The University of Nottingham

research paper series

Globalisation, Productivity and Technology

Research Paper 2005/01

Acquisition FDI and the Export Intensity of Multinational Firms

by

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The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

GEP Leverhulme Centre for Research on Globalisation and Economic Policy

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Acknowledgements

R. Kneller and M. Pisu are grateful to The Leverhulme Trust for financial support under Programme Grant F114/BF.

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Abstract

This paper investigates the impact of acquisition FDI on exporting intensity in U.K manufacturing. A quasi-likelihood estimation method is used, and the empirical estimates point to the following conclusions: (i) UK firms with higher exporting intensity are more likely to be foreign takeover targets; (ii) US acquired firms increase their exporting intensity, consistent with the idea that acquisition FDI is used as a platform for serving the wider EU market (iii) Firms acquired by European multinationals significantly decrease their export-orientation, suggesting targeting of the domestic market post-takeover; (iv) The exporting propensity of non-US and non-EU multinationals exhibits no significant change.

JEL classification: ***F14, F23***

Keywords: Foreign direct investment, acquisitions, exports**.**

Outline

1. *Introduction*
2. *Literature Review*
3. *Empirical Methodology*
4. The data
5. *Empirical Findings*
6. *Conclusions*

Non-Technical Summary

In traditional theories of international trade and multinationals firms serve overseas markets either by exporting their products or by establishing foreign production facilities. This is known in the literature as the proximity-concentration trade-off. Yet in the UK, during the period 1988 to 1996 over 80 per cent of all the brownfield FDI that occurred was the acquisition of domestic firms that had export experience. If exports and FDI are substitute methods of serving overseas markets why then do foreign firms disproportionately target UK exporters?

One explanation might be that in a world of incomplete information the export status of a firm is interpreted as an indicator of high performance by the acquirer. It has become well established across a number of studies that export firms are 'better' than non-exporters across a range of measures, including their productivity. Alternatively, to reduce the cost of assimilating the new firm into the wider organisation overseas buyers might prefer firms that are likely to be more 'similar' to themselves. Exporting firms might offer such qualities. Or maybe exports and FDI are complements? Foreign firms acquire exporters in order to exploit this aspect of the firm. The UK is used as an export platform.

In this paper we attempt to provide answers to the last of these questions by investigating the export intensity of firms following *acquisition*. The analysis uncovers interesting differences depending on whether the acquiring firm is from the US or the EU. Where US acquired firms increase their exporting intensity UK firms acquired by European multinationals have decreased their export-orientation. This is consistent with the idea that acquisition FDI is used as a platform for serving the wider EU market by US firms, whereas EU firms focus more on serving the domestic market post-takeover. For US firms it would appear that exports and FDI are complements, whereas they are substitutes for EU firms.

1. Introduction

In traditional theories of international trade and multinationals firms serve overseas markets either by exporting their products or by establishing foreign production facilities. This is known as the proximity-concentration trade-off (Brainard, 1987). Yet in the UK, during the period 1988 to 1996 over 80 per cent of all the brownfield FDI that occurred was the acquisition of domestic firms that had export experience.[1] If exports and FDI are substitute methods of serving overseas markets why then do foreign firms disproportionately target UK exporters?

One explanation might be that in a world of incomplete information the export status of a firm is interpreted as an indicator of high performance by the acquirer. It has become well established across a number of studies that export firms are more productive than non-export firms (e.g. Bernard and Jensen, 1999; Girma, Greenaway and Kneller, 2004). Alternatively, to reduce the post-acquisition cost of assimilation overseas buyers might prefer firms that are likely to be more 'similar' to themselves. Exporting firms might offer such qualities. Or maybe exports and FDI are complements? Foreign firms acquire exporters in order to exploit this aspect of the firm; the UK is used as an export platform.

In this paper we attempt to provide answers to the last of these questions by investigating the export intensity of firms following *acquisition*. Kneller and Pisu (2004) have previously documented the exports of established foreign firms for the UK; Hanson *et al.*(2001) for the foreign affiliates of US multinationals; Feinberg and Keane (2003) for the US affiliates operating in Canada. Theoretical models explaining the motives of export platform FDI can be found in Ekholm *et al.* (2003), Grossman *et al.* (2003) and Yeaple (2003).

To make a *causal* inference on the direct impact of FDI on exports we employ propensity-score matching techniques (Rosenbaum and Rubin, 1983). This is important as studies of the indirect spillover effects from FDI are beset by problems of determining the direction of causality between foreign presence in a sector and exporting dynamics. Does FDI stimulate exporting or are multinational enterprises simply attracted to sectors with high exporting intensity? It is difficult to answer this question satisfactorily with aggregate data.

Application of the matching technique requires reference to a control group, in this case a selection of firms that were not acquired. The chosen control group comes from a larger sample of domestically owned firms, which is then reduced in number to include

only those that had similar observable characteristics in the pre-acquisition period. UK owned firms are chosen as the control group to capture possible changes in the opportunities and costs firms face when exporting from the UK. Short-term, these may reflect changes to the exchange rate or macroeconomic conditions; long-term, they may reflect government policy or UK comparative advantage.

