Three Essays in International Trade

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy

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Abstract

This thesis presents three papers on international trade. The first chapter examines how trade liberalization affects firms when labor market institutions differ across countries. One would expect the country with higher labor costs to have a lower proportion of firms that enter the export market. That need not be the case when labor market institutions differ across countries. Different distortions affect the mark-up charged by firms in a heterogeneous manner. Since the distortions differ across countries, so do the mark-ups. I use this finding to show that trade liberalization can lower the survival cut-off and the average productivity of active firms in one of the countries, two of the results that are central to the canonical Melitz (2003) model.

The second chapter studies the affiliate location decision of multinational corporations (MNCs). Using hand-collected data on French MNCs, I find that they are more likely to opt for a wholesale affiliate relative to a manufacturing affiliate in more distant countries. I show theoretically and confirm empirically that this result is due to the fact that MNCs locate their wholesale affiliates in geographic proximity to their manufacturing affiliates. The former thereby serve as conduits to the exports of the latter, rather than to the exports of the parent company.

The third chapter studies firms’ export market entry decision. Using data on Peruvian firms, I find that the Great Recession did not reduce the number of new exporters. This
appears to contradict the belief that large fixed costs are the primary barrier to export market participation. I show that two temporary marginal cost shocks can explain continued entry: an inventory draw-down and a fall in shipping costs. This indicates that firms can test out export markets in response to temporary marginal cost shocks, and cast doubt upon the large fixed cost hypothesis.
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Chapter 1

The Impact of Labor Market Institutions on Markups and Export Market Performance when Firms and Countries are Heterogeneous

1.1 Introduction

It is well known that labor market institutions vary internationally, even when attention is restricted solely to developed countries. Moreover, labor economists have noted that labor market institutions help shape the size distribution of firms (see Braguinsky et al., 2011 and Garicano et al., 2012 for recent contributions as well as the references therein). Separately, it has been documented that the firm size distribution is highly skewed, with only a small number of firms serving the foreign market largely due to trade barriers and fixed exporting costs (e.g., Eaton et al., 2011a). Yet the literature on labor market frictions in an open economy typically abstracts away from at least one of these features. Models that include firm heterogeneity with export market barriers (e.g. Helpman and Itskhoki, 2010) consider countries with similar labor market institutions, whereas models that consider different labor market institutions lack either firm heterogeneity (e.g. Cuñat and Melitz, 2012) or export market barriers (e.g. Egger, Egger and Markusen, 2012). Hence, existing papers on labor market institutions in an open economy

1Botero et al. (2004) highlight the extensive variation in labor market institutions internationally and provide potential explanations for it.
present an incomplete picture as is evidenced by the findings of this paper.

In this chapter I explore how differences in labor market structures across countries affect trade outcomes. I setup a two-country model with firm heterogeneity and product differentiation akin to Melitz (2003). In both countries firms producing differentiated varieties face job-creation costs. This is the sole labor market distortion faced by firms based in country $A$. Firms based in country $B$ face the additional restriction that they must employ a unionized labor force. The bargained wage in country $B$ is therefore a mark-up over the wage in country $A$. I focus on unions as a primary source of labor market distortion because, as Botero et al. (2004) document, the strength of labor unions has a significant impact upon a host of other labor market frictions, ranging from hiring and firing costs to social security laws (see in particular Tables II and V in their paper).

I find that standard results common to trade models with heterogeneous firms need not hold in the presence of cross-country asymmetry. The channel through which differences in institutions shape trade outcomes is through their impact on the markup charged by firms. In the absence of labor market distortions, all firms charge the same markup irrespective of where they are headquartered. Introducing a distortion of any kind alters this markup. When the distortion differs across countries, so do the resulting markups. In this chapter unionized firms find it profitable to charge a substantially higher markup than their non-unionized counterparts when the labor cost gap is relatively low. Higher markups enable unionized firms to overcompensate for their higher labor costs. Entry is thereby encouraged in the unionized country, which places upward pressure on the survival cutoff there. If the labor cost gap is relatively high, however, unionized firms are forced to lower their markups, which lowers profits and discourages entry. There is thus downward pressure on the survival cutoff in the unionized country. I call this the markup effect.

