

**Trolls on State Street?:
The Litigation of Financial Patents, 1976-2005**

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This paper examines the litigation of patents relating to financial products and services, motivated by claims that entrepreneurs are obtaining and then aggressively litigating awards of dubious validity. The theoretical law-and-economics literature suggests that if patent quality is a major issue here, the overall rate of litigation should be higher and patents of dubious quality should be particularly likely to be litigated. I show that these awards are being litigated at a rate 27 times greater than that of patents as a whole. The awards being litigated are disproportionately those awarded to individuals and to smaller, private entities, consistent with the claims that these parties are exploiting the patent system in this arena.

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Introduction

In recent years, business method patents have proven to be intensely controversial. Since they were judicially endorsed in the *State Street* case in the late 1990s, numerous critics have suggested that these awards have been distorting the patent system. For instance, Merges [2000] asserted that “the increased volume of patent applications stemming from this newly patentable subject matter has pushed the patent system into crisis,” and Lessig [2000] characterized these awards as “a new monster called forth from an old statute.” Reviewing this controversy, Allison and Hunter [2005] concluded:

Although patents in other areas of technology have brought forth complaints from various quarters, the magnitude of adverse commentary and reportage on business method patents was unprecedented.

While the discussions cited above focused on the United States, if anything, these awards have been more controversial in Europe.

Many discussions of the problems associated with business method patents have focused on “patent trolls,” individuals who obtain and then aggressively litigate patents of dubious validity (e.g., U.S. Federal Trade Commission [2003]; Jaffe and Lerner [2004]). These individuals are alleged to profitably exploit the weaknesses of the patent system: the frequently cursory reviews given to patent applications in emerging areas such as business methods by underpaid, inexperienced patent examiners, and a legal system that presumes that granted patents are valid and relies on juries that are frequently ill-suited for resolving these technical disputes. In many cases, their targets, facing the prospect of an injunction that will require them to shut down key operations, will choose

to settle rather than fight back. Observers have attributed the prevalence of individuals and small patent holding companies as patent litigators to the fact that they are “retaliation proof”: if a corporation with manufacturing and service operations were to aggressively pursue rivals, it might face counter-charges of patent infringement that would disrupt its own operations. Because these individuals have no activities other than litigation, they are much less vulnerable to such threats.

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To cite one example, Vergil Daughtery, a Georgia Tech MBA, has received four patents for the pricing of “expirationless options,” despite the fact that perpetual options have been extensively studied in the finance literature since the 1960s. In June 2006, the holding company to which he had licensed the patents filed suit against the Philadelphia Stock Exchange, arguing (among other charges) that the Exchange’s proposed ten-year options infringed its patents (Schaafsma [2006]).

While a number of studies (Allison and Tiller [2003]; Hall [2003]; Lerner [2002]) have documented the increasing numbers of business method patent awards, the implications of the increase are unclear. It has long been understood that the bulk of patents have only very modest value (e.g., Pakes [1986]), so increasing numbers of these awards may or may not be economically significant. In this paper, I seek to address the limitations of earlier studies by focusing on arguably the most economically important manner in which patent awards are utilized: litigation. Because patent litigation typically entails several millions of dollars of expenditures (AIPLA [2005]), this step is unlikely to be undertaken lightly.

I focus on the subset of business method patents relating to financial products and services. Not only can these awards be readily identified—a condition that does not characterize all business method patents—but the importance of financial innovation is widely accepted: the economic importance of new products and services in the financial arena have been highlighted by, among others, Miller [1986] and Merton [1992], and empirically documented by Tufano [1989]. Yet the empirics of financial innovation have attracted remarkably little academic attention (Frame and White [2004]).

This paper seeks to document the extent to which financial patents are being litigated. Theoretical models of suit and settlement (reviewed in Cooter and Rubinfeld [1989]) suggest that more valuable and more uncertain patents should be litigated more frequently. In addition, cases where the quality of the patent in dispute is lower are likely to have more litigation. If entrepreneurs are obtaining financial patent awards of dubious merit and then using lawsuits to extract settlements, then financial patents—and those awarded to individuals and small firms specifically—should be disproportionately litigated.

