Marginal Distance: Does Export Experience Reduce Firm Trade Costs?

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Abstract Are the costs of exporting to a market reduced if a firm has experience of exporting to a neighbouring market? If so, does this effect operate through reducing entry barriers or by increasing sales once the firm is operating in the market? This paper examines linkages between current export destinations and entry, sales and exit for new markets. We find that measures of exporting experience in geographically nearby markets increase the probability of entry into a market and reduce the probability of exit. However, these same measures have very limited effect on the firm's export sales in the market. The effect of related experience on sales tends to be negative for recently entered firms. We interpret this result in the context of the Melitz heterogeneous-firm model of trade by showing that lower fixed costs reduce the entry threshold, but this lower threshold has the effect of allowing lower-sales marginal firms to be present in the market.

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1 Introduction

The distance between two countries has consistently been found to exert a strong, negative effect on trade between them.[1] The most basic explanation for the importance of distance in the gravity estimation of trade flows is that it captures the cost of physically transporting goods between countries. However, there are other potential reasons for distance to impede trade - for example, language and cultural differences may make it more difficult for a firm to assess demand for its product in a more distant market or to establish marketing and distribution networks. Although there is no disagreement on the empirical importance of distance for trade, the results from aggregate data have not been able to provide much clarification on the channels through which this distance effect operates.

The more recently available data sources containing firm-level information on export destinations can be used to disentangle some of the different ways that distance affects trade. Although there are relatively few papers that have examined firms' export activities over a range of countries, these papers have verified that the significant negative effect of distance on trade also holds at the firm level.[2] A common finding is that firms typically export to a small number of destinations and that firms begin exporting by entering closer markets before expanding (in some cases) to more distant destinations.

These findings motivate the questions asked in this paper: Is entry to a new export market made easier if the firm already exports to a neighbouring country? If so, does this effect operate through reducing entry barriers or by increasing sales once the firm is operating in the market? In other words, we look at the effect of the standard measure of distance - from the exporting country to the destination - but also at whether a firm's export patterns are affected by the distance of a destination from other markets that the firm operates in.

Suppose, for example, an Irish firm is deciding if it will export to Austria - there will be a fixed cost associated with running an operation there and to transporting its product and these costs can be proxied by the distance between the two countries. The key question this paper poses is whether these costs would be be lower if the firm already exports to, say, Germany? If distance is predominately proxying for the variable transport costs, then there is little reason to suppose the

[1] See Disdier and Head (2008) for a meta-analysis of the effect of distance in aggregate gravity estimation.

[2] See for example Eaton, Eslava, Kugler and Tybout (2008), Lawless and Whelan (2008), Fabling, Grimes and Sanderson (2010).

firm's presence in Germany would have any affect. On the other hand, there may be costs from researching the market, advertising and entry to distribution networks that are substantially eased by having a presence in a neighbouring country.

The analysis in this paper is related to the concept of "distance to the supply frontier", a term proposed by Evenett and Venables (2002). They showed that proximity to an existing market was a consistently significant factor in determining expansion into new markets for sector-level exports from developing countries. Using firm data, Eaton, Eslava, Kugler and Tybout (2008) and Albornoz, Calvo-Pardo, Corcos and Ornelas (2009) find entry to an export market is strongly related to export experience within the same region. This paper includes the regional dimension tested in these two papers, but expands the empirical analysis to examine the role played by the distance between various potential export markets.

The regressions in this paper add a range of estimates of firm export experience, particularly in exporting to nearby markets, to a firm-level gravity model to examine if experience affects trade costs. The determinants of firm entry, sales and exit for new export markets are analysed using panel data on Irish exporters from 2000 to 2007. However, these same measures have very limited effect on the firm's export sales in the market. The effect of related experience on sales tends to be negative for recently entered firms.

We interpret the results in the context of the Melitz heterogeneous-firm model of trade. We argue that the results are consistent with the idea that exporting to a market reduces the fixed costs associated with running an export operation in a nearby market. Lower fixed costs reduce the entry threshold but this lower threshold has the effect of allowing lower-sales marginal firms to operate in the market, explaining the negative effect on sales.

The remainder of the paper is organised as follows. Section 2 provides the theoretical motivation for the analysis. Section 3 describes the data used in the paper, discussing the firm-level dataset employed, the country-level variables used for gravity-style regressions, and the new variables constructed to measure aspects of a firm's export experience measures. Section 4 presents the results. Section 5 concludes.

2 A Model of Firm Exports

In this section, I discuss a simple version of the model first presented by Melitz (2003). The key features of the model are that firms are heterogeneous in their productivity and face both fixed and variable costs in order to export. The Melitz structure has often been used to model bilateral trade flows across a range of sectors and countries. However, as the data used later in the paper are for exports from a single country, we will describe a model with firms from a single exporting country and therefore we suppress the home country subscript to simplify the notation.

Assume that each country produces a continuum of separate differentiated products, and that consumers in the foreign country j have a utility function across the goods k produced in all countries that takes the form

$$U_j = \left[\int x_j(k)^{\frac{\epsilon-1}{\epsilon}} dk \right]^{\frac{\epsilon}{\epsilon-1}} \tag{1}$$

Thus, the quantity demanded x of good k in country j is

$$x_j(k) = \frac{p_j(k)^{-\epsilon} Y_j}{P_j^{1-\epsilon}} \tag{2}$$

where $p_j(k)$ is the price charged in country j for good k, Y_j is real income in country j and P_j is the Dixit-Stiglitz price level defined by

$$P_j = \left[\int p_j(k)^{1-\epsilon} dk \right]^{\frac{1}{1-\epsilon}} \tag{3}$$

It is assumed that the exporting country produces a continuum of separate differentiated products of unit mass. Of the range of possible differentiated products, each firm produces a single variety. Production takes place according to a Ricardian technology with cost-minimizing unit cost $\frac{c}{a}$, where c relates to the exporting country's cost level and a is the firm-specific productivity parameter. The productivity parameter a is assumed to be randomly drawn from a distribution $G(a)$ with probability density function on the support $[0, \infty]$.

