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Exchange Rates, Exports and FDI: A Microeconometric Analysis

by

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Abstract

Our focus is the effects of exchange rate movements on firm decisions on export market entry and export intensity. Using data on UK manufacturing firms we find that exchange rate movements have little effect on firm export participation but have a significant impact on export shares. We also investigate the effects of exchange rate movements on the export behaviour of multinationals, and find important differences according to country of origin. Multinationals firms originating from outside the European Union are less affected by changes in the exchange rate compared to those inside, whose reactions are similar to domestic firms.

JEL classification: F23, F31, F36

Keywords: Exchange rate movements, export share, multinational firms

Outline

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Non-Technical Summary

Firms involved in international business through exporting, importing or FDI are exposed to different macro shocks than apply to sales on the domestic market. Exchange rate variations are typically viewed as an important source of such shocks. Significant exchange rate volatility after the collapse of the Bretton Woods System has generated increased interest in the effects of exchange rate movements on trade, focusing on in particular the impact of exchange rate uncertainty. Although many researchers and policy makers believe exchange rate volatility has a negative impact on trade, empirical work has not yielded consistent results: reporting little or no significant evidence for a negative effect. More recent work literature, using micro data is also ambiguous.

One explanation for these findings put forward in the macro literature, but so far unexplored in the micro literature, is the role of FDI. Multinational enterprises (MNE) may be better placed to internalize exchange rates fluctuations and minimise their negative effects in a number of ways. There are a number of strategies available to reduce exposure: hedging in forward markets or holding a portfolio of assets and liabilities in different currencies, leading and lagging payables and receivables, transfer pricing and diversification. Some such as hedging and diversification are available to most MNEs; others may differ for different types of MNEs.

This paper empirically analyzes the effects of exchange rate level movements on exports. We offer the first analysis of exchange rate movements and exports for a large panel of UK firms. We apply a sample selection model which separately estimates the exchange rate effects on firms' decisions on export markets entry and their decision on export shares after entry (the extensive and intensive margins of trade).

Using data for UK manufacturing firms, we find that movements in exchange rate levels have little effect on firm export participation decisions. However, they do have a significant and negative impact on export intensity after entry. For multinationals, we find that their export behaviour is less likely to be affected by large exchange rate changes than that of indigenous firms. This difference therefore confirms one of the possible explanations for the macro evidence. However we also find there are differences according to multinationals' country of origin. Firms from outside of Europe are less affected by changes in the exchange rate, whereas multinationals from inside are affected in a similar manner to domestically owned firms. The importance of the European Union is explained by the difference in motive for FDI into the UK for firms inside and outside the EU, and by export-platform FDI in particular.

1. Introduction

Firms involved in international business through exporting, importing or FDI are exposed to different macro shocks than apply to sales on the domestic market. Exchange rate variations are typically viewed as an important source of such shocks.

Nominal and real exchange rates have fluctuated significantly since the early 1970s following the collapse of the Bretton Woods System.[1] This volatility has in turn generated increased interest in the effects of exchange rate movements on trade, focusing on in particular the impact of exchange rate uncertainty.[2] Although many researchers and policy makers believe exchange rate volatility has a negative impact on trade, empirical work has not yielded consistent results: reporting little or no significant evidence for a negative effect.[3] More recent work literature, using micro data is also ambiguous (see for example Campa (2004) and Bernard and Jensen (2004a)).

One explanation for these findings put forward in the macro literature, but so far unexplored in the micro literature, is the role of FDI.[4] Multinational enterprises (MNE) may be better placed to internalize exchange rates fluctuations and minimise their negative effects in a number of ways. Received wisdom is that there are three types of exchange rate exposure: transaction exposure, most of which is short term;[5] translation exposure;[6] and economic exposure, the extent to which a firm's future international earning power is affected by changes in exchange rates. Translation exposure is the least important. There are a number of strategies available to reduce exposure: hedging in forward markets or holding a portfolio of assets and liabilities in different currencies, leading and lagging payables and receivables, transfer pricing and diversification. Some such as hedging and

[1] See, for example, Bayoumia and Eichengreen (1998, Section 2 and Table 1) for the detailed evidence of the great exchange rate volatility after the Bretton Woods compared to that before the collapse.
[2] See Clark et al. (2004) for a new and recent literature review on the effects of exchange rate volatility on trade, and IMF (1984), Cote (1994) and McKenzie (1999) for earlier surveys.
[3] Recent empirical work adopting a gravity approach has found some evidence of a negative relationship. See, for example, Frankel and Wei (1993), Wei (1999), Dell' Ariccia (1999), Rose (2000), and Tenryro (2003). See Clark et al (2004) for a survey.
[4] Clark et al (2004) briefly summarizes papers on an offsetting effect for multinationals, such as Cushman (1983), Clark (1973) and Makin (1978).
[5] Defined as the extent to which the income from individual transactions is affected by fluctuations in foreign exchange values. Such exposure includes obligations for purchase or sale of goods and services at previously agreed prices and the borrowing or lending of funds in foreign currencies.
[6] The impact of currency exchange rate changes on reported consolidated results and balance sheet of a company. It is basically the present measurement of past events and occurs when translating foreign currency financial statement into the reporting currency of the parent company.

diversification are available to most MNEs; others may differ for different types of MNEs (horizontal, vertical FDI, export platform and so on).[7]

This paper empirically analyzes the effects of exchange rate level movements on exports. Following Bernard and Jensen (2004a) exchange rates are calculated as (3-digit) industry specific real effective exchange rate (REER) indices. In addition to the role of FDI, and in particular the role of country of origin, we contribute to the literature in several aspects. First, we offer the first analysis of exchange rate movements and exports for a large panel of UK firms. Second, we apply a sample selection model which separately estimates the exchange rate effects on firms' decisions on export markets entry and their decision on export shares after entry (the extensive and intensive margins of trade).

Using data for UK manufacturing firms, we find that movements in exchange rate levels have little effect on firm export participation decisions. However, they do have a significant and negative impact on export intensity after entry. For multinationals, we find that their export behaviour is less likely to be affected by large exchange rate changes than that of indigenous firms. This difference therefore confirms one of the possible explanations for the macro evidence. However we also find there are differences according to multinationals' country of origin. Firms from outside of Europe are less affected by changes in the exchange rate, whereas multinationals from inside are affected in a similar manner to domestically owned firms. The importance of the European Union is explained by the difference in motive for FDI into the UK for firms inside and outside the EU, and by export-platform FDI in particular.

The remainder of the paper is organized as follows. The next section presents the theoretical and empirical background. Section 3 deals with some estimation and econometric issues. Section 4 introduces our method for computing industry specific REERs. Section 5 presents the firm level data and sample used to estimate the model. Section 6 reports our empirical findings. Finally, Section 7 concludes.

2. Economic Background

[7] These ideas can be found in international business textbooks such as Hill (2005) and Rugman and Collinson (2006).

We first review evidence from aggregate data examining the relationship between exchange rate volatility and trade.[8] In general, early work provides little or no evidence of a negative relationship. For example, Thursby and Thursby (1987) focus on changes in export volumes and find no significant relationship. Recent studies employing gravity models such as Dell' Ariccia (1999) find a negative relationship, but the effects are not dramatic: "complete elimination of volatility would raise trade by a maximum of 15 percent" (Clark et al, 2004). Rose (2000) adopting the same approach also finds a significant negative but small effect using data for 186 countries.

Although macro evidence focuses mainly on exchange rate volatility and trade rather than changes of the exchange rate level and exports, it provides a starting point and throws up some interesting issues, including different effects as between developed and developing countries and differences between multinationals and non-multinationals. As pointed out in Clark et al (2004), for developed countries "where there are well developed forward markets, specific transactions can be easily hedged, reducing exposure" to large exchange rates movements. For multinational firms engaged in a large variety of trade and financial transactions across countries, fluctuations in different exchange rates may have offsetting effects on profitability, and may result in an ameliorated impact of exchange rate movements.

