Patent "Trolls": Rent-Seeking Parasites or Innovation-Facilitating Middlemen?

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I. Introduction

Proponents of the U.S. patent system argue patent protection enhances economic growth by stimulating innovation (Meurer 2003). Some, however, argue any positive economic impact of the patent system has been increasingly undercut via opportunistic litigation, particularly by non-practicing entities ("NPEs") (Chien 2009). NPEs—often disparagingly referred to as patent "trolls"—are patent owners that do not make products or 'practice' their invention (Chien 2009). According to conventional wisdom, they instead "value their (patent) rights chiefly as 'tickets' into court that give them a credible threat to sue vulnerable IP users," especially established businesses (Meurer 2003, Chien 2009).

Behind this view of NPEs is the assumption that they are not practicing their patents because they have little or no applied value. If true, the economic justification for granting limited monopolies to inventors—to incent innovation—may be absent with NPE-owned patents. Instead, the primary economic impact of NPEs may be negative—to transfer wealth to themselves via wasteful litigation.

Unfortunately, there is little empirical evidence regarding the frequency of NPE lawsuits, or the characteristics of NPE-asserted patents, including quality, in relation to litigated patents generally (Chien 2009). In this preliminary analysis, I seek to join a few others in working to fill the void. Using a set of 1800 patents litigated in 2000 and 2001, I first estimate the relative quality and strength of litigated patents as compared to all other patents. I find, consistent with Landjouw and

Schankerman (2001), evidence that patent litigation is serving its intended purpose—specifically, litigated patents appear to be stronger.

Second, within my set of litigated patents, I estimate the quality of NPE-owned patents involved in litigation relative to the quality of litigated patents not owned by NPEs. I find that NPEs may litigate relatively stronger patents than those litigated by practicing entities and individuals. Further, I find evidence consistent with the theory that NPEs fill the economically useful role of middleman for certain types of inventors at a disadvantage in the patent system. Specifically, I find NPEs are more likely to litigate inventions originally owned by foreign entities or individuals, for whom litigation is relatively more costly.

Finally, I find patent litigation generally, and NPE patent litigation in particular, is more prevalent in technological areas characterized as new or permitting relatively broad patents. This is consistent with opportunistic behavior. Overall, however, my findings suggest that wasteful litigation will not be curtailed by targeting NPEs in particular .

II. NPEs

Before explaining my analysis and findings, I provide additional background on the NPE phenomenon and its theorized economic effects. This discussion draws heavily from Chien (2009), who determined the share of high technology patent suits between 2000 and 2008 brought by NPEs. She defines a NPE as a "corporate patent enforcement entity that neither practices nor seeks to commercialize its inventions" (Chien 2009). NPEs do not include entities that engage in significant research and development (Lemley 2007). Further, they are not individual inventors seeking to commercialize their inventions (McDonough 2006).

Defenders of NPEs point to the possible economic benefits of their activities. These include organizing patent auctions, acquiring patent assets, asserting patent portfolios, and underwriting enforcement activities (Chien 2009). The most important benefit of NPEs, however,

relates to the "central role [licensing plays] in helping commercial entities obtain the rights to use valuable technologies that produce new and beneficial products" (Paul et al. 2006). In other words, NPEs may serve as necessary middlemen in facilitating licensing. Under this theory, many important inventions are the product of capital-constrained individuals or start-ups. Without these inventors having the option of selling their patent rights or licensing them to NPEs, some important innovations will go to market later or not at all (Reisman, 2008). Licensing thus bridges the gap between invention and production/dissemination and NPEs facilitate crossing that bridge.

In contrast, opponents of NPEs maintain they are more likely than other patent owners to resort to costly litigation and, even worse, they may do so on the basis of relatively weak patents that reflect insignificant innovation. There are several factors that suggest NPEs have a higher propensity to sue than other patent owners. First and most obviously, NPE's core business is enforcing patent rights (Lemley 2007). Further, because they have no products of their own, NPEs cannot be countersued for patent infringement, as is the case with IP disputes between two competing manufacturers (McCurdy 2008). Their threat to sue a practicing entity that refuses to pay a license is thus very credible (Bessen & Meurer, 2005). Finally, opponents theorize NPEs select as targets mature companies that have already developed and sold allegedly infringing products (Reitzig et al. 2006).

