

Proposal for the NBER Innovation Policy Research Grant

**Patent Arms Race:
Innovation and Litigation in the Hard Disk Drive Industry**

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January 1, 2014

PROJECT SUMMARY

The proposed research will study the relationship between innovation, patenting, and litigation. The literature on the economics of innovation suggests whether an intellectual property (IP) system provides firms with socially desirable incentives to innovate hinges crucially on its institutional quality. However, disentangling the empirical relationship between innovation, patenting, and litigation turns out to be a difficult problem because these activities stem from the firms' forward-looking and strategic behaviors, thereby making these variables endogenous.

To address this issue and empirically assess the performance of the U.S. patent system, the principal investigator (PI) and his coauthor propose to construct a dynamic oligopoly model and estimate it using data from the hard disk drive (HDD) industry, one of the best known examples of innovative industries. The model incorporates firms' benefits and costs of innovation, patenting, and litigation, respectively, and the endogenous evolution of market structure.

The PI and his coauthor, a former HDD engineer at Western Digital with his own patented inventions, have already assembled a basic panel dataset of the world's 178 HDD manufacturers including their innovation and patenting activities, from *Disk/Trend Reports* (1977–99), a commercial data-book series, and the *NBER Patent Database* (1976–2006). Our preliminary data analysis suggests patent applications and objective measures of innovation (HDD's information storage capacity in megabytes) are positively correlated in a statistically significant manner.¹

¹ Igami, Mitsuru and Subrahmanyam, Jai, *Patent Statistics as Innovation Indicators? Hard Evidence* (October 14, 2013). Available at SSRN: <http://ssrn.com/abstract=2263318>

However, this statistical regularity appears to be disrupted in years surrounding patent system reforms (e.g., establishment of the Court of Appeals of the Federal Circuit in 1982 and changes to the funding status of the U.S. Patent and Trademark Office in the early 1990s). Furthermore, the onset of a major patent litigation episode in 1988 appeared to stimulate the patenting activities throughout the industry. These observations have led us to believe that a more comprehensive, model-based empirical analysis will be fruitful for a better understanding of the impact of the IP system, and that our study should incorporate litigation activities as well.

For these purposes, we aim to focus our efforts during the academic year 2014–2015 on: (1) a thorough review of the patent reforms, and (2) the acquisition of patent litigation databases, such as Mark Lemley’s at Stanford Law School. Fortunately, the PI is scheduled to be a visiting scholar at Stanford University during the academic year 2014–2015, and hence will be in a convenient location to pursue this line of data acquisition efforts, as well as to interact with the numerous innovation scholars and other visitors including Heidi Williams.

INTELLECTUAL MERIT

This project has the potential to advance knowledge by combining the strength of multiple fields of economics including the economics of innovation, industrial organization (IO), and law and economics. The economics of innovation and law is full of important policy questions, whereas recent developments in IO have enabled researchers to quantitatively analyze problems which have been previously considered empirically intractable. The PI is one of the few economists who have started working on this potentially fruitful intersection of innovation questions and empirical IO methodologies, with emphasis on strategic industry dynamics.

BROADER IMPACTS

This project will empirically assess the welfare performance of the U.S. patent system, which is one of the most important policy issues. In particular, concerns over the so-called “patent trolls” (i.e., entities that do not commercialize patented inventions and instead focus on litigating productive firms) have led to heated policy debates and motivated recent reforms in the IP policies. Everybody understands the urgency of the issues, but there exist few empirical evidence that provide a comprehensive understanding and solution to the problem. The proposed research aims to fill this important gap.