# Marginal Distance:
# Does Export Experience Reduce Firm Trade Costs?

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# Background: Distance and Trade

- The gravity regression is perhaps the most famous relationship in international economics.
- Trade is positively related to import and export country GDP and negatively related to distance.
- Disdier and Head (2006) reported that that the average elasticity of trade with respect to distance from 103 empirical papers was -0.9.
- Suggests that distance must have a substantial impact on the costs associated with trade.
- Does exporting to a neighbouring country reduce costs of entry?
- Does experience reduce trade costs that allow the firm to sell more?
- This paper examines linkages between current export destinations and performance in new markets.

# Existing Literature on Entry Costs

- Exporting has been found to be be extremely persistent.
- Literature to date focuses mainly on firms entering exporting for the first time.
- A smaller number of papers have examined firms' export activities over a range of countries, e.g. Eaton, Eslava, Kugler and Tybout (2008), Lawless and Whelan (2008), Fabling, Grimes and Sanderson (2010).
- These papers all find that firms typically export to a small number of destinations.
- Using aggregate data, Evenett and Venables (2002) proposed the term "distance to the supply frontier" as an important factor in determining the geographic spread of exports.

## This Paper

- We add a range of estimates of firm export experience to a firm-level gravity model.
- Focusing mainly on geographic measures of firm export portfolio.
- Look at how these measures affect firm entry, sales and exit.
- Main findings are that exporting experience in related markets has a positive effect on entry and reduces the probability of exit.
- However, almost all of the experience measures have negative effects for export sales.
- We show this is consistent with Melitz-style model if exporting to a market reduces the fixed costs of exporting to 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.

## Export Participation Decision

- Each firm produces with unit cost $\frac{c}{a}$, where $c$ is the exporting country's cost level and $a$ is the firm-specific productivity.
- Two types of trade costs associated with exporting to country $j$: Fixed costs $F_j$ and variable costs $\tau_j$ (iceburg).
- Optimal selling price to country $j$ for a good produced with technology level $a$ is:

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

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

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

- Profits generated by exporting this product to country $j$ are positive as long as

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

# Firm Export Sales

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

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

- Inserting the formula for the optimal price, this gives us

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

- 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.

# Potential Effect of Experience?

- This formulation assumes that the fixed and variable costs encountered in market $j$ are the same for all firms.

- We can generalise to allow for experience in other export markets to reduce trade costs for some firms.

- For example, 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 $F_{ij} = f_j(s_{i1}, s_{i2}, ...s_{iN})$.

- Effect of experience in other markets that reduces the variable cost:
  - It would reduce the threshold to entry.
  - It would increase the sales once the firm was in market $j$.

- A reduction in fixed costs due to experience in other markets would also lower the entry threshold.

- However, once the firm is operating in a market, fixed costs do not affect its sales.

# Firm-Level Data

- Firm level data from Enterprise Ireland, 2000-2007.
- 1700 Irish-owned firms, all exporters.
- Information on exports to 50 destinations along with other firm characteristics.
- These firms account for approx. two-thirds of exports of Irish-owned firms.
- Restriction to Irish-owned firms means that this dataset is not representative of aggregate Irish exports. Irish exports dominated by export-orientated FDI.
- Focus on Irish-owned firms more likely to give results comparable to other countries.

Figure 3
Distribution of Firms by Market Coverage
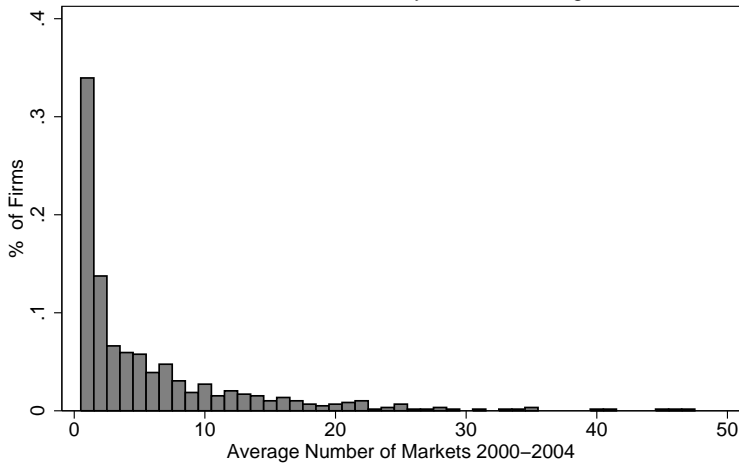
# Firm Characteristics

| 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 |

# Country Data

- Standard gravity measures used as factors that might induce a firm to enter:
  - Distance between capital cities (CEPII data, Mayer and Zignago (2006)).
  - GDP per capita (Penn World Tables).
  - Population (Penn World Tables).
  - Language - English dummy variable (Wikipedia).