To our knowledge, there is no direct evidence for the effects on export behaviour of multinationals however. There is an empirical literature on exchange rate variability and FDI decisions (see Blonigen, 2005 for a review). Some studies provide evidence for MNEs' ability to internalize the financing of investments: Lipsey (2001) reports that FDI flows are much more stable during currency crises than other flows of capital; Desai, Foley and Forbes (2004) find that investment, sales and assets of U.S foreign affiliates are significantly more than those of local firms during and after a currency crisis. These papers provide indirect evidence for the internalized or offsetting effects for multinationals.

Studies using micro data have been more successful in finding a relationship between export volumes and exchange rates. Bernard and Jensen (2004a) and Bugamelli and Infante (2003) examine the effects of exchange rate changes on export market entry employing a

[8] See Clark et al (2004) for a detailed discussion.

random-effects probit model, as well as a linear probability framework. Despite similarities in the methodology used the results differ: Bernard and Jensen (2004a) find no significant effect on exports, whereas Bugamelli and Infante (2003) find a small but significant effect (a 1 percent real depreciation raises the probability of exporting by 0.2 percentage points).

As the only paper focusing solely on this issue, Campa (2004) uses an alternative methodology to estimate the export supply equation with two components: export market participation; and conditional on being an exporter, the relationship between export volume and exchange rate changes. The exchange rate and conditional variance of the exchange rate for firm *i* are both included. The model estimates export participation as a single equation, which is a dynamic random effects probit estimated by maximum likelihood. It then estimates export supply after controlling for self-selection into exporting implied by the export participation decision. He finds that for Spanish manufacturing firms, coefficients for the exchange rate level are significant in both estimation processes, whereas exchange rate volatility has insignificant effects. A 10% depreciation would cause a 7.7% change in export volume. Most of the change in export volume is due to existing exporters.

Using a somewhat different approach Das, Roberts and Tybout (2007) also find significant cross-industry variation in the effects of exchange rate movements. Simulating the effect of a 20 per cent devaluation for three Colombian industries they report that the magnitude of the industry response depends on previous export exposure, homogeneity of expected profit flows between firms and their proximity to the export market entry threshold. Ten years after the simulated devaluation, the industry level effect varies between 14 and 107 per cent. Bernard and Jensen (2004b) study export response of US manufacturing plants to dollar depreciation in the 1980's. They report that 87 per cent of export expansion was from increased export intensity amongst current exporters and only 13 per cent from entry of new firms. Forbes (2002) studies the impact of a large devaluation on export sales of over 13,500 companies around the world, and finds on average export sales improve by 4 percent one year after devaluation. Overall, therefore, the micro evidence shows that changes in exports due to exchange rate level movements come mainly from existing exporters adjusting production.

3. Econometric Specification and Estimation Methodology

We examine the effects of changes of exchange rate level on firm export decisions using a sample selection model. As firm characteristics are likely to be correlated with unobserved firm effects, we first estimate a reduced form within a fixed effects linear probability framework, in which independent variables for firms' main characteristics are included. Following Bernard and Jensen (2004a) and Bugamelli and Infante (2003) we begin by modeling firms' export decisions as:

$$EXP_{it} = a_0 + a_1 emp_{i(t-1)} + a_2 wage_{i(t-1)} + a_3 laborprod_{i(t-1)} + a_4 age_{i(t-1)} + a_5 EXP_{i(t-1)} + a_6 REER_{i(t-1)} + u_i + e_{it} \quad (1)$$

where the subscript i denotes firms; and t, time. emp_{it} represents the logarithm of number of employees as a proxy for firm size. $Wage_{it}$ is the ratio of firms' total wage bill to number of employees; $laborprod_{it}$ represents labour productivity and is the ratio of firm total real sales to number of employees; EXP_{it} is a dummy representing firm's export status, which equals 1 if firm i exported in year t, and 0 otherwise; $REER_{it}$ is the 3-digit industry-specific REER. Finally, the error term comprises two components: u_i, capturing time-invariant firm-specific effects not included among the regressors; and e_{it}, an idiosyncratic error term. All time-varying regressors are log lagged one period to reduce possible simultaneity problems.[9] Industry and time dummies are also included to control for any fixed effects common across industries and years. (Definitions of variables are shown in the Appendix)

As noted earlier, one problem of linear probability estimation is that predicted probabilities may lie outside the 0-1 range. However, as discussed in Bernard and Jensen (2004a) while the fixed effects models produce biased and inconsistent parameter estimates, especially for the coefficient on the lagged dependent variable, it does provide a lower bound for its importance. In addition to the linear probability model we also estimate a random effects probit of the form:

[9] In all regressions we employ the lagged index. The motiovation behind this choice is the period between placing an order and receiving payment is usually at least as long as three months. The exchange rate observed and used by exporters might therefore be from a period earlier than the recorded sale. In addition decisions might be made at that point to hedge the exchange rate position.

$$EXP_{it} = a_0 + a_1 emp_{i(t-1)} + a_2 wage_{i(t-1)} + a_3 laborprod_{i(t-1)} + a_4 age_{i(t-1)} + a_5 foreign_i + a_6 EXP_{i(t-1)} + a_7 REER_{i(t-1)} + u_i + u_t + e_{it}, \quad (2)$$

where $foreign_i$ is a dummy equal to 1 if the firm is foreign owned, and 0 otherwise; u_t is a time-specific component. The use of random effects requires that firm effects be uncorrelated with the regressors. As some papers have shown, problems may remain, for example, plant characteristics may be correlated with unobserved plant effects, initial period export status may not be exogenous, and there may be sample selection bias.

To tackle the bias introduced by the initial condition and possible correlation between the control variables and unobserved heterogeneity we adopt the methodology of Wooldridge (2005). We model the firm-specific effects u_i as a function of initial condition and the other explanatory variables. We assume u_i can be expressed as,

$$u_i = \beta_0 + \beta_1 y_{i0} + \beta_2 \bar{x}_i + \xi_i \quad (3)$$

where ξ_i is assumed to be independently and normally distributed. $\bar{x}_i$ is the firm-level average of x_{it} over time. This is then inserted into Equation (2) and estimated using the standard random effects probit model.

Exporting can be thought of as a two-stage decision, firms first decide whether to export or not, and second how much to export. The other methodology we employ is a nonstructural framework two-stage sample selection model, which separates the effect of a given variable on the export supply decision into the effect on export market participation and that on volume of sales. Our econometric analysis accounts for both decisions and their interdependence. It thus avoids any bias resulting from considering them separately.[10] Two equations are estimated,

$$y^*_{it} = x_{i,t-1}\beta + u_{it} \text{ (outcome equation: export intensity/export share);} \quad (4)$$

$$d^*_{it} = z_{i,t-1}\gamma + v_{it} \text{ (selection equation: export participation);} \quad (5)$$

with

$$y_{it} = y^*_{it} \text{ if } d_{it} = 1$$

$$y_{it} = 0 \text{ if } d_{it} = 0$$

[10] Kneller and Pisu (2005) and Karpaty and Kneller (2005) adopt the same methodology.

and

$$d_{it} = 1 \text{ if } d^*_{it} > 0$$

$$d_{it} = 0 \text{ if } d^*_{it} \leq 0$$

Thus, the observed y_{it}, (export share) is zero when the firm decides not to export ($d_{it} = 0$) and positive when it exports ($d_{it} = 1$). The distribution of the error terms (u_{it}, v_{it}) is assumed to be bivariate normal with correlation ρ. The two equations are related if $\rho \neq 0$. In this case estimating only the export share regression would induce sample selection bias in the estimate of β due to the error term u_{it}, and the regressor x would be correlated. To avoid this both equations must be estimated via maximum likelihood or a Heckman (1979) two-step method. We employed the former as it is more efficient.[11] The industry-specific REER, as well as variables for firm characteristics in equations (4) and (5), are included as independent variables in both equations to examine the effects of the level of exchange rate on export participation and export intensity respectively. The only difference for independent variables in both equations (Equations 4 and 5) is the lagged export status dummy. In the export participation equation, we add a lagged dependent variable, i.e. the lagged export status, as one of the independent variables to see the role of entry sunk costs, whereas lagged export dummy is excluded in the export intensity equation, as the lagged export status is unimportant when firms have already entered.

