

Do Domestic Firms Learn to Export from Multinationals?

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Abstract

Attracting inward investment is a major preoccupation of policymakers worldwide and a wide range of instruments, including direct subventions, are deployed to attract multinational enterprises (MNEs). Intervention is predicated on the assumption that there are direct productivity spillovers associated with the presence of MNEs and the policy of attracting them is targeted at capturing these externalities. Yet robust evidence on direct spillovers is hard to find. An under-explored indirect channel for productivity spillovers is via exports. Exporting firms are more productive than non-exporting firms. Thus, if the presence of MNEs results in more indigenous firms exporting, an indirect productivity spillover will result. In this paper we identify possible transmission mechanisms for export spillovers and test for their existence on a large panel of firms in the UK. Our results confirm positive spillover effects from MNEs on the decision to export of UK owned firms as well as on their export propensity.

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I. Introduction

There is significant competition among governments to attract inward investment, using incentives such as tax allowances, duty drawbacks, investment allowances, grant in aid and so on. This signals a belief on their part in the existence of external benefits. More specifically it has been argued that multinational enterprises (MNEs) can affect productivity levels and growth rates in the industries they enter, as well as promoting skill upgrading and increased innovation¹.

This paper focuses on an under-explored spillover, namely the impact of MNEs on the export behaviour of domestic firms. The role of FDI in *aggregate* exports of host countries has been investigated by, among others, Blake and Pain (1994) for the United Kingdom, O'Sullivan (1993) and Barry and Bradley (1997) for Ireland, and Cabral (1995) for Portugal. However, this literature typically focuses on the export performance of foreign affiliates themselves, rather than the possibility that domestic firms become more export oriented as a result of MNE presence. It is that under-explored link which is the focus of this paper.

The paper is organised as follows. Section II sets the policy context and motivation. Section III reviews potential transmission channels whereby MNEs may influence the export activities of locally-owned firms and provides a brief review of the empirical evidence available so far. Section IV sets out the model to be estimated, Section V explains our empirical modelling strategy whilst Section VI describes the data set used and discusses our econometric results. Section VII concludes.

II. Policy Motivation and Context

Globally, annual flows of FDI now exceed US\$700 billion and the total stock exceeds US\$6 trillion. For the last ten years or so rates of growth of cross-border investment have been twice as high as rates of growth of armslength trade. Although FDI flows

¹ For surveys of the evidence on productivity spillovers see Blomström, Kokko and Zejan (2000), Görg and Strobl (2001) and Görg and Greenaway (2002).

into (and to a lesser extent out of) developing and transitional economies have increased, both in absolute terms and as a proportion of GDP, stocks and flows are still overwhelmingly dominated by the OECD countries.

There is very considerable policy competition between governments to attract FDI, with a range of fiscal, quantitative and administrative instruments being deployed. Tax holidays, investment credits, import duty exemptions, the provision of low cost land facilities and wage subsidies are examples of instruments commonly used. The value of subventions provided can be very significant. For example, Head (1998) reports that when Mercedes established its plant in Alabama in 1994, the State Government effectively invested \$150,000 per job. Girma, Greenaway and Wakelin (2001) report estimates of up to \$50,000 per job to attract Samsung and Siemens to the North East of England in the late 1990s. Such considerable public subventions are only worthwhile if there are benefits from the investment over and above the direct return that accrues to the MNEs: in other words, if there are spillover benefits.

MNEs are widely acknowledged as having firm specific advantages in the form of knowledge based assets (such as proprietorial information relating to product or process technology); managerial know-how; human capital assets; marketing expertise and so on. The firm's decision to invest abroad instead of pursuing other forms of internationalisation strategies, such as arm's length exporting or licensing, results from internationalisation being the most efficient means of protecting and exploiting these firm assets. But theory suggests, and policymakers clearly believe, that they are only protected imperfectly. As a result, domestic firms may be able to benefit indirectly from an MNE presence, thereby boosting their own productivity. This could occur via the acquisition of human capital – the MNE trains up local labour which then takes the acquired human capital to some indigenous firm. Or it could occur via imitation: more colloquially, 'reverse engineering'. Through these and other channels, unpriced productivity spillovers from MNEs to indigenous firms can occur and it is these that the domestic government believes it is investing in when it offers tax breaks or direct subsidies to MNEs.

The evidence, however, on the presence of productivity spillovers is rather mixed. For example, Hanson (2000) examines in detail three major MNE investments (Ford

and General Motors in Brazil, Intel in Costa Rica) and concludes that there is little evidence of productivity spillovers to domestic firms from these projects. In a more wide ranging review of the literature, covering developed, developing and transitional economies, Görg and Greenaway (2002) conclude that little by way of positive evidence can be adduced from some 40 studies. This could be due to the fact that productivity spillovers are more illusory than real, because MNEs protect their firm specific assets very effectively. Or it could be due to the fact that until recently, most work was industry based and/or cross-section. As Görg and Strobl (2001) have argued, estimates from the latter in particular are likely to be biased. With the growing availability of longitudinal data at the plant or firm level, however, more analysts are using panel or cluster techniques. Since the plant or firm is the most appropriate level of analysis when searching for spillovers, this is a helpful development and may (or may not) result in more supportive evidence being found in future.

