



Globalization of R&D by US-based multinational enterprises

Prema-chandra Athukorala^{a,*}, Archanun Kohpaiboon^b

^a Arndt-Corden Division of Economics, College of Asia and The Pacific, Australian National University, Australia

^b Faculty of Economics, Thammasat University, Thailand

ARTICLE INFO

Article history:

Received 27 July 2006

Received in revised form 5 August 2010

Accepted 1 September 2010

Available online 18 October 2010

JEL classification:

F21

O19

O32

Key words:

R&D

Multinational enterprises

Foreign direct investment

ABSTRACT

This paper examines patterns and determinants of overseas R&D investment by US-based manufacturing MNEs using a new panel dataset over the period 1990–2004. The analysis reveals that R&D intensity of operation of US MNE affiliates is determined mainly by the domestic market size, overall R&D capability and cost of hiring R&D personnel. There is no evidence to suggest that R&D specific incentives have a significant impact on inter-country differences in R&D intensity when controlled for other relevant variables. Overall, our findings cast doubts on the efficacy of efforts by host country governments to entice MNE affiliates to engage in domestic R&D activity, in a context where R&D is becoming a truly global activity.

© 2010 Elsevier B.V. All rights reserved.

1. Introduction

Multinational enterprises (MNEs) play a pivotal role in the generation of technology and its transmission across countries.¹ The potential contribution of MNE affiliates to innovatory capability of the countries in which they operate (the host countries) is therefore central to the contemporary policy debate on the developmental impact of foreign direct investment (FDI). There are two ways in which MNE affiliates provide technology to host countries; importing technology produced elsewhere within the global branch networks (technology transmission) and developing new technology locally (technology generation). The host-country governments generally attach greater importance to technology generation over technology transmission, in the hope that research and development (R&D) activities undertaken within the national boundaries may have important externalities for local scientific and technological capabilities. This expectation has resulted in a strong competition among countries to attract R&D-intensive FDI.²

The purpose of this paper is to complement and extend the existing literature on the determinants of the global spread of R&D activities of MNEs using a new panel data set relating to the operation of US-based MNEs during 1990–2004, a period characterized by significant changes in international production as part of the on-going process of economic globalization. The key research issue is the relative importance of policy-related variables in explaining inter-country differences in R&D intensity over and above the relevant non-policy (structural) variables. Compared to the previous studies on this subject,³ we examine inter-country variation in R&D intensity by taking into account a larger number of explanatory variables suggested by the theory of MNE behaviour, with a view to minimizing potential omitted variable bias in estimation. To the best of our knowledge, ours is the first attempt to examine patterns and determinants of overseas R&D activity using panel-data econometrics. The panel data approach offers a solution to the problem of bias caused by unobserved heterogeneity (in this case, country-specific peculiarities not captured by the explanatory variables), a common problem in the estimation of models with cross-section data as in the previous studies. Working with panel data also has the advantage of capturing dynamics that are difficult to detect with cross-section data. Another novelty of our analysis is the attention paid to the impact of the stage of development of host countries on

* Corresponding author.

E-mail address: prema-chandra.athukorala@anu.edu.au (P. Athukorala).

¹ MNEs account for nearly two thirds of total global business R&D (UNCTAD, 2005).

² Of course, in reality attractiveness of a given host country for R&D activity depends crucially on its technological capabilities closely related to its stage of development. However, emphasis placed on technology generation over technology transfer is a common feature observable in foreign direct investment policy across all countries, regardless of their stage of development (UNCTAD, 2005: 212–3, Sheehan and Wyckoff, 2003).

³ Kumar, 1996 (US MNEs), Kumar, 2001 (US and Japanese MNEs), Hines, 1995 (US MNEs), Odagiri and Yasuda, 1996 (Japanese MNEs), Zejan, 1990 (Swedish MNEs), and Fors, 1998 (Swedish MNEs).

the hypothesized relationship between the R&D intensity and the explanatory variables.

There is no fully developed theory of inter-country differences in R&D intensity of MNE operation. As in previous studies, we therefore formulate our empirical model in an eclectic fashion, drawing upon the analytical foundations of MNE behaviour. We strongly believe that our approach is preferable to working with an optimizing model derived from first principles assuming a 'representative' firm. This approach, notwithstanding its analytical elegance, cannot adequately address issues that arise from imperfect information and heterogeneity relating to industry characteristics and government policies (Kirman, 1992; Dunning, 2000; Vernon, 2000).

The findings suggest that R&D intensity of operation of US MNE affiliates is determined mainly by domestic market size, overall R&D capability and cost of hiring R&D personnel. Domestic market orientation of production is found to be a significant positive determinant of R&D only in low-income countries, presumably reflecting the need for product adaptation to suit special demand conditions associated with low-income levels and the lower degree of global integration of these countries. It seems that, in an era of rapid global economic integration, the nature of market orientation is not a significant determinant of R&D patterns in advanced industrialized nations and newly industrialized countries. We also find that industry composition is an important determinant of the overall R&D intensity of MNE operation in a given country over and above the other variables considered here. There is no evidence to suggest that R&D-related tax incentives and intellectual property protection have a significant impact on inter-country differences in R&D intensity when appropriately controlled for the basic location factors.

