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A FIRST LOOK AT INTERNET BUSINESS METHODS PATENTS

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A First Look at Internet Business Methods Patents

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A First Look at Internet Business Methods Patents

Abstract

Despite the concerns about the proliferation of software and Internet business patents, there has been no systematic empirical research on Internet patents. In this project, I take a first-look at Internet patents. I examine whether there are systematic differences between Internet business method patents and other software patents in the same patent classes.

Keywords: Patents, Internet, Software, Empirical Study
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A First Look at Internet Business Methods Patents

Non-technical summary

Legal scholars, economists, and firms in the industry are concerned that the policy change permitting the patenting of computer software in general, and business methods in particular, may adversely affect the incentives for innovations.

In this project, I examine whether there are systematic differences between Internet business method patents and other software patents in the same patent classes.

I find that there are some systematic differences between Internet/software patents and other patents in the same patent classes:

(i) Internet patents had fewer citations than other patents granted in the same classes. At the same time, Internet patents were assigned to fewer international patent subclasses than non-Internet patents.

(ii) Small entities were more likely to receive Internet patents than other software patents in the same patent classes.

(iii) Firms in foreign countries were less likely to receive Internet patents than firms in the U.S.

(iv) Internet patents issue faster than other patents in the same classes.

1. Introduction.

Historically, the U.S. Patent system has not granted patents for software-related products or inventions, such as business methods. Several authors note that a significant policy change occurred in the late 1980s. "Since the late 1980s, the U.S. Patent and Trademark Office with the encouragement of the U.S. Court of Appeals for the Federal Circuit has relaxed the standards governing the issuance of patents for software-related inventions (Menell (1998) p. 712)." "The Federal Circuit endorses [software] patentability without qualification (Cohen and Lemley (2001) p. 1)." Additionally, a 1998 appellate court decision in the State Street Bank & Trust v. Signature Financial Group explicitly recognized the patenting of business methods. See Lerner (2001). These policy changes have resulted in an exponential increase in applications for and grants of software-enabled business method patents.[1] According to Cohen and Lemley (2001), approximately 40,000 software patents have issued.

Legal scholars, economists, and firms in the industry are concerned that the policy change permitting the patenting of computer software in general, and business methods in particular, may adversely affect the incentives for innovations primarily for two reasons.

- As Jaffe (1999, p.35) notes, "Software products tend to be 'systems' constructed from many different pieces." Patents on pieces of software can lead to a hold-up problem and foreclose competitors. At the very least, software patents require a potential entrant to obtain many different licenses in order to produce a product. Additionally, software products need to be inter-operable or compatible. Patents on network aspects of software can provide monopoly power and limit the ability of firms and consumers to benefit from network effects that are quite prevalent in the software industry.[2]

[1] Kortum and Lerner (1998) examine the recent surge in patent applications.
[2] Gandal (1994) and Gandal, Greenstein, and Salant (1999) provide empirical evidence of network effects in computer software.

- The software industry developed in a setting without patent protection and in an environment in which the courts typically limited copyright protection to "non-network features" of software. (See Merges (1999).) Despite the limited intellectual property rights protection, the software industry was characterized by significant and rapid innovation. Prusa and Schmitz (1991) find that new entrants made many of the important advances in computer software. If preemptive patenting by large established firms proves to be a significant barrier to the entry of new firms, the software industry might experience less innovation. This is especially true in the case of the Internet, where standard setting is in its infancy.

The loudest concerns have been voiced about Internet business methods patents, which typically fall into patent class 705. Several recent Internet business methods patents seem to justify these concerns. Amazon.com recently sued Barnesandnoble.com, an Internet rival, over its patent on an "express checkout system," which is used by half of all online retailers.[3] In December 1999, a federal judge ordered Barnesandnoble.com to stop using the Amazon system.[4] Additionally, Double Click of NY has a patent on delivering ads over Internet, while Audiohighway has a patent on downloading music from Internet. Sony has a patent on a technology that can automatically download a web page at fixed intervals.