In studying the causal impact of brownfield FDI on the export intensity of firms we do not to deny that other types of causation between exports and FDI may exist and might be studied using firm level data of the type employed here. FDI might for example, encourage domestic firms to start to export or increase their export intensity. The theoretical expectation is that domestic firms learn from foreign multinationals the necessary managerial techniques and marketing expertise that can help them overcome the sunk costs associated with export markets entry (Blomström and Kokko, 1998; Görg and Strobl, 2001). The empirical literature offers some evidence in support of this hypothesis: Aitken et al. (1997), Sjöholm (1999), and Greenaway *et. al.* (2004) all document evidence that industry level FDI *indirectly* enhances the exporting capabilities of domestic firms.

In conjunction with matching we deploy the quasi-likelihood estimator for models with fractional dependent variables illustrated by Papke and Wooldridge (1996), which is arguably the most appropriate way of modelling the determinants of exporting propensity (Wagner, 2001). To our knowledge, this estimation has not been applied before in the context of UK data, and it is expected that this would provide a more accurate description of the exports trajectories of UK based firms.

There is also policy interest in the question researched in the paper. In setting policy governments would benefit from understanding how these impact on both the trade and production decisions of firms, and in particular those of multinational firms (Head and Reis, 2004). Governments the world over intervene to encourage exports and FDI. Financial incentives such as tax breaks, duty drawbacks, investment allowances and so on have been offered to multinational enterprises (MNEs) to establish foreign affiliates (see Disney *et al.*, 2003 and Görg and Greenaway, 2004). Likewise, export promotion activities range from financing trade fairs, through providing free information about foreign markets and financing market researches, to export credit insurance. The outcomes that result from these policy changes depend on whether exports and overseas production are complements or substitutes.

[1] Source: based on data from the Office for National Statistics and *OneSource*.

This interdependence between export and FDI strategies has to some extent been recently been recognised within the UK. The once different budgets of the trade and investment arms of the umbrella organisation British Trade and International have been brought together under a new organisation called UK Trade and Investment (UKTI). Presumably, they must now determine the optimum allocation of resources between these two activities.

The rest of the paper is organised as follows. Section 2 outlines the empirical modelling strategy. Section 3 describes that data. Section 4 reports the main empirical results, and Section 5 concludes.

2. Literature Review

In traditional theories of international trade and multinationals, firms serve overseas markets either by exporting their products or by establishing foreign production facilities. When there are cost advantages to concentration (such as economies of scale) firms export, whereas they establish foreign production facilities when proximity to local markets is more important (Brainard, 1987, 1993).[2]

In the more recent literature, fuelled perhaps by the period of rapid globalisation over the last quarter century, beyond the most disaggregated level of analysis, that of a single product firm, exports and FDI are argued to be complements. Within the firm complementarity is possible for example once we allow for multiple products and cross-product dependence of demand (Lipsey and Weiss, 1984), or strategic motives in the location decision of firms (Choi and Davidson, 2003).

Adding the production of multiple products allows firms' to make alternative location choices across their product range. Given the relative costs of proximity and concentration the firm could feasibly choose to become exporters in some of its products and multinational in others. Exports and FDI become correlated if there are horizontal or vertical complementarities across these products. For example, in the case of horizontal complementarities the increased demand for the good supplied by foreign production may lead to increased demand for all goods produced by that firm, some of which may be supplied through arms-length trade.

In models of strategic choice the single product firms' decision how to serve markets is determined with reference to the choices made by their competitors using a

[2] Empirical support can also be found for this model: the share of exports is increasing in scale economies and decreasing in trade costs and foreign market size (Brainard, 1987).

game-theoretic framework. For example, in some versions of these models firms establish foreign production facilities and export in order to restrict competition within the industry and raise profits (Choi &Davidson, 2003).

This pattern of substitution at low levels of aggregation and complementarity at higher levels would also summarise the empirical evidence on this point. Using industry level trade data Lipsey and Weiss (1984), Clausing (2000) and Graham (2000) all find strong evidence of complementarity. Exports tend to rise with sales by foreign affiliates. In contrast using product level data for trade in Japanese automobile parts between the US and Japan Blonigen (2001) finds clear substitution effects in nine of the ten product lines examined and vertical complementarity effects from Japanese automobiles in nine product lines.

In this paper we consider the source of FDI as a test between complementarity and substitution. Within the existing literature the source of FDI has not previously been exploited to perform such a test. In so doing we build on the work of Head and Reis (2003) and Amiti and Wakelin (2003) who find substitution at the level of the firm and country level respectively, under some circumstances. Head and Reis (2003) for example find evidence of net complementarity in the most vertically integrated firms and substitution for the least integrated using a sample of Japanese firms over a 25-year period. Amiti and Wakelin (2003) focus on the trade FDI relationship from a somewhat different perspective. They test whether reductions in investment costs stimulate different types of FDI, which in turn impacts on trade. Estimating export gravity equations for bilateral trade flows between 36 countries they find that relative country characteristics are important. When countries are different (they have different factor endowments) and trade costs are low investment liberalisation stimulates exports. Whereas if countries are similar and trade costs are high investment liberalisation reduces the flow of exports. Complementarity or substitutability therefore depends importantly on cross-country differences.