Another more indirect channel for stimulating productivity improvement which may motivate policymakers to invest public funds in attracting MNEs is the possibility that they may promote increased export activity on the part of domestic firms and, *via exports*, increased productivity. We will in the next Section focus on potential channels for export spillovers, followed by a model of spillovers in Section IV. Prior to that, however, we discuss how exports and productivity may be linked, because if they are not there would be no *a priori* case for intervention.

Policymakers have, of course, long seen the promotion of exports as a priority. In part this is due to mercantilist instincts that view exports as ‘good’ and imports as ‘bad’. But it is also in part evidence based since, in the aggregate, the growth of real exports and real output appear to be correlated through time (see Edwards 1994). Until recently, however, there was little by way of theory or evidence to link exporting and productivity at the firm level. There is now a rapidly growing literature pointing to a clear link between the two. Firm and plant level empirical work, stimulated by Bernard and Jensen (1997) and extending over a range of developing and OECD countries points to several robust findings. A striking result reported by almost all researchers is that firms that export are more productive than those that do not and that they become more productive before they enter export markets. Another

common finding is that once they enter export markets, their productivity does not increase further, though Girma, Greenaway and Kneller (2003) do in fact report evidence of second order productivity effects for the UK and like Castellani (2002) they report that increased export intensity is associated with productivity improvement. Theoretical underpinnings to these findings have been provided in the models of *inter alia* Clerides, Lach and Tybout (1998) and Melitz (2002). The key point is that exporting involves fixed costs associated with developing new markets and, in order to cover those fixed costs, productivity has to be higher to enable the firm to enter. Thus, more productive firms self-select into export markets. Once there, learning effects or pro-competition effects might lead them to become even more productive.

From our standpoint, the key point is this: if domestic firms 'learn' to export from MNEs, with consequent entry to export markets or an increase in export intensity of existing exporters, it provides a further potential route for productivity growth to occur but via exports spillovers rather than direct productivity spillovers. If such a link does exist it provides a potential justification for policy intervention to attract multinational investment. Having established that export spillovers could be beneficial in stimulating productivity change, the next question is how might they occur?

III. Multinationals and Export Performance

One immediate channel for export spillovers is by domestic firms learning from the export activities of foreign subsidiaries in the host country through information externalities, a possibility that Aitken, Hanson and Harrison (1997) emphasise. Subsidiaries may have easier access to information on foreign markets because they form part of a multinational enterprise. As Krugman (1989), Roberts and Tybout (1996) and Clerides, Lach and Tybout (1998) demonstrate, exporting involves fixed costs. These might include the establishment of distribution networks, creation of transport infrastructures, investment in advertising to gain public exposure, research about the foreign market to gain intelligence on consumers' tastes, market structure, competitors, regulations and so on. These will be lower for MNEs as they already have knowledge and experience of operating in foreign markets and can benefit from

network economies and know-how of managing the international marketing, distribution and servicing of their products. A transfer of this knowledge from MNEs to domestic firms would constitute an information spillover.

MNEs can also be a source of another sort of information not directly related to exporting, namely new technologies and management techniques, from which domestic firms could benefit through demonstration and imitation, for example via contact with local clients and suppliers and training of personnel and management staff. The presence of MNEs would thus complement the indigenous firms' innovation activities, and contribute to the emergence of a more competitive pool of local firms geared to exporting².

Entry of foreign companies will, at least in the first stage, lead to increased competition. This is particularly the case where MNEs invest in sectors with higher barriers to entry and therefore more oligopolistic market structures. Cantwell (1989) shows that the entry of US firms led to decreasing market shares of EU firms in some sectors. Increased competition in the domestic market may also be responsible for reinforcing the imitation effect, as it constitutes an incentive to engage in more efficient and leaner production techniques which in turn facilitate entry into foreign markets (see Wang and Blomström (1992) and Cantwell (1989)).

Whilst it is possible to identify the channels via which export spillovers could occur, empirical evidence on their existence is very limited. There are a few case studies which provide some support in developing countries, for instance Rhee and Bélot (1990). But Aitken, Hanson and Harrison (1997) were the first to test the hypothesis that MNEs act as export catalysts to indigenous firms in the host. Using panel data on 4,104 Mexican manufacturing plants for the period 1986-1990, they analyse a firm's decision of whether to serve the domestic market or to export, taking into account fixed costs of supplying foreign markets. They argue that the latter decrease due to information externalities resulting from the local concentration of export activity in general and MNEs' export performance in particular. They use a probit model to test

² It has been argued elsewhere in the literature that technological innovation plays an important role in promoting export performance. Empirical evidence supports this view, particularly for developed economies, see Hirsch and Bijaoui (1985) and Wakelin (1998).

the impact of MNEs on the domestic firm's decision to export, controlling for the local concentration of MNEs' export activity, sectoral concentration of export activity in general, and the overall geographic concentration of economic activity³. Their results support the hypothesis that spillovers from both MNE export activity, and export activity in general, are important. However, they are not robust to changes in the sample. When natural resource-intensive industries and those facing high transport costs are excluded, local concentration of export activity becomes insignificant. Nonetheless, export spillovers due to MNEs remain significant. In further tests of robustness, the authors replace MNE export activities by a measure of general MNE production and obtain the same positive and statistically significant relationship using the production measure as with the export variable. This raises the question of whether the impact of MNEs on export behaviour of domestic firms is associated with their export performance, or whether it occurs because of their presence in the domestic market.