The sample selection model is developed in a cross-section context. To account for the panel aspect of our data we follow Wooldridge (1995) and include the group-means of all explanatory variables as additional regressors. (For an alternative application of the same approach see Egger et al. (2006)). We test the robustness of our results to changes in this methodology in Section 6.

4. Computation of Industry-specific Exchange Rates

[11] As the distribution of the error terms from the selection equation and outcome equation are assumed to be bivariate normal, one limitation of estimating the selection model is its sensitivity to the assumption of bivariate normality. As pointed out in Vella (1998), if normality is rejected, a consistent parameter estimation method may be used, such as a semiparametric method proposed by Gallant and Nychka (1987). However, semiparametric method is less frequently used as the empirical implementation is not straightforward and parametric procedure perform well if conditional mean of the model is correctly specified. Also, evidence in der Klaauw and Koning (2003) shows that "departures from normality do not cause serous bias in the parameter estimates". Therefore given our interest is the estimate the effect of the exchange rate we continue to assume bivariate normality. See Greene (2003) for the discussion.

Our measure of the real exchange rate is similar to that of Bernard and Jensen (2004), a weighted average of exposure to different exchange rates within a given industry. This measure is operationalised for each time period using the equation set out below. As suggested by the equation it required us to identify the range of foreign countries to be included as trading partners, their relative weights and relevant price indices.

$$REER = \prod_i [(e_i / e)(p / p_i)]^{w_i} \qquad (10)$$

Where e_i is the exchange rate of currency *i* against Special Drawing Rights[12] (annual average Units of Currency *i* per SDR in index form, 1995 as the base year); e: the exchange rate of GBP against Special Drawing Rights (annual average - Units of GBP per SDR in index form, with 1995 as the base year); p: is the UK Price index (using an inflation index based on 1995 as a proxy); p_i: the Price index of country *i* (again using an inflation index with 1995 as the base year); and w_i: the share of exports of UK export destination country *i* within an 3-digit industry. We express the exchange rate in terms of the foreign currency value of a unit of the domestic currency. An upward (downward) movement therefore represents appreciation (depreciation). We compute industry specific REERs in the UK for the period from 1988 to 2004.

Export Weights: The current classification system of industries in the UK is SIC (2003). This differs from the commodity data which is classified according to SITC Rev.3. We therefore converted SITC data to SIC using the UK SIC (2003) after aggregating 5 digit SITC codes to 3 or 4 digit SITC for each 3 digit SIC sector. Following Bernard and Jensen (2004a), the top 25 UK export destinations in each year are chosen as weights. The total percentage of export value for these destinations is always between 80% and 97%, therefore capturing the main drivers of changes in the real exchange rate. Moreover, almost all individual trade (export) weights for the country ranked 26th as an export destination in each industry is less than 1%.

Since our time period coincides with a period of significant economic and political change, including the emergence of China and India and opening up of the former Soviet Republic economies, the real exchange rate index we construct accounts for changes in the destination of UK exports over time. We recognise however, that this will mean some of

[12] The Special Drawing Right (SDR), as defined by IMF, is an international reserve asset, created by the IMF in 1969 to supplement the existing official reserves of member countries. The SDR also serves as the unit of account of the IMF and some other international organizations. Its value is based on a basket of key international currencies. Since the exchange rate data for each currency from IMF is expressed as the value of units per SDR, we use SDR as an intermediary to calculate the exchange rate of each currency against GBP.

the time variation in the index will reflect changes in country weights. As a robustness check (in Section 6), we take the extreme assumption and construct an alternative exchange rate index using fixed weights, where the weight of each country is taken as an average over the entire time period. That is we allow the change in the index to reflect solely changes in the exchange rate over the 17 year period. These new weights are normalised to ensure that the exchange index equals 100 in 1995.

Price Indices and Exchange Rates: Nominal exchange rates are annual averages from the IMF, *International Financial Statistics,* these are exchange rates per SDR.[13] The nominal exchange rates are converted to index form with 1995 as the base year and deflated using an inflation index from the IMF, *World Economic Outlook Database*.

In total there are 103 three-digit industries. There is no export data for 8 industries and there are 17 industries in which more than 5 percent of the total export value is classed as 'unknown destination' (denoted as 'secret and differences') in some or all of the years. We exclude these industries, leaving REER indices for 78 industries.

Results for REER: The real exchange rate indices vary across industries and across time. Broadly speaking, they have moved together however, and appear to be highly correlated. Figure 1 shows the REERs for 2-digit industries 31 to 36 as a typical example. This is confirmed by calculating the distribution of average correlations for each industry in Table 1. Only 6 industries have a correlation with the other industries in the sample that is on average below 0.8 (Industries 172, 183, 267, 283, 335 and 362).[14]

[Figure 1 about here]

[Table 1 about here]

Turning to movements, troughs appear in 1995 for 72 out of 78 industries, and peaks for 1999 in 63 out of 78 industries. To fully understand REER movements we need information on export destinations. Table 2 reports for each industry the 17 year average of the normalized weights of UK exports to four groups of destinations: the US, Euro area, other European countries, and rest of the world. As would be expected, these show that

[13] The exchange rates for Taiwan are from the Central Bank of China, Republic of China (Taiwan).

[14] These industries are: 172 Textile weaving; 183 Dress and dye of fur, and manufacture of fur articles; 267 Cutting, shaping and finishing of stone; 283 Manufacture of steam generators, except boilers; 335 Manufacture of watches and clocks; 362 Manufacture of jewellery and related articles.

most exports are to the US and other European countries. The Euro area and other main European countries account for more than 50% of exports for almost all industries. Although US shares are not large compared to the Euro area, the US is among the top destinations in many industries. It is also worth remembering however that Canada, China, Hong Kong and Singapore pegged their currencies to the US dollar during most of the sample period. In comparison the share of 'Rest of the World' is lower than 25% for 63 out of 78 industries. Only 5 industries (160, 183, 283, 335 and 362)[15] have average shares greater than 40%. This helps to explain the low mean correlation of these with other industries of the sample.

[Table 2 about here]

To investigate changes in the REERs across years more closely Figure 2 displays first differences of the log of the REER index again for industries 31-36. One interesting feature of the data is that while changes in exchange rates are similar across industries before 2001, their movements after 2001 are quite different. An explanation is given in Figure 3, which shows the log difference in the US$ and Euro: Sterling exchanges rates over the same period. Changes in the US$ and Euro broadly follow the same pattern before 2001, whereas afterwards they move in opposite directions. As the degree of exposure to these currencies differs across industries (Table 2) so does the movement in the index after this point.

[Figures 2 and 3 about here]

Finally, in Table 3 we report additional detail on exchange rate fluctuations. The biggest average change is in 1995-1996: a 13.56% appreciation. Other large percentage changes are a 12.16% appreciation in 1989-90 and 11.79% depreciation in 1988-89. The most stable periods are 2003-04 and 2000-01. Having large appreciations, depreciations and periods of exchange rate stability makes the period 1988-2004 both interesting and information rich, and provides us with an excellent dataset to examine the impact of exchange rate movements on firm export behaviour.

[Table 3 about here]

5. Firm Data and Summary Statistics

[15] 160 Manufacture of tobacco products.

Our firm level panel dataset is constructed from the profit and loss and balance sheet data that UK firms are legally obliged to deposit at Companies House and which is then gathered by Bureau Van Dijk in the *Financial Analysis Made Easy* (FAME) database and from *OneSource*. Due to lack of availability of trade data for service industries, we focus only on manufacturing firms. The data from FAME cover the ten year period from 1994 to 2004. To extend this we merge it with OneSource data which covers 1987 to 2000.[16] After removing firms with missing values we are left with a sample of 44, 252 observations on 5876 companies. It has an unbalanced structure, with an average of 8 observations per firm.