In this paper, like Head and Reis (2003) we use information at the level of the firm, but like Amiti and Wakelin (2003) focus on cross-country variations in the source of FDI. Specifically we study the export decision of firms following foreign acquisition in the UK. In so doing we build on the observations contained in Kneller and Pisu (2004) about the export behaviour of foreign firms located in the UK relative to domestic firms. There we show that foreign multinationals are not only more likely to export than domestically owned firms, even when controlling for differences in the underlying characteristics of the firm, when they do export they are more export intensive than domestic firms. In addition

we find that foreign multinationals are more likely to acquire domestic firms with some export experience. In Section 3 we show that domestic firms with established export experience are between 55% and 77% more likely to be acquired than firms with no export experience.

Of the acquisition that takes place in the sample (there are over 540 observed acquisitions from ~ countries), following the results of Amiti and Wakelin as well as those of Brainard (1987, 1993) we might expect we are more likely to find evidence of substitution between exports and FDI when FDI is horizontally motivated. For this reason, in line with Markusen (1995), Ekholm (1998) and Lipsey (1999, 2001), we focus on acquisitions of UK firms by firms from those countries where cost differences relative to the UK are likely to be small: the US and EU.

Despite the horizontal motive for FDI from each of these countries, there are likely to be differences in the export behaviour following acquisitions depending on whether the home country is within EU or outside. It has been noted in the literature that regional economic integration increases the size of the market and hence offers the opportunity for EU-based subsidiaries of multinational firms to attain efficient production via economies of scale, and capture part of the new market (Dunning, 1997a, b). The threat of increased protection is expected to foster the conditions for outsider firms to establish subsidiaries in the EU to gain access to the integrated market and behave as insiders. This would stimulate new 'bridgehead' extra-EU investment in a specific location to be used as a base from which to serve the wider European market through exports. Hanson, Mataloni and Slaughter (2001) detail the export strategies of US multinationals across the globe and interpret FDI into the EU as being of this type. Export platform FDI is therefore likely to generate complementarity between exports and FDI (Motta and Norman, 1996; Ekholm, Forslid, Markusen, 2003; Grossman, Helpman and Szeidl, 2003; Yeaple, 2003) and acquisitions from other EU countries more likely to generate substitution.

This outcome remains by no means certain however. What makes a country attractive for FDI is likely to make its exports attractive to others (Amiti and Wakelin, 2003). Similarly increased economic integration is hypothesised to influence the distribution and volume of intra-EU FDI, as insider firms reorganise production in accordance with member countries' comparative advantages[3]. Therefore to the extent that FDI is vertically motivated in our sample will weaken the results as will cross-product complementarities in multi-product firms (Head and Reis, 2004).

3. Empirical methodology

3.1 Propensity-score matching method

The modelling problem is the evaluation of the causal effect of foreign acquisition on *y*, where *y* represents export intensity, defined as the share of exports in total shipment. Let $ACQ_{it} \in \{0,1\}$ be an indicator of whether firm *i* is acquired by a foreign establishment at time period *t*, and let y^1_{it+s} be the export intensity at time *t*+*s*, $s \geq 0$, following acquisition. Also denote by y^0_{it+s} the export intensity of the firm *had it not been acquired*. The causal effect of foreign ownership for firm *i* at time period t + s is defined as:

$$y^1_{it+s} - y^0_{it+s} \qquad (1)$$

The fundamental problem of causal inference is that the quantity y^0_{it+s} is unobservable. Thus the analysis can be viewed as confronting a missing-data problem. Following the microeconometric evaluation literature (e.g. Heckman *et al*., 1997), we define the *average* effect of acquisition on the acquired firms as

$$E\{y^1_{t+s} - y^0_{t+s} \mid ACQ_{it} = 1\} = E\{y^1_{t+s} \mid ACQ_{it} = 1\} - E\{y^0_{t+s} \mid ACQ_{it} = 1\} \qquad (2)$$

Casual inference relies on the construction of the counterfactual for the last term in equation (2), which is the outcome the acquired firms would have experienced, on average, had they not been acquired. This is estimated by the average export share of the firms that remained in domestic hands: $E\{y^0_{it+s} \mid ACQ_{it} = 0\}$.

An important feature in the accurate construction of the counterfactual is the selection of a valid control group. One way of doing so is by employing matching techniques. The purpose of matching is to pair each foreign acquired firm with a domestic firm that has not undergone any ownership change on the basis of some observable variables, in such a way that the domestic firm's export intensity path can be studied to generate the counterfactual for the newly foreign owned firm.

Since matching involves comparing acquired and non-acquired firms across a number of observable pre-acquisition characteristics (e.g. productivity, wage, size, exporting history), it would be difficult to determine along which dimension to match the firms, or what type of weighing scheme to use. It is therefore desirable to perform the matching on the basis of a single index that captures all the information from those variables. In this paper we adopt the method of propensity score-matching due to Rosenbaum and Rubin (1983). They show that matching based on the probability of

[3] Theory leads to no unambiguous predictions though (Dunning, 1997a).

