



## R&D, foreign ownership, and corporate groups: Evidence from Japanese firms



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### ARTICLE INFO

#### JEL code:

F23

F21

O30

#### Keywords:

R&D

Foreign ownership

Corporate groups

Knowledge spillovers

Foreign direct investment

### ABSTRACT

This study empirically examines whether the research and development (R&D) activities of foreign-owned firms in Japan differ notably from the R&D activities of domestically-owned firms based on a firm-level panel dataset. Our study carefully disentangles the significant differences in R&D investment behavior of subsidiaries due to three different reasons: having a foreign parent, corporate group affiliation, and the degree of relatedness between business units. The results reveal the following. First, firms that are majority-owned by another firm are less active in R&D than independent firms. Second, foreign ownership does not matter if the parent firm is from a G7 country, but R&D intensity is significantly and positively associated with foreign ownership if the parent firm is from a non-G7 country. Finally, for subsidiaries whose business is related to that of their parent firm, the R&D intensity is lower if the parent is a domestic firm, but higher if it is a foreign firm. These findings imply that globalization and the integration of firms may not only affect production patterns and global supply chains, but may also have an important impact on the level of domestic R&D activities.

### 1. Introduction

The opening of capital markets and the deregulation of cross-border investment has resulted in dramatic increases in capital flows across countries. These cross-border capital flows are very heterogeneous in nature and their impact on the global economy and countries' domestic economy needs to be understood on the basis of their specific nature. One distinct feature of recent cross-border capital flows is the significant increase in foreign direct investment (FDI) flows. Annual worldwide FDI flows increased from US\$0.21 trillion in 1990 to US\$1.45 trillion in 2013. The worldwide FDI stock rose more than ten-fold from US\$2.08 trillion in 1990 to US\$25.5 trillion in 2013.<sup>1</sup> This may potentially reflect the growing efforts in recent years by countries trying to attract foreign capital through the provision of a foreign business-friendly environment on the one hand and the strategic decisions of firms to take advantage of multinational production networks on the other.

Policy makers typically promote inward FDI based on the idea that

it enhances domestic production capacity and employment. In practice, whether these benefits come about is an empirical matter, and from an economists' point of view, the key issue is the contribution that inward FDI can make to raising domestic productivity.<sup>2</sup> This impact on domestic productivity can be both direct – if foreign firms are more productive than domestic firms – and indirect, through technological spillovers that raise the efficiency of domestic firms.<sup>3</sup> These benefits will depend on the degree of superiority in productivity and in the innovative capacity of foreign-owned firms in the host country. Therefore, the extent to which foreign-owned firms differ in their innovative capacity from domestic firms may provide helpful indications of the potential spillover effects from inward FDI.

The aim of this study is to focus on the research and development (R&D) activities of foreign-owned firms to examine whether such activities differ notably from the R&D activities of domestically-owned firms. This question is complicated by the fact that most foreign-owned firms are not single independent units, but usually local subsidiaries of integrated units of firms for which the parent firms are located in

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<sup>1</sup> World Investment Report 2014, UNCTAD.

<sup>2</sup> Numerous studies including Doms and Jensen (1998), Globerman et al. (1994), Benfratello and Sembenelli (2006), Aitkens and Harrison (1999) have investigated this issue.

<sup>3</sup> Studies on FDI spillovers in developing economies, such as Haddad and Harrison (1993) on Morocco, Aitken and Harrison (1999) on Venezuela, Djankov and Hoekman (2000) on the Czech Republic, and Konings (2001) on Bulgaria, Romania, and Poland, find insignificant or negative FDI productivity spillovers on domestic firms in the same sector. On the other hand, Liu and Wang (2003) on China and Javorcik (2004) on Lithuania find evidence of positive spillovers from FDI. Studies on FDI in advanced countries such as Haskel et al. (2002) on Britain and Keller and Yeaple (2009) on the United States also find evidence of positive FDI spillovers.

foreign territories. Thus, when comparing R&D decisions by foreign-owned firms and domestically-owned firms, two different aspects that may influence such decisions need to be taken into account: (1) the fact that a firm forms part of an integrated whole and R&D decisions by the parent and the subsidiary likely depend on each other; (2) the fact that it is “foreign” (i.e., foreign-owned). We refer to these two aspects as the “corporate group affiliation” and the “foreign ownership” which may influence R&D decisions, respectively. Therefore, the R&D decisions of independent firms may differ from those of firms that have a parent firm (i.e., corporate group affiliation). Moreover, firms with a parent firm may take different R&D decisions depending on whether their parent firm is a domestic or a foreign firm (i.e., foreign ownership).<sup>4</sup> In this study, we attempt to separately identify the differences in R&D investment behavior of Japanese manufacturing firms associated with each of these two factors, respectively.<sup>5</sup> We further examine how much the influence of corporate group affiliation depends on the relatedness between business units.

This study distinguishes between R&D activity and innovative activity in the sense that innovative activity consists of the adoption of new technologies or managerial practices that are the result of R&D activity. The reason for making this distinction is that it is possible that a subsidiary adopts a new technology developed by the parent firm and becomes highly active in innovative activities without being active in R&D itself. This distinction may be important since the location of R&D activities may be a significant factor in determining the potential spillovers.