[Table 4 about here]

Table 4 reports the structure of the panel and Table 5 reports means, standard deviations, medians and number of observations for the main variables. Column 1 refers to the entire sample; Column 2 to firms which never exported; Column 3 to firms that always exported; Column 4 to domestically owned firms and column 5 for foreign owned firms. At the mean, exporters are larger than non-exporters, in terms of employees and sales, and typically older. Unusually we find that the mean labour productivity of non-exporters is higher, although the median is lower. A similar pattern occurs for wages.

Comparing firms by their type of ownership we confirm many of the stylised facts found by others. Foreign multinational firms are on average bigger (employment and sales), more productive and pay higher wages. We also find that their average export intensity is higher than for domestically owned firms, although how much of that difference is explained by the sample composition of exporters and non-exporters in the two groups, or by the better performance characteristics of multinational firms is not clear at this stage.

[Table 5 about here]

6. Main Results

Effects of exchange rate movements: Following Bernard and Jensen (2004) we establish the robustness of our findings using a number of estimators for the export participation decision. Table 6 presents results from estimating Equation (1) for the linear probability model and Equation (2) for the random effects probit. Finally, to tackle bias introduced by the initial condition and unobserved heterogeneity we insert Equation (3) into Equation (1) and estimate using the standard random effects probit model as a robustness check. [17]

[16] Further details on the OneSource dataset can be found in Oulton (1998), while Greenaway, Guariglia and Kneller (2007) discuss the data reporting requirements and previous applications found amongst others in Conyon, Girma, Thomson and Wright (2002), Girma, Greenaway and Kneller (2004) and Greenaway and Kneller (2007).

[17] We do not report these additional regressors to conserve space.

Of the firm level determinants of export market participation a number are consistent with those found previously. Size and labour productivity are positively associated with export market participation, whereas the effects of wage and age while positive are insignificant. We also find that foreign owned firms are more likely to export than domestic firms, even when conditioning on relatively better performance characteristics. Finally, as expected we find that the lagged export status of the firm has a strong and significant impact on current export status. This tends to be taken as evidence of sunk costs of export market entry (Clerides et al. 1998, and Bernard and Jensen, 2004a).

Of primary interest to us is the coefficient on the real exchange rate variable (REER). Here we find that exchange rates have no effect on firms' decision to export, despite the large movements in Sterling over the sample period.[18] This result is robust to the methodologies used.

[Table 6 about here]

To gauge the effect on the intensive margin of exports we estimate a sample selection model, reported in Table 7. We find a similar relationship between firm characteristics on the intensive margin. Once we control for the selection into exporting we find that firms with higher levels of human capital, as measured by the average wage, are associated with higher ratios of exports to total sales. Perhaps more interestingly we find that younger firms are also more export intensive, as are foreign owned firms. Taken together the results for these firm level variables are supportive of those found using a sub-sample of the present dataset by Girma, Greenaway and Kneller (2004), Greenaway and Kneller (2007), and Greenaway, Guariglia and Kneller (2007).

Unlike the participation decision detailed in Table 6, we do however uncover a significant effect of the real exchange rate on export intensity. Exchange rate movements have a significant impact on firms' export share decisions, even after controlling for industry clustering.[19] The adjustment of exports to exchange rate movements would appear

[18] Excluding the lagged export dummy allows us to check for robustness of the remaining explanatory variables. The results from this specification are similar to those in column (b) (only the age coefficients become significant), with generally higher levels of statistical significance.

[19] Since our exchange rate is industry-specific REER, industry clustered adjustment may mitigate the effects of exchange rate on export. The sample selection models we use hereafter throughout the paper are all controlled for industry clustering.

therefore to be primarily on the intensive margin of trade. Campa (2004) and Bernard and Jensen (2004b) both find a similar impact on exports of existing exporters.

[Table 7 about here]

To understand the economic magnitude of these effects we report in Table 8 the marginal effect of the sample selection model calculated at the mean of each variable. The table shows that adding 1 index point (1995=100) to the REER will decrease export share by about 0.0034 percentage points, equivalent to a decrease of 1.28 percent.[20] As the REER index mainly changes between 3 and 10 index points each year, it therefore induces changes of export share between 5 and 13 percent at the mean. Big changes of REERs in some years may cause a change of 25 percent in export share at the mean, for example in 1995-1996. The evidence shows a higher negative exchange rate impact on export shares, compared with those of other studies from micro data such as Campa (2004), in which a 10 percent depreciation results in increases in export volume due to the increase in export intensity of 6.3 percent.

[Table 8 about here]

In the remainder of Table 7 we test for robustness. Firstly, Column 2 reports the results by including group-means of all explanatory variables as additional regressors and controlling for initial conditions.[21] Secondly, Column 3 presents results using an alternative exchange rate index using fixed trade weights. In both cases our results are robust. The real effective exchange rate is negatively associated with firm exports, albeit only at the 10 per cent level when we use the fixed weights measure. Perhaps the more noticeable effect is to increase the point estimate on the exchange rate index in the probit selection equation, with the result that this variable now declines in significance to 10 per cent. Taken together it would appear however that the real effective exchange rate is significantly and robustly correlated with the export intensity of firms.

Effects of REER: foreign vs. domestic firms: The macro literature on the effect of exchange rate movements on aggregate export flows suggests a difference in the response of domestic and multinational firms. In our analysis we capture this using the interaction between foreign ownership and industry specific real exchange rate. Given the identical

[20] This is computed using the mean of export share. From the estimates in table 12 the mean of export share is 0.2662. So the change in percentage terms is (0.0034/0.2662)100=1.28.
[21] We do not report these additional regressors to conserve space.

nature of this regression to that in Columns 1 and 2 of Table 7 we report only the coefficients for REER, the product term and foreign ownership dummy. The reference group is domestic firms.

The evidence reported in Column 1 of Table 9 suggests no difference in the response of domestic and foreign multinationals to changes in the exchange rate. Closer investigation suggests however that this is the product of a collinearity problem between the foreign ownership variable and its interaction with the exchange rate. The loss of significance of the foreign ownership dummy despite the similarity of the point estimates to those in Table 6 is indicative of this. To mitigate this multicollinearity problem we follow Wooldridge (2006) and mean-centre the REER index (subtracting the mean from the REER), also generating a new interaction with the foreign multinationality variable. The use of the mean-centred variable allows us to easily extend the specification to allow for the possibility of curvilinear effects in the relationship between exchange rates and foreign ownership (Jaccard and Turrisi, 2003). That is, we introduce the square of the mean centred real exchange rate and product of this and the foreign multinationality dummy.[22]

This has a strong effect on the results compared to Column 1. We find that the coefficient for foreign ownership becomes strongly significant once again (this occurs as result of mean centring, not adding the squared term). One interesting outcome from this approach is the first evidence of an effect on the decision to export. We find that the linear exchange rate index is not significant whereas the squared term is, suggesting that large changes in the exchange rate may affect the export participation decision. No such effect is found for export intensity of established exporters.

For the interaction terms between foreign ownership and the mean-centred exchange rate we find the intensive margin of exports is affected, whereas the extensive margin is not. In the export intensity regression the linear interaction term is insignificant, but we do find a significant effect on the quadratic interaction term, suggestive of a nonlinear interaction between REER and foreign multinationality. Foreign firms are less negatively affected by large changes in exchange rates compared to domestically owned firms when the change in

[22] To test a quadratic interaction effect between a continuous variable *X* and a dummy variable *Y*, the following model is used: $Z = \alpha_0 + \alpha_1 X + \alpha_2 Y + \alpha_3 XY + \alpha_4 X^2 + \alpha_5 X^2 Y + \varepsilon_1$, where *X* is mean-centred. The coefficient α_5 represents the quadratic interaction effect.

the exchange rate is large. The results are consistent with the idea that exchange rate changes have less impact on multinationals due to their ways of dealing with exchange rate risk.

[Table 9 about here]

Foreign Multinationality or Size? An alternative explanation for differences between domestic and foreign owned firms might be firm size. This has been used as a proxy for financial constraints faced by firms (Greenaway, Guariglia and Kneller, 2007), affecting their ability to finance export market entry and ameliorate the impact of macro shocks. Similarly, multinational firms, both domestic and foreign, are known to have 'better' performance characteristics across a number of dimensions such as size.

