Trademark Data as Economic Indicator: The United States, 1996-2000

Jay D. Gatrell and S.L. Brian Ceh
Department of Geography, Geology, & Anthropology Indiana State University, Terre Haute, IN USA 47809

This paper explores the overall efficacy of using trademark data as an economic indicator. The paper posits that trademarks—like other measures of innovation and technology production, such as the patent or R&D expenditures—can be used as an effective indicator of regional economic conditions. Yet, trademarks are distinct in that they are market centered. Unlike the production-centered innovations often associated with patents, the overall geography of innovation charted using trademark data and the performance of trademarks as an economic indicator is inherently different. Using ordinary least squares regression, the paper demonstrates that observed trademark activity can statistically predict two standard measures of economic conditions at the state-level, gross state product and personal income. The paper also maps the geography of trademarks and identifies potential points of departure relative to the established geographies of technology production.

Note: A trademark includes any word, name, symbol, or device, or any combination, used, or intended to be used, in commerce to identify and distinguish the goods of one manufacturer or seller from goods manufactured or sold by others, and to indicate the source of the goods. *United States Patent and Trademark Office (USPTO), 2001*

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Innovation studies are familiar territory for geographers. Over the past two decades, researchers have wrestled with the question of innovation and innovative regions. In the process, these same researchers have struggled to define appropriate metrics of innovation—such as total patents, patent citations, R&D spending, R&D performance, R&D expenditures, university-region linkages, and many other factors (Jaffe 2000; O'hUallachain 1999; Mitchelson 1999; Audretsch and Feldman 1996; Feldman and Florida 1994; Florida and Kenney 1994; Griliches 1990). While patents have emerged as a dominant measure of innovation, no single measure captures the full complex of socio-spatial relationships between individuals, firms, and the marketplace that define innovative milieus.

Yet, unlocking the socio-spatial relationships that promote innovation is an important and essential task because innovation and associated regional development issues are embedded within a decidedly 'local' or 'regional' collection of social, economic, and cultural structures (Malecki 1991; Saxenian 1994; Markusen 1999). As such, the purpose of this paper is to explore using an alternative measure—trademarks—to assess innovation (or perhaps more accurately corporate creativity) and predict economic change.

Trademarks Defined

Trademarks protect brand names, symbols, devices or other unique items that serve to identify firms and their goods. Trademark materials range from logos and slogans to more stylized devices designed to differentiate firms and their products in the marketplace. While the definition of a trademark is deceptively basic, the reality of the trademark is much more complex. Trademarks are more than a firm's linkage to their products in the market—they are the result of a complex set of specialized transactions within and between firms referred to as 'branding'. The activities are so important that the trademark itself often embodies the corporate culture of a firm and enables firms to enter new markets based solely on earlier commercial success and their recognizable trademark. For example, the widely recognized Nike Swoosh® arguably enabled the corporation to enter new sports equipment markets beyond the firm's original core competency—running shoes. However, the Swoosh® symbol (and the word 'Swoosh') are only two examples of a long list of items that can be trademarked, or 'marked', within the context of a firm's activities or products. The full range of 'mark-able' activities include words, phrases, slogans, or other design elements that distinguish a product in the market. For all of the above reasons, the 'branding' strategies of firms and related trademark activity represent a form of firm-creativity, market innovation, and market expansion.

The proliferation of trademarks in the late-1990s is a testament to the ease of the overall registration process and the overall importance of trademarks to the strategic and practical operation of firms in the market. In terms of the registration process, firms (or their designate—usually an attorney) complete a simple application process. The minimum application requirements are: (1) the name of the applicant; (2) a specimen; (3) a drawing of the mark (text or graphic); (4) a description of the basis for the application that demonstrates the use of the mark "in commerce"; (5) the application fee ($325 as of December 2002); (6) a list of goods and services associated with the mark; (7) a contact address; and (8) the signature (USPTO 2002). Today, the process is even simpler now that applications can be completed on-line. Indeed, the electronic system has a real time validation process that assures the submission includes all of the required information. The review process proceeds through 3 stages to determine the legal status of the application. The review process requires: (1) a review of existing marks to ensure the mark is original and does not infringe on the rights of others; (2) an assessment of the mark to determine merit (i.e., marks can not be merely descriptive, deceptive, or ornamental)[1]; and (3) "publication for opposition" in the weekly *Official Gazette*. Provided an applicant has overcome the merit threshold, no conflicting marks exist, and no other party claims/challenges the mark within 30 days from publication, the applicant will be awarded certificate of registration.