Some opponents argue that NPEs assert weak patents (Chien 2009), with the result they add to litigation without contributing to or facilitating real innovation. Note that threatened litigation of weak patents may remain credible because of the above factors plus the difficulty facing potential defendants of knowing, a priori, the strength of the patent asserted (Bessen & Meurer, 2005). NPEs with large portfolios of weak patents may remain profitable even if they successfully license a small fraction of their patent (See Chien 2009).

Other opponents, however, argue the majority of NPEs are more selective and strategic, acquiring relatively fewer strong, not weak, patents that can withstand invalidity challenges (See Chien 2009). If true, NPEs may still disproportionately add to litigation. However, the argument that NPE patents lack the primary economic justification for the grant of a limited monopoly no longer holds.

Finally, opponents of NPEs theorize they strategically assert patents in certain technological areas characterized as relatively more predictable and broader in scope. Chien (2009) argues that NPEs have focused on high-tech inventions for several reasons (See footnote 3). First, they have historically acquired their patents from distressed or bankrupt companies, principally casualties of the Internet bubble (Davis 2008). Second, products in computer and semiconductor-related industries tend to be covered by many patents, increasing the likelihood of infringement (Lemley & Shapiro 2007). Third, with high-tech or 'predictable arts,' it is arguably easier to obtain a patent that can be bought and sold free of the underlying technology. In contrast, NPEs have avoided biotech patents with more stringent enablement and written description standards more difficult to meet without having actually made the invention (See, e.g., Burk & Lemley 2002). NPEs are theorized to especially favor business method patents, which are relatively new, broad in scope and predictable (e.g., Lerner 2007).

III. Econometric Model to Test Hypothesized Traits of NPE Suits and Their Patents

To test the relative merits of the arguments for and against NPE activity, I apply the model of Lanjouw and Schankerman (2001) to the theorized characteristics of opportunistic litigation generally, and NPE litigation in particular. Lanjouw and Schankerman (2001), using a probit model, test the probability that litigated patents are more characterized by traits generally accepted as correlated with patent quality. They find that higher quality patents representing relatively more

important innovation are litigated more frequently and that larger entities litigate more as litigation is relatively less costly.

There are two parts to my analysis. First, I analyze the relationship between characteristics of patents associated with opportunistic litigation and the probability they are litigated and compare my results with Lanjouw and Schankerman's (2001). Second, I analyze the relationship between these same characteristics of patents and the probability that a litigated patent is asserted by an NPE. A probit model is appropriate for both stages because the dependent variable in each has only two possible values: In the first, whether the patent was litigated or not, and in the second whether the litigation related to an NPE-holding patent or not.

As an example, my second stage model is

$$P(NPE_i = 1 \mid \boldsymbol{P_i}) = G(\beta_0 + \boldsymbol{\beta * P_i}),$$

Or the probability that a litigated patent, *i*, is asserted by an NPE, NPE_i, depends on a vector of other characteristics of that patent, $\boldsymbol{P_i}$, and G, the standard normal cumulative distribution function.

IV. Data

To determine if litigated patents generally, and NPE-litigated patents in particular, tend to possess traits associated with opportunistic litigation or weaker patents, I merge data from two separate sources by patent number—the first including characteristics of patent litigation and the second characteristics of the litigated patents themselves.

In this preliminary analysis I use the Derwent LIT/ALERT ("Derwent sample") patent litigation database to determine which patents have been litigated. This database is maintained using reports from the district courts where patent litigation is initiated to the USPTO. While these are required reports, Lanjouw and Schankerman (2001) find that the vast majority of patent cases are missing for earlier years. However, they conclude the omissions primarily result from clerical error and find no bias in the sample when comparing characteristics of cases reported to the USPTO with

unreported cases (Lanjouw & Schankerman 2001). For this paper I accept their conclusion and use the Derwent sample despite the availability of more comprehensive, but more difficult to compile, data sources.[1] As a further limitation, my access to the Derwent sample is currently limited to cases filed between 2000 and 2006.