There are two types of trade costs associated with exporting to country j. First, there are fixed costs F_j. These can be viewed as related to bureaucratic paperwork costs associated with exporting, to marketing costs, and to the costs of running a wholesale and retail distribution chain. It is likely that each of these costs increase with the scale of exports; however, it is also likely that many of these costs need to be incurred independent of the scale of subsequent export sales. Second, there are variable costs, which are modeled with the iceberg specification so that τ_j units have to be

shipped from our country of interest to country j for one unit to arrive. These can be viewed as transport costs, tariffs, and the variable costs associated with marketing and distribution.

The assumptions about market structure and trade costs imply that the optimal selling price to country j for a good produced with technology level a is

$$p_j(a) = \frac{\epsilon}{\epsilon - 1} \frac{\tau_j c}{a} \tag{4}$$

This implies profits generated by this product in country j are given by

$$\pi_j(a) = \mu \left(\frac{P_j a}{\tau_j c} \right)^{\epsilon - 1} Y_j - F_j \tag{5}$$

where $\mu = (\epsilon - 1)^{\epsilon - 1} \epsilon^{-\epsilon}$. Thus, profits generated by exporting this product to country j are positive as long as

$$a > \left(\frac{F_j}{\mu Y_j} \right)^{\frac{1}{\epsilon - 1}} \frac{\tau_j c}{P_j} \tag{6}$$

This defines a cut-off level of productivity necessary for entry into country j as

$$\bar{a}_j = \left(\frac{F_j}{\mu Y_j} \right)^{\frac{1}{\epsilon - 1}} \frac{\tau_j c}{P_j} \tag{7}$$

so that only firms with productivity above this level will sell in country j. As would be expected, this cut-off level of productivity is increasing in both types of trade costs and in domestic cost levels, while it is negatively affected by export country GDP and the price level in country j.

This generates a level of exports of firm i to country j, which are

$$s_{ij} = p_{ij} x_{ij} = \left(\frac{P_j}{p_{ij}} \right)^{\epsilon - 1} Y_j \tag{8}$$

Inserting the formula for the optimal price, this gives us

$$s_{ij} = \left(\frac{\epsilon - 1}{\epsilon} \frac{P_j a_i}{\tau_j c} \right)^{\epsilon - 1} Y_j \tag{9}$$

Thus, sales of an individual good depend positively on productivity, on the export country's GDP and price level, and negatively on variable trade costs. Once the firm has become an exporter, fixed costs do not have any impact on the level of sales.

This formulation assumes that the fixed and variable costs encountered in market j are the same for all firms. It is straightforward to generalise these costs to allow for experience in other export markets to reduce these costs for some firms. For example, suppose that the two types of trade costs were a function of country-specific factors but were also related to firm experience.

Variable and fixed trade costs for firm i to country j could be expressed as $\tau_{ij} = f_j(s_{i1}, s_{i2}, ...s_{iN})$ and $F_{ij} = f_j(s_{i1}, s_{i2}, ...s_{iN})$. In other words, the fixed and variable trade costs related to a firm exporting to market j would depend upon the full range of export sales experience that the firms had in other markets.

Under this assumption, the standard predictions of the Melitz model that firms will enter the markets with the lowest threshold first are unchanged. However, one implication of allowing the two types of trade costs to vary across firms is that these thresholds and, by extension, the order in which markets are entered could also vary by firm. In other words, each firm will continue to enter its lowest cost market first, then the second lowest cost and so on down the hierarchy of markets generated by its set of fixed and variable costs but this ordering of market entry will not be identical for all firms. In the empirical analysis, we will be looking at entry, exit and sales in *individual* destinations and controlling for a range of firm characteristics including previous exporting experience (both overall and in related markets) so variations in the hierarchy order should not pose any econometric concerns.

Experience in other markets that reduces the variable cost of exporting would have two effects. It would reduce the threshold to entry in equation (7) and would increase the sales once the firm was in market j in equation (9). A reduction in fixed costs due to experience in other markets has the same effect on the entry threshold as a change in variable costs and will induce entry as firms find it easier to sell enough in the market to cover costs. However, once the firm is operating in a market, fixed costs do not affect its sales.

Empirically we can use this predicted difference in how the two types of trade costs effect entry compared to sales to examine if experience can be shown to affect one or both of the trade costs. If experience in nearby markets reduces variables trade costs, then we would expect to see firms that already sell to a region be more likely to export to other countries close to their existing export markets and also to sell more in these markets. However, in the case where the export experience in nearby markets only reduces fixed trade costs, we would expect to see higher probabilities of market entry for firms with experience in nearby markets but we would expect these firms to have lower sales once we have controlled for other factors.

This result is similar to the finding in Lawless (2010) that the extensive margin of exporting (number of firms exporting to a market) is negatively affected by both fixed and variable trade costs, but that there is no such clear prediction for the intensive margin (average sales per firm).

This is because lowering trade costs tends to raise the sales of continuing exporters but also leads to the introduction of new more marginal exporters with lower average sales. In the example of a specific distributional assumption for productivity, it was shown that sales per firm are directly proportional to fixed trade costs and that the offsetting effects of variable trade costs on participation and subsequent sales cancelled one another out.

3 Data

This section describes the data used in the paper. It first describes the firm-level dataset used in the analysis. It then discusses country-level variables used in gravity-style regressions. Finally, it discusses the measures of exporting experience constructed to assess whether exporting to nearby countries has an impact on entry, exit or sales in other markets.

3.1 Firm-Level Data

The firm-level data used in this paper come from a survey of Irish firms undertaken by Enterprise Ireland, a government agency charged with promoting indigenous Irish owned businesses.[3] The data used is an expanded version of that used in Lawless (2009) and Lawless and Whelan (2008). Of the 1703 firms in the sample, all exported at some point during the period covered by the dataset. The survey reports firm-level data on eight years of exporting activity (2000-2007). Comparing the total exports of the firms covered by this survey to the Census totals from the Irish Central Statistics Office, the data cover approximately two-thirds of exports from Irish-owned firms.

The restriction to Irish-owned firms means that this dataset is not representative of Irish exports as a whole. In 2004, foreign-owned companies accounted for just over 90 per cent of the country's manufacturing exports (Central Statistics Office, 2004). This is primarily due to a history of economic policy focused on attracting export-platform foreign direct investment. However, the Irish experience of FDI-dominated exports is a relatively uncommon pattern. As such, we believe that studying the export decisions and patterns of indigenous Irish firms is more likely to yield

[3] A separate agency, the Industrial Development Agency, is responsible for attracting foreign direct investment and promoting foreign-owned businesses. The data from the Enterprise Ireland survey were made available to us by Forfás, which is the Irish national policy advisory board for enterprise, trade and technology.

conclusions that apply more broadly across countries.