Trademarks as Evidence of Creativity

Despite the breadth of activities that are protected under the United States Patent and Trademark Office's (USPTO) 4 mark types (certification, service, collective, or general trade), trademarks capture the overall robustness of firms and economies insofar as trademarks cover a range of business behaviors, transactions, and outcomes. Hence, the trademark represents an investment in a specific, often new, economic activity and is a form of intellectual capital. More importantly, the decision—and investment—of firms to seek protection concretely demonstrate changing or shifting market strategies and economic conditions. For this reason, identifying spatial patterns of trademarking may prove to be an effective approach towards charting the trajectories of local economies and assessing the creative capacity of regions.

Protecting Intangible Assets

Because of the competitive nature of the marketplace, trademarks are an indicator of not only creativity broadly conceptualized—but also attempts by firms to reposition themselves and their products in the market. While it would be easy to dismiss trademarking as mere marketing tactics, these activities do not occur within a vacuum. Indeed, creative market activity (including 'branding') serves to articulate new niches in a constantly changing marketplace (Valentin-Mari 2000). Indeed, the growth and expansion of intellectual property devices (including trademarks) are often considered an essential condition for entrepreneurism and economic growth and are useful technological indicators (USPTO 2002). It is within this context that we believe trademark activities can be used to understand and explore the rapidly evolving nature of new and emerging markets and associated economic change. During the 1990s, the relationship between trademark activity and economic change is especially interesting in the U.S. as the growth of trademark activity has grown at a much faster pace than patenting (Table 1). While patents are the 'workhorse for obtaining the exclusive right' to a tangible technological innovation, the dynamics of contemporary competition, the emergence of new media (like the Internet), and globalization promote the expansion of trademark activity (Foudree and Trzyna 1999, 12; Simonot Benichou and Ponsi 2001).

Given the many potential uses of trademark data, the use of trademarks as a measure to identify regional patterns of human creativity has yet to be fully explored. This is evident by the fact that only one study can be isolated that examines the general geography of trademarks (Ceh and Hecht 1990). The authors use of trademarks is based on the assertion that patents and trademarks are inter-related innovation measures. Similarly, Greenhalgh et al. (2001) have concluded (and demonstrated) that trademarks—as a form of intellectual property—can be used as 'proxies' for technology-based economic activities. In the process, Greenhalgh and others establish that the trademark activity of firms produce social gains such as increased employment, wages, and productivity at the firm-level (Greenhalgh and Longland 2002; Greenhalgh et al. 2001; Bosworth et al. 2000).

Having demonstrated that trademarks and other protected forms of intellectual property produce known social benefits within and between firms, Greenhalgh and Longland (2002, 5) still recognize that innovation studies have failed to fully acknowledge the essential importance of and different nature of trademarks relative to patents. As such, standard metrics—such as patents and R&D spending—continue to dominate the literature. Yet, trademarks—unlike patents—detail strategic market-oriented (not production-oriented) activity that is inherently absent from other data sources (Bouchoux 2001). This important difference is reinforced by recent trends observed in the United States and around the world.

At the global scale, record numbers of trademarks are being registered with the World Intellectual Property Organization (WIPO) (WIPO 2001). In the case of a UK study, the global intellectual property strategy of firms has been characterized by a rapid and recent acceleration in trademarks relative to patents (Bosworth et al 2000). In the United States, the historical trend in patents and trademarks has been similar since the early-1970s. Yet, the general trend suggested by Bosworth et al. (2000) can be similarly observed in the U.S. (Table 1 and Figure 1). That is, total trademark applications have grown considerably in recent years and the overall growth of total trademark applications compared to total patent applications is tremendous.[2] In empirical terms, the rate of increase between 1974 and 2000 was an astounding 1097 percent compared to an observed growth of 286 percent in patent applications. In tandem, these national and global trends suggest the range of decision-making processes and behaviors associated with trademarks is distinct from patents. Indeed, the decision making process associated with the protection of all intellectual property is complex and device specific (patent, trademark, or copyright) and varies within and between firms, regions, and sectors (Foudree and Trzyna 1999; Levine 1997).

