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Transitions of Innovation Activities in Latecomer Countries: An Exploratory Case Study of South Korea

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Summary. — The main aim of this study is to explore the diverse route of innovation activities and key characteristics during the transition period of the emerging economies using the analytical framework of innovation system and product life cycle. Study distinguishes three archetypes of innovation activities: deepening of the process, architectural, and radical innovations. Study also argues that each route of innovation activities in the transition period of the emerging economies requires corresponding institutional frameworks, different base of capabilities, and different relationships among innovation actors to facilitate the transition from imitator to innovator. Finally, some policy implications of this attribute are considered.

Key words — Korea, reverse product life cycle, transition, post catch-up, innovation system

1. INTRODUCTION

Companies in latecomer countries, particularly in East Asia, are showing a strong tendency to go beyond utilizing existing technology through technology diffusion to compete as frontier players in the global markets with new products and processes. These companies are developing new strategic orientations for capacity building to create new technologies by viewing the product life cycle from a new perspective (Choung, Hameed, & Ji, 2011; Hobday, Rush, & Bessant, 2004; Kim, 1997).

Most traditional research on innovation activities of the latecomers is centered on learning and innovation activities in the catch-up period. Among these research activities, the reverse product life cycle (RPLC) theory provides a primary explanation of the evolutionary catching-up process of latecomer firms. Based on RPLC, the evolution of latecomers from adopters to creators of technology is the reverse of the firms' usual strategy in developed countries.

Although the RPLC theory demonstrates the importance of technological accumulation based on learning, assimilation, and adaptation from the mature stage, it provokes a number of questions, particularly under the changing competition environment of the latecomer firms. First, are there no other possible entry strategies except that of the entry into mature stage? Recently, latecomer firms have launched new products in the early stage of the product life cycle. The changing patterns in the latecomer firms' entry strategy require theoretical expansion of the RPLC approach. Second, which factors in the innovation system contribute to generate varieties in the entry strategies of the latecomer firms? Enabling these factors to create varieties in the firm strategies in the transition period are closely related with the organizational and institutional arrangement. In this regard, the RPLC approach is needed to expand, considering the institutional rearrangements.

This study therefore examines the emerging issues of latecomer countries undergoing transition. In particular, it explores how companies in latecomer countries approach technology creation beyond the utilization and assimilation of existing technologies. In addition, the technological capability-building process in each PLC stage is investigated in conjunction with the innovation system. The IT sector is chosen because it is the largest single export industry, as well as a challenging sector, where technological competencies are essential for competitiveness.

First, this study shows that firms do not automatically acquire the capability to create technology by simply accumulating technological capabilities; rather, technological competence must be accompanied by an organizational and institutional infrastructure that supports the acquisition of such capabilities. Successful transition from the adoption to the creation stage depends on the organizational and institutional arrangements that support innovation in a country, in addition to the strategy and resources of a single company. Second, this study argues that the timing of a firm's entry into RPLC differs in countries undergoing transition. The different paths depend on each country's level of technological accumulation, organizational capabilities, and firm strategies. Third, achieving organizational reconfiguration and institutional transformation during the transition period is important. As the country enters the fluid stage from the mature stage,

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institutional rigidity or a shortage of institutional assets may become obstacles to transition during the post-catch-up stage.

Although this study focused on Korean cases, the exploration of the post-catch-up innovation activities elucidates the understanding of the transition process toward technological advancement in newly emerging economies. This paper is organized as follows: Section 2 presents the literature review and conceptual framework for analysis. Section 3 describes three stylized taxonomies of post-catch-up innovation activities. Section 4 draws policy implications and conclusions from the "post-catch-up" discussions.

2. CONCEPTUAL FRAMEWORK: LATECOMERS' POST-CATCH-UP INNOVATION ACTIVITIES AND TRANSITION TO A NEW INNOVATION SYSTEM

(a) *Theoretical review of latecomers' innovation activities*

Discussions on the latecomers' innovation activities have been focused on why so many variations exist in the speed and performance of catch-up efforts by latecomer firms. Such micro-level discussions [1] that focused on the firms' activities and organization are categorized into three. One involves the product life cycle theory, the second attempts to understand the latecomers' catch-up and innovation strategies according to their links to the external environment, particularly the global market environment, and the third focuses on the latest frontier products.