The Enterprise Ireland survey records information on a number of firm characteristics such as employment, sales, inputs, and exporting activity. More importantly for our analysis, the survey records detailed information on exports to 50 individual markets and is a panel, so that individual firms can be followed over time. Taken together, these features make the Enterprise Ireland dataset a particularly valuable tool for assessing the heterogeneous-firm approach to trade theory outlined in the previous section.

Table 1 reports some summary statistics on the data over time - showing a gradual increase in the size and export levels of the firms as well as an average increase in the number of markets exported to. This is also reflected in the larger average number of markets entered than exited in all but one period (2005).

Figure 1 is a snapshot describing the average distribution for the number of markets. Previous work has found that international engagement by firms tends to be very concentrated. The average number of markets exported to over the period was 5.9, with a median of 2.8. The average number of destination markets per firm is higher than was found by Bernard, Jensen and Schott (2006). The firms in their analysis exported to 3.3 markets in 2000. The highly skewed nature of the distribution is common across the Irish, French and US firms. Only 17% of the firms in this paper export to more than 10 markets and just 3% to more than 25. Eaton, Kortum and Kramarz (2004) found approximately 20% of firms exporting to more than 10 markets and reported 1.5% exporting to over 50.

As well as this concentration in relatively small numbers of markets, exporting tends to be dominated by larger firms. Bernard, Jensen and Schott (2005) find that the top 1% of US trading (i.e. both exporting and importing) firms accounted for 81% of US trade in 2000. In the case of our Irish data, exporting activity is also concentrated amongst a fairly small number of larger firms. Firms employing over 500 generated 30% of the total exports in 2004 even thought they make up less than 3% of the firms in the sample. The smallest firms, although the most numerous at almost 33% of the sample, export only 2-3% of the total.

Lawless (2009) reported a number of features of the data that are relevant to the current analysis. When examined at the level of individual markets, the exporting process exhibits far more dynamics than is evident when one only observes exporting status. Although firms rarely become exporters or cease exporting entirely, firm entry into or exit out of individual markets is commonly observed.

Table 2 shows the extent of entry and exit of markets amongst exporting firms for each year of the survey. The average entry rate is 22% and the average exit is 20% showing that a substantial percentage of firms change their portfolio of export markets in each year.[4]

3.2 Country Data

Standard gravity measures of the attractiveness of markets are used as potential explanatory factors for the firm's presence in a market and also its sales - these are distance, GDP per capita, population and language. The explanatory variables at the country level come from a number of sources. Data on GDP and population is taken from the Penn World Tables (Heston, Summers and Aten, 2009). Distance between capital cities and contiguity indicators come from data compiled by the CEPII, as described by Mayer and Zignago (2006).

The GDP per capita and size of the importing country are key trade-creating variables in the gravity model, indicating the total demand in that country and is, therefore, expected to have a positive effect on trade. The geographical distance between the importing and exporting countries can be thought of as a proxy for transport costs, a significant factor in inhibiting trade flows. As such, this variable is expected to be negatively signed. Ability to communicate in a common language is predicted to reduce the costs of trade and a dummy variable for English as (one of the) official language(s) in the destination market is used to pick up this effect. The language indicator comes from a variety of sources, compiled by the on-line encyclopedia Wikipedia.[5]

3.3 Market Experience Measures

The standard gravity variables described in the previous subsection model proxy for the attractiveness of the market and the costs of exporting. In our analysis of the determinants of entry to a market j for an individual firm i, our main focus is on measures of the firm's experience in similar markets. We use k to indicate existing export markets of the firm. The costs involved in entering a new market may be affected by existing experience of exporting in general or by experience exporting to similar markets in particular. We define five measures of export experience that will be used

[4]Note that the entry and exit rates are calculated by market - the same firm may simultaneously be entering one market and exiting a different one.

[5]From http://en.wikipedia.org/wiki/List_of_countries_where_English_is_an_official_language

to test for the effects existing export markets may have on the firm's performance in a new market.

Contiguous Market Dummy The first of the market variables that we use to describe a firm's exporting experience is a dummy variable for exporting to a contiguous market - this is equal to one if the firm exported in the previous period to a country k that shares a common land border with market j. We define this contiguity dummy as exporting to *any* neighbour country, so it is equal to one even if the firm exports to more than one neighbouring country.

$$ContigDum_{jk} = \begin{cases} 1 & \text{if } border_{jk} = 1 \text{ for any } k \\ 0 & \text{otherwise} \end{cases} \tag{10}$$

Exports to Contiguous Markets The second explanatory variable for experience takes into account the intensity of the firm's export activity with neighbouring markets by summing the amount exported to all contiguous markets.

$$ContigExp_j = \sum_{k \neq j}^{k} exp_{ik} \tag{11}$$

Exports to countries sharing a land border, as captured by the contiguity dummy and level of exports to neighbouring countries may be somewhat limiting as not all countries in the sample will have land borders. Exporting experience may also be relevant to facilitating entry to a new market even if this experience is not in a direct neighbour country. The next set of experience variables therefore broaden the definition of experience to more distant markets.

Exports to Region The first of these broader variables measures the amount exported to other countries in the same region r, rather than just count directly bordering countries. To construct this variable, the set of countries in the data was divided into eight regions - the EU-15 (original European Union member states), the EU-10 (set of countries that joined the EU in 2004), Other Europe, North America, South America, Asia and Oceania, Africa and the Middle East.

$$RegExp_{jr} = \sum_{k}^{r} exp_{ik} \tag{12}$$

Table 3 shows how the exports in the data are distributed across these regions - the EU-15 countries dominate with three-quarters of the exports being sold in this region. North America

(USA, Canada and Mexico) is the second largest region, both in terms of the share of export value and in terms of the number of exporting firms active in the region. The EU-10 accounted for a relatively small share of the exports on average in the data, but we can see from Table 3 that exports to a number of these markets were growing rapidly - for example exports to Poland grew 87% over the eight year period, while exports to Slovakia more than doubled, albeit from a much lower base.