Given that previous research that has linked trademark activity to firm-level conditions, observed trends in trademarking nationally and the distinct character of trademarks, we believe trademarks can be used to understand the dynamics of regional economic conditions. Yet, some critics may note that trademarks, like patents, are an imprecise measure of innovation because of the many strategic decisions that must be answered by firms

Table 1 Applications

FY	Trademark	Patent
1974	34193	108927
1975	33898	107662
1976	37074	109227
1977	44539	109773
1978	50106	108744
1979	50672	107409
1980	52149	112315
1981	55152	114710
1982	73621	124800
1983	51014	105704
1984	61480	117985
1985	64677	125931
1986	69253	131403
1987	70002	137173
1988	76813	148183
1989	83169	163306
1990	127294	174711
1991	120365	178083
1992	125237	185446
1993	139735	188099
1994	155376	201554
1995	175307	236679
1996	200640	206276
1999	295165	278268
2000	375428	311807
Percent Growth	1097.97%	286.25%

Source: USPTO Annual Report various years.

before they seek to protect intellectual property (see Levine 1991; Griliches 1990). Indeed, Griliches (1990) notes these factors (and others) may place inherent limits on the ability of intellectual property devices as economic indicators (see also Worgan and Nunn 2002). In cases where the geography of a protection device is considered, the geography of trademarks (as mapped and assigned) is consistent with a home base strategy and may not specifically chart the geography of the innovation per se (Worgan and Nunn 2002). That is, patents and trademarks are 'assigned' to the firm and its location—not the specific innovator.[3] Bearing these issues in mind, trademark activity does represent a concrete and measurable action on the part of firms to compete and strategically position themselves and their products within the market place and has been to predict observed conditions (for example, Greenhalgh et al. 2001; Bosworth et al. 2000; Ceh and Hecht 1990). As more firms compete and markets become increasingly segmented, the strategic efforts of firms in niche markets are likely to be documented vis-à-vis the trademark. As such, trademark data can be used to capture innovation.

For the above reasons, trademark data may prove to be an effective measure of human creativity, innovation, and new venture activity. While certainly no single measure of innovation is ideal, trademarks are arguably an effective measure of new economic activity. Because of this, trademarks should be included in the suite of measures used by researchers to investigate the relationship between innovation and economic change.

Data and Models

To explore the general efficacy of employing 'trademarks' as a measure of innovation and predictor of observed economic conditions, data were obtained from the United States Patent and Trademark Office, Bureau of Economic Analysis, and U.S. Census Bureau. Data were available for all 50 states and the District of Columbia and pooled by year.[4] As a result of the pooling process, a total number of 255 valid cases (n=255) were obtained. Finally, income variables have been inflated (or deflated) to reflect 1996US$ using the President's Annual Economic Report (Council of Economic Advisors 2001).

For the purposes of this study, the dependent variables (gross state product per capita and personal income per capita) used in this study have been selected because they are standard measures used by the National Science Foundation's publication series entitled *Science and Engineering State Profiles*. The study predictors are TMA, TMG, RAG, PA, PG, and RAP. While the ability of trademarks to predict economic conditions represents a new contribution to the literature, the use of patent data as an indicator of knowledge production is also consistent with the *Science and*