Utterback and Abernathy (1975) divided the cycle of the product and process innovations into "fluid phase," "transition phase," and "specific phase." The fluid phase occurs from the development of a new product to the emergence of a dominant design. In the transition phase, process innovation is performed after the emergence of a dominant design. Finally, the specific phase occurs when the market has matured completely.

A series of research trends borrowed from the product life cycle theory has emerged. In developing countries, the process takes place in the reverse direction (Kim, 1997). In a mature market, universal and stable products and technologies arrive in developed countries without any further need for process innovation. These countries gradually accumulate the technological capabilities that enable them to absorb and improve upon the mature products and technologies. Latecomers use their own technological capabilities to embrace, absorb, and improve on the advanced countries' technologies.

However, this approach is based on a linear perspective in which the technological change occurs from the fluid phase to the mature stage, and thus, catch-up is interpreted as an issue of relative speed (Lee, Keun, Lim, & Song, 2005; Perez & Soete, 1988). Moreover, it ignores the fact that, in the case of the latecomer firms, some firms are capable of catching up whereas others are not, and several patterns of catch-up process can occur (Lee & Lim, 2001).

The second approach attempts to understand the latecomer firms' catch-up and innovation strategies according to their links to the external environment, especially the global marketplace. Hobday's analysis (1995) combines the technological catch-up process of latecomers in East Asia with the product life cycle theory and export strategy. In accordance with the stages of evolution involving the latecomer firms' technological capabilities, an export strategy evolves from the original equipment manufacturer (OEM) to the original design manufacturer to the original brand manufacturer in a parallel manner. Latecomer firms overcome resource deficiencies by targeting the areas that are easiest to imitate, least path dependent, and most transferrable. In other words, a strategy that involves low labor costs, imitation, and linking of global corporations through the OEM allows the latecomers to enter the global market more easily (Mathews, 2002). Discussions have been conducted on how latecomer firms acquire external sources of knowledge and accumulate technological capabilities by incorporating into the "global production network" (Ernst, 2002; Ernst & Kim, 2002).

The third approach is based on the resources in a broader sense: the technology accumulation process through learning and the accumulation of dynamic corporate capabilities. Many discussions on the latecomer firms deal with the process they employed to accumulate the knowledge needed to consume, use, apply, and modify existing technologies. These studies argued that latecomer firms must acquire three capabilities—production, investment, and innovation (Dahlman, Ross-Larsen, & Westphal, 1987)—and that the technological capabilities to generate and manage technical change can be differentiated with respect to a level. This level can be basic, intermediate, or advanced and is either a primary or a support function (Lall, 1992). Technological capabilities also consist of skills, knowledge, experience, and institutional structures and linkages (Bell & Pavitt, 1993). In addition to the accumulation of internal technological capacity, the theory on dynamic corporate capabilities that considers the dynamics achieved through linkages with external environments falls into this category (Choi, 1996). The theory explains the latecomer firms' competitive advantage from the perspectives of accumulating internal technological capacity, firm's position based on various forms of assets, and internal learning process.

With regard to the recent innovation activities of the latecomer firms, existing discussions suffer from the limitations in the following areas: first, conventional theories focused mainly on the latecomer firms' catch-up innovation activities, analyzing how they have achieved catch-up by capacity building, including the spread, imitation, and acquisition of technology. However, this view omits the latecomer firms that have succeeded in competing with advanced companies in the frontier product field after the catch-up. In particular, because both the type of innovation activities and the timing of entry into the product cycle also vary, the fragmented understanding of technology acquisition through adoption, application, and improvement in technology at the mature stage has almost reached its limit.

Second, whereas individual latecomer firms should employ strategy to leverage resources, institutional support for innovation is a salient factor in achieving competitiveness. Because latecomer firms have limited resources at the initial stage of entry, national-level institutions play an important role in helping firms overcome such limitations. The latecomer firms' innovation activities evolve through interactions with the elements of the innovation system, such as the industrial structure, the orientation of government policies, and the public research sector. Therefore, the accumulation of innovative capability by the latecomer firms must be analyzed in conjunction with the innovation system. The effect of institutions and policies differ in each country according to the capabilities and the level of income (Lee & Kim, 2009). Moreover, a system-level approach is important because clashes between catch-up systems and post-catch-up innovation activities can occur at the system level during the transition process.

Third, the resource-based approach must consider the internal corporate capacity building and the firm's interactions with the external environments. However, evolution of the technological capabilities of the latecomer firms does not