

## Chapter XVI

# The Performance of Standard Setting Organizations: Using Patent Data for Evaluation

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### **ABSTRACT**

*This chapter uses citations to patents disclosed in the standard setting process to measure the technological significance of voluntary standard setting organizations (SSOs). We find that SSO patents are outliers in several dimensions and importantly, are cited far more frequently than a set of control patents. More surprisingly, we find that SSO patents receive citations for a much longer period of time. Furthermore, we find a significant correlation between citation and the disclosure of a patent to an SSO, which may imply a marginal impact of disclosure. These results provide the first empirical look at patents disclosed to SSO's, and show that these organizations both select important technologies and play a role in establishing their significance.*

### **INTRODUCTION**

Voluntary standard setting organizations (SSOs) provide a venue for market participants to develop compatible standards on which to develop new products. These organizations provide an opportunity for markets to reach compatibility without

relying on possibly costly and inefficient government regulation and market-based standards wars. Given their potentially important role in high-technology markets, SSO's have been the subject of substantial amount of research using social science methods, with *JITSR* being an example. However, this research has primarily focused on

determining the incentives of market players to participate and implement standard setting, and on the optimal internal organization of SSOs. Our knowledge of the economic and technological impact of these institutions remains quite limited. Evaluating the role of SSOs is difficult because they operate in diverse markets and their effect on outcome variables such as price and quantity are often uncertain.<sup>1</sup>

This chapter attempts to evaluate the contribution of SSOs to the innovative process. We exploit patents disclosed in the standardization process as a metric for measurement. The treatment of intellectual property is an ubiquitous problem for SSOs and participants regularly must disclose relevant patents to SSOs in the process of negotiating a standard. In this chapter, we use these patents as a window into the role of SSOs in technological innovation. Patents are easily compared across time and industries, and many properties are well-known as a result of a large amount of research in economics and related fields.

Following the literature on patents, we use patent citations as a measure of economic and technological importance (Jaffe & Trajtenberg, 2002). Citations are well-known to be correlated with economic measures of the importance of a patent, such stock market valuation and the likelihood of renewal. We use patents identified in the intellectual property disclosure records of four SSOs: the European Telecommunications Standards Institute (ETSI), the Institute for Electrical and Electronic Engineers (IEEE), the Internet Engineering Task Force (IETF), and the International Telecommunications Union (ITU). We construct control samples based on technological class and application year of the patents.

We show that patents associated with standard settings differ from control patents in several important dimensions. They are more likely to be part of international families, more likely to be continuation applications, and much more likely to be litigated. Importantly, we find that SSO patents receive far more citations than an

average patent, around 3.5 times higher. More surprisingly, SSO patents receive citations over a much longer time period. We show that the average age at which a citation is received is higher for SSO than control patents and that the difference is economically and statistically significant. Interestingly, this difference is greater when we compare SSO patents to a group of highly cited control patents. One explanation for this long-lived citation pattern may be that innovations associated with standards are subject to lock-in and network effects, leading them to be important for a longer period than the average patent.

Two reasons that SSO patents differ from other patents are that the SSO *selects* patents that represent important technologies and that the SSO actually *causes* technologies to have the citation profile we observe. That is, we may wonder whether SSO patents would have had similar citation patterns if they had never been associated with an SSO. The selection effect is natural given that SSOs explicitly attempt to identify the best technology to serve a given need. Finding that the selection effect is important suggests that SSOs are successful in identifying important technologies. The causal effect may arise because an SSO embeds a technology in a standard that then exhibits long-lasting economic importance because of network effects and lock-in. Another source for a causal effect may be that because an SSO disclosure represents a public announcement, it attracts attention to a patent. Finding a causal effect for SSOs suggests that over and above the stated goals of SSOs in facilitating interconnection between complementary markets, SSOs have a further role in determining the path of technological innovation into the future.

In this chapter, we exploit the timing of disclosures to separate between the selection and causation effects. That is, the extent to which the citation pattern changes after a patent is disclosed to an SSO gives a measure of the causal effect of the SSO. We are cautious in this interpretation as the timing of disclosure depends on the eco-

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