THE ROLE OF EXAMINER WORKLOAD AND APPLICANT REPUTATION IN INTELLECTUAL PROPERTY PROTECTION

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INTRODUCTION

Management research has long recognized intellectual property rights (IPR) as an important barrier to imitation (Mahoney & Pandian, 1992; Rumelt, 1984). In an increasingly knowledge-based global economy, organizations invest in scientists and engineers to create innovative products and processes to enhance their competitive position (Diericx & Cool, 1989). While research has examined the success of various value appropriation strategies (e.g., Pisano, 2006) in the context of leakage, imitation and mobility of knowledge (e.g., Oxley and Sampson, 2004, Agarwal, Ganco, & Ziedonis, 2009), little research exists on the effect of applicant characteristics on the grant of such rights.

Patents can vary widely in scope, and the grant of broadly scoped patents sets up the potential for significant value appropriation from patent rights. However, imperfections in the patenting process and associated litigation can lead to significant uncertainty in patent scope and validity (Linden & Somaya, 2003; Lemley & Shapiro, 2005). This is because determining the scope of a patent is an inherently subjective and negotiated process between the patent examiner and the applicant. Our study unpacks how the scope of granted patent rights can be influenced by the patent applicant's reputation.

Organizations applying for patent rights over novel inventions engage in an exchange with patent examiners of the United States Patent and Trademark Office (USPTO). In this exchange the applicant organization agrees to disclose the details of its technological advance with the intent of securing exclusive rights. Patent examiners then evaluate the application based on its novelty, usefulness and value (Nordhaus, 1969). The assessment of novelty involves an examination of past inventions the focal invention builds on, i.e., the prior art of the invention (Cockburn, Kortum & Stern, 2006). If the application is found to be sufficiently novel, the applicant is granted exclusive rights over the technology.

Systematic bias in this process may disproportionately benefit some applicants at the expense of others and result in disincentives for engaging in inventive activity. Over-assessment of novelty grants patent holders the benefit of excessive intellectual property protection, harms competitors by blocking them from patenting similar technologies (Cockburn & MacGarvie, 2006) and results in excessive litigation over overlapping rights (Allison & Lemley, 1998). Under-assessment of novelty will result in a lower level of protection to the patent holder,

reducing incentives to invent (Cotropia, 2009). An accurate assessment of novelty is therefore essential to maintain competitive intensity and sustain inventive activity.

An accurate assessment of novelty should be the result of an objective evaluation of the state of the prior art before the invention. The determination of prior art relevant to a patent application is made jointly by the applicant, who discloses prior art known to him, and by the patent examiner who performs an independent search of the literature. While the applicant may attempt to gain a broadly scoped patent of greater value by not disclosing prior art, patent examiners try to curb such tendencies by performing an independent search. Examiners however perform prior art searches in a resource-constrained environment (Jaffe & Lerner, 2004, Lemley & Sampat, forthcoming) and are boundedly rational actors (Cyert & March, 1963). Overwhelmed by increasing workloads, ever higher levels of knowledge needed for such assessments, and a technical competency gap relative to inventors (Mack, 2006; Kesan, 2002; Cotropia, 2009), examiners may be unable to adequately search for relevant prior art and instead rely on decision heuristics (Conlisk, 1996) influenced by the applicant's prominence and inventive reputation.

Faced with cognitive constraints, patent examiners are forced to economize on their prior art search. We argue that patent examiners, when confronted with patent applications of uncertain quality, seek to infer the true novelty of an application based on social heuristics. Examiners are boundedly rational and cannot perform an extensive search of all prior art when evaluating a patent application (Cyert & March, 1963). We propose that this situation is exacerbated when examiners face increasing workloads. Furthermore, we hypothesize that examiners facing increased workloads use applicant reputation as a social signal in their assessment of application novelty. New firms without an inventive track record may suffer increased and unwarranted scrutiny by patent examiners, while incumbents endowed with a long history of inventive activity, may face lesser scrutiny of their current patent application. Thus, our study integrates behavioral aspects (Cyert & March, 1963) with social network logic (Granovetter, 1985; Podolny, 1994) to propose a new form of the liability of newness (Stinchcomb, 1965; Powel *et al.,* 1996).