receiving treatment (foreign acquisition in the present context), conditional on firms characteristics, removes all the biases associated with differences in those characteristics, plus having the advantage of reducing the dimensionality problem. Accordingly, we first identify the probability of being acquired (or 'propensity score') using the following probit model

$$P(ACQ_{it} = 1) = F(TFP_{it-1}, size_{it-1}, wages_{it-1}, \exp int_{it-1}, industry\ dummies) \quad (3)$$

where determinants of acquisition are motivated by the existing literature (e.g. Conyon et al, 2002). Now let P_{it} denote the predicted probability of being acquired at time t for firm i (which is an actual take-over target). A non-acquired firm *j*, which is 'closest' in terms of its 'propensity score' to an acquired firm, is then selected as a match for the latter using the 'caliper' matching method[4]. More formally, *at each point in time*[5] and for each newly acquired firm *i*, a domestic firm *j* is selected such that[6]

$$\lambda > \left| P_{it} - P_{jt} \right| = \min_{k \in \{unacuried\}} \{ | P_i - P_j | \} \quad (4)$$

where λ is a pre-specified scalar. This type of matching procedure is preferable to randomly or indiscriminately choosing the comparison group, because it is less likely to induce estimation bias by picking firms with markedly different characteristics.

Having constructed the comparison group (C) of firms that are similar to the acquired firms (A), a standard matching estimator of the causal effect of foreign acquisition can be written as

$$\delta = \sum_{i \in A} \left(y_i - \sum_{j \in C} w_{ij}\, y_i \right) \quad (5)$$

where the w_{ij} are the weights placed on the comparison firm j, generated by the matching algorithm. But this paper employs the more general difference-in-differences estimator on the matched firms to isolate the role of foreign acquisitions in the performance dynamics of firms. This is motivated by recent studies which argue that standard matching estimators are usually unsatisfactory, but in combination with difference-in-differences methodology can have the potential to "...improve the quality of non-experimental evaluation results significantly" (Blundell and Costa Dias, 2000, p. 438).

[4] The matching is performed in Stata Version 7 using the software provided by Sianesi (2001).
[5] Note that the matching strategy is only appropriate on a cross-section by cross-section basis. Once the matched firms are identified, we pool all observations on them to form a panel data of matched firms. This panel is used in subsequent analyses.
[6] A non-acquired g firm can be match to more than one exporting firms. By the same token it can happen that an acquired firm may not have a match.

The version of the combined matching and difference-in-differences estimator we use can be described as follows. Firstly, the difference between the average export share before and after the change of ownership, say $\Delta^a y$, is calculated. Then this difference is further differenced with respect to the before and after difference for the comparison control group, say Δy^c, to obtain the difference-in-differences estimator $\delta = \Delta^a y - \Delta^c y$. Defining PACQ as a dummy variable for the post-acquisition period, the regression

$$y_{it} = \phi + \delta PACQq_{it} + u_{it} \quad (6)$$

should produce a coefficient δ that can be interpreted as the average change in y that can be attributed to foreign acquisitions. In order to control for possible observable factors that may be correlated with changes in export intensity, we extend this basic framework by including a vector of regressors which consists of previous exporting experience, firm size, firm size squared, , wages, the four-digit industry growth rate, and the industry's average exporting intensity. The choice of regressors is influenced by findings in the literature. For example, Bernard and Jensen (2001) and Girma *et. al.* (2004) for the U.K, report that firms with previous exporting experience are more likely to export in the future. This is consistent with the notion that sunk entry costs are important determinants of the decision to export. Bigger firms have a higher propensity to export because of economies of scale, transaction cost efficiencies and their ability to overcome fixed costs to exporting. But it was found in the literature (e.g. Wakelin, 1998 for the U.K.; and Wagner 2002 for Germany) that the relationship between export propensity and firm size is quadratic (inverted U-shaped). It appears that the importance of firm size in overcoming fixed costs to exporting such as information gathering and marketing start to diminish after some threshold level of size. Finally, the rationale for including firm level wages is to proxy for worker quality (see Bernard and Jensen, 2001 for a similar argument).

3.2 Quasi-likelihood estimation method for fractional dependent variables

A feature of our estimation equation (6) is that the dependent variable y is bounded between 0 and 1, so that OLS is not a suitable empirical strategy. Furthermore, as convincingly argued by Wagner (2001) routinely used estimators such as the Tobit model are also flawed, because the dependent variable is bounded by definition rather because of censoring. In this paper we follow Wagner's recommendation, and estimate our model via the quasi-likelihood estimation method for fractional dependent variables developed by Papke and Wooldridge (1996).

Denoting the vector of covariates by X, the propensity to export X conditional on X is modelled as

$$E(y_{it} \mid X_{it}) = G(X'_{it}\beta) \qquad (7)$$

where G (.) is chosen to be the logistic function $G(z) = \frac{\exp(z)}{1+\exp(z)}$. The quasi-likelihood estimate (QMLE) of the parameter vector β, say, $\hat{\beta}$, is obtained by maximising the following Bernoulli log-likelihood function[7]:

$$l_{it}(\hat{\beta}) = y_{it} \log\left\{G(X'_{it}\hat{\beta})\right\} + (1 - y_{it}) \log\left\{1 - G(X'_{it}\hat{\beta})\right\} \qquad (8)$$

Papke and Wooldridge (1996) show that the QMLE is consistent and asymptotically normal. Since equation (7) is nonlinear, QMLE cannot, of course, be interpreted as partial effect. Suppressing the indices, the partial effect of a covariate , say β_k , can be obtained as

$$\frac{\partial E(y \mid X)}{\partial \beta_k} = \beta_k \frac{dG(X'\beta)}{d(X'\beta)} = \beta_k \frac{\exp(X'\beta)}{\left[1 + \exp(X'\beta\right]^2} \qquad (9)$$

Before discussing the empirical estimates from this equation, we turn to the description of the data set.