The third column of Table 3 reports the average number of markets within each region that firms operate in. This is a very rough measure of the geographic spread of firms as it is not normalised by the number of countries in the region. It shows that firms operating in the EU-15 export to an average of 3.35 of the countries in that region; firms exporting in the EU-10 area sell to an average of 1.96 markets. The region with the least diversification in terms of average markets covered is North America, where firms mainly focus on the US as the largest market. Increasing or decreasing the number of export markets can be done by entering new regions or by expanding market coverage within regions that the firm already exports. The share of firms in each region that change their market coverage by these routes are reported in the final four columns of Table 3. In the EU-15, where most exporting firms already have a presence, changes in market coverage come mainly from expanding and contracting the number of markets within the region. In more distant regions, such as South America, the entry and exit is dominated by firms moving into and out of the region completely.

Weighted Exports We use two further measures of exporting experience that capture different routes through which costs of entering a new market may be reduced. Having already introduced measures of exporting to neighbouring and regional markets, we also calculate a measure of total exports of the firm inversely weighted by the distance from market j. This weighted export measure therefore takes account of all of the firms export experience in the previous period, allowing for exports closest in distance to j to have the largest effect on if this market is entered or not. This approach of inversely weighting the other markets is based on a similar approach by Blonigen, Davies, Waddell and Naughton (2007) in their analysis of the spatial interdependence of foreign direct investment decisions. The distance measures come from the same CEPII source as the distance from the home country (Ireland) but this additional variable makes use of the full matrix of distances

between all of the destination markets.

$$WeightExp_j = \sum_{k \neq j}^{k} \frac{exp_{ik}}{d_{jk}} \tag{13}$$

Marginal Distance The final geographic experience variable used is a measure of *marginal* distance - by this we mean the smallest percentage distance from the destination to be entered j to an existing export market of the firm. This is the "distance to the supply frontier" variable suggested by Evenett and Venables (2002). The intuition for using this measure has two interpretations: First, it can be thought of as an additional transport cost. The firm already incurs transport costs to an existing destination and has a distribution network operating to that point. Extending this into a new market may therefore have different cost implications than the case where goods were to be shipped to a new market from a source country with no intermediate experience. A smaller distance between an existing and new market may also pick up market similarities in a similar way to exporting to a neighbouring country as in the earlier experience variables, but this measure has the advantage of applying to island destinations and close but non-contiguous markets.

$$MargDist = \frac{min(d_{jk})}{d_{ij}} \tag{14}$$

Table 4 shows the correlations between a selection of the firm and country variables and also the correlations between the five measures of export experience. As would be expected from the gravity literature, firm exports are negatively correlated with market distance and positively correlated with measures of market size (population) and wealth (GDP per capita) as well as with firm productivity and size (employment). Firm measures of size, productivity and number of export markets are all positively correlated with distance, indicating initial support for the heterogeneous firm predictions that larger, more productive firms export to more difficult markets. The measures of experience are relatively highly correlated, positively for the measures using exports to neighbouring or regional markets and negatively to the marginal distance measure. The experience proxies will be entered separately in the regression analysis as these high correlations might otherwise cause difficulties in the estimation.

4 Results

The empirical results for the effect of experience on exporting are presented in three subsections. The first subsection focuses on how our export experience measures affect the probability of entry to a new export destination. The second subsection looks at if export sales for all firms in a market are affected by their experience in other markets. The final subsection examines the effects of experience on the probability of a firm exiting an export market.

4.1 Export Entry Results

To understand how exporting to familiar markets affects the decision to enter a new market, we apply a gravity model specification to the entry decision. The dependent variable, $Entry_{jt}$, is a dummy variable equal to one if firm i exports to country j for the first time in period t. It is zero if the firm did not export to j in either the previous or the current period. It is important to note that this confines the sample to firms for whom entry is a feasible outcome and therefore firms currently exporting to market j are excluded as it is not possible for them to enter.

$$Entry_{ijt} = \begin{cases} 1 & \text{if } exp_{ijt} > 0 \ \ \& \ \ exp_{ij,t-1} = 0 \\ 0 & \text{if } exp_{ijt} = 0 \ \ \& \ \ exp_{ij,t-1} = 0 \end{cases} \tag{15}$$

The specification used to estimate the probability of entry is a probit regression of the following form:

$$Pr(Entry_{ijt}) = f(D_{ij}, GDPcap_{jt}, Pop_{jt}, Eng_j, FirmVars_{it}, Experience_{ik,t-1}) \tag{16}$$

There are multiple observations for each firm in each time period as they can potentially enter any of the markets they are not currently exporting to. For this reason, robust standard errors adjusted for clustering are reported for all specifications.

Table 5 presents probit specifications for country and firm variables as a benchmark before introducing the geographic experience variables. The first column uses the destination market characteristics familiar from the extensive gravity model literature on geographic export patterns. In line with our expectations, we find that distance has a significantly negative effect on the probability of export entry. The wealth and size of the country, as measured by GDP per capita and population respectively, are both positively associated with firm entry, as is the dummy variable for English as an official language.

The second column of Table 5 introduces some firm characteristics – we use output per employee as a proxy for productivity, firm size as measured by the number of employees and the number of markets the the firm exported to in the previous year as a measure of exporting experience that is not related to any particular destination. Productivity and firm size are both significantly positively related to the likelihood of the firm entering a new market. The number of existing export destinations that the firm sells in is also positively related to further entry. This can be interpreted as showing that the more established a firm is as an exporter, the more likely it is to enter an additional market. This is consistent with the more descriptive findings in Lawless (2009) where firms with more markets were found to change their market coverage (both entering and exiting) more frequently than firms with fewer markets. The final column of Table 5 adds an interaction effect between market coverage and productivity to allow for non-linearity in the effect of productivity and shows a slight decline in the effect of productivity as firms export to larger numbers of markets.

