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Title of Research:

“Is a pro-patent policy justified: empirical evidence from Japan and the U.S.”

Purpose :

There is substantial concern among policymakers in Japan and the US about the relation between patent policy and innovation. Recently, we have seen a tendency to endorse a “pro-patent” policy as a means for increasing innovation. Many believe patent rights are essential for protecting returns to innovation (what economists broadly call “appropriability”) and therefore key to promoting R&D, productivity and economic growth. In both the law and economics, it has long been recognized that commercializing an invention or disclosing its details may elicit imitation, thereby dissipating the value to the inventor and dampening incentives to invent. In theory, patents solve this appropriability problem: in exchange for disclosure of the details of the invention, society grants the right to restrict an invention's use, thereby enhancing the incentive to invent. The effect of patents on innovation is complicated by the dual role of patent-mediated information disclosure in affecting the incentives to innovate: On the one hand, the information disclosed by own patents tends to diminish appropriability, decrease the patent premium, and thus a firm's propensity to patent and its R&D incentives (cf. Horstmann et al. 1985; Arora, Ceccagnoli, Cohen, 2003, henceforth labeled ACC). On the other hand, patents held by other firms may stimulate R&D productivity via their impact on R&D information flows and thus increase, through this channel, the incentives to innovate. Since the Japanese patent system compels the disclosure of more information sooner in the innovation process relative to the U.S., an international comparison between the U.S. and Japan should reveal the differential effects on R&D incentives of greater information flows due to patents (cf. Ordoover, 1991, Cohen et al., 2002). Furthermore, it is Japan's disclosure-based system that is associated with relatively greater R&D effort). This suggests that there may be important social welfare gains from a patent system that is balanced more toward disclosure and less toward exclusivity.

In fact, despite the policy trends, there is very little empirical support for this pro-patent policy, and some reason for skepticism (cf. Mazzolini and Nelson 1998). Because firms can capture much of the benefit from their innovations through first mover advantages, secrecy and complementary sales or manufacturing capabilities, the additional benefit from patenting the invention is uncertain, particularly because patents are costly to get and to defend, disclose information, and can be invented around (Cohen, et al. 2002). In addition, the benefits that patents provide one firm can be impediments to another firm trying to develop new technology (Scotchmer, 1991). On the other hand, prior work suggests that in some industries, particularly drugs, patents are effective in protecting returns to innovation and provide important incentives for substantial R&D (Levin, et al. 1987, Cohen, et al. 2002). Thus, the net effect of patents on R&D incentives and on technical advance is not certain.

Content/Methodology:

To address the issues raised above, we developed and estimated a firm-level model of patenting and R&D effort in Japan and the U.S. using the matched surveys

from NISTEP and Carnegie Mellon University. Responses, provided by the R&D managers, were matched to each R&D unit's focus industry that represented the bulk of its R&D effort. Our U.S. and Japanese samples allow us to construct industry-level measures for over 60 distinct manufacturing industries and has firm-level data from over 1400 respondents. We supplemented the survey data with additional archival data on public R&D spending, by state/prefecture and by field (allowing us to estimate local public R&D spending for each respondent). We also added data on whether the company was public and whether it was foreign-owned, using published sources. No prior study has this extensive a set of measures from such a broad sample of firms and industries. The combination of comparable sample from both the U.S. and Japan makes this dataset unmatched as a tool for studying patents and innovative activity. We build on prior work examining the impact of patenting on innovation in the US manufacturing sector (ACC, 2003) and compare the effects of patent protection on R&D incentives between the U.S. and Japan

We estimated a firm-level model of the patent premium (the incremental return to an innovation from patenting) and its effects on R&D spending. Our unique dataset allows us to measure R&D, patenting, the strength of patents, and information flows separately, which enables us to estimate the patent premium for each industry and for each country. We estimate a system of structural equations where patent propensity, patent applications, and R&D investments are mutually determined. Exogenous variables in the model include measures of patent effectiveness, firm characteristics (such as size, IT use, globalization and ownership), inter-firm competition, and information flows (from rivals and from public sources).

Further research will expand this line of activity to include an industry-level cross-national model. We will estimate a system of equations at the industry level in which industry R&D is partly determined by industry-level R&D spillovers, non-patent appropriability (secrecy, first mover advantages, sales and manufacturing capability) and the strength of patent protection; and, at the same time, industry R&D and patents contribute to R&D spillovers. Preliminary analyses of the US data suggest that patents have a positive effect on R&D, but that spillovers also have an independent, positive effect. By extending the analyses to include the case of Japan, we can leverage the differences in the patent systems to probe the effects of patent policies and market structures on these relationships. Since the Japanese patent system discloses more information sooner in the innovation process (Ordover, 1991), estimating such a model for the US and Japan should reveal the differential effects on R&D incentives of greater information flows due to patents. After controlling for the other factors that condition R&D, a finding that greater R&D information flows due to patents strongly encourage R&D would imply that more disclosure due to patents may not, on balance, discourage innovative effort. Such a conclusion could offer important implications for patent policy in each country. We also hope to take advantage of new survey data in Japan to do an over-time comparison.

Conclusions/Observations:

Initial findings suggest that contrary to the U.S. (cf. ACC, 2003), in Japan it is profitable to patent the typical innovation and firms show substantially higher patent propensities across all manufacturing industries. However, conditioned on having applied for a patent on the innovation, the premium on a patented innovation is higher in the U.S. than in Japan. Preliminary results also show that larger firm size and strategic offensive and defensive uses of patents (for example, for prevention of suits, cross-licensing or blocking) that go beyond the licensing and commercialization of innovations (cf. Cohen, Nelson and Walsh (2000)), tend to stimulate the returns to patenting relative to other appropriability strategies to a greater extent in Japan than in the U.S.

We also find that the disclosures due to patents held by competitors stimulate a firm's R&D productivity in both countries, although this complementarity effect is much greater in Japan than in the U.S. The results thus suggest that patent protection stimulates R&D incentives and innovative performance in both countries, but the channels that mediate such positive effect are substantially different, with important implications for both business and public policy.

We are still in the process of analyzing the data and confirming the results. The model is econometrically complex and we are still working on refining measures and specifications. Thus, these initial results should be viewed with some caution. However, the model looks promising and we believe that the key results will be robust to changing specifications.

Thus, our results suggest that the impact of patenting varies significantly between the U.S. and Japan. While our results are consistent with a pro-patent policy shift, given the large cross-industry variance in the impact of patenting on innovation, we should be cautious about inferring that stronger patents would have an overall positive effect on innovation.