In Table 10 we explore this using a measure of firm size based on the number of employees in the median firm. [23] We interact the firm size dummy with the exchange rate index in the same manner as for ownership, with small firms the omitted reference group. In contrast to ownership, size does not seem to matter; the coefficients of the interaction terms are insignificant on both the intensive and extensive margins.[24] We also test for a nonlinear relationship in the interaction effects by including the size dummy interacted with the linear and squared (mean-centred) real exchange rate. Here we find that the effects of size appear limited to an effect on participation, where the interaction with exchange rates is positive and weakly significant. Large firms are more likely to start to export than small firms for a given change in the exchange rate. In contrast to the results for ownership, column 2 shows that the quadratic interaction terms in both equations are always insignificant. We find no evidence for the nonlinear difference of exchange rate effects on exports according to the size of the firm.

In the remaining regression of Table 10 we test the robustness of our findings for various subsamples of the data. In Column 3 we use firms whose employment lies above the median to generate a dummy for firm size, and in Columns 4 and 5 further separate firms according to whether they are domestically or foreign owned. It is anticipated that UK owned multinational firms are more likely to feature in the sub-sample of large

[23] These results are robust to the use of sales as an alternative measure of firm size.
[24] We also tried the continuous variable of number of employees with the REER index, and the product terms in both equations are insignificant.

domestically owned firms. To conserve space we do not report the results for the first stage export participation regressions or for the full set of control variables. Column 3 shows the effects of the real exchange rate on firms is weakly significant on export intensity.[25] The results from Columns 4 and 5 suggest however that this is explained by the effect on domestically owned firms. The exchange rate variable is found to be statistically significant only in Column 4.

[Table 10 about here]

Origin of Ownership: Girma at al: (2008) show that the export behaviour of acquired firms' in the UK differs according to whether the acquiring firm is located inside or outside of the European Union. Their results show that firms with previous export experience are more likely to be acquired by foreign multinationals, but export response in the periods following acquisition is different according to whether the headquarters of the acquiring firm is inside or outside the EU. Firms acquired by US multinationals increase their export share following acquisition, whereas EU multinationals decrease it, although they continue to export. This they suggest can be interpreted as evidence of an export platform motive for FDI discussed in Motta and Norman (1996) and Ekholm *et al.* (2003).

We hypothesise that if the export platform motive is important then multinationals from outside the EU are less likely to respond to changes in the exchange rate. The UK is used as production facilities to serve the broader European market, such that the exchange rate effect is of second-order importance compared to the decision to undertake foreign direct investment. In contrast it is possible that firms acquired by others from inside the EU may be more responsive to changes in the costs of serving local markets.

The UK is highly exposed to international markets through FDI, 47.2 per cent of employment and 47.8 per cent of sales is accounted for by foreign firms. Around 35 per cent of the observations on foreign firms are multinationals from other European Union countries. This is similar to the proportion of observations of US and Canadian multinationals (36.5 per cent), while Japan and South Korea account for a further 6 per cent. In Table 11 we separate the foreign owned variable from previous regressions into a dummy equal to one when ownership is by a firm from inside the European Union (zero

[25] We also find a weak significant effect on the export entry decision.

otherwise), and a separate dummy equal to when ownership is by a firm from outside the European Union (zero otherwise). To reduce collinearity with the exchange rate index we introduce these dummies and the corresponding interaction terms singularly in Columns 1 and 3. In Column 1 we include differences in the effect of exchange rates for non-European firms compared to domestic firms and European firms (the omitted reference group) and in Column 2 the results for European firms. Again to conserve space we report only the new variables added to the regression and the direct effect of the exchange rate index.

In both Columns 1 and 2 we find the exchange rate index remains negative and statistically significant in the export share regression. The results are suggestive however of a difference according to ownership. In Column 1 firms from outside the European Union appear to be less affected by the real exchange rate compared to domestic and European multinationals. The coefficient on the interaction is positive and significant at the 10 per cent level, although small in size, suggesting that for these firms the effect of the exchange rate is not fully offset.

The behaviour of European multinational firms is very different. The interaction term with the real exchange rate is negative and statistically significant (Column 2), suggesting that European multinationals respond more strongly than domestic and non-European multinationals. The results in Column 3 confirm these findings, and suggest they are not influenced by the inclusion of domestically owned firms. Restricting the sample to just foreign owned firms we find that the interaction term with the non-European multinational indicator is positive and significant. Exports of non-European multinational firms respond less to changes in the exchange rate than European multinationals. The point estimate on the direct effect of the exchange rate compared to Columns 1 and 2 suggests that European multinationals respond similarly to domestically owned firms.[26]

[Table 11 about here]

7. Conclusions

[26] An attempt was made to test for nonlinear interaction effects between exchange rates and the origin of ownership however no significant effects were found. It would appear therefore that the non-linearitities in Table 8 for the broader foreign multinational dummy were a consequence of the offsetting effects of the exchange rate on exports by multinationals from inside or outside of Europe.

This paper examines the effects of exchange rate movements on firm decisions on export entry, exit and export share. The analysis breaks down export adjustments between changes in export share by existing exporters and those due to changes in entry into and exit from export markets. Results show that firm export participation decisions are not strongly related to exchange rate movements, although we do uncover an effect when changes in the exchange rate are large and large firms are also more likely to respond to changes.

The exchange rate does have a significant and negative impact on the export share of firms after entry however. The responsiveness of export share on the degree of exchange rate changes is not quantitatively as small as in Campa (2004); a one index point depreciation in REER index will increase export share by about 1.28 percent. Generally, the evidence suggests that export adjustments due to exchange rate changes mainly occur through export share by existing exporters rather than changes in the number of exporting firms.

We also find the exports of foreign multinational firms are less likely to be affected by exchange rate changes than those of domestically owned firms and these differences appear to be a consequence of ownership rather than firm size. The results provide the first direct evidence for the hypothesis of multinationals' ability to deal with exchange rate risk at the micro level. However, these effects differ according to the origin of the multinational. Multinationals originating from countries outside the European Union are less affected by changes in the exchange rate compared to those inside it, which appear similarly affected to domestic firms. We conclude that these effects are a consequence of an export-platform motive for FDI. The combination of the role of FDI and the origin of ownership may help explain some of the inconsistencies found between exports and exchange rates at the macro level.

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Figure 1: Industry-specific REER for SIC Industry 31-36