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To explore these hypotheses, I construct a data-set of all financial patents awarded between January 1976 and August 2003. I then analyze which awards were litigated through the end of 2005, and the determinants of this litigation. My key findings are as follows:

- Financial patents are being litigated at a rate 27 times greater than that of patents as a whole. Even relative to the most extensively litigated major category of patents (drugs and health), the rate is more than an order of magnitude higher. This is consistent with suggestions that patent quality problems are a particularly severe problem here.
- The finance patents being litigated are disproportionately those awarded to individuals. Inasmuch as those awarded to corporations are being adjudicated, it is overwhelmingly those awarded to smaller, private entities (typically patent holding companies). This finding is consistent with claims that these entities are disproportional receiving financial patents of dubious quality. The defendants in these cases, on the other hand, are dominated by large financial institutions and exchanges.
- As in other technical realms, litigated patents appear to be more important: they have more claims, and (less consistently) are disproportionately cited by other patents. At least in part, however, the greater number of citations seems due to a “publicity effect”: litigation leads patents to be more frequently cited.
- Better disclosed patents—*i.e.*, those with more backward citations—are litigated more frequently, unlike in other areas, where they are less often the subject of suits.

The interpretation of these findings must be cautious. I have not undertaken a detailed assessment of the originality of these patents, or analyzed the way in which they

have been interpreted in the courts.¹ But collectively, the results seem consistent with the assertion that individuals are exploiting the system to obtain and litigate financial patents of questionable quality.

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The plan of this paper is as follows. Section 1 briefly reviews the changes in patent law and practice in relation to business method patents. Section 2 describes the construction of the data-set. Section 3 presents the analysis. The final section concludes the paper.

1. Business Method Patents²

There has long been ambiguity about the patentability of business methods in the United States. At least since a 1908 court decision that established the “business methods exception,” many judges and lawyers have presumed that business methods were not patentable subject matter. While the U.S. Patent and Trademark Office (PTO) has issued patents on financial and other business methods for several decades, many observers questioned their validity. Consequently, awardees were reluctant to incur the time and expense to litigate their awards.

Attitudes toward business method patents changed with the July 1998 appellate decision in *State Street Bank and Trust v. Signature Financial Group*. This case had originated with a software program used to determine the value of mutual funds, on

¹This would, of course, be a massive undertaking, since the cost of a detailed analysis of a single patent in the course of a lawsuit typically runs into the hundreds of thousands of dollars.

²This section is based on Lerner [2002] and Jaffe and Lerner [2004].

which Signature had obtained a patent in 1993. State Street Bank sued to have the patent invalidated on the grounds that it covered a business method and was hence not patentable. While State Street's argument prevailed in the district court, the Court of Appeals for the Federal Circuit, the centralized appellate court for patent cases, reversed the finding. In its decision, the court explicitly rejected the notion of a "business method exception." The Supreme Court declined to hear State Street's appeal of the appellate decision in January 1999. In the numerous articles in the trade press that followed the two decisions, the case was interpreted as unambiguously establishing the patentability of business methods.

The decision appears to have led to a substantial increase in the filing and granting of business method patents, including financial patents. One of the major concerns expressed about these awards has been about their quality. For instance, Lerner [2002] shows that while academic research is highly relevant to many financial patents, these works are far less often cited than in patents in other academically related areas, such as biotechnology. Jaffe and Lerner [2004], among others, argue that these poor awards stemmed from the lack of information available to patent examiners: with only prior patents and a few databases to examine, the examiners did not realize that many applications covered products and processes long familiar to the finance community.

2. The Plan for the Analysis

To motivate the analysis, it is useful to turn to one of the canonical pieces in the law-and-economics literature, Cooter and Rubinfeld [1989]. The model in this work

frequently litigated. If we believe that the quality of financial patents is lower than other awards, then we might expect hypothesize:

Hypothesis 1: The volume of litigation should be greater for financial patents than for patents as a whole.

