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What determines overseas R&D activities? The case of Japanese multinational firms

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Abstract

This paper explores what factors determine the nature, extent, and location of Japanese multinationals' R&D activities abroad. Taking advantage of a rich micro-level dataset from the survey on Japanese overseas subsidiaries, the study distinguishes between two types of overseas R&D: basic/applied research and development/design. We find several differences between the determinants of those R&D activities. These differences confirm the view that basic/applied research of overseas subsidiaries aims at the exploitation of foreign advanced knowledge, whereas their development/design activities are mostly influenced by the market size of the host country. Our results provide a convincing and comprehensive explanation of the geographical distribution of overseas R&D by Japanese MNEs.

JEL classification: F23; O30

Keywords: Overseas R&D activities; Multinational enterprises; Locational choice; Multinomial logit estimation

1. Introduction

There has been a remarkable expansion of overseas R&D activities by multinational enterprises (MNEs) in recent years (Kuemmerle, 1999; Granstrand, 1999; Patel and Vega, 1999; Pearce, 1999; Pearce and Papanastassiou, 1999; Le Bas and Sierra, 2002). Japanese MNEs are not exception: a drastic increase in their overseas R&D activities can be observed from the beginning of the 1990s onward. In 1989, overseas R&D expenditure by Japanese MNEs amounted to only 0.7% of the total R&D investment spent domestically,[1] although Japan's foreign direct investment increased significantly during the 1980s in response to rapid yen appreciation. However, the ratio of overseas to domestic R&D expenditure in 2002 was 4.1%, indicating that there has been a significant expansion of overseas R&D activities by Japanese MNEs in the 1990s.

In addition to the marked expansion, noteworthy changes in locational distribution of overseas R&D can

[1] This figure is obtained by dividing the amount of R&D investment by foreign subsidiaries (Ministry of Economy, Trade and Industry, *Wagakuni Kigyo no Kaigai Jigyo Katsudo* [*Overseas Activities of Japanese Firms*]) by the total R&D investment available from *Kagaku Gijutsu Kenkyu Chosa Hokoku* [*Report on the Survey of Research and Development*] compiled by the Statistics Bureau, Ministry of Internal Affairs and Communications.

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be observed. Until the early 1990s, overseas R&D activities were concentrated in the advanced economies of North America and Europe, but this is no longer the case today. Instead, over the past decade and a half or so, Japanese MNEs have also invested in R&D in newly industrialized economies and less developed countries, especially those in East Asia, as we will see in detail later.

The purpose of this study is to explore the determinants of the locational choice of overseas R&D activities by Japanese MNEs, highlighting differences in two types of overseas R&D: basic/applied research and development/design. More precisely, since we find that Japanese overseas subsidiaries performing basic/applied research are jointly performing development/design except for a few cases, as we will explain later, we distinguish between overseas subsidiaries performing both basic/applied research and development/design and those performing only development/design. For brevity of presentation, we will henceforth denote the former type of R&D activities (i.e., the combination of basic/applied research and development/design) as Type R activities, whereas the latter (i.e., only development/design) Type D. Accordingly, this paper examines what stimulates Type R and Type D activities of Japanese overseas subsidiaries.

We presume *a priori* that Type R activities are more likely to aim at the utilization and acquisition of foreign advanced knowledge that would otherwise be unavailable in the home country, while Type D activities mostly target at the adaptation of existing technologies and products to the local conditions of the host country.[2] These different purposes of overseas R&D have been pointed out by existing studies such as Kuemmerle (1999), Granstrand (1999), Pearce (1999), Le Bas and Sierra (2002), and Iwasa and Odagiri (2004).[3] Although several studies have already examined the determinants of overseas R&D using Japanese firm-level data (Odagiri and Yasuda, 1996; Belderbos, 2001) and industry-level data for the United States and Japan (Kumar, 2001), these studies do not distinguish between the two types of overseas R&D activities. However, it is quite plausible to assume that the determinants of the two types are different. For example, overseas subsidiaries are more likely to perform overseas R&D for acquisition of foreign knowledge in technologically advanced countries, whereas they tend to perform R&D for adaptation to local conditions in countries with a large market size.

This paper investigates such differences between the determinants of the two types of R&D activities abroad, using a rich firm-level panel dataset for Japanese MNEs. Our dataset consists of data for Japanese parent firms and their overseas subsidiaries both in developed and less developed countries in R&D-intensive manufacturing industries, covering the period 1996–2001. As far as we are aware, ours is the most comprehensive dataset available on overseas R&D activities of Japanese MNEs.

Our estimates are based on a multinomial logit model, in which Japanese overseas subsidiaries are faced with three options: to perform Type R, Type D, or no R&D activities. We indeed find that Japanese MNEs are more likely to perform Type R activities abroad when the national R&D expenditure-to-GDP ratio of the host country, which represents the host country's knowledge level, is high. In contrast, the R&D expenditure-to-GDP ratio of the host country has no impact on whether Japanese MNEs engage in Type D activities in that country. In addition, an increase in host-country GDP, a proxy for the local market size, raises the probability of Japanese MNEs' performing Type R activities in that country and the probability of performing Type D to a similar extent. Since Type R activities include both basic/applied research and development/design, whereas Type D represents only development/design, the difference in determinants between Type R and Type D activities may represent determinants of basic/applied research. Therefore, our findings are consistent with the view that basic/applied research of overseas subsidiaries aims at the exploitation of foreign advanced knowledge, whereas their development/design is mostly determined by the size of the local market. Other factors that influence overseas R&D include the parent firm's R&D expenditure-to-sales ratio, the overseas subsidiary's sales and years of operation, the distance from Tokyo, and the wage level of local engineers. Those results are also supported by conditional logit estimation that assumes a different decision making process from that assumed in the multinomial logit model.

These estimation results explain what drives the actual patterns of overseas R&D by Japanese MNEs. For example, during the period 1996–2001, Type R activities by Japanese MNEs were largely concentrated in

[2] Examining U.S. MNEs, Teece (1977) found that the costs of such adaptations are significant and account for 19% of total investment costs.

[3] In the previous studies, R&D for the acquisition of foreign knowledge is often referred to as demand-led, home-base-exploiting, or research-oriented R&D, and R&D for adaptation to local conditions is referred to as supply-led, home-base-augmenting, or local-support-oriented R&D. However, to clarify how we distinguish between two types of overseas R&D in our empirical analysis, we do not use these terms.