We begin to introduce the measures of export market familiarity in Table 6, beginning in the first column with the dummy variable for exporting to a contiguous market, as defined in equation (10). The positive and significant coefficient on the contiguous market dummy provides initial support for the hypothesis that experience of similar markets may reduce entry costs to subsequent markets. The next column replaces the dummy variable for *any* presence in a neighbouring country with a measure of the amount exported by the firm to all contiguous markets, thus picking up the *extent* of the experience (equation 11). This measure is also positive and significant but does not change the Pseudo-R^2 of 0.08 that was found using the dummy variable. Exports to the region as a whole (defined in equation 12) have a similar impact to using exports to neighbouring countries, although the coefficient is slightly smaller. The broader measure of geographic experience using exports for all the firm's destinations inversely weighted by distance (equation 13) also positively affects the probability of entering a new market. The coefficients on distance and GDP per capita are slightly higher (in absolute terms) when the experience measures are added but their signs and significance levels are unaffected.

Marginal distance, the percentage additional distance from the closest existing export market to the potential entry destination defined in equation (14), has the expected negative sign. The addition of this variable adds fairly considerably to the explanatory power of the model, with a Pseudo-R^2 of 0.10 compared to the 0.08 that was the highest in the other specifications. The strength of the effect of the marginal distance variable indicate that the costs of entering unfamiliar markets are substantial.

The country and firm factors from the benchmark regressions are also included in Table 6, and we can see that the addition of the firm experience measures does not substantially change the effects of these other factors. The coefficients on firm size and productivity are slightly lower when experience is controlled for, but remain positive and significant in each of the specifications, as does the broader measure of the firm's history as an exporter proxied by its total number of export markets.

So far we have seen that productivity and export experience are positively related to the probability of entering a new destination market. Table 7 explores in more detail if there is any relationship between these two factors - do they reinforce one another or could they be substitutes in some way? We interact each experience measures with firm productivity (while continuing to control for all other firm and market characteristics). For the first two measure or experience, we see that there is a negative interaction effect, which could be interpreted as indicating that experience of similar markets allows firms of slightly lower productivity enter a destination than would otherwise be the case. Further investigation of this effect and how robust it might be is a potential avenue for further research but the limited data on firm productivity used in this paper (output per worker as no TFP information is available) makes it difficult to verify here.

4.2 Export Values and Experience

The export sales regression to be estimated is given by

$$Ln(Exports_{ijt}) = f(D_{ij}, GDPcap_{jt}, Pop_{jt}, Eng_j, FirmVars_{it}, Experience_{ik,t-1}, Entry_{ij,t-1}) \tag{17}$$

using the same definitions of country and firm characteristics, and the measures of export experience used to determine entry in the previous subsection. As firms have multiple observations, one for each market they export to, we use clustered standard errors. We also add an additional factor, $Entry_{ij,t-1}$, which is a dummy variable that takes a value of 1 if the firm is a new entrant to market j. This dummy for entry will also be interacted with the measures of experience.

Table 8 presents the results for the effects of export experience measures on sales - all regressions also include the firm and country characteristics used in the entry regressions but those coefficients are of the expected sign and have been suppressed for brevity. The effects of firm productivity and size are reported and are significantly positively related to the level of exports in each of the specifications. The dummy variable for if the firm has just entered the market is included and has

a negative effect on its sales. This result is consistent with the model if one assumes that recent entrants are firms that have just crossed the threshold that makes exporting to the market profitable and are therefore likely to be smaller than the average exporter.

The first column of Table 8 shows that the dummy for exporting to a contiguous market has a negative effect for export sales, but this is not significant. For the interaction effect between recent entry and experience of a bordering country we find that recently entered firms with this experience have a negative effect on their sales that is in addition to the negative sign on the lagged entry dummy. The firm's experience in a neighbouring market therefore makes it easier for it to enter a new market, but gives no sales advantage after entry. The opposite could in fact occur, with the firm taking advantage of the lower entry threshold to operate in a market where its sales are relatively low.

In the second and third columns of Table 8, we find a positive effect on sales from the experience measures of export values to neighbouring markets or exports to the region. There is, however, again a negative effect when these experience measures are interacted with the dummy for recent entry. The firm's broader experience of export experience, as captured by its export sales weighted by their distance from market j, also has a significantly positive relationship with exports in that market. This effect turns negative when the weighted exports are interacted with recent entry to the market. The final column of Table 8 includes the smallest additional distance to market j from any other market the firm exports to, as a measure of market similarity. There is no significant direct effect of this measure on sales. Taking the results across the five measures of experience, the relationship with export values is weak relative to that found for the probability of entry, where all of the effects showed a consistently positive and significant effect.

As we did in the examination of entry, we now take a look at if these measures of firm experience are changed when interacted with firm productivity. Table 9 shows that the coefficients on the experience measures themselves are now either significantly negative or insignificant. However this negative effect of experience, is offset somewhat by a positive interaction effect with productivity. The more productive firms experience both a direct positive effect on entry and sales from their productivity but also appear to be in a better position to benefit from learning from their experience in similar markets. Again, however, a caveat must be attached to the use of output per worker as a productivity proxy. The extent of the relationship and direction of causation between productivity and experience may be a fruitful avenue for research in the event of availability of more detailed

data.

How do these results, showing insignificant or negative effects of experience on export sales, fit with the predictions of the Melitz model? Recall that in the model, there is a threshold level of sales that a firm must be able to achieve in order to cover the fixed costs of exporting to any given market. Therefore, this result is consistent with the heterogeneous-firm model of trade if these experience measures mainly capture fixed costs of exporting. This is because lower fixed costs reduce the entry threshold and allows more firms to operate in a market, but this lower threshold also has the effect of allowing lower-sales firms to be present in the market as there is now a lower sales requirement to cover the fixed cost. Therefore, if experience of related markets reflects a fixed cost advantage the firm may find it easier for it to enter a new market, but gives no sales advantage after entry.

4.3 Market Exit

The specification for the probability of the firm exiting a market is a dummy variable similar to that used for entry, where the dependent variable, $Exit_{jt}$, is equal to one if the firm exported to country j in the previous period $t-1$ but no longer exports in t and is zero otherwise.

$$Exit_{ijt} = \begin{cases} 1 & \text{if } exp_{ijt} = 0 \ \ \& \ \ exp_{ij,t-1} > 0 \\ 0 & \text{if } exp_{ijt} > 0 \ \ \& \ \ exp_{ij,t-1} > 0 \end{cases} \tag{18}$$

The specification used to estimate the probability of exit is a probit regression of the following form:

$$Pr(Exit_{ijt}) = f(D_{ij}, GDPcap_{jt}, Pop_{jt}, Eng_j, FirmVars_{it}, Experience_{ik,t-1}) \tag{19}$$

Table 10 presents the results for the effects of country and firm characteristics on the probability of exit. The country characteristics presented in the first column are all significant and, as would be expected, have the opposite signs compared to the determinants of entry and sales. Firms are more likely to exit distant and smaller markets, as well as those without English as a main language. Firms with less export experience, in terms of their total number of markets, are more likely to exit a market.[6]

[6]Earlier work with this data in Lawless (2009) showed that firms with more markets were more likely to increase or decrease their number of markets - the result here however refers to the probability of leaving a specific market and thus does not contradict that finding.