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Moreover, if we see this sector as one where opportunistic behavior by trolls is associated with litigation, we might also hypothesize that:

Hypothesis 2: Proxies for patent quality should be associated with more litigation of financial patents, perhaps to a greater extent in the population of patents as a whole.

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To proxy for the presence of patent quality problems, we will examine those patents awards to individuals and small firms, where the types of “gaming” of the patent system discussed above are most problematic.

3. Constructing the Data-Set

This section describes how I constructed the data-set used in this analysis.

Patent awards. I identify awards using the online database of the U.S. Patent and Trademark Office, which summarizes all patents awarded since January 1976. Following the procedure in Lerner [2006], I identify all patents assigned to relevant US Patent Classification subclasses. Patents are classified at the time they issue to one or more classifications. There are over one hundred thousand such classes. The PTO takes such classifications very seriously, because they ensure that examiners will be able to identify the relevant earlier awards when they engage in subsequent patent searches. As in the

earlier analysis, I employ all patents with a primary assignment to subclasses 705/4, 705/35 through 705/45, and 902/1 through 902/41. Because I wanted to be able to assess the quality of issued patents (which relies on being able to identify how frequently the awards are cited in subsequent documents), I only included patents in the sample if they were awarded through August 2003. In total, there are 2944 awards in the sample.

Litigation. I employ the Derwent LIT/ALERT patent litigation database to determine if, and how often, each patent in the sample has been litigated. This database is built using reports to the PTO from the district courts where the patent litigation is initiated. While these reports are required to be filed, as Lanjouw and Schankerman document [2001, 2003], in a considerable number of instances (about 35% in recent years and more earlier), no such report is made. (To address this deficiency, I adjust the computed patent litigation rates, as discussed below.) The data on litigation were downloaded in May 2006. There appears, however, to be substantial reporting lags: no suits from 2006 and only one after August 2005 were found.³ From the database, we gather information on the key dates, parties, and location of the case, as well as the patents that were involved.⁴ Because data provided by Derwent was incomplete (it only assigned one patent to each lawsuit prior to 1990, even if there were multiple ones at issue), I obtained the docket filings for the earlier cases and augmented their records. I

³I assume in the calculations below that the database contains all litigation involving these patents filed through the end of 2005. Thus, the estimates of the amount of litigation—and the disparities from other areas of patent litigation—are slightly understated.

⁴Because the considerable majority of patent cases ultimately settle, and these settlements are highly diverse and rarely disclosed to the public, it is impossible to characterize the outcomes of these cases in a systematic manner.

count the number of lawsuits involving each patent, regarding each case as one suit even if there are multiple defendants named.

Characteristics of patentees. I also characterize the features of the parties to whom the patents were assigned in the year of the award. First, I classify the awardees into publicly traded corporations, privately held firms, individuals, and others (e.g., government and university entities). I define publicly traded entities as those for which financial and related information for the year prior to the award is available from Compustat, WorldScope, or filings with the U.S. Securities and Exchange Commission. I classify as private firms all other cases where there is an assignee other than the inventor.⁵ For private entities, I employ a variety of sources, including the *Moody's* manuals, the *Corporate Technology Directory*, national directories of firms (particularly of Japan), and directories of various segments of the financial services industry. In these cases, I simply seek to obtain information on the revenues and employment of the firm, as well as the nation in which its headquarters is based. If I am unable to identify the relevant information in the year of award, I use information from the year beforehand or, if this is not available, the year after the award. In many cases, however, I am unable to locate the sales and revenue information: many of the assignees are small patent holding companies that keep extremely low profiles. I am, however, able to characterize the location of all assignees: if information on firm location is not available from the above

⁵Because it is difficult to determine whether non-U.S. foreign firms are publicly traded, some public firms may be misclassified as private. Given that the sample is dominated by U.S. and large Japanese firms, this problem should be limited.

databases, I employ the location of the assignee as identified in the patent award. If there is no assignee, I use the location of the inventor.