Our study contributes to both the IP and entrepreneurship literatures. First, we contribute to the literature on value appropriation using intellectual property rights by unpacking the effect of an applicant's reputation on the granted scope of patent rights. Second, we provide a more complete account of the liability of newness by illustrating how age and experience based disadvantages affect young ventures in critical exchanges with government agencies.

HYPOTHESES

The application for patent rights and its eventual grant or rejection can be viewed as an exchange between the patentee and the examiner over the scope of the granted patent. The patentee has incentives to apportion as large a scope as possible in order to maximize economic rents from intellectual property rights. Examiners are expected to counteract this tendency, by searching for and citing related prior art in the assessment process, thus reducing granted patent rights.

Negotiations between the applicant and examiner can favor the role of the applicant for two reasons. First, patentees have organizational resources at their disposal to prosecute a patent application, such as legal representation and content experts. Second, examiners are constrained

by relative lack of knowledge of the focal invention compared to inventors (Mack 2006; Kesan 2002) and an ever expanding knowledge base to search for prior art.

The inadequacy of prior art searches is worsened when examiners face time-related performance targets for patent application processing, because it reduces the time available for processing individual applications (Cockburn *et al.*, 2003, Open Letter of Patent Examiners, 2007). Cognitive constraints and bounded rationality thus render almost impossible the task of conducting a full and thorough prior art search while evaluating patent applications for novelty (Simon, 1947, Lemley, 2001). Lacking time, examiner-agents perform 'satisficing' searches for prior art (Greve, 2003, Cyert & March, 1992). Such satisficing searches, resulting from high examiner workloads, allow patentees' tendencies to expand the scope of granted patent rights to run unchecked. Higher examiner workloads thus result in lowered scrutiny of patent applications and related prior art and eventually in expanded patent scope.

Hypothesis 1: Examiner workload is positively related to patent scope, controlling for application quality.

The identity of the patentee should not have any influence on the outcome of the ideal patent application evaluation (Sampat, 2010). The degree of scrutiny practiced by patent examiners with respect to prior art search should be unaffected by applicant characteristics. Such a norm of egalitarianism has been suggested of the USPTO (Merges, 1999:597) that "all patents are created equal." However, examiners often lack the time and knowledge to conduct exhaustive prior art searches to thoroughly evaluate the claims of the applicant.

When examiners cannot perfectly assess the quality of a patent application, they may be likely to appraise the application based on other observable (but inappropriate) indicators of application quality. A particularly salient indicator is the applicant's reputation in patenting, which can be observed both directly by the examiner as well as through the examiner's interaction with other examiners at the USPTO. An examiner is therefore more likely to economize on extensive scrutiny of the patent application if the examiner perceives the applicant to be a skilled and successful patentee. Prior research suggests that firms with strong patenting histories are more likely to benefit from institutional legitimacy (Shane & Foo, 1999). Resource constrained examiners are more likely to trust the claims and rely on the prior art that applicants with a high reputation for patenting submit. For such applicants, examiners are likely to search less extensively for prior art, resulting in expanded patent scope.

Hypothesis 2: Applicant reputation is positively related to patent scope, controlling for application quality.

Highly reputable firms possess expertise and experience in the patenting process. Due to their investments in securing IPRs these highly reputable applicants are likely to benefit from effective processes which make successful applications more likely. These processes include a broader understanding of relevant prior art. Based on patent law, applicants are required to disclose relevant prior art that they are aware of when submitting a patent application. Through this increased understanding, highly reputable firms are better able to frame their invention in relevant prior art.