Kokko, Tansini and Zejan (1997) also investigate export spillovers using a cross-section of 1,243 manufacturing firms in Uruguay in 1988. They estimate a probit model using firm-level as well as sector-level variables as regressors, including a measure of the impact of foreign MNEs at the sector-level. Their results suggest that the likelihood of exporting increases with the presence of foreign MNEs established after 1973, the more outward-oriented period in Uruguay. For foreign firms established before 1972 (Uruguay's inward oriented period) there is no evidence of spillovers. They also explore whether the geographical destination of exports matters. They find most evidence of export spillovers outside of Uruguay's neighbouring markets (Brazil and Argentina). Their explanation for this is that exports to these countries are driven mainly by low transaction costs and preferential institutional arrangements.

In sum, there are few studies of export spillovers and those that do exist focus on

³ The estimating model includes a range of other variables thought to affect the export decision. These include domestic final-goods prices, cost variables, employment in the plant relative to industry average, value-added tax payments as a share of sales, royalty payments as a share of sales and a set of dummy variables to control for the foreign-ownership status, the industry of the firm, the region where it is located and the year of the observation. In addition they include variables related to the country's trade policies like average tariffs and import-licence requirements.

industrialising countries. Later in the paper we focus on export spillovers in an industrialised country, the UK. This is a non-trivial case to take since the UK is the second largest host to MNE investment globally (after the US). Before explaining our empirical analysis and results, we motivate it with a simple theoretical framework.

IV. Theoretical Framework

Like Aitken, Hanson and Harrison (1997), we begin with the choice facing a representative domestically-owned firm between serving the domestic market, exporting, or both, to maximise its profit:

$$\begin{aligned} \max_{q_d, q_f} & P_d q_d + P_f q_f - h(q_d + q_f) - m_d(q_d) - m_f(q_f) \\ \text{s.t.} & q_d, q_f \geq 0 \end{aligned} \quad (1)$$

Where, subscripts f and d refer to the foreign and domestic markets, respectively. This is a standard profit function dependent on prices, quantities sold in each market and costs. q refers to quantity of output and P to price. $h(\bullet)$ refers to production costs, $m_d(\bullet)$ and $m_f(\bullet)$ to distribution costs for domestic and foreign markets, respectively, with $m_f > m_d$. Spillovers are modelled as MNEs having a cost reducing effect on domestically-owned firms. The cost function is composed of two parts defined as⁴:

$$\begin{aligned} h(q_d + q_f) &= \frac{a}{2}(q_d + q_f)^2 + g(q_d + q_f) \\ m_i(q_i) &= \frac{1}{2}b_i q_i^2 + c_i q_i \\ i &= f, d \end{aligned} \quad (2)$$

where,

$$\begin{aligned} g &= g(X, \Omega, \Psi) \\ c_d &= c_d(X, Z_d), c_f = c_f(X, Z_f, \Gamma_{EX}, \Gamma_{MNE}) \end{aligned} \quad (3)$$

The firm's costs are divided into production costs, $h(\bullet)$ and distribution costs, $m(\bullet)$. Part is common to both markets, X , while the remainder, Z , are cost variables that are

⁴ We use the same functional form as Aitken et al (1997), with $m(\cdot)$ and $h(\cdot)$ increasing and convex in their arguments.

market specific. These are given by Z_i ($i=f,d$). Γ_{EX} , and Γ_{MNE} are, respectively, total export activity and total MNE export activity. Ω , represents the relative importance of MNEs in the domestic market and Ψ the total innovation activities carried out by MNEs. Finally, a , g , b_i and c_i ($i=f,d$) are scalar parameters.

We set up the cost function so that production costs, $h(\bullet)$ are invariant to destination of output. Distribution costs, $m(\bullet)$ on the other hand vary by destination, capturing the idea of export specific costs. Specifically, we assume that distribution costs associated with exporting - Z_f - exceed the costs of distribution in the domestic market. Information spillovers from export activities of multinationals and exports in general are shown as:

$$\frac{\partial m_f(q_f)}{\partial \Gamma_{EX}} \leq 0$$

$$\frac{\partial m_f(q_f)}{\partial \Gamma_{MNE}} \leq 0$$

Thus the higher the concentration of MNE export activities and export activity in general, the more domestic firms can benefit in terms of information externalities which in turn reduce the distribution costs of selling abroad.

