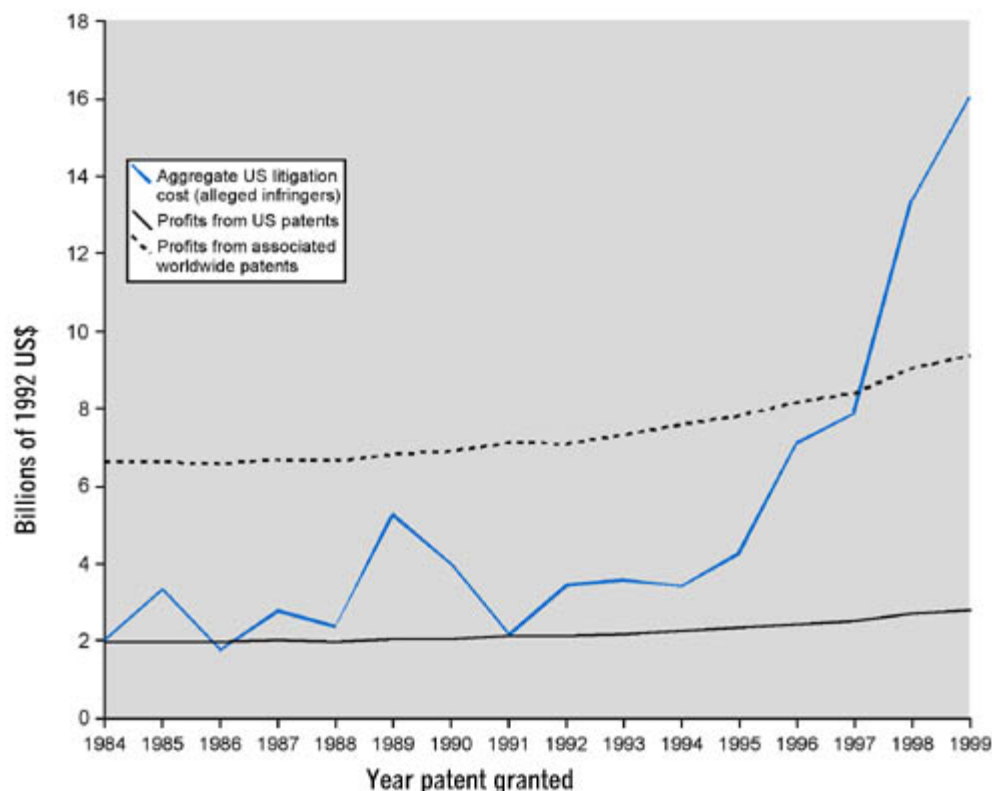


Figure 2: Patent based profits and aggregate U.S. litigation costs to alleged infringers (U.S. publicly traded firms 1984–1999).

The profit estimates are based on estimates of patent value multiplied by a rate of return. We use estimates of the value of U.S. patents that economists have obtained using well-established techniques based on patent renewal behavior (decisions to pay maintenance fees reveal the actual value patentees place on patents). We also draw on several studies of the stock market value of firms to obtain estimates of their worldwide patent values (investors' valuations of firms reveal the value of firm assets including patents). We use stock market event studies to estimate the total business cost of litigation. This, too, is an established technique that we have employed on a large scale — some 2,460 filings of lawsuits — to obtain an aggregate cost of litigation for public firms.

The results in [Figure 2](#) tell a simple but dramatic story: both measures of profits generally exceeded litigation costs during the 1980s, but costs accelerated during the 1990s, exceeding both profit measures by the end of the decade. By almost any interpretation, the U.S. patent system could not be providing overall

positive incentives for U.S. public firms by the end of the 1990s. The risk of patent litigation that firms faced in their capacity as technology adopters simply outstripped the profits that they made by virtue of owning patents. A firm looking to invest in an innovative technology during the late 1990s, taking this risk into account, would expect the net impact of patents to reduce the profits from innovation rather than to increase them.

Note that patents *do* provide profits for their owners, so it makes sense for firms to get them. But taking the effect of *other* owners' patents into account, including the risk of litigation, the average public firm would be better off if patents did not exist.

Moreover, [Figure 2](#) understates the extent to which costs exceeded benefits for several reasons: disputes settled before a lawsuit was filed are not counted, nor are foreign disputes; this comparison ignores the costs of obtaining patents and clearance; and for a variety of reasons, the estimates of worldwide patent profits are biased upwards, while the estimates of litigation costs are biased downwards.

There are some important exceptions to this overall picture of costs and benefits. Patents on chemical compositions and molecules, including pharmaceuticals, show strong benefits that substantially outweigh litigation costs. On the other hand, for software, complex and other patents the reverse is true, indicating a net disincentive. Also, we find that small firms, and likely small independent inventors, receive positive incentives. However, our analysis also indicates that the costs besetting large firms substantially reduce the rewards that small inventors earn from their patents.