## Market Experience Measures I

- 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 $j$.

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

- Intensity of the firm's export activity with neighbouring markets - sums the amount exported to all contiguous markets.

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

- Amount exported to other countries in the same region (8 regions), rather than just directly bordering countries.

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

# Market Experience Measures II

- Total exports of the firm inversely weighted by the distance from market $j$. This takes account of all of the firm's export experience but allows exports closest in distance to $j$ to have the largest effect.

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

- Marginal distance from existing market - by this we mean the smallest percentage distance from the destination to be entered $j$ to an existing export market of the firm.

$$MargDist = min(d_{jk})/d_{ij}$$

# Empirical Specification - Entry

- We apply a gravity model specification to the entry decision, exit decision and export sales.
- For entry, the dependent variable, is a dummy variable:

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

- Specification for probability of entry is a probit regression:

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

# Entry and Neighbouring Market Experience

| | Dependent Variable: Entry Dummy | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Ln Distance | -0.061* | -0.064* | -0.048* | -0.100* | -0.112* |
| | (0.009) | (0.009) | (0.010) | (0.009) | (0.009) |
| Ln GDP/Capita | 0.203* | 0.205* | 0.194* | 0.230* | 0.224* |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.015) |
| Ln Population | 0.070* | 0.071* | 0.068* | 0.080* | 0.105* |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.006) |
| English dummy | 0.070* | 0.062* | 0.038* | 0.030 | 0.093* |
| | (0.016) | (0.016) | (0.016) | (0.016) | (0.017) |
| Number Markets | 0.012* | 0.013* | 0.014* | 0.018* | 0.005 |
| | (0.002) | (0.003) | (0.002) | (0.003) | (0.003) |
| Ln Output/Employee | -0.043 | -0.045 | -0.050 | -0.050 | -0.042 |
| | (0.029) | (0.029) | (0.029) | (0.029) | (0.028) |
| Firm Total Exports | 0.087* | 0.084* | 0.082* | 0.093* | 0.072* |
| | (0.010) | (0.010) | (0.010) | (0.010) | (0.009) |
| Contig. Market Dum. | 0.297* | | | | |
| | (0.021) | | | | |
| Ln Exp. to Contig. Mkts | | 0.021* | | | |
| | | (0.002) | | | |
| Ln Exp. to Region | | | 0.018* | | |
| | | | (0.002) | | |
| Weighted Exports | | | | 0.022* | |
| | | | | (0.001) | |
| Ln Marginal Distance | | | | | -0.357* |
| | | | | | (0.020) |
| Sector controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 266300 | 266294 | 265749 | 266300 | 238081 |
| Pseudo $R^2$ | 0.08 | 0.08 | 0.08 | 0.08 | 0.10 |

# Empirical Specification - Sales

- The export sales regression to be estimated is given by

$$Ln(Exp_{ijt}) = f(D_{ij}, GDPcap_{jt}, Pop_{jt}, Eng_j, FirmVars_{it}, Experience_{ik,t-1})$$

- We also added 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.

# Export Values and Market Experience

| | Dependent Variable: Ln Exports | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Ln Distance | -0.652* | -0.644* | -0.650* | -0.624* | -0.574* |
| | (0.026) | (0.026) | (0.026) | (0.026) | (0.027) |
| Entered in $t-1$ | -0.131* | -0.272* | -0.140* | -0.217* | -0.213* |
| | (0.044) | (0.036) | (0.035) | (0.035) | (0.050) |
| Contig. Market Dum. | -0.240* | | | | |
| | (0.053) | | | | |
| Entry*Contig. Market Dum. | -0.240* | | | | |
| | (0.065) | | | | |
| Ln Exp. to Contig. Mkts | | -0.004 | | | |
| | | (0.004) | | | |
| Entry*Ln Contig Exp. | | -0.025* | | | |
| | | (0.006) | | | |
| Ln Exp. to Region | | | -0.006 | | |
| | | | (0.004) | | |
| Entry*Ln Exp. to Region | | | -0.035* | | |
| | | | (0.006) | | |
| Weighted Exports | | | | 29.82[a] | |
| | | | | (13.78) | |
| Entry*Weighted Exports | | | | -66.87[a] | |
| | | | | (29.09) | |
| Ln Marginal Distance | | | | | 0.023 |
| | | | | | (0.035) |
| Entry*Ln Marginal Distance | | | | | 0.055* |
| | | | | | (0.036) |
| Sector controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 24959 | 24957 | 24623 | 24959 | 23628 |
| $R^2$ | 0.49 | 0.49 | 0.49 | 0.49 | 0.47 |

# Empirical Specification - Exit

- For exit, the dependent variable, is a dummy variable:

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

- Specification for probability of exit is a probit regression:

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

- Additonal variables - lagged export sales, dummy if a new entrant.