Patent examiners facing increasing workloads are more likely to rely on applicant citations of highly reputable applicants. In order to conserve their resources patent examiners

first rely on the citations included in the patent application and then consider whether to engage in a broader search for prior art. At this point, resource constrained examiners are more likely to rely on heuristics such as an easily available assessment of applicant reputation, when evaluating a patent application. Heuristics are a common method through which individuals practice judgment in the face of uncertainty (Kahneman, Slovic & Tversky, 1982). Heuristics represent a simplification of complex situations in which individuals select certain aspects of the situation upon which to base judgments. The use of heuristics eases cognitive strain and makes decision processes more efficient. By using applicant reputation as a shortcut to assess application quality, examiners conserve time and cognitive effort when evaluating a patent application.

Hypothesis 3: The positive relationship between applicant reputation and patent scope is moderated by examiner workload such that the relationship is stronger (weaker) when examiner workload is high (lower).

METHODS

Beginning with Patent Network Dataverse (Lai *et al*., 2011) we focused on patents awarded after 2001 which was when the USPTO began distinguishing between applicant and examiner added citations. The USPTO data available through Google was used to identify the source of citations added to the patent. Our sample is gathered from all utility and design patents in the computer technology area from 2001-2009 in order to enable us to gather both five year backward and forward citations. After narrowing the patent database to the computer technology area and 2004 we used applicant identity to pull a random sample of 100 applicants. This smaller sample of patent applicants was used to enable the computation of the reputation variable. The network in this sense is reduced, but because of the random sampling we suggest that it accurately represents the centrality of applicants in the knowledge network. In sum our sample includes 23,660 patents granted to 100 applicants in the computer technology area which entered the application process in 2004.

Increase in workload. The increase in workload represents the percent increase in the examiner's patent volume in 2004 compared to the examiner's historical patent volume average. This was calculated based on the focal year's patent volume minus the average annual patent volume for each primary examiner. This difference was then scaled by dividing by the average patent volume to compute percentage changes in workload. Since percentage changes included zero, we added 1 to this variable to enable us to log the percentage change values.

Applicant reputation. Our key independent variable is applicant reputation. We employ a network based measure of public agents' perception of applicant quality (Podolny, 1993; Stuart, 1998) namely the applicant's centrality in the citation network over the past 5 years. Using these citations we constructed the knowledge network and computed the eigenvalue centrality measure for each applicant in the sample.

Reduction in patent scope. The reduction in patent scope represents the number of examiner added citations included in on a given patent award. Examiners are more likely to include citations which question the inventive advance (Akers, 1999; Criscuolo & Verspagen 2008) reducing the relevance the patent has in settling cases or securing licensing fees.

Control variables. We control for technological quality using a count measure of the five year forward citations of a given patent (Grilliches, 1990; Hall, Jaffe & Trajtenberg 2000). Second, we control for patent breadth using the number of claims in a given patent. Some patent applications inherently have a high level of citations because of its given area or because of the breadth of a given patent application. In order to control this potentially confounding variable we included the number of citations as a control. This scales the number of examiner added citations to represent a proportion of all citations. In addition, some applicants simply "throw applications over the fence" with no citations added. These applications are expected to inherently have higher levels of examiner added citations. These applications were controlled for with a dummy code variable representing 1 if the application had no applicant added citations.   We also control for patent type (utility versus design patents) and technology class.

Examiner added citations is a count variable that can take on only non-negative values and so the use of a linear regression model would result in inefficient, inconsistent, and biased coefficient estimates (Wooldridge 2010). Furthermore the distribution of examiner added citations is negatively skewed. With such dependent variable measures negative binomial regression is an appropriate analysis technique for estimates (Wooldridge 2010). All analysis is conducted using nbreg in Stata 10 with robust standard errors.