What is driving the litigation explosion?

Pessimists agree that the patent litigation explosion is troubling but they differ in their understanding of the cause and appropriate policy response. In a moment we will address theories of the explosion related to patent examination and patent trolls and our own theory related to patent boundaries. But first we want to provide more context by describing some of the main features of patent litigation.

All industries appear to have experienced a rapid increase in patent litigation, although the increase seems somewhat more rapid in software-related industries. This means that industry-specific factors are unlikely to explain most of what is going on. Also, business-to-business litigation has not been increasing in general, so we cannot attribute the increase in patent litigation to an overall rise in litigiousness [5]. In addition, we find no evidence to suggest that the rewards that patent holders gain from litigation have increased in the 1990s, although they may have increased during the 1980s.

[Table 1](#) displays the characteristics of publicly traded U.S. firms engaged in patent litigation in the U.S. from 1984–1999. Notice that patent litigants tend to be large firms that spend a lot on R&D and hold many patents. Remarkably, the average defendant spends more on R&D and holds more patents than the average plaintiff. These findings cast doubt on the popular view that defendants are pirates who steal technology rather than doing their own research and development. In fact, our research shows that after controlling for other relevant variables, R&D intensity is positively correlated with the probability that a firm will be accused of patent infringement and subject to a lawsuit.

Table 1: Comparison of patent litigants to other firms.					
Notes: U.S. publicly traded firms from 1984–1999. R&D and sales in millions of US\$1992. Employment in 1000s. Portfolio size measures average number of U.S. patents in force over time period.					
	Means				
				Litigants by type	
	All firms	All patenters	All litigants	Patentees	Alleged infringers
R&D	37.6	69.8	244.8	261.9	307.1
Employment	5.2	10.0	23.7	24.4	28.5
Sales	846.7	1933.9	5147.6	5382.7	6195.5
Portfolio size	44.1	92.7	375.8	424.6	442.7

Patent examination quality

Many critics of the patent system blame low-quality patent examination for the patent litigation explosion. Specifically, these critics contend that poor examination allows invalid patents to issue on inventions that are obvious or lack novelty. Supposedly, growing problems with examination have increased the fraction of granted patents that are invalid, and the resulting increase in uncertainty has caused more litigation. This theory is plausible, and there may be good reason to worry about examination quality, but it does not entirely explain the pattern of litigation across technologies or the surge of patent litigation.

Concern about invalidity centers on software patents like the “One-Click” patent owned by Amazon.com and asserted against Barnes & Noble. The invention related to a feature of e-commerce Web sites that appeared obvious to people in the field, and the Court of Appeals for the Federal Circuit found the patent was likely to be invalid on obviousness grounds. It is widely believed that the Patent Office grants patents on old and obvious software inventions because it lacks experience and access to adequate documentation of the state of software technology. Indeed, several software patents have been invalidated when they were reexamined by the Patent Office after third parties uncovered information previously overlooked by the examiner.

Perhaps there has been a recent surge of invalid software patents granted, but no such surge appears in the data on litigation outcomes. The invalidation rate for software patents is no different than the invalidation rate for other sorts of patents. Likewise, the overall rate of patent invalidation has not jumped in recent years. Even though low invalidation rates may simply reflect the low standards that the courts use to judge patent validity, invalid patents do not seem to be the main driver of costly patent litigation.

The lack of an increase in invalidation rates might simply mean that disputes over patents that are probably invalid settle quickly and don't go to trial. Indeed, if an alleged infringer has clear-cut evidence of invalidating prior art, there is little reason to expect extended litigation; we would expect extended litigation only if there is significant uncertainty about the patent. But if disputes arising from insufficient examination do settle quickly, then a decline in patent examination quality would not lead to a rise in invalidation rates *nor* would it lead to an increase in costly litigation. Of course, we suspect that there are a lot of invalid patents being issued, but they just don't show up as being a major source of costly litigation.

When we discuss software patent lawsuits below we will present additional evidence supporting the view that fuzzy boundaries rather than a surge in the grant of invalid patents is the main driver behind the patent litigation explosion. We think that large numbers of invalid patents contribute indirectly to patent litigation because they make it much more costly to conduct clearance searches on prospective technologies, that is,

to determine whether the technology possibly infringes existing patents.

Patent trolls

Perhaps patent trolls are causing the patent litigation explosion. The meaning of this term varies; in our work we define a troll narrowly as an individual inventor who does not commercialize or manufacture his or her invention. Many people claim that the increasing availability of patent litigators working for contingent fees has spurred lawsuits by such trolls, who might otherwise be unable to afford litigation. However, the share of lawsuits initiated by public firms has not declined, nor has the share of lawsuits involving patents awarded to independent inventors increased [6]. This suggests that the increase in litigation cannot be mainly attributed to patent trolls (but note our data on this question ends in 1999).

