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Standards, innovation, and latecomer economic development: Conceptual issues and policy challenges ☆

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ABSTRACT

Little is known about the impact of standards on the economic development of countries which are latecomers to industrial manufacturing and innovation. Standardization is regarded primarily as a technical issue, and hence receives only limited high-level policy support.

However, technical standards contribute at least as much as patents to economic growth. As a key mechanism for the diffusion of technological knowledge and due to the dominant leadership by advanced countries in patenting, technical standards have emerged in latecomer countries as an alternative to patenting. However, latecomer countries and their firms have a set of capabilities and constraints that are fundamentally different from that of advanced countries and firms. This paper argues that latecomer countries should adopt assessment criteria that are more fitted with latecomer contexts which emphasize learning effects and building dynamic capabilities. The paper discusses current issues that are essential in understanding the rise of Asian countries in standardization. We also examine the critical role that patents play for standardization and argue that "strategic patenting" to generate rents from *de facto* industry standards can stifle latecomer economic development.
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1. Introduction

There is an abundance of theoretical and econometric studies of how standards shape market competition, but most of these studies have focused on Western economies. And even for Western economies, fundamental public policy issues of standards setting remain grossly under-researched. According to two leading scholars of standards policy, "… [g]eneral

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agreement about appropriate public policy toward government standard setting does not exist. The most basic questions remain unaddressed" (Greenstein & Stango, 2007: pp. 1–2).

We know even less about the impact of standards on the economic development of countries which are latecomers to industrial manufacturing and innovation. Most of these countries are focused on upgrading their economies through innovation, as measured by patents. Standardization is regarded primarily as a technical issue, and hence receives only limited high-level policy support. However, China as well as Korea and Taiwan are now searching for ways to strengthen and upgrade their standardization systems and strategies.

In fact, standards contribute at least as much as patents to economic growth. As a key mechanism for the diffusion of technological knowledge, technical standards contribute to productivity growth. The macroeconomic benefits of standardization thus exceed the benefits to companies alone. For Germany, a widely quoted study conducted for the German Institute for Standardization (DIN) finds that a 1% increase in the stock of standards is positively associated with a 0.7–0.8% change in economic growth (Blind, Jungmittag, & Mangelsdorf, 2011).

But these econometric studies only scratch the surface. Equally important are qualitative impacts, for instance, of environmental, health, food and work safety standards. In fact, broad qualitative impacts of standards are essential for latecomer economic development – a well-functioning standardization system and strategy can work as a catalyst for translating new ideas, inventions and discoveries into productivity-enhancing innovation. Standards are the missing link in a growth strategy which seeks to create quality jobs in higher-value added advanced manufacturing and services (Ernst, 2013, 2011; Wang, 2013; Suttmeier, Kennedy, & Su, 2008). This poses an especially demanding challenge for countries which only recently begun to build up their standards systems and strategies.

Furthermore, rapid and disruptive technical change (such as the transition to the *Internet of Everything*[2]) creates new challenges for standardization. Of critical importance are *interoperability* standards[3] that are necessary to transfer and render useful data and other information across geographically dispersed systems, organizations, applications, or components (Gasser & Palfrey, 2013). Rising complexity and increasing uncertainty are two defining characteristics of the new world of ubiquitous globalization. Technology-based competition is intensifying, and competitive success critically depends on control over intellectual property rights and on "a capacity to control open-but-owned architectural and interface standards" (Ernst, 2002b: p. 330).

This process has increased the economic importance of standardization, but especially so for countries (like China and Korea) which are deeply integrated into international trade and global corporate networks of production and innovation (Ernst, 2009, 1994; Ernst & Kim, 2002). A fundamental driving force is the global fragmentation of production[4] where firms from late-industrializing countries initially at least act as contract manufacturers or, at best, fast followers in innovation. Latecomer firms are naturally disadvantaged in the world of international standards as they have not contributed the 'core technology' on which these standards are based. Their capabilities do not lend themselves to the shaping of system architectures. Latecomer firms are thus forced to accept standards and pay royalties as decided by the dominant economic players. On the other hand, firms which specialize in core technology development and contribute significant resources to ensuring their solutions are codified in standards will have strong market positions.

In short, it is necessary to strengthen our understanding of how standards are created and used in countries with economic institutions that differ from those in Western economies. Particularly, we need to place the current issues of standardization in the larger context of economic development in latecomer countries that seek to catch up with the productivity and income levels of the US, the EU and Japan.

This paper is organized as follows: In the next section, we contemplate why standardization is important in latecomer countries. Next, we raise the challenges faced by latecomer countries in their quest for technology standardization, including standardization tasks, the capabilities and strategies required. In so doing, we demonstrate that the costs of developing and implementing effective standards can be substantial, especially for latecomer countries. We further argue that based on the conditions and the constraints, successful standardization poses a different challenge for latecomer countries than for advanced countries. Developing these arguments, Section 4 explores the role of intellectual property rights for economic development and highlights the tension between standards and innovation. After examining the critical role that patents play for standardization, we also argue that "strategic patenting" to generate rents from *de facto* industry standards can stifle latecomer economic development. The paper concludes with policy implications.

[2] "The Internet of Everything" brings together people, process, data and things to enhance the relevance and productivity of networked connections – turning information into actions that create new capabilities, richer experiences and unprecedented economic opportunity for countries, businesses, communities and individuals.

[3] Standards shape innovation trajectories in all industries. Standards however are of critical importance in information and communications technologies (ICT) industries, particularly in relation to innovation, patents and other IPR issues. Therefore this paper is mainly concerned with standards and standardization in ICT industries.

[4] On the proliferation of global production networks (GPNs) and global innovation networks through fragmentation, see Ernst, D. (1997). *From partial to systemic globalization. International production networks in the electronics industry*. Report prepared for the Sloan Foundation, jointly published as The Data Storage Industry Globalization Project Report 97-02. Graduate School of International Relations and Pacific Studies, University of California at San Diego, and as BRIE Working Paper #98, Berkeley Roundtable on the International Economy, University of California at Berkeley, http://brie.berkeley.edu/publications/WP%2098.pdf; and Ernst, D. (2007). Innovation offshoring: root causes of Asia's rise and policy implications. Chapter 3 in: In Palacios, Juan J. (Ed.), *Multinational corporations and the emerging network economy in the Pacific Rim*. London: Routledge, co-published with the Pacific Trade and Development Conference (PAFTAD), London: Routledge.

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