

R&D investment and the government's R&D policies of electronics industries in Korea and Taiwan

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Abstract

Focusing on the electronics industry, this paper verifies and compares how bipolar R&D policy contributed to growth in productivity in Korea and Taiwan. Two implications are derived from the empirical results. First, in Korea, government's business group-centered R&D policy encouraged private R&D expenditure rather than public R&D infrastructure. Second, and in contrast, publicly funded R&D infrastructure capital stock, in recent years, significantly induced private R&D expenditures of Taiwanese electronics firms. These two implications suggest that there are various potential ways to cope with externalities associated with R&D investment in emerging countries.

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1. Introduction

According to statistics of US Display Search Inc., country-wise, liquid crystal display (LCD) production in South Korea and Taiwan had the largest and second largest global market shares, respectively, in the first half of 2004. In terms of corporate ranking, some individual firms in these countries also took the top positions. In addition, as represented by the new release announcements of the 63-in. plasma television by Samsung Electronics and the 42-in. LCD television by LG Electronics in 2002, recent technological development continuous to be noteworthy, especially in the area of LCD development.

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The objective of this study is to explore how government R&D policies in Korea and Taiwan have coped with externalities associated with R&D investment. One of the notable features of R&D investment is that the output has the properties of public goods, and some existing literature accordingly regards its social rate of return to be higher than its private rate of return.¹ Therefore, in industrialized countries, providing government subsidies, granting property rights, charging differential prices for their use by others, and combinations of these are major policies that deal with market failures that result due to externalities. This paper conjectures that government R&D policies encourage electronics firms in Korea and Taiwan to undertake externality-generating activities.

The first hypothesis is that government's business group-centered R&D policy in Korea induced cost savings in private R&D expenditure. The second is that strengthening public R&D infrastructure in Taiwan contributed to growth of firm output and productivity. The succeeding sections consider the model and its empirical implementation, and discuss the results and implications of the empirical analysis.

2. R&D investment by electronics industries in Korea and Taiwan

The electronics industries in Korea and Taiwan started similarly in the 1960s. During this period, following import-substituting industrialization, major electronics firms from industrialized countries established their production bases for the post-processing of integrated circuits in Korea and Taiwan. Inward foreign direct investment and technology transfer were encouraged during this period. In the first part of the 1970s, both governments changed their industrial policies to export-led industrialization. Since then, both countries started strengthening public infrastructure for their electronics industries. Major public research institutes, e.g., the Korean Advanced Institute of Science & Technology (KAIST), Electronics and Telecommunication Research Institute of Korea, and Industrial Technology Research Institute of Taiwan, were established during this period.

Although industrial development in both countries kept in line with each other until the mid-1970s, after this period, Korea and Taiwan took divergent paths in the development of their electronics industries. In Korea, the government encouraged major private business groups to promote technological development. In contrast, Taiwan pursued public sector-driven research and development.

In Korea, while the first R&D promotion policy was enacted as the Technology Development Promotion Law of 1972, its amendment in 1981 led to the rapid expansion in private R&D expenditure. While there were only three joint public–private sector R&D projects in the electronics sector initiated by the Korean Ministry of Science and Technology from 1967 to 1980, the number increased to 15 after 1981.² This new government R&D policy produced results. For instance, electronics firms of the three major chaebols, i.e., Samsung, Hyundai, and LG Electronics, established the mass production systems of 64 DRAM by the mid-1980s. Moreover, intra-group R&D systems contributed to the “full set type growth” of the entire chaebol since technological information derived from the R&D

¹ See Cohen and Levin (1989), Griliches (1991), Mohnen (1989, 1990) and Nadiri (1993), for example.

² The Technology Development Promotion Law of 1972 targeted the promotion of public R&D investments as represented by establishment of public research facilities. On the other hand, the amendment of the 1981 Law centered on how government enhanced private R&D investment activity.

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