# Exit and Neighbouring Market Experience

|  | Dependent Variable: Exit Dummy | | | | |
|---|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) | (5) |
| Ln Distance | 0.097* | 0.097* | 0.097* | 0.093* | 0.225* |
|  | (0.015) | (0.016) | (0.017) | (0.015) | (0.018) |
| Ln Lag Exports | -0.164* | -0.162* | -0.163* | -0.163* | -0.218* |
|  | (0.020) | (0.020) | (0.019) | (0.019) | (0.026) |
| New Entrant (t-1) | 0.103* | 0.105[a] | 0.100[a] | 0.110[a] | 0.286* |
|  | (0.047) | (0.047) | (0.050) | (0.050) | (0.049) |
| Contig. Market Dum. | -0.089* |  |  |  |  |
|  | (0.030) |  |  |  |  |
| Ln Exp. to Contig. Mkts |  | -0.006[a] |  |  |  |
|  |  | (0.003) |  |  |  |
| Ln Exp. to Region |  |  | -0.006[a] |  |  |
|  |  |  | (0.003) |  |  |
| Weighted Exports |  |  |  | -51.39* |  |
|  |  |  |  | (19.77) |  |
| Ln Marginal Distance |  |  |  |  | 0.259* |
|  |  |  |  |  | (0.034) |
| Sector controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 26109 | 26107 | 25656 | 26109 | 22999 |
| Pseudo $R^2$ | 0.11 | 0.11 | 0.11 | 0.11 | 0.18 |

# Robustness - All Experience Measures

| Dependent Variable: | (1) Entry | (2) Ln Exports | (3) Exit |
|---|---|---|---|
| Ln Distance | -0.089* | -0.561* | 0.258* |
| | (0.011) | (0.028) | (0.031) |
| Contig. Market Dum. | 0.546* | -2.260* | -0.217 |
| | (0.086) | (0.222) | (0.217) |
| Ln Exp. to Contig. Mkts | -0.39* | 0.162* | 0.023 |
| | (0.007) | (0.018) | (0.020) |
| Ln Exp. to Region | 0.006* | 0.011[a] | 0.007 |
| | (0.002) | (0.005) | (0.005) |
| Weighted Exports | 0.017* | 9.99 | -0.816 |
| | (0.001) | (11.64) | (1.64) |
| Ln Marginal Distance | -0.318* | -0.023 | 0.288* |
| | (0.025) | (0.036) | (0.045) |
| Ln Lag Exports | | | -0.224* |
| | | | (0.019) |
| New Entrant (t-1) | | -0.401* | 0.282* |
| | | (0.163) | (0.046) |
| Entry*Contig. Market Dum. | | 0.411 | |
| | | (0.270) | |
| Entry*Ln Contig Exp. | | -0.032 | |
| | | (0.022) | |
| Entry*Ln Exp. to Region | | -0.033* | |
| | | (0.007) | |
| Entry*Weighted Exports | | -38.70 | |
| | | (27.51) | |
| Entry*Ln Marginal Distance | | -0.054 | |
| | | (0.037) | |
| | | | |
| Sector controls | Yes | Yes | Yes |
| Observations | 237555 | 23291 | 22569 |
| Pseudo $R^2$ | 0.101 | | 0.177 |
| $R^2$ | | 0.484 | |

# Conclusions

- This paper incorporates measures of firm export experience into a traditional gravity model of trade.
- All of the measures of exporting experience in related markets used are found to have a positive effect on entry and a negative effect on exit.
- Experience measures also reduce the coefficient on the distance variable.
- Implies that experience in neighbouring markets reduces the threshold required for firm participation.
- In contrast, the experience measures have negative effects for export sales and this negative effect on sales is particularly strong for newly entered firms.
- This result is consistent with the heterogeneous-firm model of trade if these experience measures mainly capture fixed costs of exporting.