This view is reinforced by findings of Hall and Ziedonis (2007) on litigation in the semiconductor industry [7]. They track the proportion of suits against semiconductor firms that originate from within the industry compared to the share of patentee plaintiffs who are not semiconductor manufacturers. Most of the increase in litigation through the year 2000 is from firms who are *within* the industry. The role of external plaintiffs increases at the very end of Hall and Ziedonis' sample period (year 2000), so non-manufacturing plaintiffs may be growing in importance more recently. This view is supported by evidence from Lerner (2006) about the role of independent inventors in litigation over financial patents [8].

Of course, we have used a very narrow definition of “troll” here. If, instead, one identifies a troll as anyone who uses patents opportunistically, then troll-like behavior is certainly implicated in the surge in litigation.

Fuzzy boundaries

The best explanation for the patent litigation explosion is that the law and institutions that establish the bounds of patent rights deteriorated in recent years, especially during the 1990s. Patents no longer perform well as property, because strangers have an increasingly difficult time determining the boundaries created by the stock of patents in force. We identify four types of problems.

1. *Patent claims are hard to interpret.* Patent claims are the language at the end of the patent document that defines the scope of the patent rights. Patent law allows patent lawyers to use vague claim language. And patent courts use unpredictable rules for interpreting the claims — as a result, the interpretation by trial court judges is often reversed. Although innovators can obtain expensive legal opinions about the boundaries of patents, these opinions are unreliable. There is no reliable way of determining patent boundaries short of litigation and appeal to the Federal Circuit.
2. *Patent claims can be hidden.* Many patent applications are published after 18 months and all issued patents are published when they are granted. Nevertheless, patent applicants can hide patent claims from the public, sometimes for many years, and this practice is growing more common. Hidden claims sometimes ensnare innovators who make investments in technology while a patent is pending. In many cases, if these innovators were able to see the pending patent claims they would have made other design choices and avoided the hidden claims. In other cases, the infringing innovators would have negotiated a more favorable license than they can negotiate after committing to a particular infringing technology.
3. *Possession and the scope of rights.* Generally, tangible property rights are linked closely to

possession, hence the classic phrase: *possession is nine points of the law*. Patent law also requires possession of an invention, but often this requirement is not rigorously enforced. Courts sometimes grant patent owners rights to technology that is new, different, and distant from anything they actually made or possessed. Not surprisingly, this practice makes patent boundaries especially unclear in fast-paced fields such as biotech and computer software.

4. *The patent flood*. Ideally, innovators would check patent rights before introducing new technology. If the technology possibly infringes a patent, then the innovator and patent owner can negotiate a license. This process of identifying and interpreting patents and negotiating licenses is called clearance. Clearance costs are affected by the clarity of patent claims and the number of patents that must be checked for possible infringement. Investments in land or structures rarely involve many parcels of land and the boundaries are usually clear. In contrast, investors in new technology often need to check many patents — even hundreds or thousands for many information technology innovations. Although the patent system has features that discourage patent proliferation (notably the requirement that an invention not be obvious), empirical evidence suggests these are not working well. For many technologies the cost of clearance is too high, and the most profitable path is to simply ignore patents and hope the outcome is not too bad. As a result, 65 percent of firms do not conduct a patent search before initiating product development according to a survey by Cockburn and Henderson (2003) [9].

In our book we document how each of these problems grew worse during the 1990s. It appears that the growth in patent boundary problems sparked a surge in litigation because of a surge in inadvertent infringement.

Inadvertent infringement

Innovators, not technology pirates, are typically the targets of patent lawsuits. Innovators sometimes inadvertently infringe because a patent claim is hidden or hard to interpret. Sometimes they infringe because clearance was too costly. Other innovators are sued even though they did not infringe. Many patent owners bring losing suits in good faith, because they too are unsure whether their claims will be interpreted broadly or narrowly.

Several pieces of empirical evidence suggest that most lawsuits are filed against inadvertent infringers rather than pirates. First, the litigating parties are often distant from each other in the sense that they are in different industries and that they patent in different fields of technology. We expect that pirates usually steal technology from close rivals, and inadvertent infringement grows more likely when the asserted patents are held by distant firms. Second, we find that the risk of being sued increases in the R&D intensity of the defendant (in regressions that control for other variables). This is consistent with our view that the exposure to a patent lawsuit grows for firms that are more innovative.