In addition we also introduce a competition effect and an imitation/demonstration effect. These are captured by variables Ω and Ψ respectively and spillovers from these sources would be represented by:

$$\frac{\partial g(q_f + q_d)}{\partial \Omega} \leq 0$$

$$\frac{\partial g(q_f + q_d)}{\partial \Psi} \leq 0$$

In other words, the greater the importance of foreign firms in the domestic market the stronger the competitive pressure leading domestic firms to reduce production costs. Also the more technologically-intensive the MNE's activities in the host country, the larger the imitation potential for domestic firms to increase their efficiency in production. We must, of course, acknowledge that the firm may choose to produce zero output in either market. For tractability, however, the model is constructed such that at least q_d will always be positive.

Returning to the profit function, like Aitken, Hanson and Harrison (1997), we derive the first order conditions for profit maximisation for a representative domestic firm, as follows⁵,

$$q_d = \frac{1}{a+b_d} [P_d - aq_f^* - g(X, \Omega, \Psi) - c_d(X, Z_d)] \quad (4)$$

$$q_f^* = \frac{1}{a+b_f} [P_f - aq_d - g(X, \Omega, \Psi) - c_f(X, Z_f, \Gamma_{EX}, \Gamma_{MNE})] \quad (5)$$

For purposes of estimation, equations (4) and (5) can be rewritten as:

$$q_{dj} = \alpha_1 P_d + \alpha_2 q_{fj}^* + \alpha_3' Z_{dj} + \alpha_4' X_j + \alpha_5 \Omega + \alpha_6 \Psi + u_{dj} \quad (6)$$

$$q_{fj}^* = \beta_1 P_f + \beta_2 q_{dj} + \beta_3' Z_{fj} + \beta_4' X_j + \beta_5 \Omega + \beta_6 \Psi + \beta_7 \Gamma_{EXj} + \beta_8 \Gamma_{MNEj} + u_{fj} \quad (7)$$

Where j is the index for the firm. Z_{ij} is a $(1 \times K)$ vector of cost variables specific to market i , X_{ji} a $(1 \times J)$ vector of cost variables common to both markets, α_3 and β_3 are $(1 \times K)$ vector of coefficients. α_4 and β_4 are $(1 \times J)$ vector of coefficients, and u_{ij} is a normally distributed error term for market i and firm j , which has zero mean and variance σ_u^2 .

These equations can be transformed to reveal the determinants of the optimal quantity of output to be sold in the foreign market:

$$q_{fj} = \beta_1 P_f + \beta_2 (\alpha_1 P_d + \alpha_3' Z_{dj}) + \beta_3' Z_{fj} + (\beta_2 \alpha_4' + \beta_4') X_j + (\beta_5 + \beta_2 \alpha_5) \Omega + (\beta_6 + \beta_2 \alpha_6) \Psi + \beta_7 \Gamma_{EXj} + \beta_8 \Gamma_{MNEj} + v_j \quad (8)$$

where

$$v_j = \beta_2 u_{dj} + u_{fj}$$

The firm's optimal exported output thus depends on:

- the price of the goods;
- firm-specific production costs;
- distribution costs in the foreign and domestic markets;

⁵ If the firm decides not to export, a latent variable q_f^* could be defined such that $q_f^* = q_f$ if $q_{fj} > 0$ and $q_f^* = 0$ otherwise.

- exporting activity in the country;
- several aspects of the presence of MNEs such as their exporting activities, technological innovation activities and competitive pressure.

For empirical tractability, we transform this into a probit model of the probability that a firm exports:

$$\Pr(y_j = 1) = \Pr \left[\begin{aligned} & \beta_1 P_f + \beta_2 (\alpha_1 P_d + \alpha_3' Z_{dj}) + \beta_3' Z_{fj} + (\beta_2 \alpha_4' + \beta_4) X_j + (\beta_5 + \beta_2 \alpha_5) \Omega + \\ & (\beta_6 + \beta_2 \alpha_6) \Psi + B_7 \Gamma_{EXj} + \beta_8 \Gamma_{MNEj} + v_j \geq 0 \end{aligned} \right] \quad (9)$$

where

$$v_j = \beta_2 u_{dj} + u_{fj}$$

V. An Empirical Model of Exporting and MNEs

Building on the framework above we develop an empirical model to search for any effects of foreign MNEs on export behaviour of domestic firms. We use a panel of UK domestically-owned firms over a 5-year period, taking into account the three potential spillover channels discussed above. Since all firms in our sample produce for the domestic market, we do not need to model the entry decision, only the export decision.

However, export behaviour actually involves two decisions: first whether to export and second what proportion of output to export. We frame our econometric analysis to ensure that we not only account for both decisions but also account for the fact that they are interdependent. Our specification therefore avoids selectivity biases associated with focusing exclusively on export propensity of exporting firms, which would cast doubt on the econometric results, (see Heckman, 1979). This is particularly important since we investigate how the presence of MNEs affects the export behaviour of *all* domestic manufacturing firms, not only exporting firms.