Features of the patents. Over the past two decades, a variety of quantitative measures of patents have become widely adopted (Jaffe and Trajtenberg [2002]; Lanjouw, Pakes and Putnam [1998]). These methods rely on the citations either to or by the patent award to characterize the awards (forward and backward citations respectively), as well as the count of the claims in the awards. Patents with more forward citations and claims are frequently interpreted as being more important, while those with more backward citations are seen as more carefully describing the “prior art” of already-issued patents.

I compiled the number of forward and backward citations through July 2006 in order to have as full depiction of the patents as possible. I also identified those forward and backward citations that are self-citations. Finally, I computed two alternative measures of patent quality, generality and originality (see Jaffe and Trajtenberg [2002]).

4. An Analysis of Litigation

A. Summary Statistics

Table 1 provides an overview of the firms and patents included in the sample. Several patterns stand out in Panel A:

- While the award date of the patents in the sample ranges from 1976 to 2003, they are concentrated in the second half, with the mean award in late 1994. This reflects the acceleration of financial patenting activity in recent years.
- These patents are heavily cited relative to the typical U.S. award. Jaffe and Trajtenberg [2001, p. 439] find that the typical twelve-year-old patent had received just fewer than seven citations, or one-quarter the level seen here.⁶
- Financial patenting activity is dominated by U.S. firms, which account for 74% of the awards. In recent years, approximately one-half of [all patent](#) awards have gone to non-U.S. entities. This disparity is particularly dramatic among individuals and private firms. The foreign assignees are dominated by Japanese firms to a much greater extent than in other technical fields, which reflects the fact that Japan is one of the few nations outside the U.S. that unambiguously allows business method patents.
- As noted in Lerner [2002], the representation of government and university assignees (about 0.4%) is considerably less than in patents as a whole, and certainly much less than in other academically-linked fields such as biotechnology and advanced materials.
- While the bulk of patents are not litigated, a few awards are extensively so, with one patent being involved in fifteen lawsuits. (This is an award to an individual inventor, Lawrence B. Lockwood, which is being litigated through the patent holding company Pangea Intellectual Properties. The patent—number 6,289,319—covers an automated “financial transaction processing system,” and is

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⁶The predicted number of citations is slightly lower if one computes a weighted average based on the actual ages of the awards in the financial patents sample.

cast in sufficiently broad terms that it probably covers all e-commerce transactions, as well as those employing automated teller machines. Pangea has been targeting small firms in its litigation, in a successful effort to obtain settlements of hundreds of thousands of dollars each from firms that are reluctant to bear the cost of litigation.⁷⁾

The second panel indicates a few characteristics of the lawsuits themselves. Most involve a single financial patent, but several encompass multiple awards. More interestingly, the role of third parties here is much greater than elsewhere. Only 46% of the disputes involve an assignee or an inventor as a plaintiff or a defendant. In other cases, the litigation is being conducted by third parties (who have typically purchased or licensed the patent) instead. This share of third parties is much greater than seen elsewhere. For instance, Lanjouw and Schankerman [2001, Table 1] find that in 68.5% of the cases, the assignee is either a plaintiff or defendant. (They do not examine cases where the inventor but not the assignee was a litigator, which would increase the share at least modestly.) While this finding is not in and of itself problematic, it does hint at the importance of individuals, who are often unable to finance patent litigation themselves, in these disputes.

⁷See, for instance, the discussion in <http://www.infoworld.com/articles/hn/xml/02/05/15/020515hnpangea.html> (accessed October 10, 2006).