In looking at the determinants of export exit, we introduce two additional variables for the the firm's performance in market j that we would expect to influence the decision to exit. The first of these, the amount of sales to j in the previous period, is included in the third column of Table 10 and has a negative effect on subsequent exit. This conforms with the implication of the model that firms on the threshold of participation in an export market are also those that will sell small amounts. In this case, low sales firms are more likely than others to find themselves crossing the threshold out of the market in the following period. The next column adds a dummy variable to capture if the firm had entered the market in the previous period. We find that firms that had just entered were at substantially higher risk of exiting in the next period. This is in line with the theory that these firms are very much on the threshold of whether they can export profitably to that market. It also fits with the hypothesis that firm's do not completely know their demand in a new market until they enter as discussed by Albornoz, Calvo Pardo, Corcos and Ornelas (2009). As newly entered firms tend to have lower sales, entering lagged exports and the entrant dummy simultaneously reduces the effect of the entrant dummy but both effects remain significant.

The measures of neighbouring market experience are added to the exit regressions in Table 11. The measures all have the opposite signs than they had in the entry regressions. Exporting to a contiguous market and export amounts to neighbouring or regional markets all decrease the probability of exit, as does the broader weighted export measure. We also find that the greater the additional distance from an existing export market, the higher the probability of exiting the market. Combining these results with those of the entry and sales regressions, the overall implication is that experience of exporting to nearby markets facilitates export participation but does little to boost firm sales in the new market. Unlike the cases of entry and export values, interactions with productivity showed no significant effects in the case of exit and have therefore not been reported.

5 Conclusions

This paper incorporates measures of firm export experience into a traditional gravity model of trade. The determinants of firm entry, sales and exit for new export markets are analysed using a survey of Irish exporters from 2000-2007. The standard variables used in the gravity model proxy for the attractiveness of the market and the costs of exporting. We expand this by allowing for firm experience of nearby or similar markets to affect the entry decision. This allows us to test in a simple way if the costs involved in exporting to a new market may be affected by existing experience

of exporting in general or by experience exporting to similar markets in particular.

All of our measures of exporting experience are found to increase the probability of entry to a new market and to reduce the probability of exit. One particular measure (the marginal distance from a existing market to the new destination) has a particularly strong effect. The various measure of experience in neighbouring markets clearly reduce the threshold required for firm participation in exporting to a given market.

One might expect that these experience measures would also have a positive effect on export sales in the new market - this would be consistent with experience reducing variable costs of trade or with correlation across similar markets in demand for the firm's products. However, the opposite result is found in the data. However, these same measures have very limited effect on the firm's export sales in the market. The effect of related experience on sales tends to be negative for recently entered firms. We show that this result is consistent with the heterogeneous-firm model of trade if these experience measures mainly capture fixed costs of exporting. This is because lower fixed costs reduce the entry threshold that allows firms to operate in a market, but this lower threshold also has the effect of allowing lower-sales marginal firms to be present in the market. Therefore, if experience of related markets reflects a fixed cost advantage the firm may find it easier for it to enter a new market, but gives no sales advantage after entry.

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Figure 1: Market Coverage

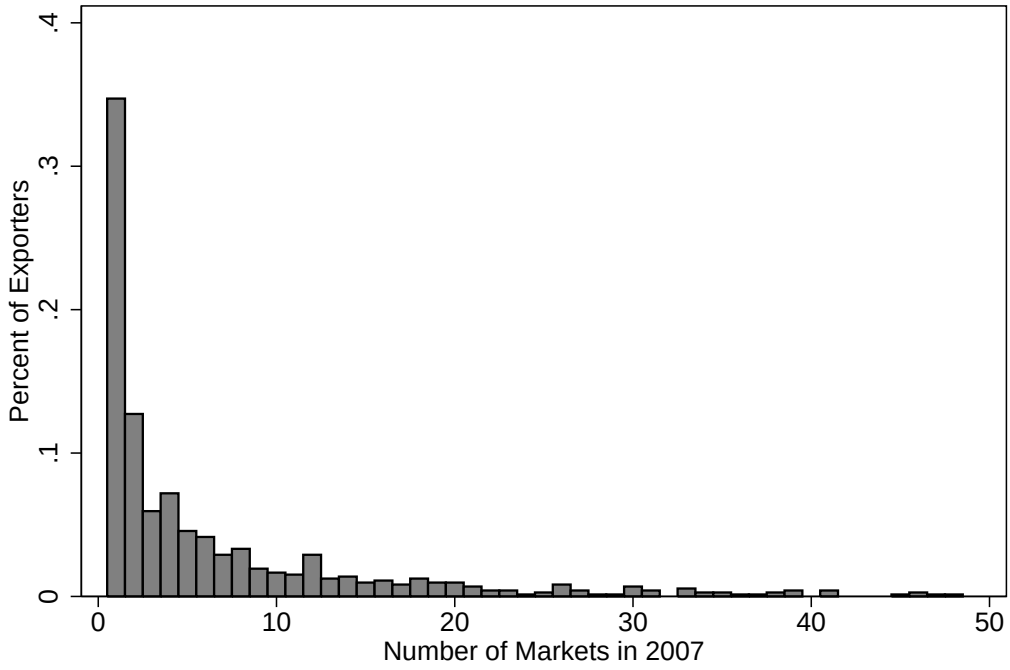

Table 1: Firm Characteristics

Mean by Year	Employment (Number)	Output/Emp. (Euro '000s)	Exports (Euro)	Export Intensity	Market Coverage	Entry	Exit
2000	84	147	7800	0.44	5.2	-	-
2001	70	156	6807	0.44	5.1	0.57	0.41
2002	77	158	7374	0.45	5.4	0.63	0.47
2003	80	185	8721	0.47	5.8	0.64	0.54
2004	87	204	10664	0.47	6.4	0.59	0.38
2005	80	196	9825	0.47	6.4	0.64	0.66
2006	81	206	10749	0.47	6.6	0.73	0.42
2007	81	208	11053	0.47	6.7	0.66	0.41

