
An Autopsy on Submarine Patents

A Window into Expectations of the World Technological Frontier

HONORS THESIS

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Abstract

A “submarine patent” is one whose issuance and publication has been intentionally delayed by its inventor with the hope that firms will independently discover and come to rely on a similar innovation at some later time, at which point the inventor causes his patent to issue and claims infringement. Although submarine patents are harmful to an innovation-led economy, previous research has struggled with how to discriminate between these subversive patents and patents whose issuance was delayed for legitimate reasons. I propose a novel identification strategy that exploits self-sorting by inventors around a 1995 policy change that was unfavorable to submarine patents. Using a regression-discontinuity design, I find that submarine patents are on average much more likely to be asserted for infringement in court cases. In addition, I conclude that submarines were more common in certain industries than others as evidenced by differential responses of industries to the policy change. Finally, I show that the failure of submarine patents within specific industries to ultimately assert infringement seems to be an indicator of which industries in the world economy experienced shifts in technological paradigms during this time, providing an additional method to assess the determinants of differences in income per capita across countries. I also describe how this result can be generalized across timeperiods.

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1 Introduction

A little-known Texas-based company filed a patent infringement complaint against social gaming giant Zynga in early 2012, alleging infringement on four patents. The issue dates of Personalized Media Communications' four patents were between June of 2010 and March of 2011, but all were filed in 1995: one on May 23, one on June 6, and two on June 7.

These four patents, and others like them, are sometimes termed “submarine patents.” This term refers to a patent whose inventor does not wish to market his invention. Instead, after filing his non-public patent application, the inventor hopes for another inventor to discover the same invention and develop it into a successful product. When this happens, like a submarine emerging from the depths, the inventor finishes the paperwork for his patent to issue and sues the now-infringing producer for a share of his profits.

Submarine patenting can be thought of in the context of the free-rider problem. If the costs of developing an invention into a marketable good are high, an inventor might choose to wait for another firm to invest in development, then extract royalties from that firm's success. Submarine patenting may also be considered to cause a deadweight loss to society in the sense that some fraction of innovators who wish to sell their products must pay an additional “tax” on their products to submarine patenters.

The economic rationale for patents is to encourage innovation. The government grants a fixed-term monopoly to an inventor in exchange for fully disclosing his invention early so that society might learn from it. At the same time, there are standards for patentability. Patents must be useful, novel, and non-obvious. The applicant carries the burden of proof of patentability, but the US Patent and Trademark Office would not be doing its job of aiding innovation if it risked disenfranchising inventors of their patents. Thus, if an inventor botches his application, he is given leniency to amend it without fear of losing his patent rights to others who would file after his original application. Section 2 discusses other legitimate reasons why a patent application may be delayed in more depth.

This paper proposes a novel strategy for identifying a large group of submarine patents. I first show that patent applicants intending to take advantage of this loophole self-sorted to file before a policy change that made submarining future patents infeasible. Having shown that patents on either side of the discontinuity are similar in all ways other than their likelihood of being submarine patents, I examine characteristics of submarine patents and find that they are on average much more likely to be involved in infringement litigation. However, I find starkly different litigation outcomes for different industry classes, and conclude that this is due to shifts in technological paradigms within certain industries. I discuss the relevance of submarine patents to measure the expectations of technological change and provide a strategy to generalize the results of this paper to construct a measure of technological expectations and identify shifts in techno-

logical paradigms over time and within industries. Such information can be useful for assessing differences in income across countries if economies that are engaged in the use of technologies that undergo paradigm shifts benefit from such technological revolutions.

The remainder of this paper is as follows. Section 2 provides background on the policy change and a review of literature within the economics of innovation. Section 3 describes the dataset of patent grants I have compiled including outward linkages to outcomes such as litigation. Section 4 puts forward a theoretical model for submarining and testable hypotheses. Section 5 conveys my findings, while Section 6 offers discussion of the wider implications of these findings to studying the economics of innovation and Section 7 finally concludes.

2 Background and Motivation

This section describes the history of the submarine loophole before proceeding to survey relevant literature.

2.1 A 21st Century Vantage Point

In order for a patent system to be susceptible to submarine patents, I argue that it must have two traits:

- (1) While the patent application is pending, other firms must have no knowledge of it. If they do, they will not use the technology.
- (2) Regardless of how long the patent pends for, once granted it must have a long enough term of force to be worth enforcing against profitable firms that rely on the invention.

Issue (1) was resolved by the American Inventors Protection Act of 1999. Since 2000, most US applications are published 18 months after filing, regardless of their status as denied, issued, or still pending.* This policy change seems to have been aimed at bringing the US in line with what other countries were doing, speeding the diffusion of knowledge, and reducing the feasibility of submarine patents.