The paper is organized as follows. Section 2 provides a succinct review of the theory of overseas R&D activities of MNEs in order to set the stage for the ensuing empirical analysis. Section 3 examines trends and patterns of overseas dispersion of R&D expenditure of US MNEs. Section 4 deals with model specification, data sources and the econometric methodology used in the regression analysis of the determinants of inter-country differences in R&D propensity. Section 5 presents the results and interprets them in the context of the existing literature. The final section summarises the key inferences.

2. Theoretical framework

The R&D location decision of the MNE is governed by both considerations which compel it to keep R&D as a headquarter function (*centripetal factors*) and those which tend to pull it away from the centre and into peripheral locations (*centrifugal factors*) (Caves, 2006, p. 117). The *centripetal factors* are of two major forms. First, technology (the assets created by the innovative process) is an important part of 'knowledge capital', which determines market power or 'ownership advantage' in international operation. There is always the possibility that geographical decentralization of R&D leads to leakage of proprietary technology to foreign competitors, attenuating the MNE's market power. Such leakage can happen through either deflection of R&D personnel to competitors or starting up their own ventures, or simply through the 'demonstration' effect. Thus, the desire to maintain strategic knowledge within the firm is a compelling reason for keeping R&D as a headquarter function.

Second, production of technology is an activity subject to firm level, rather than plant level, scale economies. The innovative process essentially involves communication and cooperation with personnel involved in product design, marketing and other related key functions. There is also the need for better motivation of R&D efforts towards objectives set by the top management through face-to-face meetings, inter-departmental relationships, and highly networked teams. Because of these reasons, dispersion

of resources for executing parallel R&D projects at plant level could be wasteful and reduce productivity of the overall R&D effort (Daft and Lengel, 1986).

The above factors are generally expected to have a significant impact on the MNE's decision to keep R&D fundamentally as a headquarter function. However, there are two '*centrifugal*' forces which necessitate some dispersion of R&D activities among various production locations. Firstly, there may be a need to adapt production processes and characteristics of products to suit local conditions and regulations. This consideration is particularly relevant when demand and/or production conditions in the host country differ significantly from the conditions in the home country, or when the geographical proximity of research facilities to manufacturing facilities in the host country reduce the time lag in adjusting production techniques or product characteristics to host country conditions. While improved communications mitigate some of the difficulties created by the distance, it is presumably an imperfect substitute for physical proximity needed for effective communication between R&D and other functional areas, notably marketing and production.

Second, MNEs may have to undertake R&D in overseas locations in order to benefit from localized technology spillovers in these locations, with a view to maintaining their competitive edge. Locating R&D facilities in prominent centres of excellence in specific technologies across the world would enable MNEs to enrich their own R&D. There is indeed evidence that independent R&D is the most effective way of 'learning' about other firms' products and processes near the sources of the spillover, when compared with licensing, patent disclosures, the hiring of competitors' R&D employees and reverse engineering (Levin et al., 1987). This is because of the positive relationship between knowledge spillover and proximity. R&D units set up in global innovatory centres could also serve as stations for recruiting local scientists and technicians, and points of contact with the scientific community in the host country (Cohen and Levin, 1989; OECD, 1998).

The early literature on R&D activities of MNEs generally considered product adaptation, which normally involves cross border transfer of mature technologies, as the dominant motive for decentralization of R&D geographically (Vernon, 1974; Caves, 2006; Dunning, 2000; Lall, 1979). Recent survey-based evidence, however, suggests that over the years the technology-seeking motive has become a significant contributing factor in decentralization of R&D by MNEs in R&D intensive industries such as pharmaceuticals, consumer chemicals, professional and scientific equipment and office equipment (Ronstadt, 1977; Pearce, 1999; Fors and Svensson, 1994; Birkinshaw and Morrison, 1995; Vernon, 2000). There are also numerous cases of acquisition of companies by MNEs outside their home base in the hope of unlocking some priced technological secrets for worldwide use. In sharp contrast to the role of a conventional R&D department that was primarily engaged in adapting established group products for the local market, the mission of the modern knowledge seeking R&D labs is to draw upon geographically differentiated frontier technology in an attempt to preserve the technological lead of the MNE. These labs are engaged in original product development or providing inputs into programs of basic or applied research to support the longer term evolution of the core technology of the MNE group at the world technology frontier.

Even if there are compelling reasons to decentralize R&D globally, the MNE's decision to undertake R&D in a given host country depends on the domestic business environment. The availability and cost of hiring of technical personnel, the nature of property right legislation, tax concessions and other incentives for R&D activities, skilled labour, and the general business climate for FDI (including political stability and policy certainty, and the foreign trade regime) are among the relevant factors in making the R&D location decision.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات