Attempts to measure the spillover effects of multinational enterprises on host countries have generally been cross-sectional and limited to labour productivity in manufacturing for a single country. Recent work in growth theory has measured the extent to which growth in total factor productivity in a country depends not only on domestic R&D capital stocks but also on foreign R&D capital stocks. This paper extends such work by adding foreign direct investment stocks to foreign trade as a channel linking total factor productivity levels between countries. This is done by considering the role of trade and FDI as diffusion channels for G6 R&D to the OECD countries. There are three main results: the coefficient estimates for FDI are higher than those for trade in the standard model; the importance of the trade channel is much reduced once FDI is included; and the overall spillovers increase significantly with the inclusion of FDI.
"...some forms of spillover from foreign direct investment may have eluded research... The investor (foreign or otherwise) is likely to capture a good deal less than the social benefit of investments that reduce transaction and information costs for many agents in the local economy. Interest attaches to both the aggregate extent of such spillovers and the degree to which foreign investors can manage their subsidiaries to limit spillovers, or capture some of their benefits." (Caves, 1998, 15)

INTRODUCTION

Recent developments in the theory of international trade and economic growth have explored a number of links between productivity levels in different countries. While research on technology spillovers is long standing, considerable interest has been stimulated by the application of these new theories at the macroeconomic level by Coe and Helpman (1995), and Coe, Helpman and Hoffmaister (1997), henceforth referred to as CH and CHH. This body of new work concentrates with few exceptions on trade as the channel which links productivity in different countries.

This paper makes a contribution to the literature by measuring international spillovers for both trade and foreign direct investment (FDI) from 6 of the G7 countries, namely Canada, Italy, Germany, Japan, the United Kingdom and the United States to all OECD countries and Israel. Table 1 presents data on stocks of R&D and FDI for the countries in the sample. What becomes immediately apparent is the concentration of both R&D and FDI among the G6 countries. These 6 countries account for about 87% of the OECD stock of R&D, which in turn accounted for 96% of the measured world stock of R&D in 1990 (CHH, 1997, 134). These 6 countries also account for 72% of all outward FDI stock of the sample countries, which in turn account for 95% of the world outward stock of FDI. The Table also indicates that countries with high levels of outward FDI tend to have high levels of R&D. It is our hypothesis that outward FDI is the dominant channel of technology diffusion. The major empirical conclusions of this paper are that much of the measured spillover effect on productivity is through FDI rather than trade, as the theory of FDI would indicate, and that studies which concentrate on trade as the channel significantly understate the extent of such spillovers.1

Another way to think about these results is as follows. Since international trade and FDI are highly correlated (see Grosse and Trevino (1996), Grosse (1997), Pfaffermayr (1996), Brainard (1997), and United Nations (1996)) then excluding FDI will result in attributing to trade spillovers that are actually occurring through FDI. By adding FDI as an additional channel of spillovers, the spillovers occurring through FDI are no longer attributed to international trade. The results presented here indicate that most of the spillovers are occurring through FDI, and also that the total spillovers that occur are larger with FDI than with trade alone.

The format of this paper is as follows. First we review the literature. Then we consider the channels for spillovers, underlining the central role of FDI. Next, the data and model are presented and the empirical results are discussed. Conclusions then are presented, noting the need to incorporate sectoral outcomes more fully as well as cooperative channels of spillovers.

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