The heterogeneous effects of trade facilitation: theory and evidence

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Abstract

The purpose of this study is to test what type of firms start to export due to trade facilitation. We develop a Melitz-based model where firms are heterogeneous with respect to productivity and must pay a fixed cost to entry the entry market, which can be reduced by government spending on trade facilitation. The model predicts that unilateral trade facilitation allows less productive firms to export. We test this prediction using Swedish firm-level data and information on the presence or absence of Swedish embassies abroad, combined with information on the amount of time each embassy spends on trade facilitation. Our results lend support to the predictions of the model.

JEL Classification: D21, D22, F12, F15

Keywords: heterogeneous firms, trade facilitation,

1 Introduction

It is a well-established fact that exporters tend to be larger and more productive than non-exporters, and that trade liberalization has important implications for the extensive margin of trade\(^1\). The effect of export promotion has received less attention in the literature.

The objective of this paper is to test the predictions of the Melitz (2003) model in the context of trade facilitation. We develop a theoretical model that allows for trade facilitation to reduce the fixed cost of exporting for firms. In the model, only firms that are productive enough to pay the fixed cost of exporting choose to enter the export market, while other, less productive, firms remain as non-exporters. The model predicts that trade facilitation at Home allows less productive Home firms to export. However, the increase in competition from abroad makes it tougher for foreign firms to export.

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1These facts are documented in Bernard and Jensen (1995) and Bernard and Bradford Jensen (1999).
We test for the effect of trade facilitation on the extensive margin by combining firm-level data on the exports of Swedish firms with information on the location of Swedish embassies abroad, as well as data on state visits. Our results suggest that the presence of an embassy in country is negatively correlated with the average productivity exporters to a country. This evidence lends support to our theoretical model. We also find that Swedish firms were more likely to begin exporting to countries where Swedish embassies were opened during the period 1997-2007.

Our study is related to previous research that directly tests the prediction of the Melitz model that a reduction in export costs allows less productive firms to enter the export market. Treffer (2004) find that U.S. tariff reductions have a much weaker effect on aggregate productivity of Canadian manufacturing sectors than Canadian tariff reductions, and Breinlich and Cuñat (2010) point out that this is likely the result of the lower U.S. tariffs allowing less efficient Canadian plants to begin exporting. Our study aims to directly test this prediction of the Melitz model in the context of trade facilitation.

Several studies in the literature has examined how aggregate trade flows are affected by the foreign service (Rose (2007)), export promotion agencies (Gil, Llorca, and Serrano (2008), Lederman, Olarreaga, and Payton (2010)) and state visits (Nitsch (2007)). Recent work using firm level data has focused on various margins for trade, such as the product extensive margin (Persson (2011)) and the firm intensive margin (Girma, Gong, Görg, and Yu (2009)). The studies most related to our work, however, are empirical studies by Görg, Henry, and Strobl (2008) and Martincus and Carballo (2008, 2010), who examine how export promotion activities encourage firms to enter new markets. These studies focus on the extensive and intensive margins of trade. In contrast, our study takes a different approach to these by testing for impact of trade facilitation on aggregate productivity and entrant productivity, a test that is directly implied by our theoretical model.

The paper is organized as follows: Section 2 contains the theoretical model. Several predictions of the empirical model are tested in section 3. Finally, section 4 concludes the paper.

2 The Model

2.1 Basics
This paper employs a modified version of the Melitz (2003) monopolistic competition trade model with heterogeneous firms. There are $m$ countries. Each country $j$ has a single primary factor of production labour, $L_j$, used in the A-sector and the M-sector. The A-sector is a Walrasian, homogenous-goods sector with costless trade. The M-sector (manufactures) is characterized by increasing returns, Dixit-Stiglitz monopolistic competition and iceberg trade costs. M-sector firms face constant marginal production costs and three types of fixed costs. The first fixed cost, $F_E$, is the standard Dixit-Stiglitz cost of developing a new variety. The second $F_D$ is a ‘beachhead’ costs reflecting the one-time expense of introducing a new variety
into the domestic market. There is also a ‘beachhead’ cost for the foreign market, but this cost
can be lowered by trade facilitation from the government. The entry cost in the foreign market
is therefore \( F_X/d_{jk}(t) \), where \( d_{jk}(t) \) is the level of trade facilitation, which is a function of the
tax rate \( t \). We assume that the beachhead costs are symmetric in order to simplify notation but
countries’ spending on trade facilitation is allowed to be asymmetric. Our approach to modelling
asymmetric fixed export costs is similar to Akerman and Forslid (2007). The properties of the
\( d \) function are described in the next section.