In addition, the pattern of litigation across technologies suggests that fuzzy boundaries drive much patent litigation. We find low rates of litigation for chemical compounds, including pharmaceuticals. Economists have long recognized that patents on chemicals work particularly well because these patents have very well-defined boundaries [10]. In contrast, economists recognize that complex technologies (*e.g.*, electronics, computers) may have relatively poorly defined patent boundaries. Patents on complex technologies have higher litigation rates and lower values than chemical patents. We expand on this point in the next section concerning software patents.

Software patents

Software patents have especially severe boundary problems. Problems arise because claims to software tend to use functional language. In contrast, patent claims to chemical compounds use more precise structural language. Our analysis of case law suggests that software claims are more likely to change meaning over time. Many notorious cases feature patent claims to pre-Internet inventions that are stretched to cover Internet technologies. Compared to chemicals there is less standardized language regarding software and claim meaning sometimes shifts with the industrial or technological context. Our data shows that software patents are much more likely than other patents to have their claim construction reviewed on appeal — an indication that parties to these lawsuits have fundamental uncertainty over the boundaries of these patents.

Critically, software patents do seem to exhibit some marked differences from other patents when it comes to litigation. Software patents are more than twice as likely to be litigated as other patents; patents on methods of doing business (which are largely software patents) are nearly *seven* times more likely to be litigated. This does not appear to be a temporary problem that will disappear as the Patent Office does a better job rejecting patents on old and obvious inventions. Unfortunately, as [Figure 3](#) shows, the probability that a software patent will be litigated has been *increasing* substantially rather than decreasing.

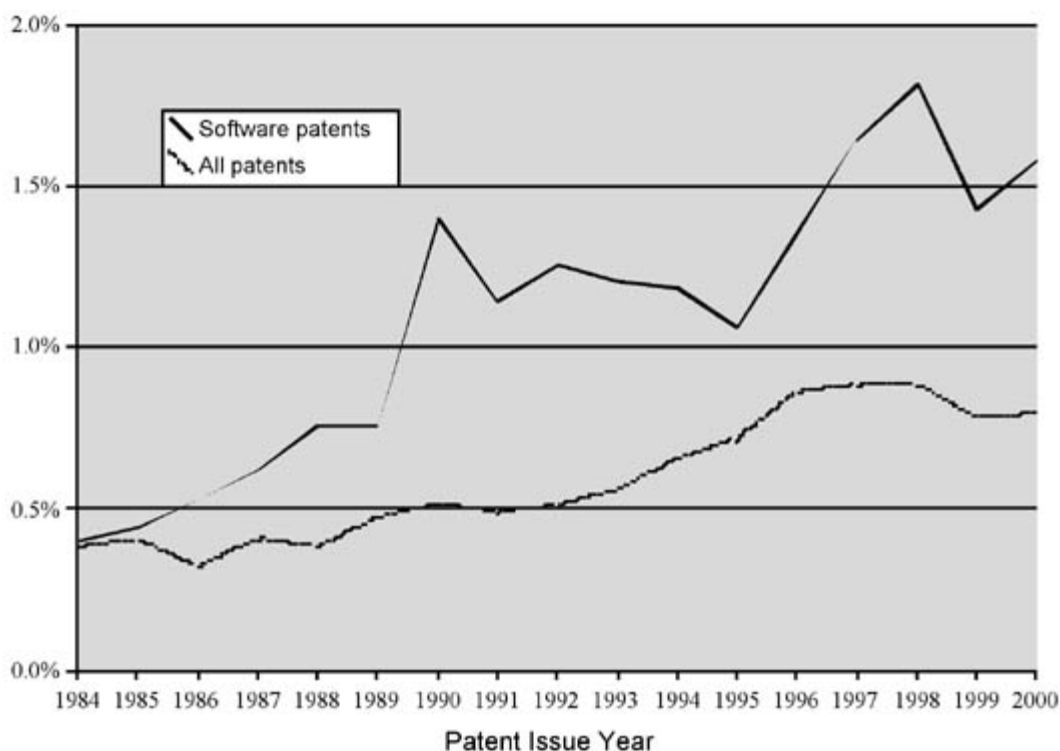


Figure 3: Probability that a software patent is in a lawsuit within four years of the grant date.

And, despite being a relatively new area for patenting, software patents accounted for a quarter of patent litigation by the late 1990s.