The divorce between innovation and litigation in this field is further underscored by Table 2. This presents the five most frequently represented firms in several categories, which prove to be dramatically different:

- The first column reports the most frequently represented financial innovators, as reported in Lerner [2006]. This compilation is based on stories in the *Wall Street Journal* on financial innovation between 1990 and 2002.⁸ This list is dominated by financial institutions and includes a major publisher.
- The second column presents the most frequent financial patentees between January 1976 and August 2003. While Citigroup appears here as well (and other financial institutions appear further down on the list), it is dominated by information technology companies. These firms—which routinely file for protection of hardware and software inventions—rapidly began filing for patents on innovations that were developed in the course of projects for financial service firms after the *State Street* decision (or even before).
- The most frequent plaintiffs⁹ in financial patent litigation between 1976 and 2005 are reported in column 3. This list, in contrast to the others, is dominated by

⁸Mergers and acquisitions introduced complications to the tabulations. Citicorp appears in the first column because it was an active innovator until its acquisition by the Travelers Group in 1998. Subsequent innovations by this institution were attributed to Citigroup, its corporate parent in 2003 (which is credited with innovations developed by the new combined entity and the old Travelers Group). (Lerner [2006] provides a more detailed description of the procedure used.)

⁹In some cases, entities file for “declaratory relief,” or for a ruling that a patent they are being threatened with infringing is invalid. These cases appear relatively rare in the sample. Prior to making this and the subsequent tabulation in the fourth column of Table 2, I eliminate cases where the defendant is an assignee or an inventor of a patent in contention, but the plaintiff is not. I also eliminate from the list of defendants parties that appear twice or more as plaintiffs, as these cases are also likely to be suits for declaratory

patent holding companies that have no lines of business other than licensing and litigating patent awards.

- The most frequent defendants in financial patent litigation between 1976 and 2005 are reported in the fourth column of Table 2. In contrast to the plaintiffs, the compilation of the most frequently represented defendants is dominated by major investment banks, trading exchanges, and other established financial institutions.

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B. Key Determinants of Litigation

I then examined the propensity for different classes of patents to be litigated. The basic distribution of patent awards over time is presented in Table 3. The first two columns make clear that the number of financial patents granted has increased in recent years and that the rate of litigation (which is expressed as suits per thousand awards) peaked among the patents awarded between 1990 and 1994.

The data in column 2, however, have two limitations. First, as alluded to above, not all cases are reported to the PTO. Lanjouw and Schankerman address this issue by comparing the number of cases reported to the PTO with the number of case filings identified as patent related by the Federal Judicial Center.¹⁰ From this information, they are able to compute an adjustment factor, which scales up the number of reported cases to reflect non-reporting.

relief. In the third and fourth columns, when two firms are involved in the same number of suits, I rank them based on the number of patents over which they have litigated.

¹⁰This administrative office compiles a database of all litigation, but does not indicate which patents were involved in individual cases.

The second limitation has to do with the fact that all patents are not litigated immediately after issue. Rather, a considerable number of cases are initiated involving patents that are a few years old (the probability of litigation drops considerably for older patents). Because many of the patents in our sample are quite young (having been awarded as recently as mid-2003), this truncation bias may be significant. Based on patents awarded between 1982 and 1986, Lanjouw and Schankerman [2003] report adjustment factors: i.e., factors that allow one to compute the total expected amount of litigation over a patent's lifetime based on activity in the initial years.¹¹

Column 3 presents the adjusted amount of litigation. Once these corrections are made, there is no clear time trend in the amount of litigation: the upward adjustments are greatest for the oldest patents (due to the severe non-reporting biases in early years) and the most recent ones (because of their greater truncation). Comparing the litigation rates to the similarly adjusted data of Lanjouw and Schankerman [2001, Table 1], the overall rate of litigation is some *twenty-seven times greater* than in their overall sample of awards.

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¹¹There are two subtle differences between my procedure and Lanjouw and Schankerman's. First, the earlier authors assumed that there was only one patent per lawsuit due to the limitations in the early Derwent data noted above, while I researched the cases to determine missing patents. Because there are on average 1.3 patents per case in my sample, this will slightly inflate the reported rate. Second, approximately twenty percent of the entries in the Derwent database are duplicate records, referring to different actions in the same suit. I deleted these entries (which apparently was not done by Lanjouw and Schankerman). Thus, collectively these two adjustments should have a very modest effect on the comparisons.