My source of patent information is Hall, Jaffe & Tratjenberg's (2001) ("the NBER authors") NBER U.S. Patent Citations data file ("NBER data file"), which contains detailed information on three million U.S. patents granted between 1963 and 1999. I use the NBER data file to compile a number of characteristics of patents that researchers have found relate to the quality, strength, or tendency of a patent to be involved in opportunistic litigation.

The NBER data file's coverage ends in 1999 and a large percentage of patent litigation begins within two years of patent grant dates. Therefore, I only utilize the subset of the Derwent sample that includes patent cases filed in 2000 or 2001.[2] This subset includes 1797 different patents litigated in 1026 different cases. With roughly 2000 total cases filed in 2000 and 2400 in 2001, my subset captures about 25% of total patent cases filed those two years (IPLC).

After matching my two datasets, I find that the oldest patent litigated was granted in November 1978. Because I only include two years of litigation data, the coefficients in my initial analysis of the characteristics of litigated patents are far less importance than their sign and significance. Accordingly, I drop all patents granted before 1978. This leaves over 1,850,000 patents in the first part of my analysis.

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[1] The Stanford Intellectual Property Litigation Clearinghouse ("IPLC") includes all patent infringement lawsuits filed from January 1, 2000 to the present. Unfortunately, I only possess access to the IPLC's online search engine which requires one to visit multiple web pages to collect all necessary data on each case. I may do so in future research. For an overview of the IPLC, see generally Press Release, Stanford Law School, Stanford Law School Launches Intellectual Property Litigation Clearinghouse (Dec. 8, 2008).

[2] Note I will be able to expand this subset to include cases through 2006 when the NBER authors release an expanded NBER data file at the end of 2010.

Patent Litigation Characteristics. From the Derwent sample I created my dependent variables for both steps in my analysis. For the first, I create a dummy litigation variable for all patents litigated in 2000 or 2001. For the second, I create a dummy variable equal to one for all suits involving an NPE. This includes all patent infringement actions initiated by an NPE plaintiff and declaratory actions brought against NPE defendants. Summary statistics for the second part of my analysis, testing the impact of various factors on the probability an NPE asserts a litigated patent, are in Table 1.

Identifying NPEs is admittedly an inexact science. I utilize Chien's (2009) method and identify patent suit parties as NPEs if the entity was described by a court description, entity website, news article or blog post as a "non-practicing enforcement/licensing entity, NPE or troll." Chien (2009) argues this method is conservative for two reasons: 1) Many NPEs do not advertise, making it difficult to verify what they do; and 2) Some suits in an individual's name are likely NPE-funded.

I identified 95 of the 1026 lawsuits in my sample, 9.3%, as including an NPE as a party. This percentage is in the ballpark of earlier estimates of the share of patent lawsuits involving NPEs. Ball and Kesan (2008) estimate that 5% of suites in 2000 and 2002 were brought by patent licensing firms. However, troll watchdog group "Patent Freedom" has placed the share of NPE suits at 12%.[3]

While several other characteristics of lawsuits are relevant to this study, time constraints impacted this preliminary analysis. One interesting characteristic is the number of alleged infringers in a patent suit. Prior NPE researchers suggest NPEs sue relatively more entities than firms suing competitors. Thus, NPE contribution to litigation costs may be multiplicative. More detailed analysis should include this and other relevant characteristics of patent litigation.

[3] See Patent Freedom, Current Research: Litigations Over Time, https://www.patentfreedom.com/research-lot.html.

I have, however, included one important litigation characteristic associated with NPE suits in my final regression—namely, whether the alleged infringer in a patent suit is a large corporation. Recall NPEs are theorized to strategically target established firms with deep pockets that are already practicing the content of the asserted patent (Chien 2009). I define large corporations as publicly traded companies or large private companies included on Forbes' list.

Patent Characteristics. I collect several types of patent data from the NBER data file. First, subtracting the patents' application year from its grant year, I calculate the duration of successful patents' application. Graham and Mowrey (2004) studied the relationship between application duration and litigation and found support for the hypothesis of a "Submarine" patent strategy. Prior to patent law reforms in the 1990s, patent trolls may have delayed their patent's application in order to surprise established firms after they have begun selling an infringing product. Graham and Mowrey find the strongest evidence of "Submarine-ing" in software patents, an area thought to include more opportunistic litigation. However, Graham and Mowrey admit longer application duration may reflect the processing of more important, higher quality patents, and not strategic delay.