Whether the labor cost gap is large or small depends upon the degree of product market competition. Unionized firms are able to profitably charge a high markup when they have sufficient market power. An increase in product market competition lowers a firm’s ability to
pass on its higher labor costs to consumers in the form of higher prices. When that happens the threshold at which the labor cost gap is considered to be small falls. This is the *product differentiation effect*.

In equilibrium these two forces interact and generate a critical value of relative labor costs at which the labor cost gap is considered to be ‘large.’ This critical value is decreasing in the elasticity of substitution between varieties, which is a proxy for the degree of product market competition. If the cost gap is above the critical value, then the country with a more flexible labor market has a higher survival cutoff and a larger fraction of its firms enter the export market, as in Helpman and Itskhoki (2010). The opposite is true if cost gap is below the critical value.

In a setting with cross-country differences in markups, trade liberalization can lower export sales for exporters based in $B$ if the cost gap is significantly above the critical value. The same occurs for exporters based in $A$ if the cost gap is significantly below the critical value. This arises even with CES preferences.$^2$ In either scenario, trade liberalization lowers the fraction of firms that enter the export market for one of the countries, thereby also lowering the average productivity of active firms. All three predictions are at odds with the standard findings of heterogeneous firm models based on Melitz (2003).

At the industry level the model predicts an ambiguous relationship between the labor market institutions of trading partners and the trade balance between them in differentiated varieties. I show that there exist combinations of trade costs, labor cost differences, and the degree of product differentiation at which either country may be a net exporter of differentiated products. This need not reflect either employment or output patterns within the industry. For a special case of the model it is possible to show that when the fraction of firms that export is the same in both countries, $B$ runs a trade surplus in differentiated varieties, though aggregate sectoral employment and output are higher in $A$.

---

$^2$A recent paper by Spearot (2013) shows that when preferences are quasi-linear, as in Melitz and Ottaviano (2008), trade liberalization can lower export sales for the most productive exporters in the absence of any rigidities. In section 4.3 of this chapter I discuss how the mechanism behind the result in his paper differs from the one in this chapter.
The rest of this chapter is organized as follows. Section 2 provides a brief review of the relevant literature. Section 3 outlines the principal assumptions of the model, and section 4 goes over its predictions. I conclude in Section 5.

1.2 Related Literature

International trade economists have been studying the impact of labor market institutions on trade outcomes for a number of decades. Early studies have dealt with minimum wages (Brecher, 1974), efficiency wages (Copeland, 1989; Matusz, 1996), labor unions (Brander and Spencer, 1988; Mezzetti and Dinopoulos, 1991; Zhao, 1995), and search frictions (Davidson et al., 1999) within the prism of either the Ricardian or the Heckscher-Ohlin models. Since the publication of Melitz (2003), many of these issues have been re-examined within a heterogeneous firm setting. Eckel and Egger (2009) extend Zhao (1995) to a setting with heterogeneous firms to study a firm’s decision to offshore production abroad in the presence of a domestic labor union. Egger and Kreickemeier (2009, 2012) have incorporated fair wages into the Melitz framework, while Davis and Harrigan (2011) have looked at efficiency wages. Felbermayr et al. (2011) examine dynamic models of trade with unions and search frictions.

A drawback common to the second set of papers is that they consider trade between two symmetric countries. Although a justifiable simplification on most occasions, such an approach does not provide us with an understanding of how cross-country differences in labor market institutions impacts trade outcomes. It is well-known that trading partners have vastly different labor market structures; one need only compare the labor market institutions of the US with those of Germany (see Table III in Botero et al., 2004). These differences are reflected in outcomes, be it at the firm or at the industry level. This suggests that models neglecting country heterogeneity are missing an important element, akin to trade models prior to 2003 that neglected firm heterogeneity.

The only papers that deal with heterogeneous countries in a heterogeneous firm setting with non-Walrasian labor markets are Helpman and Itskhoki (2010) and Egger, Egger and Markusen
Since both papers are closely related to this one it is necessary to elaborate on how this chapter differs from them. Helpman and Itskohki (HI henceforward) embed Davidson et al. (1999) in a Melitz setting, and consider the consequences of cross-country differences in vacancy creation costs for firms. In their model, the structure of the labor market is the same for both countries, although the degree of labor market regulation varies across countries. This is a crucial distinction and is the principal reason as to why the predictions of this model differ from those of HI (see also section 3.4 of this chapter).