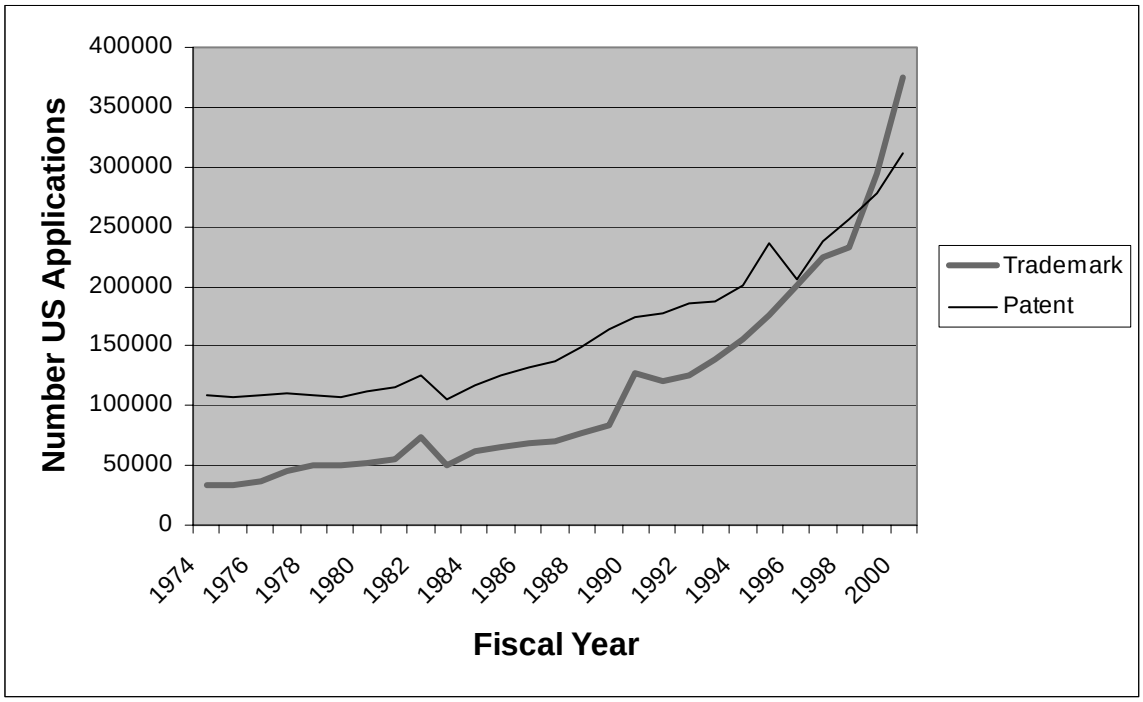

Figure 1. Total U.S. Applications, 1974-2000
Source: U.S. Patent and Trademark Office, 2001.

The following variables were created:

GSP = gross state product per capita;

PI = personal income per capita;

TMA = total annual trademark applications per state lagged by 1 calendar year;[5]

TMG = total trademarks awarded per capita;

RAG = the proportion of applications to marks granted;

PA = total annual patent applications per state lagged by 1 calendar year;

PG = total patents awarded per capita; and

RAP = the proportion of applications to patents granted.

Engineering State Profiles and well established in economic geography.

In addition to the variables described above, three other variables have been created. First, a pooling metric was created (T). The creation of a dummy variable in a pooled time-series like this study serves to control for variance within and between the annual data sets (see Gatrell 2002; Lin et al. 2001; DeVol 1999). Second, two interaction terms were created to account for the interaction between patent and trademark activity. Using the general principles of the expansion method (see Casetti 1972), ratio level data were interacted (PA*TMA and PG*TMG).

For geographers, the interaction of variables using the 'Casetti Method' has an added significance because the method statistically accounts for how variables interact with each other across space. The approach enables researchers to pursue 'creative' research and aids in the development of models that explore the many and diverse set of local contingencies that shape socio-spatial relationships (Casetti 1972, 81; Jones and Hanham 1995). Hence, the expansion method contextualizes empirical analysis (Jones and Hanham 1995). When used within the context of the stepwise approach (as in this study), the expansion method seeks to incorporate diversity rather than build increasingly *'more elaborate*

models in the hope of taming it' (Jones and Hanham 1995, 197). In practice, the method allows researchers to meaningfully and statistically account for a variety of inter-connected variables not modeled directly and/or reduce the total number of variables entered on the right-hand of the equation.

The pooling and interaction terms are defined below:

T = a pooling metric based on year (1996 = 1, 1997 = 2, and so on);
AI = the interaction between patent and trademark applications (PA*TMA)
GI = the interaction between patents and trademarks granted (PG*TMG).