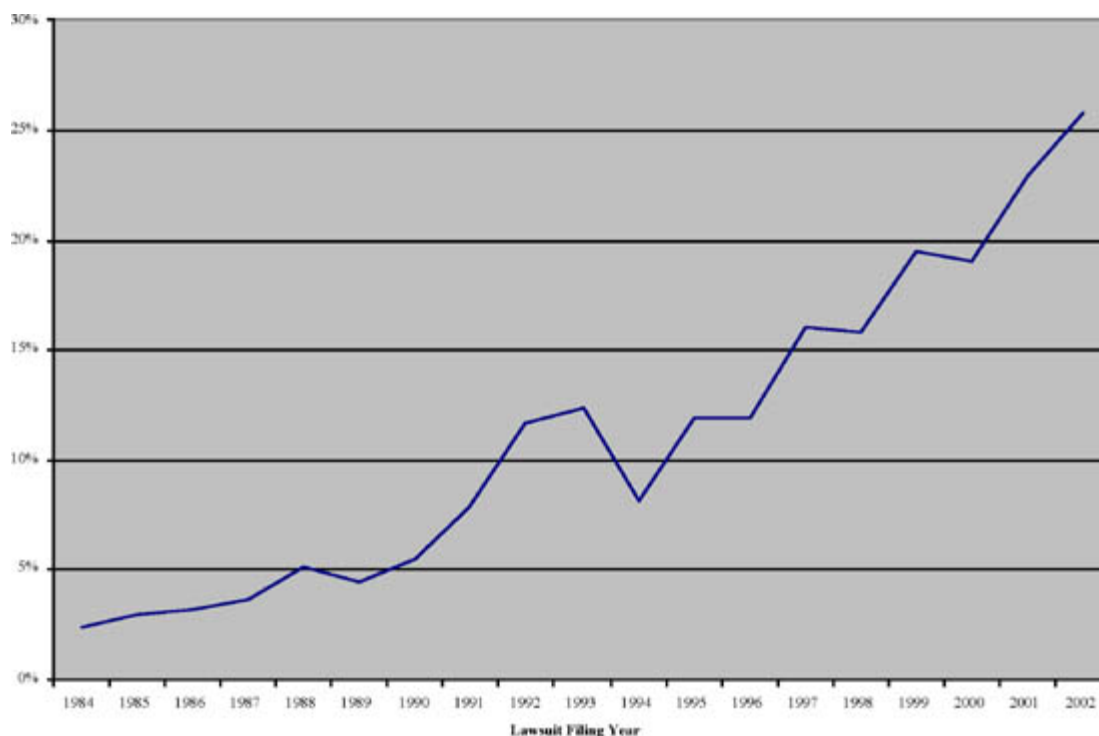


Figure 4: Percentage of lawsuits involving software patents.

Patent reform

What will it take to fix the patent system and make it an effective tool for encouraging innovation? Maybe this won't be a difficult task, given that patents provided positive incentives as recently as the 1980s. Indeed, many people have been quite optimistic that the current round of draft legislation and recently renewed attention from the Supreme Court will soon lead to a rebirth of effective patent policy.

We differ from most other reform advocates because of our focus on fuzzy boundaries instead of patent trolls or problems with patents on old and obvious inventions. We think that effective reform will probably require structural changes in the operation of the Patent Office and the patent courts. Many of these reforms could be difficult to achieve both as a matter of politics and policy. They include:

- Changes in the way patent claims are defined, recorded in the application process and made public, including strong limits on hidden claim language.
- A robust “indefiniteness” standard that invalidates patent claims that can be plausibly interpreted in multiple, fundamentally different ways.
- A new role for the Patent Office where, for a fee, innovators can obtain opinion letters on whether their technology infringes a patent.
- Reforms to limit overly abstract patents in software and other technologies. At the very least, patent law should prevent software patents from claiming technologies far beyond what was actually disclosed as the invention. If this proves inadequate, then we suggest subject matter tests to limit the range of software inventions that can be patented, tests similar to those used during the 1970s and 1980s.
- A strong requirement that patents should not be granted on obvious inventions, coupled with substantially higher renewal fees. Ideally, patent renewal fees should be set by a quasi-independent


agency and should be based on empirical economic research. These reforms will help stem the patent flood by screening out unwarranted patents and discouraging renewal of low-value patents.

- Besides improving patent boundaries, we also favor reforms to mitigate the harm caused by fuzzy boundaries. These include elimination of punitive damages when the infringing technology was independently invented and other changes in patent remedies that might discourage opportunistic lawsuits.

Our book provides some details about how we would implement these and other patent reforms. We do not present this list as a blueprint for reform. We are not sure which of these reforms is politically feasible, or how effective any one of these reforms will be. Rather, we provide this list as a suggestion of the sort of reforms that are probably required to address the problem of fuzzy patent boundaries.



Conclusion

Today, the U.S. patent system imposes more costs on innovative firms than benefits. This is a sad state for an institution designed to encourage innovation. Perhaps it is not too surprising, though. Economists understand that patents sometimes promote innovation and economic growth, but that role is limited and highly contingent on the nature of the patent law and institutions. To succeed patents must work like property — they must have clear boundaries. The fuzzy boundaries in today's patent system have touched off an explosion of patent litigation that has turned a patent-based subsidy of innovation into a tax. 

