

International linkages and productivity at the plant level: Foreign direct investment, exports, imports and licensing

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Abstract

Productivity growth may be affected particularly for developing countries by international linkages or technology transfer. We evaluate relationships between productivity and FDI, exports, imports and licensing for Turkish manufacturing plants in the apparel, textiles, and motor vehicles industries. We assess performance premia associated with these international technology transfer channels that control for plant size and location. We then use a structural model to allow for plant-specific input composition and interactions, estimated alternatively by quantile regression and semi-parametric techniques to recognize plant heterogeneity and to accommodate simultaneity and selection issues. Overall, we find that productivity is most closely related to foreign ownership, especially for larger plants and in combination with other forms of technology transfer, followed by exporting and then licensing.

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1. Introduction

Productivity growth determines the ability of an economy to improve its standard of living, and is often considered to be the main source of cross-country income differences (Hall and Jones, 1999). An important issue in our increasingly global economic environment is thus whether international linkages can enhance firms' productivity and competitiveness. It may be particularly

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important for developing or low/middle income economies such as Turkey to identify how and to what extent productivity is related to international linkages that could narrow the income gap from more developed countries.

Endogenous growth theory views innovation as the main source of productivity growth (Romer, 1990, Lucas, 1988), although it may be associated with either internal or external factors. In particular, studies have shown that international linkages or technology transfer may be closely related to productivity growth (Coe and Helpman, 1995, Eaton and Kortum, 1999, Keller, 2002). Countries such as Turkey that are still on a development path may especially rely on the technology and knowledge produced by more developed countries rather than direct investment in research and development.²

Four main channels of international linkages appear in the literature. Foreign ownership or foreign direct investment (FDI) is often considered the strongest conduit for international technology transfer (Blomström and Kokko, 1998, Aitken and Harrison, 1999, Carr et al., 2001). Learning by exporting has perhaps received the greatest attention (Kraay, 1997, Clerides et al., 1998, Castellani, 2001, Bigsten et al., 2002, Girma et al., 2003). The role of technology embodied in intermediate material and capital imports has been recognized (Grossman and Helpman, 1991, Xu and Wang, 1999, Eaton and Kortum, 2001). Foreign licensing has also been considered (Eaton and Kortum, 1996), although it may not have a significant productive effect if the best technologies are not available by license (World Investment Report, 2000).

These channels may have both separate and synergistic productive effects, as well as linkages with internal factors such as input mix or size. Blomström and Kokko (1998), for example, show that FDI may enhance host country firms' productivity through knowledge flows from cumulative R&D efforts in the foreign country, and of skilled employees and management techniques across countries. However, productive effects may concurrently arise from exports that move the domestic firms along the learning curve and imports of production technology by the multinational enterprises. Augmenting labor force skills in the host country is also essential for successful international technology transfer because it determines absorptive capacity (Nelson and Phelps, 1966). Higher shares of technical or management workers would thus be expected to be associated with greater productivity improvements from international linkages.

There are two primary hypotheses about how firm productivity is related to international linkages. The first suggests that more productive firms self-select into, say, export markets, because their characteristics make them better able to deal with the costs and complexities of international markets. The second is that knowledge effects stem from exposure of exporting firms to cutting-edge technology and managerial skills from their international counterparts.

Most empirical studies of export-productivity relationships support the self-selection hypothesis (Bernard and Jensen, 1995, Clerides et al., 1998, Aw et al., 2000, Delgado et al., 2002), although others find learning-by-exporting (Kraay, 1997, Castellani, 2001, Bigsten et al., 2002, Girma et al., 2003, Van Biesebroeck, 2005). Both of these effects may also be evident; firms that participate in international markets may be inherently more productive but also improve their productivity through international linkages (Yasar and Paul, 2005).

The role of firm heterogeneity in explaining relationships between productivity and international technology transfer has also been explored theoretically. Melitz (2004) and Roberts and Tybout (1997) find that more productive producers in an industry become exporters, and Bernard et al. (2003) show that the heterogeneous efficiency underlying such choices implies

² R&D expenditures for Turkey are, for example, only about 0.5% of GDP, compared to 2.4% for the OECD countries, 2.6% for the U.S., and 2.9% for Japan (World Bank, 2004, average for 1996–2001).

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