Table 2: Market Entry and Exit

	Firm-Country Pairs	Entrants	Exits	Entry Rate	Exit Rate
2000	4454	n.a.	n.a.	n.a.	n.a.
2001	5046	1267	675	0.28	0.15
2002	4739	1128	1435	0.22	0.28
2003	4448	916	1207	0.19	0.25
2004	4146	672	974	0.15	0.22
2005	4328	1262	1080	0.30	0.26
2006	4586	1028	770	0.24	0.18
2007	4798	740	528	0.16	0.12

Table 3: Regional Exports, Entry and Exit

	Share of total exports	Number of firms	Markets per firms	% Enter region	% Exit region	% Expand in region	% Contract in region
EU-15	0.75	764	3.35	0.03	0.04	0.11	0.09
EU-10	0.01	132	1.96	0.14	0.10	0.11	0.09
Other Europe	0.02	179	1.74	0.12	0.11	0.10	0.09
North America	0.13	297	1.38	0.12	0.12	0.06	0.05
South America	0.01	49	1.53	0.21	0.20	0.05	0.06
Asia & Oceania	0.05	214	2.76	0.07	0.07	0.16	0.13
Africa	0.02	98	1.52	0.16	0.14	0.12	0.10
Middle East	0.01	118	1.80	0.12	0.12	0.12	0.10

Table 4: Correlation Matrix

	Exports_{ij}	Distance	GDP/Capita	Pop.	English	Output/Employee	Markets
Exports_{ij}	1						
Distance	-0.2247	1					
GDP/Capita	0.1376	-0.3142	1				
Population	0.2048	0.1057	-0.2942	1			
English dummy	0.2122	0.0659	0.0718	0.351	1		
Output/Employee	0.2646	0.1012	-0.0937	-0.0571	-0.1007	1	
Number Markets	-0.1007	0.3034	-0.2052	-0.1538	-0.2198	0.3175	1
Employment	0.3914	0.0345	-0.0333	-0.0591	-0.0791	0.0845	0.1561
	Contig. Dum	Exp. Contig. Mkts.	Region	Weighted Exp.			
Contiguous	1						
Exp. Contig. Mkts.	0.9792	1					
Exports Region	0.4484	0.458	1				
Weighted Exp.	-0.0005	0	0.0016	1			
Marginal Dist.	-0.5129	-0.5069	-0.4293	-0.0152			

Table 5: Entry and Firm Export Experience

	Dependent Variable: Entry Dummy			
	(1)	(2)	(3)	(4)
Ln Distance	-0.157*	-0.117*	-0.126*	-0.126*
	(0.008)	(0.009)	(0.009)	(0.009)
Ln GDP/Capita	0.225*	0.223*	0.234*	0.232*
	(0.012)	(0.014)	(0.014)	(0.014)
Ln Population	0.094*	0.079*	0.084*	0.084*
	(0.005)	(0.006)	(0.006)	(0.006)
English dummy	0.149*	0.080*	0.090*	0.088*
	(0.013)	(0.015)	(0.016)	(0.016)
Ln Output/Employee		0.112*		0.093*
		(0.029)		(0.043)
Firm Size		0.089*	0.051*	0.043*
		(0.016)	(0.016)	(0.016)
Number Markets			0.025*	
			(0.002)	
Productivity*Markets				-0.006*
				(0.002)
Sector controls	No	Yes	Yes	Yes
Observations	440300	292800	295100	292800
Pseudo R^2	0.03	0.05	0.07	0.07

Notes: Probit coefficients reported with robust standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level.

Table 6: Entry and Neighbouring Market Experience

	Dependent Variable: Entry Dummy				
	(1)	(2)	(3)	(4)	(5)
Ln Distance	-0.034*	-0.095*	-0.080*	-0.125*	-0.121*
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
Ln GDP/Capita	0.207*	0.207*	0.198*	0.232*	0.228*
	(0.014)	(0.014)	(0.015)	(0.014)	(0.015)
Ln Population	0.075*	0.075*	0.073*	0.084*	0.107*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
English dummy	0.131*	0.126*	0.106*	0.088*	0.113*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)
Ln Output/Employee	0.086[a]	0.085[a]	0.077[a]	0.092[a]	0.070[b]
	(0.043)	(0.043)	(0.033)	(0.043)	(0.041)
Firm Size	0.042*	0.036[a]	0.031[a]	0.043*	0.027[b]
	(0.015)	(0.016)	(0.016)	(0.016)	(0.015)
Number Markets	0.044*	0.046*	0.047*	0.053*	0.031*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
Productivity*Markets	-0.005[a]	-0.005[a]	-0.005[a]	-0.006*	-0.004[a]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Contig. Market Dum.	0.303*				
	(0.022)				
Ln Exp. to Contig. Mkts		0.022*			
		(0.002)			
Ln Exp. to Region			0.019*		
			(0.002)		
Weighted Exports				0.023*	
				(0.001)	
Ln Marginal Distance					-0.365*
					(0.020)
Sector controls	Yes	Yes	Yes	Yes	Yes
Observations	292800	292794	292249	292800	245016
Pseudo R^2	0.08	0.08	0.08	0.075	0.095

Notes: Probit coefficients reported with robust standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.

Table 7: Entry: Experience and Productivity Interactions

	Dependent Variable: Entry Dummy				
	(1)	(2)	(3)	(4)	(5)
Contig. Market Dum.	0.641*				
	(0.114)				
Contig.Dum*Productivity	-0.069*				
	(0.023)				
Ln Exp. to Contig. Mkts		0.057*			
		(0.009)			
Contig.Exp.*Productivity		-0.007*			
		(0.002)			
Ln Exp. to Region			0.023[a]		
			(0.009)		
Region Exp.*Productivity			-0.001		
			(0.002)		
Weighted Exports				-13.22	
				(32.88)	
Weighted Exp.*Productivity				2.75	
				(6.83)	
Ln Marginal Distance					-0.048
					(0.119)
Marginal Dist.*Productivity					-0.064*
					(0.025)
Sector controls	Yes	Yes	Yes	Yes	Yes
Observations	292800	292794	292249	292800	245016
Pseudo R^2	0.08	0.08	0.08	0.07	0.095

Notes: Each specification also includes the country and firm characteristics included in Table 6. Probit coefficients reported with robust standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.