Using the data described above, two equations were derived. The regression models presented below are tested using ordinary least squares (OLS) regression and the stepwise approach. The intent of the two rudimentary models is to demonstrate the basic utility of incorporating trademark data into future studies. Or more accurately, this pilot study may encourage further discussions and debates on the general issue of trademarks and trademark databases.

$$GSP = a + bTMA + bTMG + bRAG + bPA + bPG + bRAP + bT + bAI + bGI \quad (1)$$

$$PI = a + bTMA + bTMG + bRAG + bPA + bPG + bRAP + bT + bAI + bGI \quad (2)$$

Where
GSP is gross state product per capita in 1996$;
PI is personal income in 1996$;
TMA is total trademark applications lagged by 1 calendar year per capita;
TMG is total trademarks granted per capita;
RAG is the ratio of applications to trademarks granted;
PA is total patent applications lagged by 1 calendar year per capita;
PG is total patents granted per capita;
RAP is ratio of applications to patents granted;
T is the pooling metric;
AI is the interaction between patent and trademark applications (PA*TMA); and
GI is the interaction between patents and trademarks granted (PG*TMG).

Results

In general, the results support further research into the efficacy of using trademark data to predict observed economic conditions (see Table 2). In both equations, trademark indicators statistically account for observed variance in GSP and PI. Specifically, the observed relationship between both GSP and PI and the trademark measure TMA is direct and strong. Moreover, the performance of the specific variable TMA underscores the importance of creativity (TMA) (and by implications the related transactions) to economic growth. Indeed, creativity is itself statistically 'more powerful' that the actual protection of intellectual property (TMG) per se in both equations as TMG is not 'entered' in either analysis. In addition to TMA, the pooling metric is statistically significant and positive in both equations indicating that the relationship is increasingly positive over time. This temporal relationship is all the more impressive as the economic indicators (GSP and PI) have been inflated using the appropriate economic indicators.

Interestingly, no patent indicators are included in the stepwise analysis. Yet, the under-performance of the patent indicators does reinforce the assertion that the behaviors/activities associated with patents verses trademarks are distinct from one another legally, functionally, and structurally. In the case of the interaction terms, interaction between total patents and trademarks granted is slightly negative in equation two. This result reinforces the importance of creativity versus the ability to actually protect intellectual vis-à-vis the issuance of either a patent or trademark. Likewise, the performance of the interaction variable in equation 2 (and the absence of any interaction terms in equation 1) indicates the dynamics between the two variables vary across space; thereby suggesting that trademarking and patenting activities are not the same.

In equation one, two trademark indicators are statistically significant (TMA and RAG) and dominate the analysis. In the second equation, a single trademark indicator (TMA) strongly predicts observed variance in PI. In both cases, observed levels of TMA in states traditionally considered the hubs-of-high tech and dot-com start-ups, such as California, Utah, Massachusetts, and Colorado (Figure 2), positively co-vary with observed PI. Yet, the interaction between the patents and trademark grants (GI) suggests the traditional geography of high tech is

Table 2

Stepwise Regression Analysis[6]

(t-values)

	GSP	PI
Constant	0.02	19.63
	(20.80)	
TMA	0.002	0.608
	(26.26)	*(16.01)*
TMG	-	-
	-	-
RAG	-0.007	-
	(-11.12)	-
PMA	-	-
	-	-
PMG	-	-
	-	-
PAG	-	-
	-	-
T	0.001	1.32
	(5.04)	*(9.34)*
AI		-
		-
GI		-0.00
		(-7.86)
r-square	0.755	0.612

considerably more complex than once considered within the context of knowledge production and the protection of intellectual property.

While measures of intellectual property are associated with the growth and expansion of high tech industry, the specific device used (either patents or trademarks) may chart the unique geography of new versus the old high technology economies. That is, patents are more closely associated with sectors producing tangible (e.g. manufacturing) versus intangible (e.g. service) goods. In contrast, the performance of trademarks illustrates the highly competitive nature of the high tech information sector and the market-orientation of dot-com firms. With the high visibility of the firms in the late-1990s, the growth and expansion (or more accurately the explosion) of trademark activity in both new and old economy firms was inevitable as new companies sought to define their market and old companies sought to protect theirs (Fourdee and Trzyna 1999).