There is heterogeneity with respect to firms’ marginal costs. Each Dixit-Stiglitz firm/variety
is associated with a particular labour input coefficient – denoted as \( a_i \) for firm \( i \). After sinking
\( F_E \) units of labour in the product innovation process, the firm is randomly assigned an ‘\( a_i \) from
a probability distribution \( G(a) \).

Our analysis exclusively focuses on steady-state equilibria and intertemporal discounting is
ignored; the present value of firms is kept finite by assuming that firms face a constant Poisson
hazard rate \( \delta \) of “death”.

Consumers in each nation have two-tier utility functions with the upper tier (Cobb-Douglas)
determining the consumer’s division of expenditure among the sectors and the second tier (CES),
dictating the consumer’s preferences over the various differentiated varieties within the M-sector.

All individuals in country \( j \) have the utility function

\[
U_j = C_{Mj}^\mu C_{Aj}^{1-\mu} ,
\]

where \( \mu \in (0,1) \), and \( C_{Aj} \) is consumption of the homogenous good. Manufactures enter the
utility function through the index \( C_{Mj} \), defined by

\[
C_{Mj} = \min \left( \int_0^{N_j} c_{ij}^{(\sigma-1)/\sigma} di \right)^{\sigma/(\sigma-1)} ,
\]

\( N_j \) being the mass of varieties consumed in country \( j \), \( c_{ij} \) the amount of variety \( i \) consumed in
country \( j \), and \( \sigma > 1 \) the elasticity of substitution.

Each consumer spends a share \( \mu \) of his income on manufactures, and demand for a variety
\( i \) in country \( j \) is therefore

\[
x_{ij} = \frac{p_{ij}^{-\sigma}}{P_j^{1-\sigma}} \mu E_j ,
\]

where \( p_{ij} \) is the consumer price of variety \( i \) in country \( j \), \( E_j \) is expenditures, and \( P_j \equiv \left( \int_0^{N_j} p_{ij}^{1-\sigma} di \right)^{\frac{1}{1-\sigma}} \) the price index of manufacturing goods in country \( j \).

The unit factor requirement of the homogeneous good is one unit of labour. This good is
freely traded and since it is chosen as the numeraire

\[
p_A = w = 1;
\]

\( w \) being the nominal wage of workers in all countries.
Shipping the manufactured good involves a frictional trade cost of the “iceberg” form: for one unit of a good from country \( j \) to arrive in country \( k \), \( \tau > 1 \) units must be shipped. It is assumed that trade costs are equal in both directions and that \( \tau_{jj} = 1 \). Profit maximization by a manufacturing firm \( i \) located in country \( j \) leads to consumer price

\[
p_{ijk} = \frac{\sigma}{\sigma - 1} \tau a_i
\]

in country \( k \).

Manufacturing firms draw their marginal cost, \( a \), from the probability distribution \( G(a) \) after having sunk \( F_E \) units of labour to develop a new variety. Having learned their productivity, firms decide on entry in the domestic and foreign market, respectively. Firms will enter a market as long as the operating profit in this market is sufficiently large to cover the beachhead (market entry) cost associated with the market. Because of the constant mark-up pricing, it is easily shown that operating profits equal sales divided by \( \sigma \). Using this and (3), the critical 'cut-off' levels of the marginal costs are given by:

\[
a^{1-\sigma}_{Dj} B_j = F_D,
\]

\[
a^{1-\sigma}_{Xjk} \phi B_k = F_X/d_{jk} (t),
\]

where \( B_j \equiv \frac{\mu E_j}{\eta_j} \), and \( \phi \equiv \tau^{1-\sigma} \in [0, 1] \) represents trade freeness. Trade facilitation enters the model through \( d_{jk} \), where \( d_{jk} > 1 \) implies that trade facilitation by country \( j \) is reducing the fixed cost of export for its firms in country \( k \). \( d_{jk} \) is financed through taxation \( t \), which we discuss further in the next section. Firms will take the entry cost \( F_X/d_{jk} \) as given when deciding which markets to enter.