Table 8: Export Values and Market Experience

	Dependent Variable: Ln Exports				
	(1)	(2)	(3)	(4)	(5)
Ln Output/Employee	0.081*	0.801*	0.783*	0.802*	0.806*
	(0.072)	(0.072)	(0.071)	(0.068)	(0.080)
Firm Size	0.789*	0.786*	0.771*	0.755*	0.778*
	(0.033)	(0.033)	(0.032)	(0.033)	(0.034)
Entered in $t-1$	-0.222*	-0.312*	-0.199*	-0.257*	-0.257*
	(0.048)	(0.045)	(0.042)	(0.043)	(0.055)
Contig. Market Dum.	-0.092				
	(0.058)				
Entry*Contig.Dum.	-0.155[a]				
	(0.081)				
Ln Exp. to Contig. Mkts		0.011[a]			
		(0.005)			
Entry*Ln Contig. Exp.		-0.017*			
		(0.006)			
Ln Exp. to Region			0.026*		
			(0.005)		
Entry*Ln Exp. to Region			-0.030*		
			(0.006)		
Weighted Exports				50.85*	
				(15.47)	
Entry*Weighted Exports				-75.57*	
				(20.25)	
Ln Marginal Distance					-0.037
					(0.037)
Entry*Ln Marginal Distance					0.033
					(0.042)
Sector controls	Yes	Yes	Yes	Yes	Yes
Observations	25128	25126	24792	25128	23711
R^2	0.43	0.43	0.44	0.44	0.42

Notes: Each specification also includes the country and firm characteristics included in Table 6. Standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.

Table 9: Values: Experience and Productivity Interactions

	Dependent Variable: Ln Exports				
	(1)	(2)	(3)	(4)	(5)
Ln Output/Employee	0.782*	0.841*	0.766*	0.801*	0.794*
	(0.071)	(0.075)	(0.069)	(0.068)	(0.076)
Entered in $t-1$	-0.224*	-0.310*	-0.206*	-0.256*	-0.257*
	(0.048)	(0.045)	(0.041)	(0.043)	(0.055)
Contig. Market Dum.	-0.617[a]				
	(0.246)				
Ln Exp. to Contig. Mkts		-0.049[a]			
		(0.020)			
Ln Exp. to Region			-0.102*		
			(0.026)		
Weighted Exports				70.96	
				(107.83)	
Ln Marginal Distance					0.057
					(0.193)
Experience measure*Productivity	0.103[a]	0.011*	0.025*	-3.079	-0.019
	(0.049)	(0.004)	(0.005)	(17.32)	(0.040)
Experience measure*Entrant	-0.150[b]	-0.016*	-0.028*	-76.15*	0.033
	(0.080)	(0.006)	(0.006)	(19.41)	(0.042)
Sector controls	Yes	Yes	Yes	Yes	Yes
Observations	25128	25126	24792	25128	23711
R^2	0.43	0.43	0.44	0.44	0.42

Notes: Each specification also includes the country and firm characteristics included in Table 6. Standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.

Table 10: Exit Benchmark

	Dependent Variable: Exit Dummy				
	(1)	(2)	(3)	(4)	(5)
Ln Distance	0.094*	0.134*	0.119*	0.167	0.105*
	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)
Ln GDP/Capita	-0.157*	-0.208*	-0.196*	-0.277*	-0.214*
	(0.024)	(0.023)	(0.022)	(0.025)	(0.024)
Ln Population	-0.058*	-0.081*	-0.052*	-0.104*	-0.052*
	(0.009)	(0.009)	(0.011)	(0.010)	(0.011)
English dummy	-0.130*	-0.211*	-0.167*	-0.257*	-0.149*
	(0.022)	(0.023)	(0.027)	(0.024)	(0.028)
Ln Output/Employee		-0.143*	0.051	-0.110*	0.021
		(0.029)	(0.042)	(0.039)	(0.046)
Firm Size		-0.130*	0.029	-0.100*	0.011
		(0.022)	(0.022)	(0.020)	(0.024)
Number Markets			-0.040*	-0.034*	-0.039*
			(0.013)	(0.012)	(0.014)
Productivity*Markets			0.002	0.002	0.002
			(0.002)	(0.002)	(0.002)
Ln Lag Exports			-0.173*		-0.163*
			(0.016)		(0.018)
New Entrant (t-1)				0.239*	0.106[a]
				(0.042)	(0.047)
Sector controls	No	Yes	Yes	Yes	Yes
Observations	31747	30447	30447	26129	26129
Pseudo R^2	0.02	0.04	0.11	0.07	0.11

Notes: Probit coefficients reported with robust standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.

Table 11: Exit and Neighbouring Market Experience

	Dependent Variable: Exit Dummy				
	(1)	(2)	(3)	(4)	(5)
Ln Lag Exports	-0.163*	-0.162*	-0.162*	-0.162*	-0.216*
	(0.018)	(0.018)	(0.018)	(0.018)	(0.025)
New Entrant (t-1)	0.104[a]	0.105[a]	0.100[a]	0.111[a]	0.287*
	(0.047)	(0.047)	(0.047)	(0.047)	(0.049)
Contig. Market Dum.	-0.086*				
	(0.029)				
Ln Exp. to Contig. Mkts		-0.006[a]			
		(0.003)			
Ln Exp. to Region			-0.005[b]		
			(0.0030		
Weighted Exports				-55.91*	
				(20.96)	
Ln Marginal Distance					0.250*
					(0.034)
Sector controls	Yes	Yes	Yes	Yes	Yes
Observations	26129	26127	26127	26129	23002
Pseudo R^2	0.11	0.11	0.11	0.11	0.18

Notes: Each specification also includes the country and firm characteristics included in Table 6. Probit coefficients reported with robust standard errors in parentheses, adjusted for clustering by firm. Firm variables lagged one period. * indicates significance at 1% level, [a] at the 5% level and [b] at the 10% level.