Our export decision equation is:

$$EXP_i = \alpha + \beta_1 FRD_s + \beta_2 MNEM_s + \beta_3 MNEX_s + \beta_4 DRD_s + \beta_5 SEI_s + \beta_6 INDEM_s + \beta_7 PP_s + \beta_8 PC_s + \beta_9 WAGE_i + \beta_{10} ASSETS_i + \beta_{11} TURN_i + \beta_{12} FUNDS_i + v_i \quad (10)$$

and our export propensity equation is:

$$EXPROP_i = \alpha + \beta_1 FRD_s + \beta_2 MNEM_s + \beta_3 MNEX_s + \beta_4 DRD_s + \beta_5 SEI_s + \beta_6 INDEM_s + \beta_7 PP_s + \beta_8 PC_s + \beta_9 WAGE_i + \beta_{10} ASSETS_i + \beta_{11} TURN_i + u_i$$

(11)

where

$$v_i \sim N(0,1)$$

$$u_i \sim N(0,\delta)$$

$$corr(v_i, u_i) = \rho$$

$$(v_i, u_i) \sim \text{bivariate normal} [0, 0, 1, \delta, \rho]$$

and the subscripts i and s refer to the firms and sectors respectively. Details of variable definitions for both estimating equations are set out in detail in Table 1.

Table 1 - Variables definitions and data sources

VARIABLES	DESCRIPTION	SOURCE
<i>EXP</i>	dichotomous variable taking the value 1 if the domestically-owned firm exports and 0 otherwise	OneSource
<i>EXPROP</i>	export propensity of domestically-owned exporting firms computed as the ratio of exports/ turnover	OneSource
<i>PP</i>	5-digit level SIC(92) sectors' producer price index numbers of products manufactured in the UK	National Statistics
<i>TURN</i>	firm level turnover for domestically-owned firms	OneSource
<i>WAGE</i>	total remuneration/ number of employees	OneSource
<i>ASSETS</i>	fixed assets/ number of employees	OneSource
<i>PC</i>	average producer costs computed using 3-digit SIC(92) sector data and the number of firms in the respective sector	National Statistics
<i>FRD</i>	expenditure on R&D performed in UK by foreign businesses at the 2- digit level SIC(92)	National Statistics
<i>DRD</i>	expenditure on R&D performed by domestic businesses/ Total expenditure in R&D - 2-digit SIC(92) level	National Statistics
<i>FUNDS</i>	shareholders' funds / Turnover	OneSource
<i>SEI</i>	total domestic exports in industry i / total domestic exports in country	OneSource
<i>MNEM</i>	employment share of MNE in each sector using data at 5-digit level	OneSource
<i>INDEM</i>	share of industry i employment in total employment in the country, computed at 5-digit level	OneSource
<i>MNEX</i>	$\frac{\text{(MNE exports in industry } i \text{ / total exports in industry } i)}{\text{(total MNE exports / total exports)}}$	OneSource
<i>YEAR 93-96</i>	year dummies	

Note that many of the independent variables are common to both equations, for reasons that are explained below.

Equation 10, our export decision equation, is estimated for the full sample of firms. *EXP* is a dichotomous dependent variable, which takes the value 1 or 0 depending on whether the domestic firm decides to export or not. This equation also performs the sample selection for the second model that focuses exclusively on the export propensity of the sub-set of firms that do decide to export. The dependent variable for equation 11, which explains the share of output exported, is then *EXPROP*, the ratio of exports to total turnover.

Building on the theoretical model in Section IV, we include a number of spillovers variables. Clearly we need to control for a number of factors, not least those that will fashion the export market entry decision of indigenous firms and which will be independent of the factors likely to determine MNE presence⁶ First, we include three regressors to test for possible export spillover channels. *FRD* is the expenditure on R&D carried out by foreign MNEs in the UK. This captures the contribution of MNEs to the available stock of technological knowledge, on the assumption that the more innovation activities carried out by MNEs, the larger the potential for imitation from which domestic firms can benefit. *MNEM* is the relative weight of MNEs in total employment in a sector. It accounts for the relative importance of MNEs at the sector level in the domestic market. The greater their relative importance, the stronger the competitive pressure on domestic firms. Finally *MNEX* is the relative importance of MNEs' export activities in a sector scaled by the relative importance of MNEs' exports in total exports. Following Aitken, Hanson and Harrison (1997), we assume that the greater the importance of MNEs in the exports of a given sector the higher the scope for domestic firms to benefit from information externalities. We expect to obtain positive coefficients for *FRD*, *MNEM* and *MNEX*.

We do of course need to control for the fact that MNE's may locate in sectors with

⁶ As an anonymous referee pointed out, if the factors which determine whether domestic firms export are the same as those which determine MNE presence we would have a potential endogeneity problem. However, the recent literature on firm level determinants of exporting suggests this is unlikely to be a serious problem (see, for example, Bernard and Jensen 1999; Clerides, Lach and Tybout 1998; Castellani 2002; Girma, Greenaway and Kneller 2003).

higher export ratios. We do this, by including *SEI*, which is the relative importance of sector *i* in domestic exports. This captures the export structure of the host country and controls for factors that affect a sector's overall export profile. The variable *INDEM* is included to control for industry size at the national level (in terms of employment), which allows for possible general spillovers not directly associated with export activity. In terms of sector and firm-specific variables we include *PP*, domestic producer price indices; *PC*, average production costs; *WAGE*, average wages; and *ASSETS*, fixed assets per employee. We also include *DRD*, which captures the domestic contribution to the total innovation activities carried out in the UK, since this will affect the likelihood of exporting. Since there is a well-established link between firm size and exports, firm turnover (*TURN*) is included⁷. Finally, in the export decision equation we control for shareholders' funds per unit of output available to the domestic firm (*FUNDS*). This captures the domestic firms' financial capacity to meet the extra costs associated with setting up export operations and is only included in the first estimating equation, since the firm's ability to overcome liquidity constraints influences the decision to export but not export propensity as it relates to fixed rather than variable costs.