Finally, free entry ensures that the ex-ante expected profit of developing a new variety in country \( j \) equals the investment cost:

\[
\int_0^{a_{Dj}} (a^{1-\sigma} B_j - F_D) dG(a) + \sum_{k,k \neq j} \int_0^{a_{Xjk}} (\phi a^{1-\sigma} B_k - F_X/d_{jk} (t)) dG(a) = F_E.
\]

2.2 Solving for the Long-run Equilibrium

In this section, we apply two simplifying assumptions. First, the model is solved with two countries, \( j \) and \( k \). We refer to \( j \) as “Home” and \( k \) as “Foreign”. Second, we follow Helpman, Melitz, and Yeaple (2004) in assuming the probability density function to be Pareto:

\[
G(a) = a^\theta.
\]

Integrating (8) and using (6) and (7) gives \( B_{jk} \),

\[
B_j = \left( \frac{F_E F_D^{\beta - 1} \cdot (\beta - 1) (1 - d_{jk}^{\beta - 1} \Omega)}{1 - d_{jk}^{\beta - 1} d_{kj}^{\beta - 1} \Omega^2} \right)^{\frac{1}{\beta}},
\]
where $\beta \equiv \frac{\sigma}{\sigma - 1} > 1$, and $\Omega \equiv \phi^\beta \left( \frac{F_X}{F_D} \right)^{1-\beta} \in [0, 1]$ is an index of trade freeness. Using this expression, (6) and (7) gives the cut-off marginal costs. The cut-off for a domestic non-exporter is given by:

$$a_{Dj}^\theta = \frac{(\beta - 1) F_E (1 - d_{jk}^{\beta - 1} \Omega)}{F_D (1 - d_{jk}^{\beta - 1} d_{kj}^{\beta - 1} \Omega^2)},$$

where $d_{jk}^{\beta - 1} \Omega \in [0, 1] \forall j, k$ ensures a positive solution for the cutoff. The cut-off cost for exporters is given by

$$a_{Xj}^\theta = \frac{F_E (\beta - 1) \Omega d_{jk}^{\beta - 1} (1 - d_{kj}^{\beta - 1} \Omega)}{F_X (1 - d_{jk}^{\beta - 1} d_{kj}^{\beta - 1} \Omega^2)}.$$

**Proposition 1** (Home Country Effects): Home country trade facilitation will increase the marginal cost cut-off for exporters at Home and decrease the marginal cost cut-off for non-exporters at Home.

**Proof:** Home trade facilitation’s positive effect on the marginal cost cut-offs for Home exporters follows from (11). See the appendix for a proof that trade facilitation decreases the marginal-cost cut-offs for Home non-exporters.

This model with asymmetric trade facilitation leads to the prediction that unilateral trade facilitation at Home leads to a softer cutoff for Home exporters due to the lower export beachhead cost. This means that trade facilitation at home leads to lower average productivity among those firms exporting to the particular destination. This contrasts with the standard Melitz model result, where bilateral trade liberalization leads to a softer export cutoff in both countries. The marginal cost cut-off becomes tougher at Home for non-exporters due to entry. Lower export costs increase expected profits for Home firms, which leads to increased entry. The entry effect of trade facilitation can clearly be seen in the equation describing the mass of firms in each country, which is derived later in the paper.

**Proposition 2** (Foreign Country Effects): Home country trade facilitation will increase the marginal cost cut-off for non-exporting firms at Foreign and decrease the marginal cost cut-off for exporters at Foreign.

**Proof:** Home trade facilitation’s positive effect on the marginal cost cut-offs for Foreign non-exporters follows from (10). See the appendix for a proof that trade facilitation decreases the marginal-cost cut-offs for Foreign exporters.