Second, I obtain several measures of patent quality widely utilized in prior studies (Lerner 2007; Jaffe & Trajtenberg 2002; Lanjouw & Schankerman 2001). These include the number of claims in a patent, the citations received by a patent, the citations made by a patent, and Jaffe and Trajtenberg's (2002) measure of generality and originality, which are closely related to citations received and made respectively. Patents receiving more citations after their grant, more general patents, and those with more claims are interpreted as covering a more important innovation or being higher quality (Lerner 2007). Patents including more citations to "prior art" are frequently interpreted as being more thorough (Lerner 2007). Alternatively, patents with fewer citations to "prior art" may be more original (Jaffe & Trajtenberg 2002).

Third, I utilize two characteristics of patentees: 1) Whether a patent is assigned to a corporate entity; and 2) Whether it is assigned to a foreign (i.e., non-U.S.) entity or individual. Lanjouw and Schankerman (2001) found that corporate owners of patent were much more likely to become involved in patent suits than individual owners. They surmise that corporations have a relatively lower cost of litigation. Others, however, argue that patents may be more valuable to individual owners (Chien 2009). And of course, litigation is unlikely to be relatively more costly for NPEs, whose business model is based on enforcing patent rights (Chien 2009). Regarding foreign ownership, Lanjouw and Schankerman (2001) find American-owned patents are 4.7 times more likely to be litigated than foreign-owned ones. This is again consistent with theorized differences in the relative cost of entering litigation.

Finally, I utilize three alternate sets of patent technology classification dummies. Much prior research suggests that opportunistic patent litigation by trolls or others is most common in classes of patents that potentially cover broad subject matter and/or in emerging technology where USPTO examiners can least distinguish strong from weak patents. These include high tech patents analyzed by Chien (2009) and business method patents analyzed by Lerner (2007).

Lerner (2007) analyzed only the financial industry subset of business method patents which require computers. For my third technology classification, I create a broader business method patent identifier using all of USPTO technology classification 705. For my second classification, I recreate Chien's (2009) high tech category, which includes all business method patents in 705 as well as the USPTO classifications that contain most computer hardware and software patents.

For my first technology classification, I create five dummies that cover the six technology classes created by Jaffe and Trajtenberg (2002). These include: 1) Chemical; 2) Computer or communications; 3) Drug or medical; 4) Electrical or electronic; 5) Mechanical; and 6) Other patents. "Other" is my omitted category.

V. Results

Characteristics of Litigated Patents

Table 2 reports the results of the first stage of my analysis. Table 2 includes three specifications each including alternate measures of quality. From the magnitude of the log-likelihood values for each regression, as well as the Chi-squared test results, I conclude that each regression has significant explanatory power.

Odd numbered columns (1), (3) and (5) use citations received and citations made. As a robustness check, these are replaced with Jaffe and Trajtenberg's (2002) generality and originality in columns (2), (4) and (6). Specification 1 includes the five dummies that cover the NBER author's six technology categories. Specification 2 replaces these with the high technology patent indicator. Specification 3 replaces this with the computer-related business method patent indicator.

All predictors except years between application and grant have consistent significance across all specifications. The fact this "Submarine" predictor is only significant in Specification 3 suggests that much of the variation in application duration is explained by the more comprehensive technology categories in the first two specification. In contrast, whether or not business method patents are litigated is less dependent on application duration. Thus, I conclude that my "Submarine" predictor's significance is likely explained by the longer duration to obtain drug or medical patents, which from Specification 1 I see are predicted to be more likely litigated.

Turning to Landjouw and Schankerman's (2001) measures of patent quality, I find my results consistent with theirs—the evidence suggests litigated patents are relatively higher quality. They theorize that more claims, citations received and citations made are correlated with higher quality patents. The coefficients on each of these indicators is positive and statistically significant to the 99% level for each.

The same is true of the alternate quality measures, generality and originality. However, I lose some statistical significance in switching from citations received to generality. The fewer observations in the even specifications reveal the fact that the NBER authors omitted values of generality or originality for many patents in the NBER file. This lost significance may be explained by some systematic basis for their omissions.

