Optimal foreign investment dynamics in the presence of technological spillovers

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ABSTRACT

In this paper we present a dynamic model of a firm which is deciding whether to outsource parts of its production to a less developed economy where wages and the level of technology are lower. Outsourcing reduces production costs but is associated with spillovers to foreign potential competitors. Spillovers over time increase productivity of firms in the foreign country and make them stronger competitors on the common market. The paper analyzes the inter-temporally optimal behavior of the firm and shows that two outcomes are possible in the long-run. One outcome is that there is one steady state where the firm invests a positive amount in the foreign country and the other outcome is a continuum of steady states with no investment. The paper then derives conditions such that it is optimal for the firm to invest in the foreign country and characterizes different types of optimal dynamic investment patterns. In addition, using numerical dynamic optimization methods, the effect of the speed of technology adoption and of the wage differential on total labor income in the home country is studied taking into account the transition dynamics.

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1. Introduction

With the decline of communism at the end of the 20th century, Central and Eastern European economies have become more open and more attractive for foreign capital. At the same time, the high growth rates of Asian countries such as China or India have also attracted foreign investors more frequently. Although most of foreign direct investment (FDI) is still undertaken in industrialized countries such as the US, Great Britain, France, Italy, and the Netherlands, just to mention a few, more and more direct investment flows to the newly industrializing countries (NICs) in Central and Eastern Europe and to Asian economies. According to the UNCTAD 2007 World Investment Report, the highest increase in FDI inflows from 2005 to 2006 among all regions occurred in South-East Europe with a growth of 74%. One important motivation for firms to invest in NICs is to get access to these markets; however, recent empirical evidence suggests that cost considerations have gained importance relative to market entry motives for foreign investment and are now in many cases the main factor influencing the location decisions of firms (see Kinkel and Lay, 2004).[1]

From a political perspective, FDI is highly appreciated in the countries where the investment is undertaken. An important aspect in this respect is the expectation that FDI does not only generate income for local firms and workers

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[1] See e.g. Dunning (1993) for a discussion of different motives for FDI.

but also raises the productivity of local producers in the industry where investment takes place and also in vertically related industries. Hence, many NICs hope that spill-overs will reduce the gap to the technological frontier and that may help make the whole economy benefit from the new investments.

Firms in developed countries are, of course, aware that their activities in foreign countries may prove negative in the long-run while their competitors benefit from their superior production technology. Hence, the firms will put great importance on the protection of intellectual property rights when investing in less developed countries. The effects of the protection of intellectual property rights have been studied in the economics literature in the context of endogenous growth models. For example, Parello (2008) demonstrates that stronger protection of intellectual property rights reduces the rate of technology transfer to less developed countries since it implies a smaller rate of imitation. In contrast to that, Dinopoulos and Segerstrom (2009) show that stronger protection of intellectual property rights raises international technology transfer within multinational firms and proves to be beneficial for less developed economies.

But even if property rights are observed, there seems to be evidence that FDI is associated with positive spill-overs although the empirical evidence concerning the existence of positive horizontal spill-overs from FDI is mixed[2] (see e.g. Görg and Greenaway, 2004). Thus, recent empirical studies find positive horizontal spillovers from FDI using firm level data from Hungary (Halpern and Murakozy, 2007), Romania (Smarzynska and Spatareanu, 2008), and from 17 emerging market economies (Gorodnichenko et al., 2007). Several channels of spill-overs have been discussed in the literature, most prominently the demonstration effect, labor turnover (both inducing horizontal spill-overs), and vertical linkages (see e.g. Saggi, 2002).

So, while the firm that undertakes FDI may gain in the short-run from lower costs in NICs, spill-over effects can raise productivity of (potential) competitors in foreign countries. In particular in industries where markets have become globalized, such improvements of the competitiveness of foreign producers might severely affect future revenues of the firm. Therefore, a firm thinking about FDI faces a trade-off between short-run cost advantages and losing its competitive edge on the (global) market in the long-run.

A dynamic view is needed to analyze the trade-off described above, and in this contribution we present a theoretical model of a firm that faces the corresponding inter-temporal optimization problem. In contrast to other contributions within that line of research (see our literature review below), we assume that firms in the home country and in the foreign country compete on the same market. Most existing theoretical work relies on the market opening motive for FDI and assumes a local market in the foreign country. In our framework, the firm under consideration operates on an oligopolistic market and may move some of its production by investing in physical capital in a NIC. Such investment, however, goes along with positive spill-overs which raise the productivity of competitors of the firm in the NIC. The incentive to invest in the foreign country are cost reductions due to lower wages there.

Our assumption is that firms in less developed countries may be able to catch-up to the technology level of developed economies in line with arguments proposed by Nelson and Phelps (1966) and applied to the technology transfer problem by Boucekkine et al. (2006), for example. However, in contrast to those studies, where the technological gap does not vanish in the long-run, we allow for a different outcome. In our setting, the long-run outcome may be either that foreign firms catch-up to the firm in the developed country implying that they produce with the same technology or firms in the foreign countries always lag behind. Which of these two situations turns out to be optimal depends on the initial technology level in the less developed country among other things.

While most contribution in the literature do not explicitly study the dynamics of the model, our goal with this paper is to pay special attention both to the long-run outcome of our model as well as to its transition dynamics. In particular, we are interested in the question of how the transient and the long-run outcomes are affected by economic factors like the initial productivity and wage gap between the regions or the spillover rate. A main finding of our study in this respect is that there are two classes of co-existing steady-states: one with and one without FDI, and that small changes in the economic factors mentioned above might induce that the long-run outcome jumps from one type to the other. The insight that there might be a non-continuous shift between an FDI and a non-FDI regime is a new finding in this area of research that is based on our dynamic approach. This insight has important implications for economic policy design. The best way to reach certain policy goals might be to influence the system so that the initial state moves into the basin of attraction of a steady state that is desired by the policy-maker. Although we do not explicitly consider the role of a policy maker in our model, we give some indication of such type of analysis by examining the impact of key parameters on current and accumulated labor income and on accumulated firm profits. In terms of transient investment dynamics, our dynamic approach allows us to address an issue raised by empirical observations about the dynamic patterns of foreign investment. Using data from German manufacturing firms, Kinkel and Maloca (2008) report that about 17% of the firms who have moved (parts of) their production abroad in 2000/2001 re-transferred it back to Germany within the following five years. Obviously, such a pattern of investment followed by disinvestment might be due to incorrect expectations about production conditions in the foreign country or actual changes in these conditions, but, as we show in this study, under certain conditions it might also correspond to intertemporally optimal behavior in the presence of technological spillovers.

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[2] One aspect speaking against spill-overs is that firms can work in technological enclaves isolated from local firms as pointed out by Grether (1999, p. 1288).