Despite the concerns about the proliferation of software and Internet business patents, there has been no systematic empirical research on Internet patents.[5] In this project, I examine whether there are systematic differences between Internet business method patents and other software patents in the same patent classes. Tables 1 and 2 below show that only a handful of Internet patents issued before 1998. So in some sense, this study is

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[3]See Kaufman, L., "Amazon Sues Big Bookseller Over System For Shopping," NY Times, Business/Financial Desk, October 23, 1999.

[4]Hansell, S., "Amazon Wins Court Ruling to Protect Patent on Order System," Business/Financial Desk, December 3, 1999.

[5]Lerner (2001) examines the relationship between academic research in finance and patents for financial formulas and methods.

premature. Nevertheless, given the importance of the Internet and the concern about the breadth of Internet/software patents, it is important to examine even preliminary data.

I find that there are some systematic differences between Internet/software patents and other patents in the same patent classes:

(v) Internet patents had fewer citations than other patents granted in the same classes. At the same time, Internet patents were assigned to fewer international patent subclasses than non-Internet patents.

(vi) Small entities were more likely to receive Internet patents than other software patents in the same patent classes.

(vii) Firms in foreign countries were less likely to receive Internet patents than firms in the U.S.

(viii) Internet patents issue faster than other patents in the same classes.

I discuss these results in greater detail in sections 4 and 5.

The paper proceeds as follows. In section 2, I provide some background material. Section 3 discusses methodology and describes the data. In section 4, I estimate a simple model and discuss the results. Section 5 provides preliminary conclusions and suggestions for further work.

2. Background

Since the public policy concern is about "software" rather than "hardware" patents, the treatment group in this study is "Internet software" patents. The "treatment" group is defined to be patents with the words or phrases "Internet", "world wide web", "world-wide web", or "www," in the title or abstract that have classes 705, 707, and 709 as the *first (or primary) classification* in 1999. This yielded 260 patents. In class 705, there were 62 such patents, class 707 had 68 such patents, and class 709 had 130 patents. Many patents have multiple US classification numbers. If all patents with 705,707, and 709 classifications had been included, there would have been 319 such patents in 1999. See tables 1 and 2.

Table 1 shows that slightly more than 55 percent of all Internet patents list one of these three classes as the primary class. Table 2 shows that over time approximately 60 percent of all Internet patents are assigned to at least one of the three classes (705,707,709).

Class 705 is defined by the USPTO as "Data Processing: Financial, Business Practice, Management, or Cost/Price Determination." This class includes the many of the so-called "outrageous" software patents. Class 707 is defined to be "Data Processing: Database and File Management, Data Structures, or Data Processing," while class 709 is defined to be "Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating." [6]

There clearly is some overlap among these patent classes. Table 3 shows that there is more overlap among these patent classes for Internet patents than other software patents, especially for classes 705 & 709.

The total number of patents that have been issued in these three classes has grown at a much higher rate in recent years than the overall rate of patenting in the U.S. See table 4. Clearly some of the explanation is due to the "friendly court" policy that has prevailed since the late 1980s, although Kortum and Lerner (1998) provide evidence that much of the increase in patenting is due to rapid advancements in technology in general, and information technology in particular.

The control group consists of 346 randomly selected non-Internet patents from these patent three classes for 1999. The control patents were selected randomly so that approximately 9-10 patents were included from each of the three classes each month.

Before I discuss the data, it's interesting to note that the USPTO also uses a definition to identify "Internet-related" patents. Their definition of Internet-related is much broader

[6] See the USPTO at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/def/index.htm for details on patent classes.

than my definition. It includes all of the phrases I employ, as well as such phrases as "ftp site" and "telnet." See USPTO (2001) for the complete list of phrases. The report issued by the USPTO on Internet-related patents does not undertake any analysis, but rather breaks the patents down by domestic v. foreign grants and by patent grants per firm. In 1999, 3341 U.S. patents and 651 foreign Internet related patents issued. The countries with the greatest number of Internet related patents in 1999 were Japan (314), Canada (90), the U.K. (57), and Israel (34). The three firms with the largest number of patents granted in 1999 were IBM (477), Microsoft (165) and Sun (158).