Next, I consider my two assignee characteristic predictors. The negative statistically significant coefficient on foreign assignee is consistent with Landjouw and Schankerman's (2001) finding that foreign assigned patents are less likely to be litigated. The negative, statistically significant coefficient on corporate assignee is the one predictor where my results diverge from theirs. They find a positive relationship. On reexamination, I note they designate corporate assignment as any assignment at all.

In contrast, I use the NBER patent data file's assignee classification to designate as corporate assignees only non-government entities. This does not include government or individual assignees, which are presumably included in Landjouw and Schankerman's measure. My measure suggests that patents assigned to the inventor (unassigned) or to another individual are more likely to be litigated. This evidence is consistent with opportunistic litigation.

To complete my baseline differences between patents litigated in 2000 and 2001 and those not litigated, I conclude that my technology predictors are consistent with prior theoretical and empirical consensus. I find that whether a patent is electrical or electronic is not a significant predictor of litigation. However, the other four NBER categories are, with chemical and mechanical patents less likely and computer/communications and drug/medical patents more likely to be litigated. The pharmaceutical industry is one of the few that relies heavily on patents to protect their innovations (Levin et al., 1987). Therefore, it is not surprising that this category positively correlates with litigation, while categories where patents are less important (e.g., mechanical) do not.

However, the positive correlation of computer and communications patents with litigation confounds this explanation. Instead, it is likely explained by the prevalence of newer technology and broader patents. The large positive coefficients on high tech and business method patents in the second two specifications support this conclusion and are consistent with possible opportunistic litigation in these areas.

Characteristics of Litigated Patents Asserted By an NPE

Table 3 reports the second part of my analysis, namely predictions of when patent suits will involve an NPE. The first three specifications are the same as in my first stage analysis, substituting NPE as the dependent variable. However, I include the 'alleged infringer is a large corporation' predictor in Specification 4, which otherwise repeats Specification 2, column (3).

In this section I also interpret significant coefficients using Stata's prtab command which shows the predicted probability for each of the values of the specified variable.[4] All of these values are calculated with the other predictors held at their mean.

The "Submarine" predictor, application duration, is again consistently insignificant. Clearly, I have not captured significant "Submarine" activity on the part of NPEs in my sample.

Turning again to Landjouw and Schankerman's (2001) measures of patent quality I find evidence that the quality of patents asserted in litigation by NPEs relatively higher. The number of claims, citations received and generality measures are again positive and statistically significant, suggesting patents asserted by NPEs are even higher quality than other litigated patents. Neither citations made nor originality is significant here. However, the implication of this result is less apparent since more prior art citations can correlate with a better specified application or a more original invention (Jaffe & Tratjenberg 2002). Thus, the overall evidence suggests that if anything, NPEs assert stronger patents, though arguable ones no more original than other litigated patents.

[4] http://www.ats.ucla.edu/stat/stata.dae/probit.htm.

Most importantly, the results for my assignee indicators support the position that NPEs act as beneficial middlemen asserting the rights of two groups for whom we would expect litigation to be relatively more costly. This is especially true for patents originally assigned to a foreign entity. The coefficients on this predictor are consistently large and significant. Using column (1) as an example, the probability a litigated patent is asserted by an NPE is 7.3% for domestic assignees and 15.1% for foreign assignees—an increase in almost 8%.

The evidence for my conclusion from the corporate assignee predictor is less persuasive as it has less than uniform significance. However, where significant, it is consistently negative, suggesting that NPEs assert more individual- or inventor-assigned patents in litigation than other claimants. Again using column (1) as an example, the predicted probability a litigated patent is asserted by an NPE is 3% (7.5% total) less for those with corporate assignees.

Regarding the NBER classifications, the results of this second analysis surprisingly differ from those in the first. Chemical, drug/medical and mechanical are no longer significant, suggesting that these classifications have nothing to do with NPE litigation. In contrast, computer/communications remains positive and highly significant and is joined by electrical/electronic patents. From column (1), the probability a litigated patent is asserted by an NPE is 23.2% for computer patents and 4.9% for all others—an increase of 18%. The result for electrical patents is only slightly less impressive—20.7% total and 13.9% higher.