Most of our data were taken from *OneSource*, a database containing the latest available accounts and related information for over 100,000 firms in the UK, covering a wide range of firm characteristics⁸. We selected domestically-owned firms in UK manufacturing, defined between sectors 15000 and 37000 of the Standard Industrial Classification (1992). We then eliminated all holding companies, due to the specific character of these firms. We also kept only firms with 10 or more employees on average over the last ten years in order to eliminate the very smallest of firms. A total of 10,402 firms matched these criteria. However, inevitably there were missing observations for many firms and we retained only those that had data available for at least three consecutive years. Our final sample is made up of 3,662 firms with at least three years of data between 1992 and 1996 (see Appendix A), yielding a panel of over 11,000 observations.

⁷ See, for example, Bernard and Jensen (1999); Delgado, Fariñas and Ruano (2002); Girma, Greenaway and Kneller (2002).

⁸ *OneSource* aims to cover the population of economically active firms in the UK.

VI. Econometric Results

We use an econometric technique based on the Heckman selection model (see Heckman, 1979). This takes into account the truncated nature of the sub-sample of firms used in the export propensity model and incorporates a sample selection mechanism given by the export decision equation. We pooled the five years of firm-level data, clustering it by firm, which allows the use of robust standard errors and unspecified serial correlation within firms while assuming independence between them. Finally, since it proved impossible to test simultaneously for the existence of spillovers from competition effects and information externalities due to the (not unexpectedly) strong correlation between *MNEM* and *MNEX* (see Appendix B) we report results for the two effects separately.

Maximum likelihood estimates for our two estimating equations are shown in Tables 2 and 3. The reported *Wald* test for overall significance indicates that taken jointly the coefficients of the regressors are significant. Also the correlation coefficient - ρ - between the error terms of the export decision and export propensity equations is significantly different from zero. This is also confirmed by the likelihood-ratio test, which validates our choice of the Heckman selection model.⁹

The Export Decision

Table 2 reports coefficient estimates for the export decision. Our model is able to correctly predict 71% of domestic firms' decisions of whether to export or not. The presence of MNEs in the domestic market clearly appears to increase the probability of an indigenous firm becoming an exporter. More specifically, we find a positive and significant coefficient on *FRD* (expenditure on R and D by foreign businesses) which is consistent with a demonstration effect. The positive and significant coefficient on *MNEX* suggests that local firms benefit from contact with the MNEs' exporting strategies and techniques. With respect to the competition effect we found that the relative importance of MNEs in the domestic markets, (*MNEM*) is positively and significantly associated with a higher probability that the domestic firm is

⁹ Estimating these equations separately using OLS without correcting for the sample selection (given by parameter λ - inverse Mills ratio) would lead to omitted-variable bias.

exporting.

The results for *SEI* (which captures the relative importance of the sector in aggregate exports) confirm that belonging to an export-oriented sector helps domestic firms establish their own export activities. With respect to *INDEM* we found a significant and negative relationship between this and the probability of a firm exporting, suggesting that firms in large domestic sectors tend to focus more on serving the home market. The coefficients on the variables: turnover, producer prices, production costs and domestic expenditure on R and D (*TURN*, *PP*, *PC* and *DRD* respectively), all had the expected sign but turned out to be insignificant. We found, however, a positive and significant relationship between average labour remuneration (*WAGE*) and the probability of a firm being an exporter. This may be capturing the importance of labour skills for the competitiveness of British firms' production in world markets.

In conclusion, there is evidence to support the hypothesis that the presence of foreign MNEs in UK manufacturing influences the export orientation of domestic firms. Our results clearly suggest the presence of export spillovers. Though we cannot discriminate clearly between competition and information externalities effects, our results suggest that increased competition may be the principal transmission channel.

Export Propensity

Table 3 reports the estimated coefficients for the export propensity equation. Again we include *MNEX* and *MNEM* separately. We find no evidence of export information spillovers from MNEs. In other words, although the export experience of foreign firms may influence whether or not domestic firms export, it does not appear to have a significant impact on export intensity. There is, nonetheless, evidence that information externalities from export activities in general play an important role, with *SEI*, confirming that sector-specific factors are important determinants of overall export propensity.