3. Methodology & Discussion of Data

I compared the Internet patents to the control group by U.S. patent class.[7] The comparisons involved:

- Patent breadth or scope: Are the Internet business method patents broader than other patents in the same patent class? Lerner (1994) used the number of international patent subclasses as a proxy for patent scope. He also considered using US patent classes as a proxy for patent scope, but rejected this variable in part because "the U.S. classification system has not had a systematic overhaul since 1872 (p.321)." He justifies this approach by showing that patents assigned to more international subclasses (i) are more likely to be cited in future patents, i.e., they have more forward citations,[8] and (ii) are more likely to be litigated. Since Internet patents are in a nascent stage, we cannot compute forward citations, nor can we examine patent litigation.[9] Hence, we employ the number of

[7]Lanjouw and Schankerman (1999) have used similar methodology to examine the characteristics of litigated patents.

[8]Trajtenberg (1990), and Jaffe, Trajtenberg, and Henderson (1993) have used patent citations to measure the value of innovations.

[9]As was mentioned earlier, this project can be thought of as a pilot study. Hopefully, it will encourage the collection of data over a longer period of time.

international patent subclasses as a proxy for patent scope. I explore whether this measure distinguishes the Internet patents from the control group.[10]

- Originality or "basicness:" Trajtenberg, Henderson and Jaffe (1997) propose that patents that have relatively few citations, or whose citations are diverse in terms of the technologies that they draw on, are indicative of more "basic" or "original" inventions. (See Scotchmer (1991) and Scotchmer (1996) for using the patent system to create incentives to develop basic technologies.)

- Ownership structure and nature & size of firm: Compared to the control group, are Internet business method patents typically held by large firms (with significant market power) or are they held by new firms whose major asset is the patent themselves? In the latter case, we would perhaps be less worried about the proliferation of such patents. This is a vital thing to know in judging the extent to which the flow of patents is a barrier to invention, or a necessary protection for innovation and entry for new firms.

Patentees are required to file small or large entity status. This, in part, determines the fees patentees pay. See Allison and Lemley (2000) for more details. The small entity category is further divided into three subcategories: individuals, non-profit organizations, and small businesses. Although the information is not verified by the USPTO, Allison and Lemley (2000) note that "misrepresenting entity size is illegal and can theoretically invalidate the patent" (p.8).[11]

- Location of Assignees and Inventors: I have data on the location of both the inventor and the assignee. In the study, location means state or, in the case of

[10]Another possible (although problematic) proxy for patent breadth is the number of claims included in the patent application. One can make an argument that a larger number of claims represents a broader and more general patent. On the other hand, firms may agree to reduce the number of claims in order to receive a patent more quickly.

[11]The information on small entity status is not publicly available. I am grateful to Jim Hirabayashi at USPTO, Information Products Division--Technology Assessment and Forecast (TAF) Branch for providing me with these data.

patents invented or assigned outside of the U.S, foreign country. Large firms typically invent less patents than are assigned to them. Hence if a small firm owns an Internet patent, it is more likely that firm and inventor will be from the same state or foreign country. In our data set, California and New York firms have many more patents than firms in other U.S. states and Japanese firms have many more patents than other foreign countries.

- Time to receive a patent: The time between the application date and the date a patent is received can depend on many factors including the availability of patent examiners during a particular time period. But it would be somewhat surprising to see systematic "processing" time differences among Internet and non-Internet patents from patent classes 705, 707, and 709 during the same period.

I collected the following data on all of the patents.

CITATIONS is a variable that counts the number of backward citations to existing patents.

CLAIMS is a variable that counts the number of claims in the patent.

INT_SUBCLASS is the number of 4 digit international patent classifications listed on the patent.

TIME is a variable that measures (in years) the difference between the application date and the date that the patent is granted.

IBM is a dummy variable that takes on the value one if the patent is assigned to (owned by) IBM. The variables MICROSOFT and SUN are similarly defined.

MAJORFIRM is a dummy variable that equals one if the patent is owned by IBM, Microsoft or Sun.

FOREIGN is a dummy variable that takes on the value one if the patent is owned by a non-U.S. firm.
CALIFORNIA is a dummy variable that takes on the value one if the patent is assigned to a firm or entity in California. The dummy variables NEW YORK and JAPAN are similarly defined.