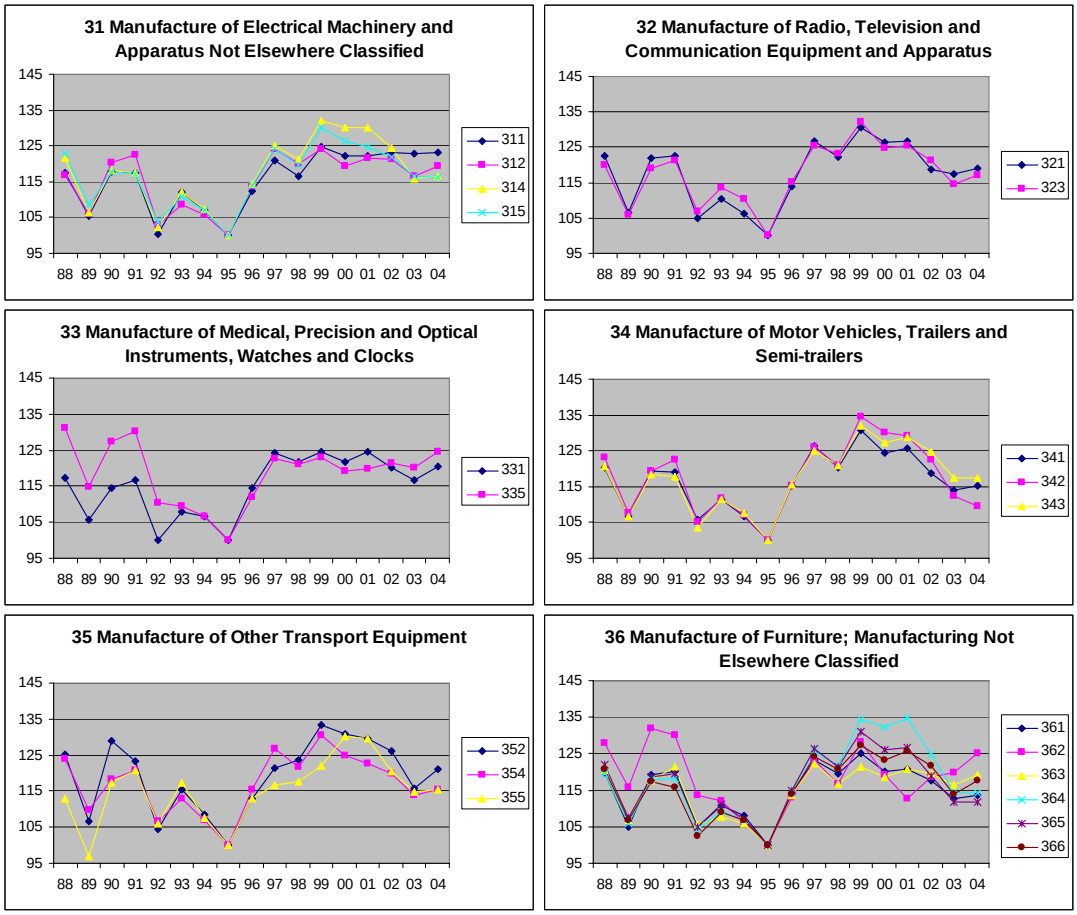

Table 1: Mean of Correlations of REER for Each Industry

Average Correlation	Number of industries
≥ 0.9	46
0.8—0.9	26
<0.8	6

Max average correlation: 0.998 Min average correlation: 0.403

Table 2: Average Shares of UK Export Destinations for Each Industry (1988-2004)

SIC code	US	Euro Zone	Other EC	Rest	SIC code	US	Euro Zone	Other EC	Rest
151	0.73%	82.25%	2.40%	10.90%	265	3.05%	62.94%	9.59%	15.75%
152	2.67%	77.57%	4.88%	10.41%	266	7.73%	66.19%	4.94%	12.97%
153	2.86%	71.00%	6.65%	11.71%	267	28.05%	41.24%	3.59%	21.14%
155	2.93%	69.35%	2.13%	14.94%	268	9.65%	57.17%	6.24%	13.79%
156	1.51%	75.56%	9.33%	7.52%	271	8.44%	56.44%	10.85%	15.20%
157	2.10%	72.55%	8.84%	7.46%	273	12.62%	53.20%	9.14%	13.37%
158	7.52%	53.06%	7.31%	18.14%	274	11.00%	47.62%	9.12%	25.04%
159	15.89%	40.42%	1.83%	25.60%	281	4.78%	43.96%	8.11%	24.23%
*160	0.61%	47.03%	0.29%	42.47%	282	7.27%	56.54%	7.87%	16.58%
171	5.12%	63.75%	5.45%	15.04%	*283	4.27%	21.91%	5.49%	49.99%
172	7.25%	42.99%	5.43%	28.13%	287	9.78%	53.23%	10.68%	13.71%
174	7.69%	63.70%	8.88%	9.96%	291	15.82%	36.56%	8.55%	22.82%
175	9.71%	52.96%	7.82%	15.04%	292	13.24%	43.27%	6.77%	17.61%
176	3.17%	60.27%	6.26%	21.06%	293	16.88%	47.04%	7.13%	16.82%
177	8.39%	67.30%	7.36%	12.33%	294	16.31%	44.74%	6.38%	18.33%
181	6.55%	72.42%	8.56%	9.46%	295	16.40%	35.17%	6.37%	19.38%
182	4.88%	60.20%	9.22%	14.95%	286	11.34%	52.71%	6.91%	14.28%
*183	1.77%	42.71%	9.31%	43.80%	297	6.04%	67.73%	5.33%	11.99%
191	13.54%	40.22%	3.56%	37.51%	300	11.51%	64.58%	8.51%	9.15%
192	9.76%	55.04%	10.10%	16.94%	311	12.98%	35.47%	5.54%	24.60%
193	14.47%	57.60%	4.55%	14.80%	312	11.90%	37.25%	6.54%	26.86%
201	3.69%	78.24%	4.98%	8.20%	314	7.50%	59.46%	9.76%	11.41%
202	3.60%	74.13%	6.18%	10.60%	315	7.90%	53.03%	9.35%	16.24%
203	2.58%	75.14%	3.32%	12.98%	321	9.97%	59.78%	5.08%	20.61%
204	2.20%	83.62%	7.21%	4.89%	323	6.76%	62.57%	7.66%	12.72%
205	15.82%	52.52%	7.90%	13.85%	331	17.31%	44.29%	6.85%	17.84%
212	9.85%	64.05%	5.28%	11.44%	*335	6.62%	26.24%	16.40%	44.35%
221	13.96%	40.82%	6.67%	24.07%	341	14.23%	65.51%	3.45%	10.28%
222	9.72%	51.97%	8.67%	13.39%	342	5.29%	71.22%	5.41%	11.61%
231	1.99%	29.60%	55.12%	11.22%	343	11.01%	60.33%	5.49%	14.10%
242	8.86%	47.10%	4.80%	17.73%	352	4.50%	45.43%	11.89%	30.66%
244	14.62%	48.76%	4.71%	18.68%	354	13.79%	65.15%	7.92%	9.48%
245	4.34%	55.98%	9.41%	16.36%	355	4.67%	51.17%	8.09%	27.72%
246	10.35%	49.33%	6.81%	15.92%	361	17.92%	55.98%	7.57%	11.22%
252	8.32%	58.31%	9.24%	10.94%	*362	13.98%	21.88%	15.22%	43.30%
261	9.14%	58.82%	7.90%	13.91%	363	20.42%	47.08%	6.28%	17.41%
262	18.31%	37.97%	4.20%	25.06%	364	10.31%	60.50%	13.22%	9.56%
263	12.04%	50.07%	2.01%	27.22%	365	8.79%	68.97%	7.35%	9.03%
264	1.85%	67.33%	1.73%	25.47%	366	10.92%	48.65%	7.90%	17.78%

Euro area: Austria, France, Germany, Finland, Italy, Belgium, Spain, Greek, Portugal, Netherlands, Ireland, Luxembourg.
Other EC: Denmark, Norway, Switzerland, Sweden
* 5 industries with average share of rest of world greater than 40%.