RESULTS

Hypothesis 1 predicts that examiners with increasing workloads are less likely to reduce patent scope by adding citations of prior art. To test the first hypothesis we include the workload variable which is negative (-.027) and significant ($p < .001$) indicating that as the change in examiner workload increases the number of examiner added citations decreases offering support for the hypothesis 1.

Hypothesis 2 predicts that as a given applicant's reputation increases the likelihood of examiners reducing patent scope through adding prior art citations declines. To test the first hypothesis we include the reputation variable. The coefficient for reputation is negative (-.020) and statistically significant ($p < .01$) which supports the hypothesis that as applicant reputation increases the number of examiner added citations decreases.

Hypothesis 3 predicts that both workload and reputation will be mutually reinforcing such that the relationship is stronger (more negative) when examiners face increasing workloads while prosecuting patents of highly reputable applicants. Finally, to test the third hypothesis we added reputation, workload and their interaction term. The interaction of workload and reputation is positive (.013) and significant ($p < .05$) opposite of the hypothesis.

DISCUSSION

IP rights have long been viewed as a barrier to imitation and potential source of competitive advantage. Recently scholars have suggested that the patenting process may be subject to problems of validity (Linden & Somaya, 2003; Lemley & Shapiro, 2005).

Prior research has emphasized strategic decisions made by managers upon securing IP rights (e.g., Pisano, 2006) while less work has focused on the process of securing IP rights. In this paper we have focused on the examiner-applicant relationship to better understand how examiners may be influenced by their working conditions and applicant characteristics. We find

support for our hypothesis that increases in examiner workload lead examiners to search less for prior art.

Second we suggest that boundedly rational examiners are prone to rely on heuristics of application quality. Patent examiners should ideally evaluate a patent application based solely on its technological merits; however, examiners face competency gaps and resource constraints that impede such an evaluation. We rely on the organizational ecology literature to argue that examiners will consider applicant reputation when evaluating the novelty of a patent application, and that reputation will positively impact patent scope. We find support for this hypothesis.

Finally, contrary to our hypothesis we find that examiner workload and applicant reputation appear to operate as substitutes rather than complements. Examiners with increasing workloads were more likely to reduce the scope of highly reputable applicants. In order to better understand this finding we conducted a post-hoc analysis in which we found that increases in examiner workload were highly correlated with examiner experience (p = .92). We engaged in a number of interviews with a patent examiner and attorney as well as reviewing the literature. Based on these sources it appears that patent examiners are incentivized to not make a serious error. Patents widely publicized for being subpar represent a strong incentive for examiners not to make a serious mistake when evaluating a patent application. Thus when considering the potential tradeoffs for evaluating a patent application, experienced examiners may be more likely to consider the potential risks of not scrutinizing a well-known and reputable applicant when compared to other applications. Because of the applicant's reputation, experienced examiners may be more likely to include citations when compared to less experienced examiners. Furthermore less experienced examiners may be more time constrained when evaluating patent applications because of a lack of procedural knowledge. This pressure may lead less experienced examiners to rely on applicant reputation when compared to more experienced examiners.

This research has two main limitations. The most challenging limitation is our proxy for application quality. Because our reputation measure is dependent upon prior patents we expect highly reputable applicants to submit higher quality patent applications. We control for patent quality by including forward citations and number of claims both of which have been argued to be proxies for patent quality. Future studies may consider a more qualitative measure of patent quality which includes the evaluation of patent experts. Our second limitation is the limited technological area and time scope of this study. Although the choice of technological area and year was intentional based on our research question, the findings of this study apply only to the computer technology area in 2004. Future researchers may consider including other industries and multiple years to test the generalizability of these findings.

Our study considers two previously disconnected literatures related to the institutional influences on venture performance and IP rights. We extend research on interorganizational relationships by considering how resource constraints in public organizations can influence IP protection outcomes for technology firms. Finally, we contribute to entrepreneurship research by highlighting a previously ignored dimension of the liability of newness for young technology ventures.

REFERENCES AVAILABLE FROM THE AUTHOR(S)