SMALL ENTITY is a dummy variable that takes on the value one if the patentee has small entity status. The variables INDIVIDUAL, NONPROFIT, & SMALL BUSINESS are similarly defined. (Recall that within small entity status, the three subcategories are individuals, non-profit organizations and small businesses.) Since so few of the small entity patents are held by non-profits, we do not include this variable in the analysis.

SAME_I_A_STATE is a dummy variable that takes on the value one if the assignee and inventor are from the same U.S. state or foreign country.

Descriptive Statistics are contained in Tables 6a and 6b. It is striking to note that individuals hold 19 percent of the Internet patents; individuals hold only 7 percent of the non-Internet patents.

The three firms included in the variable MAJORFIRM own the most patents by far in the data set. Together these firms account for 20% of the Internet patents and 21% of the non-internet patents. IBM owns 13% of the Internet patents and 11% of the non-internet patents in the data set. Sun owns 3% of the Internet patents and 5% of the non-internet patents. Similarly, Microsoft owns 4% of the Internet patents and 4% of the non-internet patents. See table 5.

The tables show that California is the state with the largest number of patents in our data set. 29% of the Internet patents were assigned to firms or entities in California. 23% of the 346 non-internet patents were assigned to firms or entities in California. New York is the next largest state in terms of assigned patents. 19% of the Internet patents were assigned to firms or entities in New York, while 14% of the non-internet patents were assigned to firms or entities in New York. Many of the patents assigned to New York State have inventors that live outside of New York State. This is especially true in the case of non-internet patents where 77% of the patents assigned to New York firms have inventors who live outside of New York. (Clearly there is a large IBM effect here.) In the case of Internet patents, 50% of the patents that were assigned to New York entities were invented in New York.

Foreign entities have far fewer Internet patents than other patents in the same class. 21% of the non-internet patents were assigned to foreign firms, while only 7% of the Internet patents were assigned to foreign firms. This trend is even more pronounced for Japan, the foreign country with the largest number of patents in our data set. (Japanese firms received 62% percent of the foreign patents assigned to foreign firms in our data set.) While 14% of the non-internet patents are held by Japanese entities, only 3% of the internet patents are held by Japanese entities. This difference suggests that the Japanese firms have not yet moved into Internet business methods as quickly as U.S. firms. Nearly all of the patents assigned to Japan were invented in Japan. Of the 48 patents assigned to Japanese entities in the control group, 47 were invented Japan. Other foreign countries (excluding Japan), hold 7% of the non-Internet patents and 4% of Internet patents.[12]

4. Econometric Analysis

I estimated the following model

(1) INTERNET = $X\beta + \varepsilon$,

[12]Israel is the foreign country with the next largest number of patents in our data set. 11 of the 346 non-internet patents were assigned to Israel. No patents in the internet group were assigned to Israel. An additional 3 patents in the non-internet group were invented in Israel but assigned to US companies.

using a (maximum likelihood) binary probit, where INTERNET is a dummy variable that takes on the value one if the observation is an Internet patent and zero otherwise, X includes the explanatory variables, the β are coefficients, and ε is a random error term. The results are shown in tables 7a and 7b.[13] The difference between the two tables is that in table 7a the variable SAME_I_A_STATE is used as a proxy for small entity status. In table 7b, the variables "INDIVIDUAL" and "SMALL BUSINESS" are employed instead of SAME_I_A_STATE. There is little difference in the results.

Tables 7a and 7b show that Internet patents had fewer citations and the difference is statistically significant. This suggests that the internet patents are more likely to be "basic" innovations than other patents in the same class. On the other hand, the tables show that Internet business method patents were assigned to fewer international patent subclasses than non-Internet patents. This suggests that the Internet patents are narrower than other patents in the same class.[14]

These results seem somewhat contradictory and warrant further exploration. One possibility is that since the patentees have control over the number of citations and since the examiners have control over the assignment of subclasses, these results represent differences in opinions among patentees and examiners. That is, the patent examiners believe that the patents are relatively narrow, while the patentees believe that they are broader.