Business units of a corporate group can share intangibles that are created within the entire business organization (Hortacsu and Syverson, 2009). This implies that R&D decisions are likely to be made by the parent firm for its business units. From the perspective of multi-unit corporate group R&D activities, there are centralized R&D systems with emphasis at the corporate level on one hand, and decentralized R&D system with emphasis at the division level on the other. There have been numerous studies evaluating the merits and demerits of having a centralized R&D system versus a decentralized R&D system, as discussed in Argyres and Silverman (2004). These studies find that R&D units at the corporate level tend to be devoted to more generic broad application research, whereas R&D units at the division level are more directed toward product-specific research. Furthermore, if divisions use related technologies, R&D tends to be located at the corporate level, whereas if divisions are diversified in terms of their products, R&D typically is allocated more at the division level. This means the more subsidiaries and their parent firm have in common, the more R&D activities are likely to be located at the corporate level, which in turn may have implications for the level of R&D performed at the subsidiary level.

A corporate group with a foreign parent may have a meaningful implication for the R&D activities of its subsidiaries. A foreign parent in an advanced country may provide access to more advanced technology which may reduce the subsidiary’s need for R&D investment (Un and Cuervo-Cazurra, 2008). On the contrary, if a domestic subsidiary resides in a country with technologically capable researchers and research capacity, the foreign parent may choose to invest more R&D at the domestic subsidiary.<sup>6</sup> Having a foreign parent may improve

financing opportunity for the subsidiary and it may lead domestic subsidiary to invest more in R&D as it has a better access to capital for investment from the capital markets in other countries (Kumar and Aggarwal, 2005; Un and Cuervo-Cazurra, 2008).

Foreign ownership in general does not imply multinational operation as the firm could be a single independent company. However, in some cases of foreign ownership where a domestic subsidiary is owned by a foreign parent, the resulting corporate group is one specific form of multinational enterprise. Foreign ownership is defined by ownership structure, but on the other hand, MNE is defined by its production and sales structure. MNEs indicate firms that distribute their shares of production and/or sales across many countries. Therefore, MNEs essentially involve cross-border ownership. However, from a perspective of a country, MNE operating in its territory does not necessarily imply foreign ownership as there could be MNEs with domestic parent having subsidiaries in other countries and also MNEs with foreign parent having subsidiaries in many countries including domestic location.<sup>7</sup>

This study empirically investigates how corporate group decisions and foreign ownership influence the R&D activities of local subsidiaries using a manufacturing firm-level panel dataset based on the *Basic Survey of Japanese Business Structure and Activities* for the period from 2000 to 2008. The main results of our analysis are as follows. First, the R&D intensity of firms that are subsidiaries of a corporate group is lower than that of independent firms. Second, controlling for the influence of corporate group affiliation, we find that the R&D intensity of subsidiaries is positively related with foreign ownership only when the parent firm is located in a non-G7 country. Third, when subsidiaries and their parent firm operate in a related business, the effect of corporate affiliation can be positive or negative, depending on whether the parent firm is foreign or domestic. These findings imply that globalization and the formation of corporate groups may not only affect production patterns and global supply chains, but also have an important impact on the level of domestic R&D activities.

We believe this study contributes to the literature by explicitly separating out differences in R&D behavior due to foreign ownership and corporate group affiliation. Furthermore, while existing studies such as Bertrand (2009); Guadalupe et al. (2012), and Un and Cuervo-Cazurra (2008) only discuss the innovativeness and R&D behavior of foreign-owned firms or foreign-acquired firms, this study looks deeper to understand how the technological capabilities of the parent firm country as well as the degree of relatedness between parent and subsidiary business units influence the R&D investment behavior of foreign-owned subsidiaries.

The structure of this study is as follows. Section 2 reviews preceding studies on the links among foreign ownership, R&D, innovative activities, and productivity. Section 3 then presents the empirical model and methodology we use for our analysis. Next, Section 4 describes the data, while Section 5 presents the empirical results. Section 6 concludes.

## 2. Literature survey

### 2.1. Centralized vs. decentralized R&D systems

For firms in a corporate group, the R&D activities of the parent and its subsidiaries are likely to be determined systematically together, taking into account the objectives of the group as a whole. Numerous studies have investigated different types of R&D allocation systems within a firm (or corporate group) and found that organizational structures for research have different implications for research output. For instance, Argyres and Silverman (2004) and Kay (1988) suggest that centralized R&D systems, where R&D is concentrated at the

<sup>4</sup> Since our data does not include foreign-owned independent firms, we cannot identify “foreign ownership effect” in general. Therefore, the “foreign ownership effect” identified in this study is conditional on corporate group affiliation.

<sup>5</sup> Due to limitations in the data set we use, we can only identify whether a firm has a parent firm and the nationality of its parent firm. A firm with a domestic parent firm may be part of a multinational corporate group as some of its sister subsidiaries may be foreign. This implies that we cannot fully distinguish whether a corporate group is multinational or not. Therefore, our analysis is restricted to examining the effects arising from “corporate group affiliation,” but not those arising from “multinational corporate group affiliation.” We further examine whether there is a difference in having a domestic or a foreign parent firm.

<sup>6</sup> Guellec and de la Potterie (2001) find that the degree of international research collaboration is higher for smaller countries and for countries with lower R&D intensities. Tsukada and Nagaoka (2015) recently find that international co-inventions increase in the sectors where the domestic country provides an increasingly smaller pool of inventors.

<sup>7</sup> However, we do not intend to investigate the effect of multinational operation directly in this study since multinational operation can only be identified partly in our data set. The limitation of our data set is explained in Section 4.

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