4. The data

The United Kingdom is a relatively large industrialised economy, the fifth largest exporter of manufactures globally and the second largest host to FDI. Unfortunately the UK production census (the Annual Respondents Database) does not collect information on exporting activity of firms. Therefore in order to make progress on this issue, instead we use the firm level survey *OneSource* which does. Further details on the *OneSource* dataset can be found in Oulton (1998) and previous applications found amongst others in Conyon, Girma, Thomson and Wright (2002), Girma, Greenaway and Kneller (2004) and Greenaway and Kneller (2004).[8] *OneSource* provides information on employment, physical capital, output and cost of goods sold in a consistent way both across firms and

[7] The estimation is conducted using STATA Release 7, and details are available from the authors upon request.

[8] *OneSource* uses a non-stratified sample with an oversampling of large firms. Given that exporters and multinational firms have consistently been found to be larger than non-export firms and that acquisition by

across time.[9] The data were screened to select those firms for which there are a complete set of information about the value of output, factors of production and export. Companies that are dissolved or in the process of liquidation were also excluded.

The *OneSource* dataset contains information about the foreign-ownership status of the firm for the latest year alone, such that it is not possible to identify when a firm has become a subsidiary of a foreign multinational. To track the dynamics of ownership, we matched the population of manufacturing firms in the database to the list of U.K. firms acquired by foreign multinationals. This data is supplied by the Office for National Statistics (ONS) in the UK.[10]

Our database spans the decade between 1988 and 1998. However since we are interested in analysing the post-acquisition trajectories of previously domestically owned firms, we need at least two years' information in the post acquisition period. Furthermore the matching process described in the previous section requires data on the pre-acquisition period. For these reasons we consider foreign take-overs that took place between 1989 and 1996.

Table 1, in the first column, gives the total number of acquisitions contained in the data and its frequency by year. As can be seen there are a total of 549 observed acquisitions. In the second column, we report the number of acquired firms that have been matched to non-acquired firms as well as the numbers of matched acquisitions conducted by multinationals from the EU and US. Of the 549 foreign acquisitions in our sample, 541 have been matched and used in the subsequent analysis.[11] Of the acquisitions in the matched sample only 17 per cent are not by EU or US firms; 47 per cent are by EU multinationals and 36 per cent by multinationals from the US. Outside of an obvious peak in acquisitions from the EU in 1992 there appear to few obvious patterns to this behaviour over time.

[Table 1 here]

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foreign firms is seldom of small firms this is unlikely to be of concern in this study, although it might be used as an additional motive for using matching techniques.

[9] For this study we used the *OneSource* CD-ROM entitled "UK companies, Vol. 1", for October 2000.

[10] This information which is in hard copy format is obtained from the Office of National Statistics upon special request. The matching process required considerable effort, and I wish to thank Mehtap Hisarciklilar for helping us in this regard.

[11] In the UK foreign acquisition is disproportionately of firms with export experience. In previous work, Girma, Kneller and Pisu (2003), we calculated that on 14 per cent of foreign acquisitions are of firms with no export experience. Non-export firms make up about 34 per cent of all firms in the UK.

The population of the (potential) control firms consists of manufacturing subsidiaries[12] of domestic firms that are not acquired by foreign multinationals. This leaves us with an unbalanced panel of 4,596 purely domestic firms over the sample period. To generate the sample of control firms used in estimation we estimate a probit regression of the probability of acquisition by firms. Here we regress a zero/one acquisition dummy against a series of firm characteristics (TFP, size, wages and export intensity) and industry and time effects. The results for the firm characteristics are reported as Table 2. As can be seen from this table the probability of acquisition is increasing as the TFP, size and average wage of the firm increases. Perhaps most interesting for this study however is the evidence that foreign firms target domestic firms with higher export intensity, the probability of acquisition is increasing in the export intensity of the firm. Using this equation resulted in 409 non-acquired firms being found to be good matches for 541 foreign acquired firms[13]. Thus less than one in ten domestic firms are deemed to display observable characteristics similar to those acquired companies.

[*Table 2 here*]

A number of the differences between the export intensity of domestic and foreign firms have previously been discussed in Kneller and Pisu (2004) and so we do so only briefly here. In Table 3 we report the characteristics of the acquired firms in our sample along with those of the matched sample and unmatched samples of non-acquired domestic firms.

Comparing across foreign and domestically owned firms in the *Onesource* dataset, in Kneller and Pisu (2004) we reported that foreign firms are more likely to export than indigenous enterprises, and on average when they sell abroad they export a higher share of total output. About 25% of domestic firms report no sales abroad, whereas the comparable figure for foreign enterprises is around 15%. The export intensity of domestic firms is also lower, the median export share of foreign owned firms being 21 per cent compared with 8 per cent for domestically owned firms. From Table 3 it would appear that compared to the average domestic firm foreign firms tend to acquire domestic firms that are amongst the most export intensive. The export intensity of firms that are foreign acquired is 15.5 per cent. Prior to acquisition the export intensity of the firm would appear to be much closer to

[12] Parent companies were omitted if they have consolidated accounts as this leads to double counting. We also exclude firms with annual employment or output growth exceeding 100 per cent, given doubts about the reliability of these extreme data points.

that of foreign firms in Kneller and Pisu (2004) than domestic firms. There is a difference across countries however. Inspection of the raw data reveals that just prior to acquisition, the average export share was 10.6 per cent and 16 per cent for the firms taken-over by European and other non-US multinationals respectively.