Table 2 – The Export Decision

Dependent variable: EXP

Regressor	Coeff.	t-stats	Coeff.	t-stats
FRD	0.0001	5.79***	0.0001	3.53***
DRD	0.11	0.69	0.23	1.51
MNEX	0.1	1.83*	-	-
MNEM	-	-	1.42	6.16***
SEI	8.94	4.65***	8.74	4.87***
INDEM	-32.29	-11.43***	-29.83	-10.46***
PP	-0.01	-1.23	-0.004	-0.84
PC	-0.0001	-0.03	-0.0002	-1.12
WAGE	1.89	4.19***	1.65	3.64***
ASSETS	-0.26	-3.69***	-0.26	-3.83***
TURN	0.0001	0.9	0.0001	0.96
FUNDS	0.07	1.91**	0.07	1.84**
Year93	0.004	0.13	-0.002	0.96
Year94	-0.12	-3.09***	-0.12	-3.07***
Year95	-0.04	-0.63	-0.02	-0.37
Year96	0.03	0.45	0.03	0.4
Const.	0.82	1.89*	0.42	0.96
Number of obs.	11372		11372	
Log Likelihood	-5875.66		-5780.15	
Wald chi ² (14)	309.93		312.06	

*** significant at 1%; **significant at 5%; *significant at 10%

Table 3 – Export Propensity

Dependent variable: EXPROP

Regressor	Coeff.	t-stats	Coeff.	t-stats
FRD	0.0001	3.03***	0.0001	1.62*
DRD	0.04	1.49	0.06	2.02**
MNEX	0.02	1.41	-	-
MNEM	-	-	0.16	3.82***
SEI	0.85	4.61***	0.86	4.69***
INDEM	-2.77	-4.38***	-2.51	-3.95***
PP	0.003	3.79***	0.003	3.92***
PC	0.0002	9.41***	0.0002	8.032***
WAGE	0.63	6.38***	0.62	6.21***
ASSETS	0.02	1.08	0.02	1.04
TURN	0.0001	2.21**	0.0001	2.19**

Year93	-0.014	-2.76***	-0.01	-2.68***
Year94	0.01	0.848	0.01	1.01
Year95	0.003	0.3	0.01	0.66
Year96	0.01	0.72	0.01	0.85
Const.	-0.20	-2.45**	-0.25	-2.93**
Number of obs.	11372		11372	
Censored obs.	7948		7948	
Uncensored Obs	3424		3424	
Log Likelihood	-5875.65		-5780.15	
Wald chi²(14)	309.9		312.1	
λ	-0.05		-0.05	
ρ	-0.22		-0.22	
Wald test of independence of equations, ($\rho=0$)	Chi ² (1)=32.81 Prob>chi ² = 0.0		Chi ² (1)=34.14 Prob>chi ² =0.00	

*** significant at 1%; **significant at 5%; *significant at 10%

With respect to other spillover channels, there is significant evidence of demonstration/imitation effects as well as competition effects, since the coefficients for *FRD* and *MNEM* are both positive and significant. It seems therefore that foreign MNEs not only affect the decision of domestic firms to export but also their export propensity. We also find a positive and significant coefficient for *DRD* suggesting that domestic technological innovation is important to the competitiveness of domestic firms' export activities in the United Kingdom, despite not being crucial to the decision to export. As far as the firm-specific variables are concerned, size, cost and average wages all positively and significantly influence export propensity. It thus seems that production costs may be more important when increasing export propensity than the initial decision to export. To conclude, the results for the export propensity equation confirm a role for export spillovers from MNEs. The size of the estimated coefficients suggests that the competition effect is again the most important channel.

VII. Conclusions

This paper has investigated, for the first time to our knowledge, export spillover effects from MNEs to domestic firms in an industrialised economy. We began by explaining why this is an important issue from a policy perspective and by setting out the links between exporting activity and productivity. We then outlined reasons why we expect spillovers to exist, focusing particularly on information externalities,

demonstration effects and competition effects and set out a theoretical model to inform our empirical analysis. The latter followed a two-stage strategy, modelling both the decision of whether or not to export and export propensity. In both we included a range of variables to control for the possibility that the same factors that determine whether an indigenous firm enters export markets also determine whether MNE's are present. With regard to the decision of whether to export or not, we found that the probability of domestic firms exporting was positively influenced by the intensity of foreign R&D expenditure, the relative importance of MNEs' production and MNEs' export activities in the host market. However, by far the most important of these is the level of foreign production in the sector.

When we focused on export propensity we again found evidence of a positive impact associated with MNEs. The variables controlling for the intensity of R&D expenditure and the relative importance of MNE production in the domestic market are found to be positively and significantly correlated with the export propensity of domestic firms. There is however no significant evidence of export information externalities. Again the most important channel for this export-enhancing effect appears to be increased competition resulting from foreign MNEs.

Our results are consistent with the predictions of our model and provide a robust analysis of links between MNEs and the export performance of indigenous firms. We present evidence that the export enhancing effect of FDI for the host country is not limited to the export performance of the foreign affiliates themselves, but also associated with higher export orientation of domestic firms. Our answer to the question posed at the start of the paper, "Do Domestic Firms Learn to Export from Multinationals?" is yes, this appears to be the case in the UK.