Figure 2: First Differences of REER for SIC industry 31-36

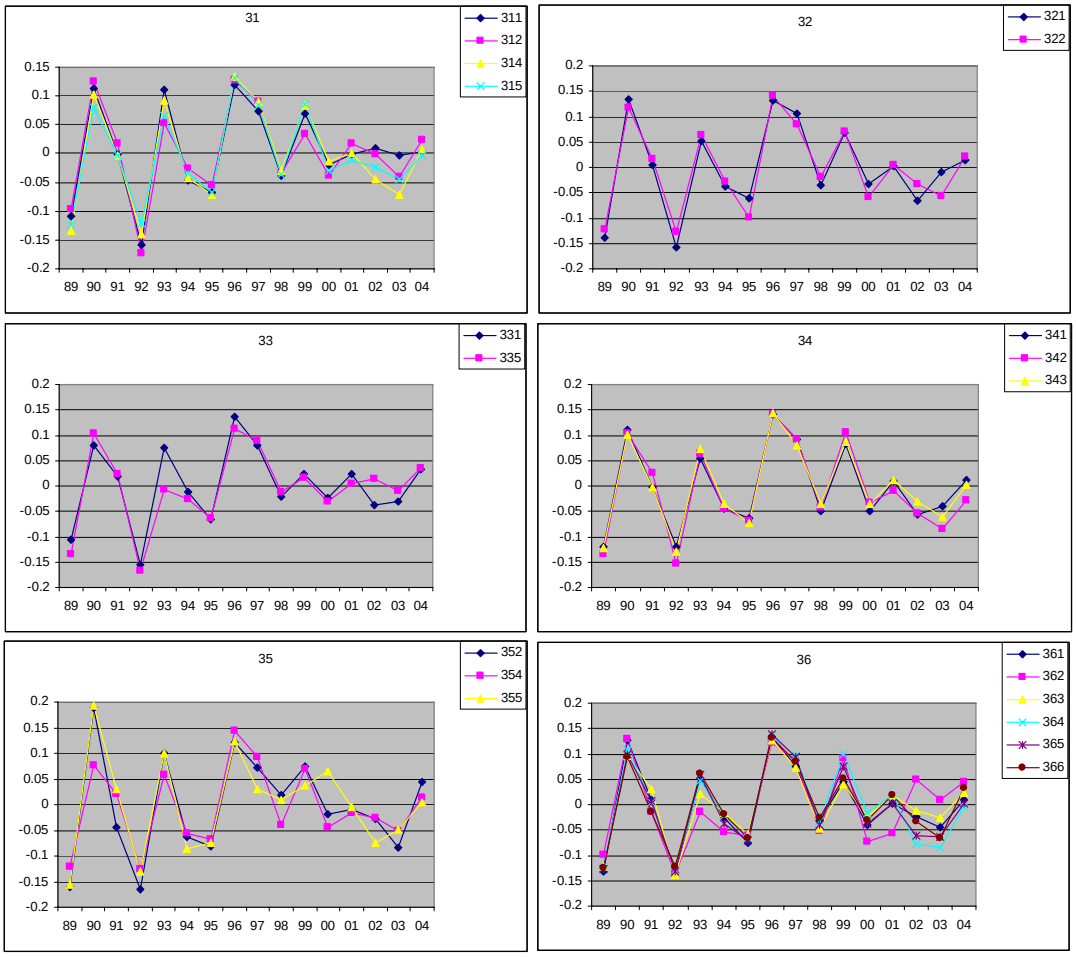

Figure 3: First Differences of Log USD/GBP and EURO(DM)/GBP

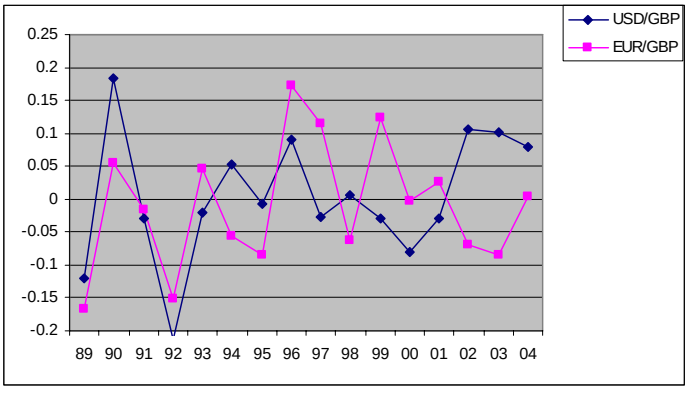

Table 3: Statistics of Percentage Changes of REER across All Industries

Year	Mean	Max	Min	SD
88-89	-11.79%	-8.93%	-15.07%	0.0132
89-90	12.16%	21.20%	6.70%	0.0276
90-91	0.89%	8.41%	-4.41%	0.0187
91-92	-12.59%	-6.47%	-17.89%	0.0206
92-93	6.27%	14.73%	-3.48%	0.0324
93-94	-3.55%	1.42%	-8.25%	0.0162
94-95	-6.48%	-4.16%	-9.47%	0.0100
95-96	13.56%	16.22%	7.46%	0.0160
96-97	9.27%	14.71%	-1.29%	0.0221
97-98	-3.02%	13.05%	-7.38%	0.0256
98-99	7.38%	16.83%	-2.04%	0.0300
99-00	-3.52%	6.65%	-8.89%	0.0204
00-01	0.40%	5.65%	-5.43%	0.0170
01-02	-3.49%	5.85%	-8.29%	0.0329
02-03	-5.30%	3.17%	-9.92%	0.0239
03-04	0.56%	4.63%	-6.10%	0.0176

Table 4: Structure of the Unbalanced Panel for the sample of regression

Number of Obs. per Firm	Number of Firms	Percent	Cumulative
1	416	0.07	7.08
2	449	0.08	14.72
3	450	0.08	22.38
4	456	0.08	30.14
5	429	0.07	37.44
6	372	0.06	43.77
7	426	0.07	51.02
8	473	0.08	59.07
9	633	0.11	69.84
10	267	0.05	74.39
11	269	0.05	78.97
12	231	0.04	82.90
13	252	0.04	87.19
14	267	0.05	91.73
15	267	0.05	96.27
16	219	0.04	100.00
Total	5,876	100.00	

Table 5 Summary Statistics of the Key Variables (mean, overall SD, median and #obs.)

	1. Total sample	2. Firms that never exported	3. Firms that always exported	4. Domestic firms	5. Foreign firms
No. of Obs.	44252	7214	22686	23679	20572
Real sales	45357.99 (223029) 10722.6	25262.21 (96228) 6595.92	39752.49 (134056) 12878.24	36685.51 (231008) 8222.49	55339.79 (213046) 14448.1
No. of emp.	394.87 (1561.3) 129	237.45 (572.78) 84	389.92 (1289.4) 153	374.43 (1759.7) 116	418.41 (1295.3) 146
Age	29.66 (25.11) 22	27.45 (25.66) 18	31.29 (25.39) 24	31.40 (24.94) 24	27.65 (25.16) 18
Labor prod.	148.93 (1248.8) 82.42	194.00 (1723.55) 74.60	127.36 (355.61) 83.53	120.54 (966.88) 70.15	181.62 (1509) 99.11
Real Wage	19.81 (11.52) 18.19	20.80 (18.80) 18.01	19.40 (7.78) 18.16	17.97 (11.47) 16.64	21.93 (11.20) 20.14
Export Share	0.233 (0.271) 0.114	0	0.328 (0.267) 0.260	0.187 (0.244) 0.071	0.286 (0.289) 0.186

Note: In each box, mean, overall standard deviation (in the parentheses), median are reported from top to bottom respectively.

Table 6 Models of Export Entry

	(1) Entry: Fixed-effects Linear probability (t statistic)	(2) Entry: Random-effects Probit (z statistic)	(3) Entry: Random-effects probit (z statistic) (controlling for unobserved heterogeneity and initial conditions)
REER	0.00037 (0.80)	0.0026 (0.42)	0.0118 (1.56)
Wage	-0.0033 (-0.60)	0.0365 (0.76)	0.0314 (0.79)
Employment	0.0186 (7.74)***	0.0857 (6.53)***	0.1208 (3.34)***
Labour productivity	0.0075 (2.16)**	0.064 (2.52)**	0.041 (0.79)
Firm age	0.00006 (0.02)	0.00134 (0.09)	0.0383 (0.61)
Foreign Multinat. dummy		0.2022 (5.43)***	0.1188 (2.22)**
Lagged export status	0.3565 (87.6)***	2.888 (93.2)***	1.986 (52.99)***
Wald chi2		11095.08	6347.55
Number of firms	5, 876	5, 876	5, 876
Number of observations	44, 215	44, 215	44, 215

(i) * indicates significant at 10%; ** indicates significant at 5%; *** indicates significant at 1%
(ii) All variables are lagged and are in logs (except dummy variables).