There are two forces that affect firms at Foreign. The presence of a greater number of Home exporters in the Foreign market toughens competition, while the lower expected profits of operating in Foreign lead to fewer firms at Foreign. The Home competition effect dominates for Foreign exporters, while the reduced entry leads to a softer cutoff for Foreign non-exporters.
We will assume that, in spite of trade facilitation, it will never be easier to export than to sell in the domestic market, which implies that \( a_{Xj} < a_{Dj} \forall j, k \). The condition for this to hold is \( F_X / \Omega F_D > \left( d_j^\beta (1 - d_k^{\beta - 1} \Omega_{kj}) \right) / \left( 1 - d_j^{\beta - 1} \Omega_{jk} \right) \) for all \( j, k \). The model reduces to the standard Melitz model if there is no trade facilitation \((d_{jk} = d_{kj} = 1)\). The price index in country \( j \) may be written as

\[
P^{1-\sigma}_j = \Psi^\beta (\beta - 1)^{1-\sigma} (n_j a_{Dj}^{1-\sigma} + n_k \phi a_{Dk}^{1-\sigma} \left( \frac{a_{Xk}}{a_{Dk}} \right)^{\theta - 1 - \sigma}),
\]

(12)

where \( \Psi = \left( \frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \). The effect of trade facilitation on the cut-offs for both exporters and non-exporters is summarised by the following proposition. The mass of firms in each country can be calculated using (6), (10), (11), and (12) together with the fact that \( B_j = \frac{\mu L_j}{F_D^\beta} \): 

\[
n_j = \frac{\mu (\beta - 1)}{F_D^\beta} \frac{L_j (1 - d_k^{\beta - 1} \Omega) - L_k (1 - d_j^{\beta - 1} \Omega) a_{Dk}^{\beta - 1} \Omega}{(1 - d_k^{\beta - 1} \Omega)(1 - d_j^{\beta - 1} \Omega^2)}. \quad (13)
\]

This equation shows how an increase in country \( j \)'s level of trade facilitation, \( d_{jk} \), will make it a more attractive location (base) for exporting firms. Trade facilitation will affect the ex ante attractiveness of entry in country \( j \), and it will therefore lead to a higher mass of firms in equilibrium.

Using (9), the CES price index in each country is given by

\[
P^{1-\sigma}_j = \frac{\mu L_j}{F_D^\beta} \frac{\mu L_j \left( 1 - d_j^{\beta - 1} d_k^{\beta - 1} \Omega^2 \right)^{\frac{1}{\gamma}}}{\left( F_E F_D^{\beta - 1} (\beta - 1) (1 - d_j^{\beta - 1} \Omega) \right)^{\frac{1}{\gamma}}}. \quad (14)
\]

The export volume of country \( j \) is given by

\[
V_{Xjk} = \int_0^{a_{Xj}} a^{1-\sigma} dG(a \mid a_{Dj}) \cdot \frac{F_X}{a_{Xj}^{1-\sigma}} = \frac{\beta F_X}{\beta - 1} \left( \frac{a_{Xj}}{a_{Dj}} \right)^{\theta} \frac{F_X}{d_{jk}} n_j. \quad (15)
\]

**Proposition 3:** The volume of export increases in a country’s level of trade facilitation.

Proof: This follows from (10), (11), (13) and that \( \beta \theta > 1 \).

The following section calculates the optimal level of trade facilitation. As in the Melitz model, welfare always increases \( (P \text{ decreases}) \) with trade liberalization; that is, with a higher \( \phi \) (a higher \( \Omega \)).

### 2.2.1 The governments problem

The government taxes income to finance the trade facilitation. Since labour is supplied inelastically this amounts to a lump sum tax. The rate of trade facilitation is assumed to be subject to diminishing returns, \( d'(t) > 0, d''(t) < 0 \). We will in this section assume that
\[ d_{jk} = t_j^\gamma R_j, \text{ where } R_j \equiv (w_j L_j)^\eta. \] The government maximises indirect utility with respect to \( t \) taking the long-run solutions for the cut-offs into account:

\[
\max_t V_j = k \frac{(1 - t_j) w_j}{p_{A_j} P_j^{\mu}}
\]