We included dummy variables for both whether the assignee was a foreign firm and whether the assignee was a Japanese firm. Thus for Japanese firms, both dummy variables take on the value 1. The estimated coefficient associated with the dummy variable for foreign firms is negative and significant, suggesting that other things being equal, firms in foreign countries were less likely to receive Internet patents (relative to other patents in the category) than firms in the U.S. The estimated coefficient associated

[13]Convergence was obtained after three iterations and the covariance matrix was computed using second derivatives.

[14]The difference in claims between Internet and non-Internet patents was not statistically significant.

with the dummy variable for Japanese firms is also negative and significant, suggesting that other things being equal, firms in Japan are less likely than other foreign countries to receive Internet patents (relative to other patents in the category) than firms in other foreign countries.

Table 7a shows that the major firms that hold patents in the relevant software categories are less likely to hold Internet patents than other software patents in the same classes. This is shown by the negative and significant sign on the variable MAJORFIRM. This suggests that Internet patents are more likely to be held by smaller firms. The coefficient associated with the variable SAME_I_A_STATE is also positive and significant suggesting that for Internet patents, inventors and assignees are likely to be in the same state. This again suggests that smaller firms are more likely to receive Internet patents.

The results of table 7b regarding small entity status are quite striking. Internet patentees are much more likely than non-internet patentees to be individuals and somewhat more likely to be small businesses. This is shown by the large positive and significant coefficient on "INDIVIDUAL" and the positive and significant coefficient on "SMALL_BUSINESS." Interestingly enough, although it is still negative, the coefficient on MAJORFIRM is no longer statistically significant in table 7b. Table 7b thus implies that a key difference between Internet and non-Internet patents is that the former tend to be held by small entities.

Both tables show that Internet patents issue faster than other patents in the same classes and the difference is statistically significant. This is somewhat surprising and deserves further examination. Is it because the (perceived) lack of prior art makes the patent examiners' work easier?

A sense of how well the models performed can be determined by calculating the correct number of predictions, where the predicted values for INTERNET are assigned a value equal to one (zero) if the estimated value of $X\beta$ is greater than (less than) one-half. Both models have a correct prediction rate of approximately 65%. In general, the models are much better in predicting non-internet patents. The model in table 7b does better in correct predictions for non-internet patents (80% vs. 73%), while the model in table 7a does better in the case of internet patents (54% vs. 44%).

5. Conclusions and Further Research

I find that Internet patents had fewer citations than other patents granted in the same class, suggesting that the Internet patents involve more basic innovations. At the same time, Internet patents were assigned to fewer international patent subclasses than non-Internet patents, suggesting that the Internet patents are less broad than other patents in the same class. As was noted earlier, further examination is needed here. If Internet patents are indeed broader, this would be troubling, since broad patents discourage future innovation.

Another potentially troubling finding is that Internet patents issue faster than other patents in the same classes. This might imply that these patents are being issued too quickly, perhaps due to the perceived lack of prior work.

On the positive side, there is strong evidence that small entities were much more likely than large entities to receive Internet patents. This suggests that preemptive patenting by large established firms is not a significant barrier to the entry of new firms in Internet related areas. This is encouraging because new entrants made many of the important advances in computer software industries. If there was preemptive patenting by large established firms, Internet related software industries might experience less innovation.

This project was a first-look at Internet patents. It would be ideal to extend this analysis to the 1998-2001 period. I hope to do so in the near future.

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TABLES

Table 1: Internet Patents by (first) U.S. Classification: 1999

U.S Classification	Number of internet patents
Class 709	130
Class 707	68
Class 705	62
Class 370	40
Class 345	34
Class 370	30
Class 713	25
Class 395	12
Other Classes	72
Total	473

Table 2: Internet Patents, 1996-2000.