That NPEs are even more likely to litigate patents in these technology categories is not surprising as the kind of 'high tech' covered by Chien (2009) bleeds into the NBER authors' electrical/electronic category. This is demonstrated by the significance of the high tech predictor in specification 2 and 4. Using column (3), the predicted probability a litigated patent is asserted by an NPE is 14.2% (22.8% total) more for high tech patents.

Furthermore, from Specification 3, I find that NPEs are far more likely than other claimants to assert business method patents. Using column (5), the predicted probability a litigated patent is asserted by an NPE is 42.2% (50.9% total) more for business method patents. This result is consistent with the arguments that NPEs strategically assert broad or unpredictable patents.

Finally, in Specification 4, I find strong evidence supporting the theory NPEs target large corporations expected to have a higher ability and likelihood of settling. Using the final column, the predicted probability a litigated patent is asserted by an NPE is 16.4% if the alleged infringer is a large corporation. However, that percentage declines to 0.3% if the alleged infringer is not.

VI. Conclusion

Given the amount of negative commentary regarding NPEs, I am surprised to find as much evidence as I have supporting those who argue that NPEs serve a useful role in the patent system and generally do not assert weaker patents then those asserted by other litigation claimants. The evidence suggests NPEs may in fact assist foreigners and individuals in collecting the rewards they are entitled to by current patent law.

Nevertheless, many of my findings are consistent with opportunistic NPEs litigating certain types of patents correlated with broad claims, emerging technologies or easier to understand arts—specifically technology and business method patents. NPEs litigate these kinds of cases far more frequently than other entities. This suggests NPEs chose their cases strategically so as to optimize their expected litigation payoff.

My findings are merely preliminary. To obtain more robust and informative results necessary for any policy recommendations, I look forward to recreating this analysis with a larger sample of patent cases and more characteristics of patent litigation and alternate measures of patent quality.

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Table 1. Descriptive Statistics for Sample of 1797 Patents Litigated in 2000 or 2001.

Variable	Mean	St. dev.	Min	Max
Litigation Characteristics				
Suit involved an NPE	0.118	0.323	0	1
Alleged infringer a large firm	0.552	0.497	0	1
Patent Characteristics				
Years between application and grant	2.08	1.15	0	9
Number of claims in patent	22.1	23.7	1	276
Citations received	11.4	20.5	0	237
Citations made	14.4	19.6	0	343
Generality	0.373	0.284	0	0.909
Originality	0.443	0.275	0	0.923
Corporate assignee	0.752	0.432	0	1
Foreign assignee	0.143	0.350	0	1
Patent Tech Classifications				
Chemical	0.069	0.254	0	1
Computer/communications	0.283	0.451	0	1
Drug/medical	0.188	0.390	0	1
Electrical/electronic	0.140	0.347	0	1
Mechanical	0.120	0.325	0	1
High tech patent	0.233	0.423	0	1
Computer related business method patent	0.039	0.195	0	1

Table 2. Probit Estimation for Patent Litigation. Estimation includes all 1.7 million utility patents granted between 1978 and 1999. The dependent variable is a dummy indicating whether the patent was litigated in 2000 or 2001.