where \( p_{A_j} = w_j = 1 \ \forall j \). Using (10), (11), (14), and (13), we can rewrite the maximization problem as:

\[
\max_{t_j} V_j = (1 - t_j) \left( \frac{\mu L_j \left( 1 - t_j^{\eta(\beta - 1)} R_j^{\beta - 1} F \right) \left( \frac{R_j^{\beta - 1} F}{1 - t_j^{\eta(\beta - 1)} R_j^{\beta - 1} F} \right)^{\frac{1}{\beta}}}{\left( \frac{F E F_{D_j}^{\beta - 1} (\beta - 1) \left( 1 - t_j^{\eta(\beta - 1)} R_j^{\beta - 1} F \right) \right)^{\frac{1}{\beta}}} \right)^{\frac{1}{\beta - 1}}
\]

3 Empirical implementation

3.1 Data

We use annual manufacturing census data at the firm level from Statistics Sweden combined with data on opening dates of embassies, embassy time use, and state visits by the Swedish regent between 1997 and 2007. The firm level data contains information about firm exports by destination. Firm TFP is calculated using the Levinsohn and Petrin (2003) method. We employ four different dependent variables. The first is the average productivity of firms exporting to a given country in a given year. The second is the average productivity of firms that begin to export to a given country in a given year. We remove observations where firms exit after only one year in order to remove erratic exporters from the sample. The third dependent variable is the log value of exports to a given country in a given year, and the fourth dependent variable is the log number of firms that export to a given country in a given year.

We employ two different measures of embassy presence as a proxy for export facilitation. First, we use data on the presence or absence of Swedish embassies in several countries during the period 1997-2007 as a measure of trade facilitation. Of the 173 countries in the data for which we have data on the presence of an embassy, new embassies were set up in 8 countries over the period. We construct a dummy variable to capture the presence of an embassy, which takes a value of one in the years where an embassy is present in a country and zero otherwise.

We also use data on the time use in of embassy employees and other Swedish authorities such as the Swedish Export Council and the Swedish International Development Agency in export facilitation in each country to construct a second measure of trade facilitation. The time use data is taken from a survey undertaken by the Swedish Ministry of Foreign Affairs. We use the 2007 time use data as a proxy for each embassy’s time use over the entire period. We construct a variable which equals the log of the number of hours spent facilitating trade in the years where an embassy is present in a country and zero otherwise. This measure varies across
Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Productivity</td>
<td>29.79</td>
<td>25.49</td>
</tr>
<tr>
<td>Entrant Productivity</td>
<td>24.23</td>
<td>24.77</td>
</tr>
<tr>
<td>Value Export (million SEK)</td>
<td>2690</td>
<td>9020</td>
</tr>
<tr>
<td>Number of Exporters</td>
<td>282</td>
<td>550</td>
</tr>
<tr>
<td>Hours</td>
<td>1051</td>
<td>2615</td>
</tr>
<tr>
<td>ln_opencc</td>
<td>4.36</td>
<td>.59</td>
</tr>
<tr>
<td>tariff (%)</td>
<td>9.5</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Source: Statistics Sweden, author’s calculations

embassies and therefore contains more information compared to the simple dummy variable approach. We have data on time use for 81 countries.

We include a number of control variables in the analysis such as population and GDP per capita (taken from CEPII data), which controls for destination country market potential. We also include state visits by the Swedish regent as a control variable. We employ two different measures of openness to trade to control for changes in exports to a destination country that has nothing to do with Swedish embassies. We use average manufacturing tariffs\(^2\) (taken from the World Development Indicators) and the ratio of exports plus imports to GDP (taken from the Penn World Tables) as our two proxies for openness. Descriptive statistics for these variables are provided in Table 1.

3.2 Empirical Specification

Our regressions use the following specification:

\[
Y_{ct} = \beta_0 + \beta_1 Emb\_dum_{ct} + controls_{ct} + d_t + d_c + \varepsilon_{ct},
\]

(16)

where \(Y_{ct}\) is the outcome variable of interest in country \(c\) in year \(t\). \(Emb\_dum_{ct}\) is the embassy dummy and \(d_t\) and \(d_c\) are year and country fixed effects. \(\varepsilon_{ct}\) is the error term.