Comparing the first two columns in Table 3 it is also clear that acquired and domestic firms differ across a number of characteristics and not just export intensity. Supporting the results from the probit model acquired firms also have higher TFP, output, employment and capital/labour ratio and pay higher wages. In Kneller and Pisu (2004) we considered whether across all firms the higher export intensity of foreign owned firms was explained by the advantageous firm level characteristics. In part this is true: firms with a larger export share are more productive, larger and more skilled intensive. Conditional on these firm level variables we still find however, that an indicator of foreign ownership is positive and strongly significant. Foreign firms are more export intensive even after controlling for the sort of firm level variables used in previous studies to model the export behaviour of firms. Upon further investigation however we find that conditional on these firm level characteristics these results are driven by non-EU firms in the sample, including US firms. EU firms are actually less export intensive than domestically owned firms with identical characteristics. This is the first evidence that export and FDI are complements when FDI is used as an export platform, but substitutes in market seeking FDI more generally.

The success of propensity score-matching is confirmed in Table 3, where it can be seen that matched firms display considerable homogeneity compared with the substantial heterogeneity in the unmatched sample. The treatment group is now much closer to the control group in its observable characteristics. Differences between the mean of acquired and non-acquired firms, for the variables in Table 3, in the matched sample are substantially lower than those in the non-matched sample. The reduction in the differences is around 70 percent.

[Table 3 here]

5. Empirical findings

[13] Notice the propensity score-matching method can pair a comparison firm with more than one acquired firm. It is also possible that an acquired firm may not have a good enough matching firm, and we left the 8 such firms in our original sample from subsequent analyses.

Table 4 gives the OLS and QML estimates from our empirical model. In regressions 1 and 2 we do not separate firms according to the country of the acquiring firm, while in regressions 3 and 4 we make this distinction. This has an important effect on the results, as does the choice of estimator. According to the OLS estimates in regression 1, firms with some exporting experience and firms in sectors with high exporting intensity are more likely to have higher exporting propensity. By contrast firm size, the quality of labour and growth of the domestic market do not exert any discernible impact on exports shares. The finding that firm size and exports intensity are unrelated is surprising, given previous findings in the literature (see *inter alia* Girma et al., 2004; Wagner 2001). However these results are not robust to the use of QMLE. Regression 2 confirms the empirical findings in the literature that the size-exports relationship has an inverted U shape, and exports share at the firm level is a positive function of the quality of labour.

As far as the impact of acquisition FDI is concerned separating out the country of acquisition has an important effect on the results that is robust across methodologies. In regressions 1 and 2 the effect of acquisition on the export intensity of firms is insignificant relative to the control group of domestic firms. However when we separate out firms according to the country of residence of the acquiring firm this insignificant effect would appear to be driven by contradictory trends in the export intensity of EU and US firms. From regression 3 firms acquired by US multinationals appear to have increased their exports share by an average of 2.9 percentage points. This is even more remarkable when one consider the fact that the average pre-acquisition export share for this group of firms was already relatively high at 16 per cent. This is consistent with the idea that acquisition FDI is used as a platform for serving the wider EU market, or with increasing vertical integration (intra-firm trade) within multinational firms. In sharp contrast, firms that are taken over by European firms experience a decline in exports share by about 2.8 percentage points. In line with Amiti and Wakelin (2003) there are differences in the relationship between exports and FDI across countries, even when FDI is likely to be horizontally motivated. European firms acquire domestic firms in order to gain access to the domestic market; there is net-substitution of exports for FDI. US firms acquire UK firms for access to the wider EU market, such that FDI is positively correlated with exports. Finally, the exports share effect of FDI from other countries is found to be statistically insignificant.

[Table 4 here]

Table 5 reports the marginal effects of foreign acquisitions on the export share for regression 4 calculated using equation (9). Since these effects depend on the actual values

of the covariates this allows us to study the impact of foreign acquisition on the export shares across the distribution. Therefore along with the mean change we report the median, maximum, minimum and the standard error. From this table the average exporting effect of US acquisitions is reasonably close to the OLS estimate at 3.13 percentage points, while the median value is 3.6 percentage points. For EU acquisitions at the mean the export share declines by 2.45 percentage points, while the median effect is 1.05.

[Table 5 here]

Again using the results from regression 4 in Figure 1 we plot out the kernel density of the estimated impact on export intensity from foreign acquisition. There are several points worth noting from these figures. Firstly, the effect on the export share of these previously domestic firms from acquisition by other European firms is uniformly negative, whereas that from US acquisitions is uniformly positive. Secondly, this effect is bimodal for both types of acquisition, although most clearly in the case of US acquisitions.