This rate appears to be far greater than that in other fields. In the technology group with the greatest litigation rate in the Lanjouw-Schankerman sample, “drugs and health,” has a litigation rate that is less than 7% that seen in financial patents. Nor do other emerging technologies—where uncertainty is presumably greater—appear to have rates approaching financial patents. For instance, Lerner [1995] examines the litigation of the first [2048](#) biotechnology awards. He finds that the rate of litigation was [less than one-fifth the rate seen here](#).

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Table 4 considers the litigation rate for patents with different classes of owners. Here again, there are dramatic differences between the litigation of these patents and that of patents more generally. There are substantial differences along three dimensions:

- Lanjouw and Schankerman [2001, page 145] found that corporate owners were far more likely to become involved in a patent suit than individual owners. Here, precisely the opposite result holds: patents assigned to individuals are five times more likely to be litigated than those held by public corporations, and 50% more likely to be so than those held by private firms (which include both smaller operating firms and patent holding companies).
- Overall (Lanjouw and Schankerman [2001, Table 1]), patents by individuals and institutions in the United States are 4.7 times more likely to be litigated than foreign-owned ones. Among financial patents, the ratio of the probabilities is almost twice as large (8.9 times).
- No clear patterns appear overall in the litigation rate of firms of different sizes (Lanjouw and Schankerman [2004, Table 3]). Here, by way of contrast, a

dramatic effect appears. Among patents awarded to firms with fewer than 200 employees at the time, there is more than one lawsuit per patent. Among the patents awarded to the largest firms (those with over 200,000 employees), there is no litigation at all in this sample. When firms are segmented by revenues, a similarly dramatic pattern appears.

Thus, the characteristics of the patentee—particularly, type and size—appear to drive the decision to litigate financial patents to a considerably greater extent than in other fields. The prevalence in litigation of small firms and individual inventors—exactly the population alleged to be manipulating the patent system— is quite anomalous.

I compare the characteristics of the patents themselves in Table 5. Following Lanjouw and Schankerman [2001], I examine domestic and foreign patentees separately, as their citation practices may differ. I contrast patents that are and are not litigated. Like litigated patents overall, litigated financial patents have more forward citations and claims. The difference in the number of forward citations, however, is much smaller and no longer statistically significant at the five-percent confidence level when I compute citations per claim. Thus, while litigated financial awards may be more expansive in their claims, they are not disproportionately cited once the number of claims are controlled for (unlike litigated patents more generally).

Moreover, among patents generally, patents with more backwards citations—which economists have interpreted as ones that more carefully reveal their intellectual predecessors—are less likely to be litigated. Among financial patents, the opposite

pattern holds: litigated patents actually reveal more prior art. This cross-tabulation suggests that the decision to litigate financial patents may be driven less by the merits of the cases, and more by other considerations.

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In the tabulations above, we have assumed that forward citations proxy for importance, which drives litigation. There might be another relationship between citations and innovation, however: patents that are litigated might be more frequently cited, not because they are more important, but rather because the publicity generated by the lawsuit calls attention to the award. This might lead to false inferences.

Following the procedure of Lanjouw and Schankerman [2001, Table 4], I test for the presence of a publicity effect. In particular, for all litigated patents, I look at the mean number of citations obtained in the years after the patent was applied for. In the first column, I look at the citations per year for patents that had not yet been (but eventually will be) litigated, separating the awards by the time since the patent has issued. I then compute in subsequent columns the number of citations that all patents received in the year after the filing of the lawsuit, the second year after such a suit, and so forth.