Proposition 1 implies that \(\beta_1\) should have a negative sign when \(Y\) is average productivity and the number of exporters. Proposition 2 implies a positive sign when \(Y\) is the aggregate export volume.

3.3 Empirical Results

The results for the effect of embassy presence on aggregate productivity and entrant productivity are given in Table 2. Columns (1) and (2) present the results when the dependent variable in (16) is aggregate productivity, while columns (3) and (4) present the results when the dependent variable in (16) is productivity of entrants. All regressions include country and year

\(^2\)"Tariff rate, applied, simple mean, manufactured products"
Table 2: Effect of embassies on aggregate and entrant productivity

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Aggregate Productivity</th>
<th>(2) Aggregate Productivity</th>
<th>(3) Entrant Productivity</th>
<th>(4) Entrant Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(population)</td>
<td>-7.679</td>
<td>5.214</td>
<td>-23.15*</td>
<td>-19.35***</td>
</tr>
<tr>
<td></td>
<td>(20.96)</td>
<td>(10.04)</td>
<td>(12.61)</td>
<td>(6.754)</td>
</tr>
<tr>
<td>ln(GDP per capita)</td>
<td>-6.048</td>
<td>0.195</td>
<td>2.494</td>
<td>-2.848</td>
</tr>
<tr>
<td></td>
<td>(7.158)</td>
<td>(2.638)</td>
<td>(2.869)</td>
<td>(1.909)</td>
</tr>
<tr>
<td>tariff</td>
<td>0.112</td>
<td>0.0982*</td>
<td>0.0851</td>
<td>-0.00304</td>
</tr>
<tr>
<td></td>
<td>(0.183)</td>
<td>(0.0566)</td>
<td>(0.133)</td>
<td>(0.0556)</td>
</tr>
<tr>
<td>ln(openc)</td>
<td>-3.822</td>
<td>1.345</td>
<td>-0.962</td>
<td>0.790</td>
</tr>
<tr>
<td></td>
<td>(3.405)</td>
<td>(0.897)</td>
<td>(2.360)</td>
<td>(0.782)</td>
</tr>
<tr>
<td>emb_dum</td>
<td>-4.893***</td>
<td></td>
<td>-1.475</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.607)</td>
<td></td>
<td>(0.978)</td>
<td></td>
</tr>
<tr>
<td>visit_dum</td>
<td>-3.080*</td>
<td>0.268</td>
<td>0.857</td>
<td>0.182</td>
</tr>
<tr>
<td></td>
<td>(1.589)</td>
<td>(0.742)</td>
<td>(0.866)</td>
<td>(0.597)</td>
</tr>
<tr>
<td>emb_dum*ln(hours)</td>
<td></td>
<td>-0.241***</td>
<td>-0.234**</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0604)</td>
<td>(0.111)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>164.7</td>
<td>-36.27</td>
<td>211.4*</td>
<td>232.1***</td>
</tr>
<tr>
<td></td>
<td>(208.9)</td>
<td>(117.4)</td>
<td>(115.3)</td>
<td>(71.56)</td>
</tr>
<tr>
<td>Observations</td>
<td>1120</td>
<td>653</td>
<td>1039</td>
<td>601</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.114</td>
<td>0.267</td>
<td>0.032</td>
<td>0.125</td>
</tr>
<tr>
<td>Number of countries</td>
<td>173</td>
<td>81</td>
<td>172</td>
<td>81</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Includes country and year fixed effects and cluster at the country level. The coefficients on our two measures of embassy presence (emb_dum and emb_dum * ln(hours)) have a statistically significant and negative effect on aggregate productivity, in line with the prediction of our model. The coefficients are less significant in the entrant productivity regressions, with a statistically significant result using the embassy dummy interacted with the logged hours spent on trade facilitation. The state visit control, visit_dum, is weakly significant in column (1) and negative for the aggregate productivity regressions. The regressions using the ln(hours) variable have much fewer observations due to the fact that observations with zero hours are removed from the sample.