Table 7 Sample Selection Model

	(1) Sample Selection with REER		(2) Sample Selection with REER (controlling for unobserved heterogeneity and initial condition)		(3) REER using average trade weights	
	Export Dummy	Export Share	Export Dummy	Export Share	Export Dummy	Export Share
REER	0.00214 (0.33)	-0.0039 (-2.02)**	0.0087 (1.56)	-0.0037 (-2.27)**	0.0107 (1.41)	-0.0047 (-1.77)*
Wage	0.0362 (0.73)	0.0916 (3.09)***	-0.0246 (-0.38)	0.006 (0.68)	0.0512 (0.93)	0.1167 (6.91)***
Employment	0.0435 (2.32)**	0.00207 (0.44)	0.007 (0.20)**	0.0053 (1.02)	0.047 (2.41)**	0.0016 (0.33)
Labour productivity	0.0375 (1.20)	-0.0102 (-1.09)	0.0375 (1.20)	0.0013 (0.21)	0.0479 (1.48)	-0.0104 (-1.08)
Firm age	-0.0244 (-1.56)	-0.0096 (-2.53)**	-0.158 (-2.97)***	-0.0072 (-1.16)	-0.025 (-1.52)	-0.0109 (-2.83)***
Foreign Multinat. dummy	0.1316 (4.26)***	0.058 (6.80)***	0.0766 (1.87)*	0.054 (5.80)***	0.123 (3.92)***	0.054 (6.46)***
Lagged export status	3.04 (39.94)***		2.36 (45.51)***		3.04 (39.94)***	
Lambda (standard error)	-0.0341 (0.006)***		-0.0759 (0.007)***		-0.0349 (0.006)***	
Rho (standard error)	-0.1331 (0.021)***		-0.2965 (0.021)***		-0.1363 (0.023)***	
Number of firms	5, 876		5, 876		5, 876	
Number of observations	44, 215		44, 215		44, 215	

(i) * indicates significant at 10%; ** indicates significant at 5%; *** indicates significant at 1%
(ii) Z statistics in parentheses
(iii) all variables are lagged and are in logs (except dummy variables)
(iv) robust standard errors adjusted for clusters in 3-digit industries.
(v) ρ is the estimated correlation between the error terms of the two equations; if it is different from zero it suggests that the two equations are related and that the selection model is appropriate; λ is the estimated coefficients of the inverse Mills ratio; if it is different from zero it suggests that there is sample selection.

Table 8: Marginal Effects of the Sample Selection Model (clustered)

	Export Dummy	Export Share
Lagged Export status	0.817 (0.0115)***	
REER	0.00038 (0.00115)	-0.0034 (0.002)*
Lag log of employment	0.0078 (0.0035)**	0.00456 (0.00455)
Lag log of wage	0.0065 (0.0087)	0.084 (0.027)***
Lag log of labour productivity	0.0067 (0.0055)	-0.0068 (0.00876)
Lag log of age	-0.00437 (0.0027)	-0.01015 (0.0036)***
Foreign owner dummy	0.0234 (0.00567)***	0.0605 (0.0086)***

Notes: (i) *significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Sample Selection Model: Foreign vs. Domestic Firms

	(1) interaction with Foreign Multinational dummy		(2) quadratic interaction with Foreign Multinational dummy[a]	
	Export Dummy	Export Share	Export Dummy	Export Share
REER	0.0006 (0.10)	-0.004 (-2.02)**	-0.004 (-0.62)	-0.004 (-1.93)*
Foreign Multinat dummy	-0.278 (-0.94)	0.0552 (1.24)	0.128 (3.22)***	0.0531 (6.28)**
REER* Foreign dummy	0.0035 (1.40)	0.0000 (0.07)	0.0036 (1.39)	0.0003 (0.57)
$REER^2$			0.001 (2.07)**	-0.000 (-0.49)
$REER^2$ *foreign dummy			0.000 (0.04)	0.000 (1.99)**
Lambda (std. error)	-0.0341 (0.0056)***		-0.0341 (0.0056)***	
Rho (std. error)	-0.1332 (0.0209)***		-0.1332 (0.0208)***	
No. of obs.	44, 251		44, 251	

Notes: (i) See notes from Table 6
(ii) a The REER index used in Column 2 is mean centred.
(iii) The regressions additionally include the control variables listed in Table 6

Table 10: Sample Selection Model: Big vs. Small Firms

	(1) interaction with Size		(2) quadratic interaction with Size[a]		(3) Sub-sample of large firms	(4) Sub-sample of large domestic firms	(5) Sub-sample of large foreign firms
	Export Dummy	Export Share	Export Dummy	Export Share	Export Share	Export Share	Export Share
REER	0.002 (0.33)	-0.004 (-2.0)**	-0.004 (-0.63)	-0.004 (-1.69)*	-0.0046 (1.93)*	-0.006 (-2.24)**	-0.0032 (-1.31)
Employ ment	0.042 (2.32)**	0.0020 (0.28)	0.04 (2.20)**	0.002 (0.40)	0.02 (2.48)**	0.0091 (1.04)	0.027 (2.60)***
Foreign Multinat dummy	0.1314 (4.25)***	0.058 (6.78)***	0.131 (4.29)***	0.058 (6.81)***	0.0469 (4.04)***		
REER* Size Dummy	0.000 (0.09)	0.0000 (0.01)	0.004 (1.95)*	-0.000 (-0.30)			
$InREER^2$			0.001 (1.71)*	-0.000 (-0.14)			
$InREER^2$* Size dummy			0.000 (0.77)	-0.000 (-0.04)			
Lambda (std. error)	-0.034 (0.006)***		-0.034 (0.006)***		-0.02 (0.006)***	-0.024 (0.008)***	-0.018 (0.01)*
Rho (std. error)	-0.1331 (0.0206)***		-0.1330 (0.0208)***		-0.08 (0.024)***	-0.103 (0.034)***	-0.073 (0.04)*
No. of obs.	44, 215		44, 215		21, 138	10,508	10, 630

Notes: (i) See notes from Table 6
(ii) a The REER index used in Column 2 is mean centred.
(iii) The regressions additionally include the control variables listed in Table 6

Table 11: Foreign European firms VS. Foreign Non-European firms

	(1) interaction with Non-European dummy (full sample)		(2) interaction with European dummy (full sample)		(3) interaction with Non-European dummy (Subsample: foreign firms)	
	Export Dummy	Export Share	Export Dummy	Export Share	Export Dummy	Export Share
REER	0.002 (0.31)	-0.004 (-2.22) **	0.002 (0.34)	-0.004 (-2.06) **	0.0023 (0.27)	-0.004 (-1.88)*
Non-European Multinat. dummy	-0.125 (-0.46)	0.004 (0.08)			0.093 (0.30)	-0.035 (-0.62)
REER* Non-European Multinat. dummy	0.0017 (0.72)	0.0008 (1.71)*			-0.001 (-0.44)	0.0012 (2.41) **
European Multinat. dummy			-0.176 (-0.55)	0.097 (2.02) **		
REER* European Multinat. dummy			0.002 (0.93)	-0.001 (-3.19) ***		
Lambda (std. error)	-0.0339 (0.0056)***		-0.0343 (0.0055)***		-0.0258 (0.0105)***	
Rho (std. error)	-0.1334 (0.0208)***		-0.1335 (0.0204)***		-0.0972 (0.0390)***	
No. of obs.	44, 251		44, 251		20, 572	

Notes: (i) See notes from Table 6
(ii) a The REER index used in Column 2 is mean centred.
(iii) The regressions additionally include the control variables listed in Table 6

Appendix: Definitions of the Variables Used

Export dummy*:* dummy variable equal to 1 if the firm's overseas turnover is positive
Real intangible assets: the firm's intangible assets deflated by RPI indices (Source: Office of National Statistics)
Real Sales*:* includes both UK and overseas turnover deflated by PPI indices (Source: Office of National Statistics)
Labor productivity: the ratio of the firm's total real sales to its total number of employees.
Real Wage: the ratio of the firms' total wage bill (which includes wages, salaries, social security and pension costs) to number of employees, deflated by RPI indices.
Foreign owner dummy*:* dummy variable equal to 1 if the firm's primary ownership country is not UK, and 0 otherwise. This variable is only available in the last year of observations available for each firm. We therefore have to assume that a firm which was foreign owned in its last available year was foreign owned throughout the period in which it was observed.
Log of employment: Number of employees
Export Share: ratio between overseas turnover and total turnover
Age: the subtraction of current year and the incorporation year for each firm in each year
Industry specific REER: 3-digit manufacturing industry level real effective exchange rate