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Research Policy

journal homepage: www.elsevier.com/locate/respol



Catch-up cycles and changes in industrial leadership: Windows of opportunity and responses of firms and countries in the evolution of sectoral systems[☆]

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ARTICLE INFO

Article history:

Received 15 April 2014

Received in revised form 20 May 2015

Accepted 1 June 2016

Available online xxx

Keywords:

Industrial leadership

Catch-up

Sectoral systems

Windows of opportunity

Leapfrogging strategies

ABSTRACT

This study proposes a framework that aims to explain why successive changes in industry leadership (called also the catch-up cycle) occur over time in a sector. In catch-up cycles, latecomer firms and countries emerge as international leaders, whereas incumbents lose their previous positions. New leaders are then dethroned by newcomers. To identify factors at the base of catch-up cycles, this article adopts a sectoral system framework and identifies windows of opportunity that may emerge during the long-run evolution of an industry. This study proposes three windows related to the specific dimensions of a sectoral system. One dimension is related to changes in knowledge and technology. The second dimension pertains to changes in demand, and the third includes changes in institutions and public policy. The combination of the opening of a window (technological, demand, or institutional/policy) and the responses of firms and other components of the sectoral system of the latecomer and incumbent countries determines changes in industrial leadership and catch-up. Sectors differ according to the type of windows that may open and the responses of firms and other components of systems. Empirical evidence of catch-up cycles is presented from six sectors, namely mobile phones, cameras, semiconductors, steel, mid-sized jets, and wines.

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1. Introduction

Changes in industrial leadership from an incumbent country to a latecomer are often observed in several industries, such as the steel industry. In the first half of the 20th century, US firms dominated the production of steel, but they were soon replaced by Japanese companies that emerged in the 1970s. However, Japanese firms have been challenged by Korean firms since the 1980s (Yonekura, 1994; Lee and Ki, 2016). The successive shifts in leadership in the automobile industry are evident in the shift of leadership from

Germany to the US, the US to Japan, and possibly to Korea or China. In the mobile phone industry, Motorola invented the mobile phone and is considered the pioneer in the industry. However, Nokia gained control of the market given the emergence of mobile phones based on different standards, namely, GSM digital technologies. The era of smartphones emerged later and enabled Samsung and Apple to topple Nokia (Giachetti, 2013; Giachetti and Marchi, 2010).

These phenomena of successive changes in industrial leadership are called “catch-up cycles”. Many industries have witnessed several changes in industry leadership and successive catch-up cycles. In these cases, the incumbent fails to maintain its superiority in technology, production, and marketing. Such a failure allows a latecomer to catch up with the incumbent. Later on, the latecomer that has gained leadership will relinquish its position to a new latecomer. This study attempts to explain these phenomena by answering the following questions. How is the catch-up cycle characterized? How does it occur? How do latecomers catch up with incumbents and acquire industrial leadership?

A framework that answers these questions should include determinants of successive catch-up cycles that go beyond the product life cycle theory (Posner, 1961; Vernon, 1966); such a framework should focus on the movement of innovation and production from

[☆] Previous versions of this paper were presented at the Bocconi University Milan Workshop (2012), the Seoul Workshop (2013), and the 2013 Globelics Conference. This work was supported by a joint research program between Bocconi University and Seoul National University under the framework of an international cooperation program managed by the National Research Foundation of Korea (2012K2A1A2031787) and the Catch-up Program coordinated by Richard Nelson. We also thank an anonymous referee, and Martin Bell for his thoughtful guidance throughout the revision of the paper.

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advanced to emerging countries. The framework should start from well-established explanations of catch-up that are centered on initial conditions (Fagerberg, 1988; Fagerberg et al., 2010), macro variables (e.g., labour costs and exchange rates) (see Katz, 1995), firm capabilities (Bell and Pavitt, 1993; Kim, 1997; Lall, 2001), and national innovation systems (Freeman, 1987; Lundvall, 1992; Nelson, 1993). These studies provide comprehensive explanations on the catch-up phenomenon. However, the conceptual framework involved in examining successive catch-ups must go beyond these explanations because leadership frequently changes from one country to another and the features and determinants of catch-up differ across sectors.

We need to clarify a number of issues before we proceed with the article. First, we refer to “catch-up” as the process of closing the gap in global market shares between firms in leading countries and firms in latecomer countries. Catching up does not mean cloning. Firms and countries conduct activities differently, thereby leading to the development of an indigenous process of learning and capability building. The process of catching up firms and countries often diverges from the practices of pioneering firms and countries that serve as industry models. The organizational, managerial, and institutional aspects of productive practices are often the most difficult to replicate and must be adapted to indigenous conditions, norms, and values. Firms and countries that are catching up may perform activities that are different from those adopted by the leaders as a result of a local process of learning and capability building. The countries involved in this process may follow different trajectories of technological and product advancements and position themselves in varying ways along the catching up ladder (Katz, 1995; Bell and Pavitt, 1993; Kim, 1997; Malerba and Nelson, 2011; Lee, 2013).