Because of the overall strength of trademark applications (TMA) in both equations, the analysis indicates the attempt to protect intellectual property and develop new intellectual capital is in and of itself an important activity. For example, one scenario by which the application process is itself important would be attempts by firms to thwart rivals. Alternately, trademark activity may also indicate the growth and expansion of new firms. In highly competitive and emerging markets, such as the Internet rage of the 1990s, trademarks may serve as one of the more valid and tangible measure of entry into a new market and/or response to competition (Hicks 2000). As such, trademark practices may also serve as a proxy measure of strategic rivalries and/or new start-ups in the marketplace.

In fact, the findings suggest the 'risk' associated with seeking trademark protection is in and of itself a determinant of overall performance of local economies. This finding (or more accurately observation) parallels Feldman's (1994) assertion that a region's *entrepreneurial ethos* matters. That is, the capacities of individuals, firms, and institutions to engage in risk taking (and the capacity of a region to support risk taking activities) are an essential condition for regional economic change. In the process, the unique findings of equations 1 and 2 with respect to applications versus awards supports a deeper investigation of non-economic conditions that drive innovation and regional development. More importantly, the equations imply that perhaps a methodological distinction could be drawn between (and future variables developed) intellectual property (awards) and intellectual capital (applications). In doing so, the relative conditions of socio-spatial structures and the manner in which these structures foster risk and knowledge creation might be more fully understood.

In terms of the overall conditions, equation 1 performs objectively better; suggesting the overall dynamics of a regional economy may be more closely tied to innovation than individual income levels per capita. Yet, the r-square value demonstrates that observed trademark activities statistically account for variance in both gross state product and personal income per capita.

Patterns

Figure 2 demonstrates that the distribution of trademark applications tends to parallel the tendencies found in the vast R&D and patent literatures. Yet, the analysis indicates that the traditional dynamics of patenting do not necessarily hold for trademarking. Indeed, an interpretation of the map based on the standard R&D and patent literatures alone can not fully account for the overall trademark performance For example, the strength of observed levels of activity in smaller states, like Minnesota, Utah, and Nevada, and the relative weakness of traditional manufacturing centers, such as the Great Lakes and Pacific Northwest, suggest the geography of trademark data is more complex than the accepted geography of technology production. For example, Michigan is a national leader in many technology indicators—but noticeably absent from the Top Ten ranking for trademark data. Like Michigan, Washington and other key performers—such as North Carolina— are absent from the "Top Ten" and these states under-perform relative to traditional science and technology indicators. The absence of Washington is even more puzzling since the state is home to software giant Microsoft and the expansion of trademarks has been linked to the growth and expansion of the software industry (Hicks 2000). While major manufacturing regions like the Great Lakes, have historically accounted for a major share of "technology" production and R&D performance (see Ceh 2001; O'hUallachain 1999; Feldman and Florida 1994), the geography of trademarks is decidedly different (see Table 3). In fact, the generally accepted principle that O'hUallachain (1999) crystallizes in the phrase "Size Matters" with respect to the production of knowledge cannot be strictly applied to trademark data.

Similarly, the performance of large states, like California, is uneven. This is especially an issue with respect to the relative success rate between applications and registrations in both patents and trademarks. Indeed, indicators of success (the ratio of lagged applications to registrations) indicate that some states are more successful than others—and major industrial states under-perform. For example, the most efficient regional economy with respect to the production and protection of intellectual property