Issue (2), however, was resolved earlier, when an agreement was signed by member nations of what was to become the World Trade Organization in 1994. With the goal of a more globally homogeneous system of IP enforcement to foster international trade, the Agreement on Trade-Related Aspects of Intellectual Property Rights contained a number of standards for laws pertaining to copyright, patenting, and other intellectual property.

One of the many standards introduced was a harmonization of patent term. TRIPS, agreed on near the end of the 1994 Uruguay Round of the General Agreement on Tariffs and Trade (GATT), mandated that

*There are a few exceptions to mandatory application publication, the most notable of which occurs when applicants certify

WTO members grant patent protection of at least 20 years, starting the clock at the filing date of a patent. Prior to TRIPS, applicants in the US were granted a patent term of 17 years from issue date. President Clinton signed the GATT on December 8, 1994, with patent term reforms set to take effect six months later, on June 8.

The effect of the policy change was a tremendous flood of patent applications just prior to the shift. On June 7, ten times as many applications were filed as any other day excluding the month leading up. The Appendix contains a press release from the USPTO from June 28 explaining that it received a quarter of the year's projected filings in just nine days. From the vantage point of 1995, this is a curious anomaly. But now that most of these applications have either issued or been abandoned, we see that this cohort of patent applications differs in important ways from other cohorts, and I will argue in Section 4 that it offers a unique window into the behavior of submarine patents.

2.2 Related Literature

This section begins with a survey of metrics that other studies have used to measure patent value, then discusses ways that economists believe inventors appropriate revenue from their inventions in different industries. After a brief summary of the sparse literature on submarine patents, I overview the vast literature concerned with the effects on the economy of differing rates of technological progress.

2.2.1 Measures of Patent Value

The patent literature is rich with a variety of metrics for patent value and quality. Much of the earliest work in defining the roll of patent statistics within economics was done by Griliches (1991) and others at the NBER's research program in productivity. The underlying motive was to better understand economic processes that lead to productivity gains – pursuing “the dream of getting hold of an output indicator of inventive activity,” in Griliches' words. Following after Scherer (1984), who linked 15,000 patents to the 443 largest US manufacturing firms in the FTC's Line of Business Survey, Griliches and others explored outward linkages to R&D figures and stock market data for publicly traded corporations.¹⁶ Griliches (1991) summarizes that a strong relationship can be identified at the cross-sectional level between R&D expenditure and the number of patents a firm has received. He further concludes that there may be evidence of diminishing returns to R&D expenditures.⁸

Hall, Jaffe, and Trajtenberg (2001) provide a more modern approach to patent data characteristic of the growing availability of digital information, particularly for patents. Of the 400 three-digit classes the USPTO groups patents into, the authors condensed the data into 36 two-digit technological sub-categories,

and ultimately into six higher-level categories: Chemical (excluding drugs), Computers and Communications, Drugs and Medical, Electrical and Engineering, Mechanical, and Others. However, their study reflects the difficulties of others who have attempted similar groupings, and they suggest that “while convenient, the present classification should be used with great care, and reexamined critically for specific applications.” They also discuss the usefulness of backward citations (citations a patent makes) as constituting a “paper trail” to measure knowledge spillovers and forward citations (citations received) as indicative of the “importance” of a patent. They put forward new measures in the form of Herfindahl concentration indices: Generality – the percentage of citations a patent makes in classes other than its own – and Originality – the percentage of citations received from other classes. They briefly discuss some validation strategies for these metrics. For example, Computers and Communications scores high on Generality, consistent with the view that it is a general purpose technology, and high on originality, in accordance with a view that it tends to break traditional models in terms of innovation.¹¹

Hall, Jaffe, and Trajtenberg (2000) provide further insight into outside linkages of patent data. The study found that, in predicting firms’ market value from patent counts, weighting patents by their citation counts could better predict firms’ market value, indicating that forward citations are in some way tied to a notion of a patent’s “value.”¹⁰

In a different vein, a comprehensive survey by Scherer and others of US and German firms found payment of renewal fees to be a reliable proxy for patent value. They also confirm that the distribution of patent values is highly skewed, with a few patents being extremely profitable.¹⁷

Table 1 summarizes and expands upon a dichotomy proposed in van Zeebroeck et al (2008), which classifies the strategies used by economists to view patent data as either patent-based or market-based.¹⁸ Many of these techniques are revisited in Section 4, in which the feasibility and applicability of their use for this project are discussed.

2.2.2 Appropriability of Inventions

Within the field of economics, two major investigations have been carried out into how firms appropriate rents from their innovations. The first, published in 1987, was a survey of 650 R&D executives in 130 different lines of business (as defined by the FTC). It is sometimes referred to as the Yale survey.¹³ The second was administered in 1994 to 1478 R&D labs, and is sometimes referred to as the Carnegie Mellon survey.⁵

The Yale survey divided its questions into product and process patents. In general, firms reported capturing profits from product innovations with patents more often than with process innovations, perhaps because it is more difficult (and less desirable) to keep product innovations secret. For processes, lead time

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