About the authors

James Bessen is Director and Founder of Research on Innovation (<http://www.researchoninnovation.org/>), a non-profit organization created to conduct, sponsor and promote research on technological innovation and to disseminate the results of this research to a broad audience, both in academia and in industry. He is also currently Lecturer in Law at the Boston University School of Law and he edits the *Technological Innovation and Intellectual Property* newsletter (<http://www.researchoninnovation.org/WordPress/>).

Michael J. Meurer is Professor of Law and Michaels Faculty Research Scholar at the Boston University School of Law.

Acknowledgements

Thanks to Brian Kahin and James Toupin for helpful comments.

Notes

1. This article is based on parts of our forthcoming book *Do Patents Work?* (<http://researchoninnovation.org/dopatentswork/>).

2. Part of this increase results from an increase in the average number of patents involved in each lawsuit, but the trend is upward even after adjusting for this increase. Also, the increasing numbers of patents per lawsuit suggests that the increase in patenting is more than just an increase in the number of inventions.

3. Notice that although the latest reported patent issue date is 2000, this graph depicts the effect of litigation up through the year 2004. The figure uses a four-year window because lawsuits are more likely to be filed during the first few years after issue than during later years. Also, note that this time pattern of lawsuit filings appears to be stable over our sample period.

4. The probability of lawsuits per patent determines the effective cost of enforcing a patent. An increase in this probability makes patents more costly to enforce and therefore less valuable to innovators. Lawsuits per R&D reflect the cost to innovators of the risk of having to defend a patent infringement lawsuit.

5. For example, contract lawsuits in federal court which usually feature businesses as both plaintiff and defendant have trended down between 1990 and 2004.

6. We find that from 1984–1989, 24 percent of the lawsuits filed involved patents that had been awarded to individuals; from 1990–1999, the comparable figure was 22 percent. Similarly, of the lawsuits against public firms, 29 percent were filed by other public firms during the 1980s; during the 1990s, 31 percent were filed by other public firms.

7. Bronwyn H. Hall and Rosemary Ham Ziedonis, 2007. “An Empirical Analysis of Patent Litigation in the Semiconductor Industry,” working paper, at http://elsa.berkeley.edu/~bhhall/papers/HallZiedonis07_PatentLitigation_AEA.pdf.

8. Josh Lerner, 2006. “Trolls on State Street? The Litigation of Financial Patents, 1976–2005,” working paper, at <http://www.people.hbs.edu/jlerner/Trolls.pdf>.

9. Iain M. Cockburn and Rebecca Henderson, 2003. “The IPO Survey on Strategic Management of Intellectual Property,” Intellectual Property Owners Association, Washington, D.C. (November); survey overview and results available at Association’s Web site at <http://www.ipo.org>.

10. The specific nature of the pharmaceutical industry may also play a role, but we find that inorganic chemicals also have low litigation rates, while biotech patents that are not simple chemical entities have high litigation rates.

Comment by James Toupin, General Counsel, USPTO

My thanks to the editors for the opportunity to comment on Professors Bessen’s and Meurer’s article. These comments do not pretend to offer conclusions on the important subjects that their article touches, and certainly do not present conclusions of my agency on them. Rather, I try to suggest the further work that might be needed to reach a more comprehensive view of the issues at stake.

Professors Bessen and Meurer are to be congratulated for adding a new set of proposals to the current debate on patent policy. Unfortunately, at least in the abbreviated form presented in this article, their diagnosis of the patent system falls prey to some of the fault-finding temptation that bedevils academic research in this area. The desire to come up with an idea for an improved system can create a rush to find systemic problems.

The problem begins with the authors’ view that patent litigation is outstripping the growth in patents. It is possible, comparing litigation trends to patenting trends, to conclude that this was the case from FY1991 to FY1998. In that period, the number of new patent cases filed compared to total utility patents in force rose from .0010 to 0.0019. Since then, however, the ratio has remained stable, never increasing beyond .0019, falling in FY 2005 to .0017. In FY 2005 the absolute number of new patent cases fell compared to the

previous year for the first time since FY 1986.

What has occurred since the late 1990s is a fall in the rate of new patent litigation compared to patent application filings. In 1996, that ratio reached a high of .00962. It has fallen since then, to .00712 by mid-decade. Thus, post-1990s trends are contrary to those that appeared in the 1990s. If patent litigation was outstripping patenting activity in the 1990s, that phenomenon seems to have changed.