Second, we define “leadership” according to the definition proposed by Mowery and Nelson (1999), who broadly used the term “industrial leadership.” These authors referred to industrial leadership as possessing advantages in world markets as a result of being ahead of one’s competitors in terms of product or process technologies or production and marketing practices and strategies (Mowery and Nelson, 1999; p. 2). The present article refers to “leadership” as the position of a country that has achieved a commanding position in a specific industry based on its share in the global market and its superiority in technology, production, or marketing. Changes in industrial leadership involve innovative behavior of the catching up country. However, the global market share of a country in an industry is difficult to measure because this often refers to the leading firms in a country. Another challenging task is comparing the dynamics of global market shares of countries over a long period because the boundaries and characteristics of the industry may change drastically over time. Given these observations, we maintain our definition of industrial leadership in terms of domination of global markets in an industry. Such a domination is assessed through a combination of measured market shares and evaluation of industry experts.

Third, we focus on the sectoral leadership of a specific country. We claim, as will be discussed later in the article, that firms share a common context related to the national or local networks, infrastructure, university system, human capital, financial organization, and institutions and policies of the country. Given this reason, firms from the same countries often emerge as leaders in a sector. Depending on the size and characteristics of a sector, this leadership may imply a large or small number of firms. For example, the wine sector consists of a large number of firms in most countries, whereas the camera industry in Japan consists of a small number of firms that changed over time from two to five or six firms. The sector may even consist of a single firm, such as steel in Korea or mid-sized aircraft in Brazil.

Finally, we focus on catching up by “latecomers”/“emerging countries” (we use these two terms interchangeably). We explain why a firm from a latecomer country could gain international leadership and eventually lose its leadership position to firms from another latecomer country. Our proposed conceptual framework is quite general and can also be applied to the catch-up of latecomer firms in a specific industry of a developed country.

This Special Issue includes an analysis of a variety of sectors from high-tech to traditional ones: mid-sized aircraft (Vértesy, 2016), mobile phones (Giachetti and Marchi, 2016), wine (Morrison and Rabellotti, 2016), semiconductor memories (Shin, 2016), cameras (Kang and Song, 2016), and steel (Lee and Ki, 2016). While in most of them the shift of leadership is in favour of Asian countries, for two (mid-size aircraft and wine) the leadership moves to Latin America or returns to Europe. In addition, the analysis of the wine sector allows us to shed light on the dynamics of natural resource-based sectors, which present peculiar features compared to the other sectors.

Our conceptual framework indicates successive catch-up cycles and changes in industrial leadership based on the notions of sectoral system and the evolution of this system. We examine industries as systems. According to Malerba (2002, 2004), the building blocks of a sectoral system consist of regimes of knowledge and technologies, demand conditions, actors and networks, and institutions. These elements interact in various ways. These interactions generate a variety of outcomes in innovative and market performance, growth, and industry structure and dynamics. Sectoral systems evolve and change over time. Some of these changes are incremental and build upon previous characteristics and features, whereas other changes are radical and represent discontinuities with the past.

We refer to these discontinuities in the dynamics of a sectoral system as “windows of opportunity.” The concept of “windows of opportunity” was first used by Perez and Soete (1988) to refer to the role of the rise of new techno-economic paradigms in the leapfrogging of latecomers who take advantage of a new paradigm and overtake incumbents. We expand the notion of windows of opportunity by linking them to the building blocks of a sectoral system. We then identify three types of window, namely, technological, demand, and institutional. “Technological windows” could explain the advances of Korean producers in consumer electronics in the digital era against the incumbent Japanese who were leaders during the analog era (Lee et al., 2005). A “demand window” refers to a new type of demand, a major shake-up in local demand or a business cycle. A major increase in demand in China or a new set of consumers (e.g., demand for low cost cars in India) may enable new firms from a latecomer country to enter the market. A business cycle creates a situation, wherein the incumbents encounter difficulty during economic downturns, whereas latecomers enjoy costs of entry that are lower than those in normal periods (Mathews, 2005). An “institutional/public policy window” can be opened through public intervention in the industry or through drastic changes in institutional conditions. For example, public policy windows are prominent in several catch-up cases, such as in high-tech industries in Korea and Taiwan (Lee and Lim, 2001; Mathews, 2002), the telecommunications industry in China (Lee et al., 2012), and the pharmaceutical industry in India (Guennif and Ramani, 2012).

This study utilizes the concepts of “windows of opportunity” and of “response” of firms and other components of the sectoral system of a country to the opening of a window of opportunity in an industry. Firms in latecomer countries may take advantage of these windows because of their responses. These responses depend on their learning processes, level of capabilities, organization, and strategies. In addition, the responses of the other components of the sectoral system in a specific country may play a major role in the catching up because of the diverse types and levels of networks,

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