In the model of Egger, Egger and Markusen (EEM henceforward) firms face minimum wage constraints. Since the constraint binds in only one of the countries, the countries do differ in terms of the structure of their labor market. However, EEM abstract away from all trade impediments, both fixed and variable. Consequently, all firms export. The absence of a partition between exporters and non-exporters shuts down one of the key mechanisms of the Melitz framework. This is not a trivial point, for it is well-known that heterogeneous-firm models produce different predictions in the absence of export-market barriers. The present model combines differences in the structure of the labor market, akin to EEM, along with export market impediments, akin to HI.

1.3 Model

1.3.1 Preferences

The world is composed of two countries called A and B. Where necessary countries will be indexed by $i$. Each country is populated by a continuum of $N$ identical workers. Workers supply one unit of labor and derive utility from consuming a bundle of differentiated varieties.

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Cuñat and Melitz (2010, 2012) also focus on heterogeneous countries. Both papers add labor market frictions and productivity shocks to the Dornbusch, Fischer and Samuelson (1977) model. They show that countries with more flexible labor markets specialize in more volatile industries, and have a comparative advantage in those industries. Chor (2010) reaches similar conclusions within the Eaton and Kortum (2002) framework. Both sets of papers lack firm heterogeneity and fixed trade costs.
indexed by $j$: 

$$U_i = \left[ \int_{j \in \Omega_i} y_{ij}^{\frac{\sigma - 1}{\sigma}} \, dj \right]^{\frac{1}{\sigma - 1}}.$$ 

$\sigma > 1$ is the elasticity of substitution and $\Omega_i$ is the set of varieties available to consumers in country $i$. Utility maximization generates the following demand function for each differentiated variety in country $i$: $y_{ij} = D_i p_{ij}^{-\sigma}$, where $p_{ij}$ is the price of variety $j$ in country $i$ and $D_i = E_i P_i^{\sigma - 1}$ is the demand shifter. Each firm is small relative to the industry and takes the demand shifter as given. It will be solved for in general equilibrium. $E$ denotes aggregate national expenditure on manufactures, and $P$ is the standard price index.

### 1.3.2 Sectors and Factors of Productions

Both economies are comprised of two sectors. One sector is comprised of a large mass of identical firms producing a homogeneous good which, following Eckel and Egger (2009), I call capital. There are no trade barriers in this sector, ensuring that the price charged by firms in this sector is identical in both countries. The price of the homogeneous good can therefore be normalized to one. The labor market in this sector is assumed to be frictionless in both countries.

Consequently, workers are paid the value of their marginal product. Since one worker produces one unit of output, the value of the marginal product of labor is equal to the price, which is one. That is, $w_0 = 1$ in both countries.

As in Melitz (2003), entry into the differentiated goods (manufacturing) sector requires the payment of the sunk cost $f_e$, which is paid in units of the homogeneous good. Upon payment firms receive the property rights to a unique horizontally differentiated variety and draw a productivity level, $\theta$, from a common distribution $G(\theta)$ with support on $[1, \infty)$. Following the

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4Introducing labor market frictions into this sector will not alter any of the main results of this chapter. For justification the reader can compare the working paper version of HI — Helpman and Itskhoki (2007) — with the published version. The working paper version assumes no labor market frictions in the homogeneous good sector whereas the published version incorporates search frictions into this sector while retaining the assumption that this good is traded internationally at no cost. The results pertaining to the survival and export cutoffs and the fraction of firms that export are the same in both versions.
convention in the literature I assume a Pareto distribution for the productivity draws, with shape parameter $k > \sigma - 1$. Akin to the homogeneous good sector, labor is the only factor of production. A firm with a productivity draw of $\theta$ requires $l$ workers to produce $y$ units of output. Production for the domestic and export markets require the payment of the additional fixed costs $f$ and $f_x$, respectively. Both are paid in units of output. Firms choosing to export also face the standard iceberg trade cost, denoted by $\tau > 1$. As in HI, a firm producing a differentiated variety requires $b$ units of capital in order to create one employment position. Because the countries are asymmetric, trade in manufactures may not be balanced. All trade imbalances are repaid in capital.