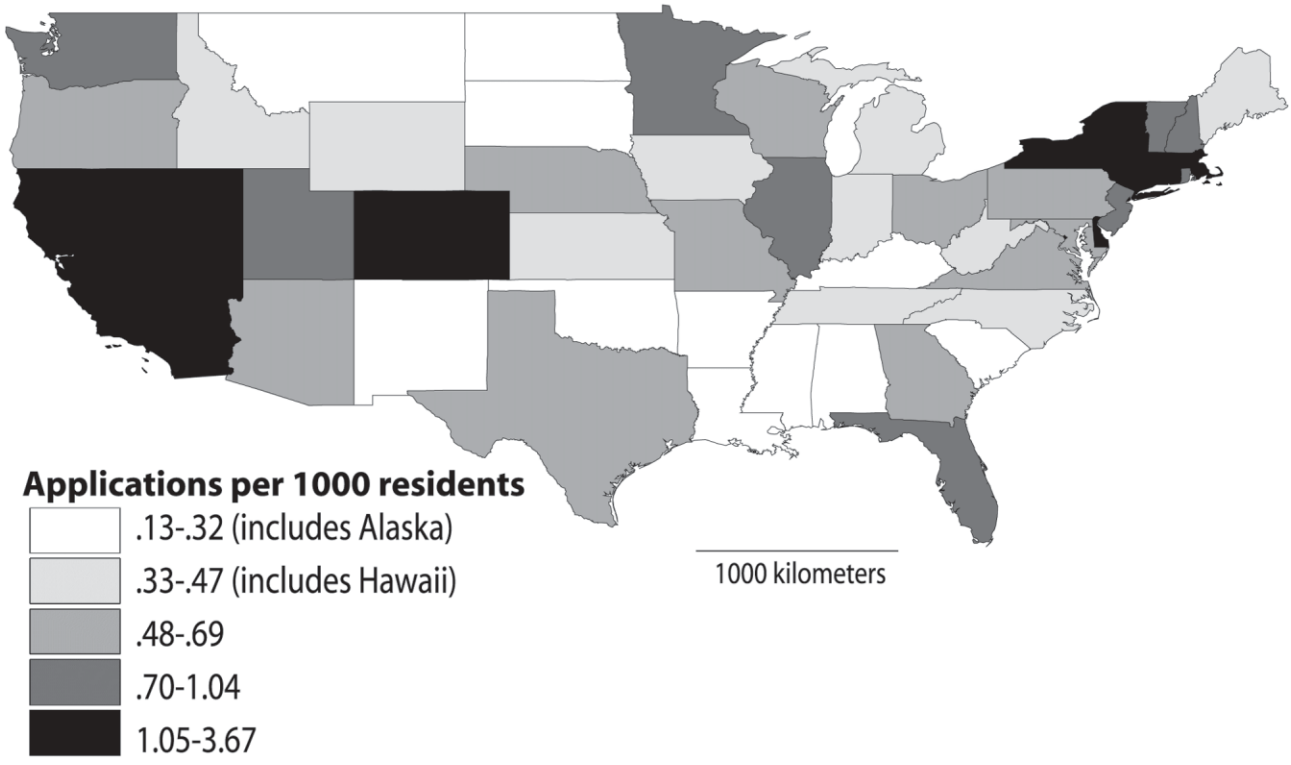

Figure 2: Average Annual Trademark Applications, 1995-1999

in the area of patenting is Indiana (one of the smallest Great Lake States). Similarly, the trademark efficiency of knowledge production systems in Wyoming, Nevada, Maine, Indiana, and others is somewhat counterintuitive. Indeed, the success rate observed with respect to patent and trademark data reinforces the assertion that different socio-spatial processes drive the decision-making process of firms. The mixed performance of classic industrial states and the emergence of smaller states (as presented in Table 3) suggests the regional variables that drive patenting and trademarking are different, too.

Suggestions for Future Research

Based on this initial geography of trademark activity in the United States, several prospective research trajectories can be identified. First, the observed differences between trademarks and other indicators indicate the behavior of firms may also vary by industrial sector. For example, the overall performance of core information technology states, like Massachusetts and California, and the emerging high-tech economies in Utah, Georgia, and Colorado that are closely associated with the so-called "New Economy" suggest the geography of trademarks may differ by industrial sector. Second, the overall efficiency associated with knowledge production systems based on the ratio of applications to registrations has the potential to unlock an entirely new research area not yet addressed in the geographic literature. That is, are more efficient intellectual property protection systems more innovative or more sustainable? At any rate, the overall efficiency of knowledge producing regions with respect to the sole issue of intellectual property is an area that has not been address in the literature. Finally, trademark data, like patents, are distinct from research and development (R&D) expenditures in that the importance of 'home base' command and control activities is evident. This appears to be the case not only in Delaware; but also New Jersey and Connecticut. Consequently, trademark data may reinforce the results of previous research. However, the counter-intuitive performance of some states suggests a traditional home-base strategy may not be observed across all sectors or indicators. For all these reasons, continued research that addresses and investigates the geography of trademark activity should be encouraged.