	Specification 1		Specification 2		Specification 3	
	(1)	(2)	(3)	(4)	(5)	(6)
Years between application and grant	0.00173	0.00256	0.00553	0.00714	0.0124**	0.0137**
	(0.00679)	(0.00772)	(0.00631)	(0.00692)	(0.0052)	(0.0055)
Number of claims in patent	0.00770***	0.00859***	0.00779***	0.00883***	0.00795***	0.00893***
	(0.00037)	(0.00040)	(0.00037)	(0.00039)	(0.00037)	(0.00039)
Citations received	0.00653***		0.00704***		0.00728***	
	(0.00037)		(0.00037)		(0.00037)	
Citations made	0.00391***		0.00379***		0.00378***	
	(0.00040)		(0.00040)		(0.00040)	
Generality		0.0768**		0.0528*		0.0759**
		(0.0325)		(0.0320)		(0.0318)
Originality		0.200***		0.146***		0.177***
		(0.034)		(0.033)		(0.033)
Corporate assignee	-0.0898***	-0.1084***	-0.102***	-0.117***	-0.068***	-0.0828***
	(0.0195)	(0.0214)	(0.019)	(0.021)	(0.019)	(0.0207)
Foreign assignee	-0.285***	-0.299***	-0.295***	-0.316***	-0.286***	-0.302***
	(0.022)	(0.025)	(0.022)	(0.025)	(0.022)	(0.024)
Chemical patent	-0.209***	-0.211***				
	(0.033)	(0.037)				
Computer or communications patent	0.281***	0.304***				
	(0.025)	(0.028)				
Drug or medical patent	0.256***	0.310***				
	(0.026)	(0.029)				
Electrical/electronic patent	0.0169	0.0157				
	(0.0276)	(0.0304)				
Mechanical patent	-0.0891***	-0.127***				
	(0.028)	(0.032)				
High tech patent			0.390***	0.407***		
			(0.021)	(0.023)		
Business method patent					0.932***	1.009***
					(0.064)	(0.025)
Constant	-3.24***	-3.26***	-3.25***	-3.23***	-3.25***	-3.25***
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
Observations	1723616	1314662	1723616	1314662	1723616	1314662
Log-likelihood	-11025	-8971	11102	-9070	-11170	-9117
Prob > Chi-squared=	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parenthesis. *, **, and *** denote significance at the 10%, 5% and 1% confidence level.

Table 3. Probit Estimation for NPE Patent Litigation. Estimation includes sample of 1797 patents litigated in 2000 or 2001. The dependent variable indicates whether a litigated patent is asserted by an NPE.

	Specification 1		Specification 2		Specification 3		Spec. 4
	(1)	(2)	(3)	(4)	(5)	(6)	
Years between application and grant	0.0308	0.0625	0.0341	0.0630	0.0324	0.0418	0.0515
	(0.0375)	(0.0422)	(0.0361)	(0.0409)	(0.0360)	(0.0412)	(0.0402)
Number of claims in patent	0.00986***	0.00915***	0.01009***	0.00593***	0.0108***	0.00966***	0.00957***
	(0.00162)	(0.00194)	(0.00015)	(0.00186)	(0.0015)	(0.00186)	(0.00172)
Citations received	0.00549***		0.00686***		0.00762***		0.00555***
	(0.0017)		(0.00169)		(0.00165)		(0.00178)
Citations made	0.00100		0.00028		0.00108		-0.00020
	(0.00208)		(0.00211)		(0.00210)		(0.00234)
Generality		1.01***		1.13***		1.23***	
		(0.21)		(0.21)		(0.21)	
Originality		0.199		-0.002		0.198	
		(0.214)		(0.209)		(0.207)	
Corporate assignee	-0.191*	-0.332***	-0.159*	-0.293***	0.0019	-0.119	-0.192*
	(0.108)	(0.126)	(0.104)	(0.021)	(0.1056)	(0.128)	(0.117)
Foreign assignee	0.421***	0.528***	0.433***	0.561***	0.549***	0.653***	0.476***
	(0.113)	(0.140)	(0.110)	(0.136)	(0.109)	(0.137)	(0.122)
Chemical patent	-0.459	-0.452					
	(0.317)	(0.367)					
Computer or communications patent	0.926***	0.831***					
	(0.143)	(0.189)					
Drug or medical patent	0.0489	0.146					
	(0.172)	(0.222)					
Electrical/electronic patent	0.672***	0.744***					
	(0.160)	(0.207)					
Mechanical patent	-0.144	-0.116					
	(0.211)	(0.258)					
High tech patent			0.758***	0.554***			0.689***
			(0.089)	(0.113)			(0.097)
Business method patent					1.38***	1.50***	
					(0.16)	(0.21)	
Alleged infringer a large corporation							1.73***
							(0.20)
Constant	-1.99***	-2.39***	-1.82***	-2.09***	-1.85***	-2.26***	-1.82***
	(0.16)	(0.22)	(0.12)	(0.17)	(0.02)	(0.18)	(0.12)
Observations	1797	1188	1797	1188	1797	1188	1797
Log-likelihood	-537	-347	-557	-373	-557	-357	-557
Prob > Chi-squared=	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parenthesis. *, **, and *** denote significance at the 10%, 5% and 1% confidence level.