1.3.3 Labor Market Structure

Country $A$: Non-unionized Labor

The labor force in $A$ is non-unionized. However, the wage is not equal to the value of the marginal product of labor since firms face vacancy creations costs. Instead, as in HI, the wage is determined through the bargaining process outlined in Stole and Zwiebel (1996a, b). A firm bargains with each worker simultaneously and separately such that the outcome of the bargaining process — the wage — is equal to the contribution of the marginal worker to the surplus from the match after the cost $b$ has already been sunk. The wage is the solution to the following differential equation:

$$w = \frac{\partial}{\partial l} (r - wl).$$

$w$ denotes the wage, $r$ denotes the firm’s revenue and $l$ its employment level. As is well-known from HI, the solution to this differential equation yields a wage bill that is a constant fraction of the firm’s revenues: $wl = \rho r$, where $\rho = \frac{\sigma-1}{2\sigma-1}$.

The firm anticipates this outcome and chooses the amount of labor in order to maximize
its expected ex-post variable profits:

\[ l = \arg \max_l \{ (1 - \rho)r - bl \} \quad \text{subject to} \quad r = D^\frac{1}{\sigma} y^{\frac{\sigma - 1}{\sigma}} \quad \text{and} \quad y = \theta l. \]

The resulting employment, output, revenue, marginal cost and price functions for a firm with productivity draw \( \theta \) for domestic operations are:

\[ l(\theta) = D \theta^{\sigma - 1} \left( \frac{\rho}{\theta} \right)^{\sigma}, \quad y(\theta) = D \theta^\sigma \left( \frac{\rho}{\theta} \right)^{\sigma}, \quad r(\theta) = D \theta^{\sigma - 1} \left( \frac{\rho}{\theta} \right)^{\sigma - 1}, \]

\[ c(\theta) = \frac{2b}{\theta}, \quad p(\theta) = \frac{b}{\theta \rho}. \]

All firm-level variables for export operations are analogously defined, with \( \theta \) replaced by \( \theta/\tau \) and \( D_B \) replacing \( D_A \) as the demand shifter.\(^5\) Given the employment and revenue functions, we can solve for the wage using the fact that \( w = \rho (r/l) \). As in HI, all firms pay the same wage which is equal to the vacancy creation cost:

\[ w_A = b. \]

**Country B: Unionized Labor Force**

Manufacturing workers in \( B \) are represented by a union that bargains with all firms simultaneously over both wages and employment, as in McDonald and Solow (1981). The solution lies on the contract curve which connects the points of tangency between a firm’s isoprofit curve and the union’s indifference curve in the \((l, w)\) space.\(^6\)

The union’s utility function consists of the product of its payoff: \((w - \hat{w}) l\). \( \hat{w} \) is the union’s

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\(^5\)Expressions for both demand shifters are provided in Appendix A.1.

reservation wage which will be discussed in more detail below. The Nash Product from an agreement between the union and a firm can be written as

\[
NP = \left[ (w - \hat{w}) l \right]^{\eta} \left[ r - wl - bl \right]^{1-\eta},
\]

where \( \eta \in [0, 1] \) is the union’s bargaining strength. Maximizing the Nash Product with respect to employment and wages gives us the following first-order conditions:

\[
\eta [r - wl - bl] = (1 - \eta) \left[ wl + bl - \frac{\sigma - 1}{\sigma} r \right],
\]

\[
\eta [r - wl - bl] = (1 - \eta) (w - \hat{w}) l.
\]

Combining the two first order conditions enables us to solve for the wage:

\[
w_B = \hat{w} + \frac{\eta}{\sigma - 1} (b + \hat{w}).
\]

Since the primary focus of this chapter is on a cross-country comparison, the union wage-premium within a country is not as important as the gap in unit labor costs between the two countries. The between-country comparison is made easier by setting \( \hat{w} = w_A \). Recalling that \( w_A = b \), the wage of a manufacturing worker in \( B \) can then be expressed as a markup over the wage of a comparable worker in \( A \):

\[
w_B = b \left( \frac{\sigma - 1 + 2\eta}{\sigma - 1} \right) > b = w_A.
\]

The labor cost gap is largest in industries with lower product market competition (low \( \sigma \) industries). This is intuitive as firms with greater market share have a larger surplus that can be extracted by the union.\(^7\)