Table 3: Science & Technology Indicators, FY 1997

Rank	Trademark Applications	Trademarks Granted per capita	Trademark Applications per Capita	Ratio of Lagged Applications to Registration	R&D Expenditures	Industrial R&D	R&D/GSP	Patents	Patents per Capita	Ratio of Lagged Applications to Registrations
1	CA	CA	DE	DE	CA	CA	NM*	CA	DE	IN
2	NY	NY	DC	NV	MI	MI	DC	NY	CT	DE
3	IL	IL	CA	WY	NY	NJ	MI	TX	VT	MT
4	FL	FL	CT	ME	NJ	NY	MA	IL	MA	PA
5	TX	TX	NV	SC	MA	MA	MD	NJ	ID	MD
6	NJ	OH	MA	RI	TX	TX	WA	MI	MN	MI
7	MA	PA	CO	IN	PA	WA	ID*	OH	NJ	VT
8	PA	MA	NY	IA	IL	PA	NJ	PA	NH	CT
9	OH	NJ	UT	NE	WA	IL	CA	MA	CA	OK
10	GA	MN	MN	ID	MD	OH	RI	FL	CO	AL

**Major Department of Energy facilities*

Sources: USPTO 2001, NSF Science & Technology Indicators 2000

Conclusion

While these results are not intended to be definitive, they are interesting and suggest trademarks may be an effective measure of innovation and can be used to explore regional innovation systems. While not perfect, the trademark does measure activities that patents do not. Unlike patents, the protections necessary to protect a 'branded name' in emerging markets cannot be secured through other means—such as trade secrets or covert publishing tactics (Levine 1997). Instead, the trademark is a highly visible measure—and is intended to protect the most visible activities of firms. Because of this visibility and the role of trademarks in the marketplace, trademark research may prove to be an exciting and promising research area. In conclusion, the purpose of this paper has been to encourage future research into, and discussions of, the relationship between trademarks and regional economies, the geography of trademark production, and the local determinants of trademark production.

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Endnotes

[1] Trademarks can not be "primarily merely descriptive" (USPTO 2002). Marks that would be descriptive include geography (such as Midwest), surnames, or ornamental language and characteristics (such as a color or a reference to color). Also marks can not be "deceptively misdescriptive" of the good or service. For more information, visit the USPTO website at http://www.uspto.gov.

[2] Correlation analysis of patent and trademark applications data since 1974 yields a Pearson's R of 91 percent.

[3] However, we believe trademarks—unlike patents—are more closely associated with the 'home geography' of the firm as primary marketing and administrative functions tend to be located at a firm's home base. Likewise, the application process is necessarily centered at the home location.

[4] While the scale of the data is admittedly coarse, state-level data are the most readily and complete data sets available for all variables and enables the research project to observe the general relationship between trademarks and economic indicators. Additionally, state-level datasets are the primary unit of analysis in the Science & Technology (S&T) planning community and are often used by economic geographers investigating innovation (i.e., Ceh 2001; Calzonetti and Gatrell 2000, Calzonetti et al 1999; Mitchelson 1999; Feldman and Florida 1994). To see an effective and comprehensive paper that combines a policy discussion and state-level analysis of S&T data please refer to Mitchelson (1999). Nevertheless, state-level data does limit the scale and scope of the analysis. For example, state-level data does not enable the analysis to explore questions of localization, relative productivity within and between metropolitan regions, or other place-specific questions (for example, Jaffe 2000; 1994). Likewise, state-level data does not allow researchers to explore the dynamics of the technology transfer/innovation process at the firm scale (Mitchelson 1999).

[5] The data has been 'lagged' to account for the USPTO's self-reported 'action' period of 6-13 months to verify receipt (USPTO 2001). Additionally, the stated goal of the USPTO's FY 2000 annual report is to determine the registerability of all applications within 13 months. However, the exact length may be considerably longer depending upon the legal issues associated with a specific mark. The goal of the USPTO is to obtain an average action time of 5.8 months (USPTO 2002).

[6] A variance inflation factor (VIF) was calculated for each variable in the estimated equation and the VIF all variables are less than 1.75. The obtained VIF values are well below the critical levels of 5-10 which *may* suggest the existence of multicollinearity and/or the potential for poorly estimated equations.

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