

Intra-firm Technology Transfer and R&D in Foreign Affiliates: Substitutes or Complements?
Evidence from Japanese Multinational Firms

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Abstract

There is increasing interest both among researchers and policy makers in international technology transfer and overseas R&D undertaken by multinational firms (e.g. Branstetter et al., 2006). The introduction of new and improved technologies through intra-firm international knowledge transfer and the adaptation and augmentation of these technologies through local R&D activities are essential for the competitiveness of foreign affiliates of multinational firms. They are expected to positively impact the host country economy through increased productivity and potential technology spillovers to local firms.

This paper examines the simultaneous impact of local R&D and intra-firm international technology transfer on productivity growth in foreign affiliates, as well as the potential complementarity or substitutability between these two sources of technology. Consideration of both sources is important as host countries' tax and trade policies may be directed to reduce technology imports with the purpose of stimulating local R&D. An earlier study at the industry level by Hines (1995) found that higher withholding taxes were associated with lower technology royalty payments and higher levels of local R&D, which suggested a possible substitutability between technology adapted or created through local R&D and technology created and transferred by the parent. On the other hand, one may expect a complementary relationship to exist if local R&D enhances the 'absorptive capacity' (Cohen and Levinthal, 1989) of affiliates to effectively introduce new parent technologies. The issue of possible substitutability or complementarity between technology imports and in-house R&D has been the subject of empirical investigation, but previous studies have focused on the performance effects for local firms in developing countries (e.g. Deolalikar and Evenson 1989; Braga and Willmore 1991; Basant and Fikkert, 1996) in the context of restrictive technology import policies.

We derive our econometric specification from an augmented Cobb Douglas production function including interactions between technology transfer and affiliate R&D in the augmentation of the knowledge stock. The model also takes into account potential productivity convergence by including lagged productivity levels. We estimate the dynamic productivity model on a large sample of Japanese manufacturing affiliates worldwide in 1996-1997 and 1999-2000. The empirical results confirm that both affiliate R&D and intra-firm technology transfer from the parent firm contribute to productivity growth, with technology transfer exhibiting decreasing marginal returns. Furthermore, the two sources of technology are complements: use of one source of technology increases the marginal impact of the other. Multinational firms' affiliates benefit more directly from the two sources of technology, as coordination between the parent and affiliate will allow local R&D to be specifically governed to absorb, adapt and build on parent firm technologies. The implication is that local R&D is less efficient and less likely to be performed on a large scale if affiliates face restrictions on the use of parent-developed technologies. Host countries tax and trade policies directed at reducing payments for technology imports are unlikely to serve as an effective tool to stimulate local R&D. They may instead reduce productivity growth with negative consequences for potential spillovers to the local economy and economic growth.