This bimodal relationship would appear to be explained by the initial export intensity of the acquired firm. In the case of EU acquisitions the declines in export intensity are by less than the median decline, although still negative, when the initial export intensity is low, whereas the change in export intensity is above average when the export intensity of the firm is already high. For US firms, the opposite occurs. The change in export intensity is below median when the initial export intensity of the firm is low, whereas the change is above average when the initial export intensity is high. For this reason when we regress the change in export intensity on initial export intensity the correlation is negative in the case of EU acquisitions and positive in the case of US acquisitions.[14] Export intensities are converging downwards amongst EU acquisitions whereas they are diverging amongst US acquisitions.

This result would suggest that the export strategies of US affiliates in the UK are more diverse than those of EU affiliates. The latter would seem to focus on serving the host market, prevalently. After all European multinationals already are inside the EU therefore may serve the other European national markets through export or establishing production facilities therein. On the contrary, among US affiliates there are those that appear to concentrate on selling in the UK market only, similar to EU firms, and those that use the UK as export platform to serve the wider European market (or to export back to the home country).

[14] This results is robust to the inclusions of industry fixed effects, time effects, measures of industry export intensity, domestic market growth and the change in the size of the firm.

From this results it is clear as FDI and post-acquisition export strategies of MNEs are closely interwoven. The fact to have the headquarter inside or outside the EU seems to be one of the major determinant of the export behaviour of foreign affiliates. Therefore, since the UK receives high volumes of FDI inflows (second only to the US), export performances of its manufacturing sectors are, presumably, affected by the source countries/regions of FDI flows these industries receive.[15]

It is clear then that changes to policy aimed at affecting FDI inflows or exports may have an impact on the other. For example, if policymakers hope to improve the export performance of a certain sector, then existing policies that encourages the entry of European multinationals are likely to operate in the opposite direction but affected positively if it encourages additional entry of US MNE's.[16]

[Figure 1 here]

6. Conclusions

Policymakers see export intensity as an important indicator of industry performance, and there is now a growing body of evidence that documents a causal relationship between exporting and business performance [e.g. Kraay (1999), Wagner (2002) and Girma *et al.* 2004]. One of the channels through which the exporting propensity of domestic establishments might be enhanced is indirectly through FDI, what might be labelled export spillovers from FDI - (Blomström and Kokko, 1998; Görg and Strobl, 2001). The theoretical expectation is that domestic firms learn from foreign multinationals the necessary managerial techniques and marketing expertise that can help them overcome the sunk costs associated with export markets entry. The empirical literature offers some evidence in support of this hypothesis: Aitken et al. (1997), Sjöholm (1999), and Greenaway *et al.* (2004) all document evidence that industry level FDI *indirectly* enhances the exporting capabilities of domestic firms.

The present paper focuses on the *direct* impact of FDI on exports by considering the export dynamics of foreign acquired firms in the UK manufacturing sector. Given that the UK is the second largest host to FDI after the USA, it is clearly a non-trivial case to explore. The paper applies a quasi-likelihood estimation method for regression models with

[15] The UK has a total of $400bn of direct foreign investment, and attracted $78bn in 1999 according to the United Nations Conference on Trade and Development. It is estimated that more than one-third of the UK's manufacturing sector is now foreign owned. The UK is home to over 22% of all foreign direct investment in the EU. This includes over 40% of both US and Japanese investment.

[16] Note however that there could be positive *indirect* effects from EU multinationals, through export spillovers (Greenaway *et al.*, 2004).

fractional dependent variables to isolate the causal effect of recent foreign acquisitions on the export orientation of erstwhile domestic establishments.

The analysis uncovers interesting heterogeneity in the way acquisition FDI affects exporting intensity. First, US acquired firms increase their exporting intensity by an average of 3.1 percentage points. This is consistent with the idea that acquisition FDI is used as a platform for serving the wider EU market, or with increasing vertical integration within multinational firms. For these firms exports and FDI are complements. Second, UK firms acquired by European multinationals have decreased their export-orientation, suggesting that they have focused more on serving the domestic market post-takeover. For these firms exports and FDI are substitutes. Third, the average exporting propensity of subsidiaries of non-US and non-EU multinationals has not exhibited any significant changes.

Overall the results presented in this paper demonstrate the prevalence of exporting as a motive for acquisition FDI in the U.K. But to what degree are the exports of these multinationals intra-firm? And to what extent does extra-EU acquisition FDI involve the use of affiliates as export platforms to serve European customers? Answering these questions will help assess the relative importance of the EU market access motive and the comparative advantage (in terms of relative production costs, for example) motive in attracting foreign investors to the U.K.

Additional interest in the topic results from its policy impact. Alterations in economic policy or the macroeconomic environment affecting exports may also have an impact on FDI flows, where this effect might be positive or negative. Given this, policies influencing exports and FDI should not be seen as, or devised independently. This seems to have been recently recognised by officials in the UK, where the agencies previously involved in the export and FDI promotion policies have been merged into a single entity

Our econometric estimates indicate that exporting is an integral part both intra-EU and extra-EU FDI. Economic policy should therefore concentrate on ensuring that the UK has an environment that supports exports, such as exchange rate stability and the supply of skilled workforce. It bears to remember that the *indirect* benefits of attracting exporting MNEs could also be substantial. As the recent study by Greenaway et al. (2004) shows, UK-owned firms increases their export propensity in response to exporting activities of MNEs in their sectors. This export enhancing effect of FDI will improve the international competitiveness of the indigenous firms, thereby making a significant contribution for the long-term economic growth of the nation.