The results in Table 6 show that at least part of the difference in citations between litigated and non-litigated patents is driven by the “publicity effect.” In the three years after the dispute, the litigated patents garner 5.2 more forward citations relative to the baseline before the inception of litigation. (By the fourth year, the citation rate has returned to the baseline.) For the mean patent in the sample, which is twelve years old,

this translates into a little under one-half of a citation per year. This accounts for roughly 23% of the difference in annual forward citation rates for litigated and non-litigated financial patents (4.0 and 2.1).

I then turn in Table 7 to a regression analysis to explain the prevalence of litigation. The unit of observation is each patent award in the sample. I employ two dependent variables in the reported regressions. The first (following the analyses in Table 5 of Lanjouw and Schankerman [2001]) is an indicator denoting as one instances where the patent was litigated before the end of 2005, and zero otherwise. The second is the count of lawsuits in which the patent was involved. (I do not adjust here for truncation or reporting biases, instead employing the year of the award as a control variable.)

In the first three regressions (which include a Poisson and more robust negative binomial regression when using the count of lawsuits), I employ a set of control variables modeled after those used by Lanjouw and Schankerman [2001]. These include the number of claims, the number of forward and backward citations per claim, and their squares, and the share of citations that are self-citations (which may be less informative about quality or the thoroughness of the disclosure in the patent application).¹²

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¹²I omit a number of independent variables less appropriate to a single industry sample, such as a measure of the similarity of each patent to the patents citing the award. Because so many of the awards are litigated by third parties, I do not run separate equations estimating the prevalence of litigation initiated by patentees and alleged infringers.

In Table 8, I explore the magnitude of the coefficients. I analyze the first, third, fourth and fifth regressions reported in Table 7. In the first column, I report the predicted dependent variable at the means of the continuous variables and with the binary variables coded as zero. In the subsequent rows, I change one independent variable at a time, e.g., increasing the number of claims by one standard deviation or shifting the binary variables denoting a U.S. assignee from zero to one. In each case, I show the change in predicted dependent variable as the independent variable is shifted.

The basic patterns in the three regressions are that firms with more claims are more frequently litigated: a one standard deviation increase in the third regression increases the predicted number of suits per thousand from 72 to 160. Those with more forward citations experience an even more dramatic increase—a one standard deviation boost in the third regression raises the litigation rate per thousand to 244—though this effect weakens among firms with the highest citation rates. Firms with more backwards citations similarly are more frequently litigated: counter to the pattern seen in the overall population of awards, patents with better disclosure of the prior art do not experience less litigation.

Regression 4 adds a variety of characteristics of the patentee to the specification. (once again, each patent is a separate observation, so some patentees are represented multiple times in the regression). Consistent with the cross-tabulations in Table 4, patents awarded to public corporations are far less likely to be litigated: the predicted litigation rate falls by nearly two-thirds. Those patents awarded to individuals and particularly U.S.

residents are more likely to be so. When I add employment and sales in the year of the award to the specification in regressions 5 and 6, the sample size shrinks (both due to the exclusion of individuals and the absence of data for many private entities), but the basic patterns remain. For instance, a one standard deviation increase in employment in the fifth regression reduces the expected amount of litigation by 78%. Geographic location is no longer statistically significant in this case: the results in regard to nationality seem entirely driven by U.S. individuals and private firms for which no financial data are available.

More important patents do appear to be more frequently litigated, as the economic models of suit and settlement would suggest, other results seem more problematic to reconcile with this view. [The tendency of public corporations and larger firms to litigate their patents less frequently is consistent with the hypothesis about patent quality delineated above.](#) More problematic is the fact that better disclosed patents—i.e., those with more backward citations—attract more rather than less litigation suggests that something else is going on.

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C. Robustness Checks

I undertake a variety of robustness checks to examine whether the results are sensitive to the specification used. Most of these changes appear to have little impact.

The first concern is whether the results are sensitive to the particular specification used. One natural concern relates to our assumption that there is a linear trend over time

in the propensity to litigate patents of different vintages, as would be the case if older patents were more frequently litigated simply because they had more time to generate conflicts. It may instead be that the patent office granted particularly problematic patents in certain years or the cost of litigation varied over time. To address this concern, I repeat the specification reported in column 3 of Table 7 in column 7 of the same table, now employing dummy variables for the award year. The key results are little changed.