This is, of course, exactly what one would expect to occur in an economic system that had fallen into disequilibrium — a corrective readjustment. Had they extended their study into this decade, the authors might have analyzed how rational actors in a resilient patent system were capable of responding to the problems of the 1990s without policy corrections. The article notes (to leave open the possibility that complaints about “trolls” may prove warranted) that the study stops in 2000. It fails to note the same limits of its database in reaching its diagnosis that something is wrong with the patent system. The subsequent data tend to confirm the conclusion that so-called troll activity is not increasing patent litigation rates. At the same time, those data tend to contradict the authors’ overall diagnosis of the patent system.

In other respects too, the article risks mistaking transient phenomena for lasting features of the system. One of the salient developments of the 1990s was the fact that Federal Circuit decisions established software and business methods as patentable subject matter. These decisions brought into the ambit of the patent system firms that previously had not been concerned with the possibility of patent infringement. It would hardly be surprising that industries that had not previously institutionalized patent clearance or licensing processes would find themselves unprepared for patent litigation risks, or that industries in which patenting had not previously been an important business strategy would engage in more patent litigation after it becomes one. The process of institutionalizing patent rights recognition may be a more important factor than the “fuzzy boundaries” problem on which Professors Meurer and Bessen focus. It is possible, of course, that both explanations have elements of the truth. Exclusive concentration on “fuzzy boundaries,” however, can contribute to the illusion that developing clearance and licensing mechanisms is futile and thus discourage the benefits the latter can bring.

The fact that software-based inventions are a relatively recent development may also help explain some other facts that the article reports. For example, the article notes that patent litigation instituted in the first four years of the patent term rose during the 1990s. This is of course exactly what one would predict as software patents became more important. Software-based products are renowned for having relatively short product cycles. One would thus expect that suits based on patents covering such products would occur relatively promptly after the patent issued. Moreover, with the growth in patent applications having outstripped patent examiner hiring in the 1990s, particularly in the information technology area, the time from patent application to patent grant has lengthened. That trend was exacerbated by the increase in the use of continuation applications. Thus, the fourth year of a patent may now come later after an invention or the introduction of an infringing product than it used to. The significance of suits within the first four years of a patent grant requires more analysis.

The very methodology that the study employs may lead to partial results. The analysis concentrates on publicly held corporations, because information reported by such companies provides the authors a (surely very rough) proxy for cost information. We have seen that the focus on the 1990s may have been misleading. So too with the focus on publicly held corporations. One of the important entrepreneurial trends of the 1990s was the development of privately held firms that, beginning with inventions that they converted to intellectual property assets, pursued initial public offerings. In such instances, the patent system was serving one of its prime functions — to provide a legal foundation for new investment and invention by those without existing production and marketing resources. A methodological concern may have led this article to undervalue such effects.

Far from supporting the idea of a “patent litigation explosion,” the data that the article reports could suggest that patent litigation is underutilized. The authors report that firms do not conduct patent clearance in commencing 60 percent of new product development. In the face of such willful ignorance of patent rights,

one would expect the litigation rate for patents to be much higher. The fact that it is not may suggest that discovering and pursuing infringement is too costly for many patentees. If so, barriers to patent enforcement may lead potential infringers to scofflaw behavior and diminish the value of patents as an incentive to invention and new entry. The cost of a given patent suit may be high. But if the likelihood that any given product will be subject to patent litigation is low, firms may be slow to invest in the means to effectively investigate others' property rights. If the likelihood of suit is sufficiently low, it will not matter whether a patent, if discovered, had fuzzy boundaries; they may be quite willing to risk litigation through ignorance of others' patents even if the metes and bounds of the patent rights are clear. The point is not that the authors are wrong but that the same data may also support other policy conclusions that they are unwilling to make.

This article, and the research underlying it, explores important issues about the patent system. And the article's policy recommendations may be quite sound. The authors, however, appear to have jumped to an explanation of complex phenomena as due to a single or principal cause. The time period of their study reduces their perspective on the complexity of the phenomenon, and they a little too hastily treat evidence supporting the existence of the problem with which they are concerned as negating the existence of other factors that may be as or more important. There is clearly more work to be done in this area.

Addendum

Professors Bessen and Meurer in [their response](#) to my comments balance my use of the term “scofflaw” by resorting to the term “troll.” Neither term is particularly enlightening, and in both cases we have used pejoratives where what is needed is reasoned analysis that is not obscured by loaded terms.

About the author

James Toupin is General Counsel of the United States Patent and Trademark Office.

Reply by James Bessen and Michael J. Meurer

Mr. Toupin offers a thoughtful rebuttal to our indictment of the patent system. He believes the patent system experienced some problems adjusting to the introduction of software and business method patents during the 1990s, but those problems are now behind us. As supporters of the patent system and admirers of the innovative capacity of the American economy, we wish he were right.