Year	Internet Patents	Internet Patents in classes 705,707,709
2000	650	382
1999	473	319
1998	195	129
1997	27	16
1996	6	4

Table 3: Overlap Among Patents in Classses 705, 707, & 709 in 1999

	705 only	707 only	709 only	705&707	705&709	707&709	All three	Total
All	826	1372	1653	84	57	274	34	4300
Internet	53	58	135	8	19	37	9	319
Others	773	1314	1518	76	38	237	25	3981

Table 4: Total Number of Patents in Classes 705, 707, & 709, 1996-2000

Year	# of patents: Class 705	# of patents: Class 707	# of patents: Class 709	Total # of patents Overall
2000	1056	1642	2290	176,350
1999	1001	1764	2018	170,265
1998	741	1587	1872	166,801
1997	382	799	777	125,884
1996	274	672	638	122,953
1995	203	513	463	114,864

Table 5. Ownership of Patents by Firms.

	Total # of patents in data set	Internet Patents	Percent Internet
IBM	72	33	46%
SUN	27	8	30%
Microsoft	25	11	44%
Fuji	17	3	18%
Intel	15	5	33%
ATT	10	8	80%
Other Firms	440	192	44%

Table 6a: Descriptive Statistics for Non-Internet Patents

Variable	No. of obs.	Mean	Std. Dev.	Minimum	Maximum
CITATIONS	346	13.77	15.11	0	168
CLAIMS	346	22.90	18.92	1	181
CALIFORNIA	346	0.23	0.42	0	1
JAPAN	346	0.14	0.35	0	1
NEW YORK	346	0.14	0.34	0	1
INT_SUBCLASS	346	1.06	0.26	1	3
TIME	346	2.67	1.07	0.75	8.67
FOREIGN	346	0.21	0.41	0	1
MAJORFIRM	346	0.21	0.41	0	1
SAME_I_A_STATE	346	0.64	0.48	0	1
SMALL_ENTITY	343	0.23	0.42	0	1
IINDIVIDUAL	343	0.073	0.26	0	1
NONPROFIT	343	.0058	0.076	0	1
SMALL BUSINESS	343	0.15	0.36	0	1

Table 6b: Descriptive Statistics for Internet Patents

Variable	No. of obs.	Mean	Std. Dev.	Minimum	Maximum
CITATIONS	260	12.33	11.10	0	79
CLAIMS	260	24.61	19.19	1	204
CALIFORNIA	260	0.29	0.46	0	1
JAPAN	260	0.031	0.17	0	1
NEW YORK	260	0.19	0.39	0	1
INT_SUBCLASS	260	1.03	0.17	1	2
TIME	260	2.47	0.60	0.75	4.08
FOREIGN	260	0.070	0.25	0	1
MAJORFIRM	260	0.20	0.40	0	1
SAME_I_A_STATE	260	0.72	0.45	0	1
SMALL_ENTITY	259	0.40	0.49	0	1
IINDIVIDUAL	259	0.19	0.39	0	1
NONPROFIT	259	.0077	0.088	0	1
SMALL BUSINESS	259	0.20	0.40	0	1

Table 7a: Probit Regression, Dependent Variable INTERNET

Independent Variables	Coefficient	T-statistic
Constant	0.52	1.51
CITATIONS	-0.0090	-2.06
CLAIMS	0.0025	0.86
TIME	-0.15	-2.39
INT_SUBCLASS	-0.40	-1.58
MAJORFIRM	-0.40	-2.47
SAME_I_A_STATE	0.39	3.23
CALIFORNIA	0.080	0.62
NEW YORK	0.50	2.65
JAPAN	-0.63	-2.05
FOREIGN	-0.46	-1.91
Total Observations 606		
Log Likelihood –384.1		

Table 7b: Probit Regression, Dependent Variable INTERNET

Independent Variables	Coefficient	T-statistic
Constant	0.51	1.65
CITATIONS	-0.0074	-1.73
CLAIMS	0.0030	1.03
TIME	-0.12	-1.73
INT_SUBCLASS	-0.43	-1.65
MAJORFIRM	-0.22	-1.30
INDIVIDUAL	0.69	4.01
SMALL_BUSINESS	0.28	1.87
CALIFORNIA	0.12	0.91
NEW YORK	0.37	2.05
JAPAN	-0.44	-1.39
FOREIGN	-0.46	-1.88
Total Observations 606		
Log Likelihood –379.2		