Another possibility is that the specification is problematic because it fails to account for the large number of zero observations in the sample. One way to address this problem is to estimate a zero-inflated negative binomial specification, in which a first stage estimates the probability that the patent is litigated at all, and the second focuses on the number of suits filed conditional on there being litigation. I report the second stage in column 8 of Table 7, again using a second-stage specification akin to that in column 3. (The first stage, which includes controls for the year of the award, the employment and sales of the firm, and the status of the assignee, is not reported.) While the sample is considerably smaller—reflecting the data limitations in the first-stage equation—the basic results go through as before. (The positive impact of backward citations is no longer significant in this specification.) In unreported regressions, I repeated the other analyses using zero-inflated equations, and found that the key results were qualitatively unchanged, though sometimes at lower levels of statistical significance.

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Another concern is that lawsuits may vary in intensity. In some cases, suits may be dropped or settled soon after being filed; in others, litigation may progress for years.

(Of course, a suit that is quickly settled for a large amount may also be very disruptive to a defendant.) In order to measure the intensity of litigation, I total the number of docket filings in each case, using the records of the PACER system.¹³

I then estimate Tobit regressions, employing the cumulative number of docket entries in the lawsuits associated with each patent as the dependent variable. Columns 9 through 11 report the regressions corresponding to the negative binomial analyses in columns 3, 5, and 6. The primary results that appeared in the earlier regressions continue to go through as before.

I also undertook a variety of other robustness checks in unreported analyses. Among the changes were:

- Using the adjusted counts of lawsuits, as in Tables 3 and 4, rather than the actual counts as the dependent variable in the regressions. (In the reported regression, by controlling for the year of the award, I at least partially addressed the differing vintages of the awards.) In ordinary least squares regressions, the results were similar in both the magnitude of marginal effects and statistical significance.
- Repeating the analysis using alternative measures of patent importance, such as originality and generality (Jaffe and Trajtenberg [2002]) in lieu of the

¹³In approximately five percent of the cases, I am unable to obtain the index of the docket file, either through PACER or an examination of the physical docket. In these instances, I assume that the case had zero docket entries. I also repeat the analysis, assuming that these missing cases have the mean number of docket entries, and find that the results are essentially unchanged.

citation counts. These alternative measures proved to have limited explanatory power.

- Using the logarithm of sales and employment, and estimating these equations using all observations (with a dummy variable denoting cases with missing firm-level information). The results were little changed.
- Employing the additional financial data available on public firms. The basic patterns continued to hold when these controls were added.
- Adding fixed effects for the firms awarded the patents. In regressions akin to that reported in column 3 of Table 7, the results were little changed: patents with more forward citations and claims were significantly more likely to be litigated. When measures of firm characteristics were added, however, these coefficients' significance dropped sharply from the reported regressions, which reflected the fact that the features of the firms only changed slowly (if at all).

5. Conclusions

This paper examines the controversial topic of business method patents. Many critics suggested that “patent trolls,” individuals who obtain and then aggressively litigate patents of dubious validity, have exploited the weaknesses of the patent system in ways that have serious economic consequences.

I focus on the subset of business method patents relating to financial products and services. I show that financial patents are being litigated two dozen times more frequently

than patents as a whole. The awards being litigated are disproportionately those awarded to individuals and to smaller, private entities. Taken together, the results are consistent with suggestions that individuals are exploiting the system to obtain and litigate financial patents of questionable quality.

This paper leaves open numerous questions. One of the most interesting is whether there have been benefits from financial patents that at least partially offset some of the costs associated with the apparent abuse of these awards. For instance, some practitioners suggest that the prospect of obtaining patent protection has encouraged financial institutions to pursue projects that they might not have otherwise, as well as to enter into strategic relationships that might have been difficult to negotiate without patents. I hope to explore these impacts in future research.

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