The results for the effect of embassy presence on export value and the number of exports are given in Table 3. Columns (1) and (2) present the results when the dependent variable in (16) is the natural logarithm of export value, while columns (3) and (4) present the results when the dependent variable in (16) is the natural logarithm of the number of exporters. The coefficients on our two measures of embassy presence (emb_dum and lhourstotint) not statistically significant in these regressions. Overall the results suggest that the total number of exporters and the value of exports is not significantly affected by the presence or absence of embassies after controlling for other factors, but there appears to be a connection between embassy presence in a country and the productivity of firms that export to that country. The fact that firms exit
| Table 3: Effect of embassies on export value and number of exporters |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| **Dependent variable:**         | (1)             | (2)             | (3)             | (4)             |
| log(exports)                    | 2.576           | 2.907***        | 0.0517          | -0.132          |
| ln(population)                  | (1.824)         | (1.038)         | (0.417)         | (0.301)         |
| ln(GDP per capita)              | 0.963*          | 1.691***        | 0.476***        | 0.525***        |
| (0.505)                         | (0.354)         | (0.129)         | (0.118)         |
| tariff                          | 0.00542         | -0.00887        | 0.00204         | -0.00173        |
| (0.0126)                        | (0.00973)       | (0.00314)       | (0.00172)       |
| ln(openc)                       | 0.0891          | -0.0978         | 0.0702          | 0.0526          |
| (0.254)                         | (0.172)         | (0.0754)        | (0.0501)        |
| emb_dum                         | -0.0973         | 0.0912          |                  |                 |
| (0.185)                         | (0.0614)        |                 |                 |
| visit_dum                       | -0.360***       | -0.188**        | -0.0224         | 0.0192          |
| (0.0867)                        | (0.0784)        | (0.0432)        | (0.0313)        |
| emb_dum*ln(hours)               | 0.00189         | 0.0139          |                  |                 |
| (0.0235)                        | (0.00835)       |                  |                 |
| Constant                        | -12.73          | -22.20**        | -0.175          | 2.246           |
| (19.32)                         | (10.53)         | (4.112)         | (3.211)         |
| Observations                    | 1120            | 653             | 1120            | 653             |
| R-squared                       | 0.236           | 0.407           | 0.098           | 0.314           |
| Number of land_id               | 173             | 81              | 173             | 81              |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Includes country and year fe
clustered at country level.
and enter markets often is likely to confound the detection of the extensive margin in the data, but we see that the entrants in markets with an embassy tend to have a lower productivity.

4 Conclusion

The purpose of this study was to directly test the prediction of the Melitz model that trade liberalization allows less productive firms to begin exporting. We develop a Melitz-based model where firms are heterogeneous with respect to productivity and must pay a fixed cost to entry the entry market, which can be reduced by government spending on trade facilitation. The model predicts that unilateral trade facilitation allows less productive firms to both export. We test this prediction using Swedish firm-level data and information on the presence or absence of Swedish embassies abroad, combined with information on the amount of time each embassy spends on trade facilitation. Our results lend support to the predictions of the model.

References


Proof of Proposition 1:

The first part of Proposition 1 can be seen in equation (10) and (11). The effect of home country trade facilitation on home’s marginal cost cutoff can be seen in the following derivative:

$$\frac{\partial a^\theta_{Dj}}{\partial d_{jk}} = \frac{F_E (\beta - 1)^2 \Omega d_{kj} d_{\beta - 1} (1 - d_{\beta - 1}^\theta \Omega)}{F_X (1 - d_{\beta - 1}^\theta d_{\beta - 1}^\theta \Omega^2)}$$

The effect of foreign country trade facilitation on home’s marginal cost cutoff can be seen in the following derivative:

$$\frac{\partial a^\theta_{Xj}}{\partial d_{kj}} = \frac{F_E (\beta - 1)^2 \Omega^2 d_{\beta - 1} d_{\beta + 1} (1 - d_{\beta - 1}^\theta \Omega)}{F_X (1 - d_{\beta - 1}^\theta d_{\beta - 1}^\theta \Omega^2)}$$

The derivatives are positive since $d_{\beta - 1}^\theta \Omega \in [0, 1] \forall j, k$. 

A Mathematical Appendix