Table 1

Frequency of foreign acquisitions by year

Year	Unmatched sample	Matched sample	*EU acquisitions*	*US acquisitions*
1989	64	63	31	22
1990	60	58	37	11
1991	74	71	34	28
1992	69	67	50	7
1993	51	50	21	21
1994	92	92	39	36
1995	81	80	22	49
1996	58	60	22	22
Total	549	541	256	196

Table2

The determinants of foreign acquisitions:

Marginal effects probit estimates

TFP	0.006
	(3.73)***
SIZE	0.004
	(6.50)***
WAGES	0.020
	(6.31)***
Export intensity	0.033
	(7.90)***
Year dummies	jointly significant

Log likelihood	-2567.8
Observations	23317

Notes:

(i) Robust t-statistics in parentheses

(ii) significant at 10%; ** significant at 5%; *** significant at 1%

Table 3

Mean (and standard deviation) for some variables of interest:

Unmatched and matched sample:

Variables	**Unmatched sample**			**Matched sample**		
	Control	Acquired	Difference	Control	Acquired	Difference
Export intensity	.0836 (.001)	0.1551 (.003)	0.068	.1288 (.003)	.1547 (.003)	0.026
TFP	.006 (.003)	.219 (.007)	0.213	.178 (.009)	.224 (.007)	0.046
Log output	8.886 (.007)	9.741 (.018)	0.855	9. 463 (.022)	9.731 (.018)	0.268
Log wages	2.669 (.002)	2.806 (.004)	0.137	2.765 (.005)	2.809 (.004)	0.044
Log employment	4.662 (.007)	5.205 (.017)	0.543	5.088 (.021)	5.195 (.017)	0.107
Log capital/worker	6.788 (.006)	7.290 (.014)	0.502	6.817 (.017)	7.285 (.014)	0.468
# of observations	35124	6260		4140	5830	

Table 4

The impact of foreign acquisitions on exporting intensity :

QMLE estimates

(Expint_d.do)

	OLS	QMLE	OLS	QMLE
Exporting experience	0.239	2.513	0.238	2.508
Dummy	(55.83)***	(38.81)***	(55.76)***	(38.85)***
Log wages	0.009	0.203	0.007	0.184
	(1.26)	(2.61)***	(1.02)	(2.33)**
Log employment	0.009	0.183	0.010	0.202
	(1.06)	(1.77)*	(1.17)	(1.94)*
Log employment	-0.001	-0.015	-0.001	-0.017
squared	(0.85)	(1.67)*	(1.07)	(1.91)*
Domestic market	-0.002	0.032	-0.003	0.020
Growth	(0.32)	(0.60)	(0.45)	(0.37)
Sectors exporting	0.508	4.184	0.499	4.164
	(18.21)***	(18.27)***	(17.88)***	(18.12)***
All acquisitions	-0.005	-0.032		
	(1.18)	(0.79)		
US acquisitions			0.029	0.226
			(3.53)***	(3.72)***
EU acquisitions			-0.028	-0.277
			(5.37)***	(5.18)***
Other acquisitions			0.001	0.023
			(0.09)	(0.27)
Constant	-0.306	-9.155	-0.278	-8.898
	(9.38)***	(22.54)***	(8.44)***	(21.42)***
Observations	8966	8966	8966	8966
R-square/AIC	.158	.522	.158	.522
		-2307.64		-2307.64

t-statistics are in parentheses, and they all are based on robust standard errors.

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

Table 5

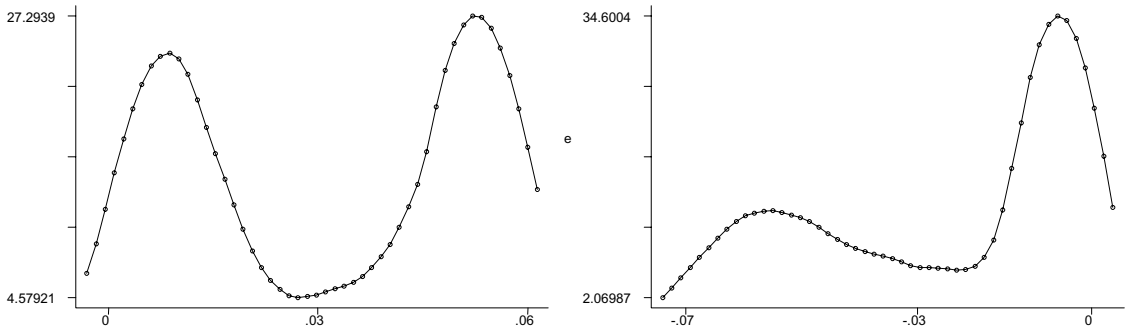
Percentage point increase in exporting intensity

due to foreign acquisition:

	N	Min	Mean	Median	Max	Standard error
US acquisitions	913	0.01	3.13	3.6	5.65	0.021
EU acquisition	1477	-6.92	-2.45	-1.05	0	0.023
Others acquisitions	479	0	0.03	0	.06	0.003

Note: N is the number of *post-acquisition* observations in the sample.

Figure 1: Kernel density of export intensity impacts of foreign acquisitions



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