Initially, Mr. Toupin counters some of our empirical evidence on the patent litigation explosion with some of his own. He notes that our evidence ends in the 1990s and suggests that more recent evidence shows that the patent system is back on track. He observes that the ratio of “new patent cases filed compared to total utility patents in force” nearly doubled in the 1990s, and it has remained stable or even declined slightly since then. And he adds a second piece of evidence — new patent litigation divided by patent applications has fallen by 26 percent in the last ten years from its peak in 1996.

We are not comforted by these observations. Notice that even by his measures, litigation rates are still very high — 70 percent higher in FY2005 than FY1991.

More importantly, the ratio of lawsuits to total patents in force is misleading because lawsuits do not occur evenly over the life of a patent. Lawsuits are more likely to be filed during the first few years after issue

than during later years. This means that Toupin's simple ratios do not accurately represent the actual trends. We control for this problem by examining the probability that a patent is in a lawsuit within a specified time frame (the approach we used to derive [Figure 1](#)) [1]. This measure accounts for the sharp variation in litigation rates over the life of the patent.

The ratio of litigation to applications is even less meaningful. The issue is whether litigation imposes costs on innovators and raw patent applications are hardly a good measure of invention, especially since continuing applications make up a growing portion of applications and now account for one-third of new patent applications. We contend the best measure of the burden created by litigation is the ratio of lawsuits to R&D, and the growth rate of R&D this decade has not kept pace with the growth rate of patent lawsuits.

Finally, notice that although our data in [Figure 1](#) ends with patents that issued in the year 2000, it includes lawsuits filed through the year 2004 — the x-axis represents the issue date of the patent, not the year of the lawsuit. So this figure does, in fact, capture the trends that occurred during the first half of the current decade.

His second argument is that we did not properly account for the recent growth of software and business methods patents, and how those patents differ from other patents. He is not surprised that software patents are litigated more frequently than other patents during the first four years of their lives. He observes that software products have a short lifespan in the market, and thus software patent lawsuits would naturally occur soon after issue. We did explore the time pattern of litigation over the life of patents in our research, although not in this article. Most lawsuits occur early in the life of a patent for all technologies, not just software. Moreover, the lags from grant to lawsuit do not seem to be getting shorter for the years that we can observe. So the observed upward trend in litigation probabilities is not mainly explained by the growing importance of software patents, although these do contribute to the increase.

Mr. Toupin develops his argument further by making the plausible assertion that the institutions for clearance and licensing are less developed for software and business method patents. He believes that over time these institutions are improving and this will cause litigation rates to fall. A related argument that we sometimes hear is that as the PTO gets better at examining these patents their quality will improve and litigation will decline.

Regrettably, this has not happened. The probability of litigation over software patents has grown, not declined, since the mid-1990s ([Figure 3](#) in the paper). This has happened despite greater experience within the PTO (it has been thirteen years since *In re Alappat* authorized patents on all types of software inventions [2]). And we see no evidence that clearance and licensing of software patents is growing easier. Indeed, we report in our book that software patents present questions of boundary interpretation to the Federal Circuit twice as often as the average patent.

Mr. Toupin also observes that most of the empirical analysis that we discuss in this article concerns publicly traded firms. We do consider small inventors in our book and find that this does not alter our basic policy conclusions. Certain small inventors are prospering from opportunistic lawsuits, but we find evidence that after excluding trolls, the average small inventor has also been harmed by the increasingly fuzzy boundaries of our patent system. Also, it is important to keep in mind that most R&D is done by publicly traded firms.

Finally, Mr. Toupin laments that scofflaws are taking advantage of patent owners, especially small inventors who face high enforcement costs, by ignoring patent rights. Reforms that make patent enforcement easier might be good policy if patent boundaries were clear. But firms often fail to clear their technologies despite the high penalties already imposed by patent litigation that we document. This suggests that “reducing barriers to enforcement” is not likely to improve patent clearance behavior without some basic changes to patent boundaries and it might serve, instead, to simply inhibit development of new technologies. We need less litigation, not more.

If Microsoft and other large firms, with all their resources, cannot avoid inadvertent patent infringement

(illustrated by the huge judgments against Microsoft in recent software patent cases), there must be something very wrong with the property rights created by the patent system. Fuzzy boundaries are what are wrong. We must address boundary problems and fix a patent system that today is on average a drag on innovation.

Notes to Reply

1. Alternatively, one could use a time-weighted truncation adjustment.

2. See, for example, <http://www-swiss.ai.mit.edu/6805/assorted-short-pieces/alappat-summary.html> or <http://digital-law-online.info/cases/31PQ2D1545.htm>.

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What's Wrong with the Patent System? Fuzzy Boundaries and the Patent Tax by James Bessen and Michael J. Meurer

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