What implications does this have for policy? At the outset we acknowledged the extensive policy competition between governments to attract MNEs. This is (implicitly or explicitly) predicated on the assumption of externalities being present. Previous work has suggested, however, that evidence in support of direct productivity spillovers is limited. Our results here suggest that export spillovers may be present. That being so, this may constitute an indirect channel by which MNEs raise the productivity of domestic firms.

Appendix A: Number of firms per year in the sample

<i>Year</i>	<i>Number of firms</i>
1992	3501
1993	3564
1994	3636
1995	3662
1996	3662

References

- Aitken, B., G.H. Hanson and A.E. Harrison, 1997, "Spillovers, foreign investment and export behaviour", *Journal of International Economics*, vol.43, p.103-132
- Balasubramanyam, V.N., M. Salisu and D. Sapsford, 1996, "Foreign direct investment and growth in EP and IS countries", *Economic Journal*, vol.106, p.92-105
- Barry, F. and J. Bradley, 1997, "FDI and the trade: the Irish host-country experience", *Economic Journal*, vol.107, p.1798-1811
- Bernard, A. and Jensen, J.B., 1999, "Exceptional Exporters' Performance: Cause, Effect or Both", *Journal of International Economics*, Vol. 47, pp.1-25.
- Blake, A.P. and N. Pain, 1994, "Investigating structural change in UK export performance: the role of innovation and direct investment", *NIESR Discussion paper n.71*
- Blomström, M., A. Kokko and M. Zejan, 2000, *Foreign Direct Investment: Firm and Host Country Strategies* (London, Macmillan)
- Blomström, M. and H. Persson, 1983, "Foreign investment and spillover efficiency in an underdeveloped economy: evidence from Mexican manufacturing industry", *World Development*, vol.11, p.493-501
- Blomström, M., 1986, "Foreign investment and productive efficiency: the case of Mexico", *Journal of Industrial Economics*, vol.35, p.97-110
- Cabral, S., 1995, "Comparative export behaviour of foreign and domestic firms in Portugal", *Banco de Portugal Economic Bulletin*, March, p.69-78
- Cantwell, J., 1989, *Technological innovation and multinational corporations*, Oxford, Basil Blackwell.
- Castellani, D., 2002, "Export Behaviour and Productivity Growth: Evidence from Italian Manufacturing Firms", *Weltwirtschaftliches Archiv*, Vol.138, pp.605-628.
- Clerides, S., S. Lach, and J. Tybout, 1998, "Is Learning by Exporting Important?", *Quarterly Journal of Economics*, Vol. 113, pp.903-948.
- Delgado, M., J. Fariñas and J. Ruano, 2002, "Firm Productivity and Export Markets: A Non-Parametric Approach", *Journal of International Economics*, Vol.57, pp.397-422.
- Girma, S., D. Greenaway, and R. Kneller, 2003, "Does Exporting Lead to Better Performance? A Microeconometric Analysis of Matched Firms", *Review of International Economics* (forthcoming)

- Girma, S., D. Greenaway, and K. Wakelin, 2001 “Who Benefits from Foreign Direct Investment in the UK?”, *Scottish Journal of Political Economy*, Vol. 48, pp.119-133.
- Görg, H. and D. Greenaway, 2001, “Much Ado About Nothing: Do Domestic Firms Really Benefit from Foreign Direct Investment?”, GEP Research Paper 01/37, Leverhulme Centre for Research on Globalisation and Economic Policy, University of Nottingham.
- Görg, H. and E. Strobl, 2001 “Multinational Companies and Productivity Spillovers: A Meta Analysis”, *Economic Journal*, vol. 111, pp. F723-F739.
- Haddad, M. and A. Harrison, 1992, “Are there positive spillovers form direct foreign investment? Evidence from Panel data for Morocco”, *Journal of Development Economics*, vol.42, p.51-74
- Hanson, G., 2000, “Should Countries Promote Foreign Direct Investment?” (mimeo, University of Michigan).
- Heckman, J. J., 1979, “Sample selection bias as a specification error”, *Econometrica*, vol.47, p.153-161
- Hirsch, S. and I. Bijaoui, 1985, “R&D intensity and export performance: a micro view”, *Weltwirtschaftliches Archiv*, vol.121, p.138-251
- Kokko, A., R. Tansini and M. Zejan, 1997, “Trade Regimes and Spillover Effects of FDI: Evidence from Uruguay” (mimeo, Stockholm School of Economics)
- Melitz, M, 2002, “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”, *Econometrica* (forthcoming).
- O’Sullivan, P.J., 1993, “An assessment of Ireland’s export-led growth strategy via foreign direct investment: 1960-1980”, *Weltwirtschaftliches Archiv*, vol.129, p.139-158
- Rhee, Y.W. and T. Bélot, 1990, “Export catalysts in low-income countries”, *World Bank Discussion Papers*, no72
- United Nations Conference on Trade and Development (UNCTAD), 1997, *World Investment Report 1998. Trends and determinants*, United Nations, Geneva
- Wakelin, K., 1998, “Innovation and export behaviour at the firm level” *Research Policy*, vol.26, p.829-841
- Wang, J-Y and Blomström, M., 1992, “Foreign investment and technological transfer: a simple model”, *European Economic Review*, vol.36, p.137-155