\(^7\)The fact that \( w_B \) adjusts endogenously due to changes in \( \eta \) and \( \sigma \) highlights the benefits of deriving the outcome of union-firm bargaining rather than simply assuming that \( w_B \) is some constant and exogenous markup over \( w_A \). Doing so would shut down the mechanisms driving the model’s results. A similar point about the benefits of modeling labor cost gaps endogenously rather than assuming the existence of some exogenous cost differential is made by Copeland (1989).
Given the wage, we can solve for labor demand, output, revenue, marginal cost, and price functions for domestic operations:

\[ l(\theta) = D\theta^{\sigma-1} \left( \frac{\gamma}{b} \right)^{\sigma} , \quad y(\theta) = D\theta^{\sigma} \left( \frac{\gamma}{b} \right)^{\sigma} , \quad r(\theta) = D\theta^{\sigma-1} \left( \frac{\gamma}{b} \right)^{\sigma-1} , \]

\[ c(\theta) = 2b\theta \left( \frac{\sigma - 1 + \eta}{\sigma - 1} \right) , \quad p(\theta) = \frac{b}{\theta \gamma} , \]

where \( \gamma = \frac{\sigma - 1}{2\sigma} < \rho \). Firm-level variables for export operations are analogously defined.

### 1.3.4 Institutions, markups and production cutoffs

#### Entry

The survival cutoff for each country \( i \) is derived from the free entry condition:

\[ f_e = \int_{\theta_i^*}^{\infty} \pi_{i,d}(\theta)dG(\theta) + \int_{\theta_{i,x}^*}^{\infty} \pi_{i,x}(\theta)dG(\theta) , \]

where \( \pi \) denotes firm profits and the subscripts \( d \) and \( x \) denote domestic and export market operations, respectively. \( \theta_i^* \) and \( \theta_{i,x}^* \) represent the survival cutoff and the productivity of the marginal exporter, while \( G(\theta) \) is the cumulative distribution function of the productivity draws.\(^8\)

Due to export profits each country’s cutoff depends upon both domestic and foreign labor market institutions. Before solving for the cutoffs it is necessary to examine the channels through which labor market institutions influence them.

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\(^8\)Given the zero profit conditions we can express domestic and export profits in terms of the cutoffs and the fixed costs: \( \pi_{i,d}(\theta) = f \left[ \left( \frac{\theta}{\theta_i^*} \right)^{\sigma-1} - 1 \right] \) and \( \pi_{i,x}(\theta) = f_x \left[ \left( \frac{\theta}{\theta_{i,x}^*} \right)^{\sigma-1} - 1 \right] \). Moreover, \( \theta_{i,x}^* \) can be written in terms of \( \theta_{i-1}^* \) (see Appendix A.1). Substituting into the two zero-profit conditions provides us with a system of two equations in two unknowns.
The markup effect and the product differentiation effect

With heterogeneous firms and free entry any factor that raises a firm’s ex-post profits will encourage entry, thereby exerting upward pressure on the survival cutoff. Ex-post variable profits are defined as \( \pi_i^o(\theta) = y_i(p_i - c_i) \). They depend upon output and the absolute markup (price minus marginal cost).

In a CES setting without any distortions each firm charges a constant markup over marginal cost, which is equal to \( \sigma/(\sigma - 1) \). One of the consequences of labor market rigidities — or any distortions for that matter — is to alter the markup function. Since labor market institutions differ across countries so do the markups. We can see this by re-writing the price levels in terms of the marginal costs:

\[
p_A(\theta) = \left(\frac{2\sigma - 1}{2(\sigma - 1)}\right) c_A(\theta), \quad p_B(\theta) = \left(\frac{\sigma}{\sigma - 1 + \eta}\right) c_B(\theta).
\]

While the relative markup charged by firms based in \( A \) remains constant irrespective of the marginal cost such is not the case for firms in country \( B \). Changes in \( \eta \) alter both \( c_B \) as well as the relative markup.\(^9\)

The equilibrium in country \( B \) is influenced by the union’s conflicting objectives. The union seeks to raise both the wage and the employment level. The two are in conflict with each other. As long as the union’s reservation wage \( \hat{w} > 0 \), an increase in the wage has a greater impact upon the union’s utility function than a proportionate increase in employment. The union is therefore willing to trade a higher wage in exchange for a lower employment level. Consequently, a unionized firm produces less output than a non-unionized firm with a comparable productivity draw. Since the price level is inversely correlated with a firm’s output, by raising production costs and reducing output, unions also raise the price level. Hence, \( p_B > p_A \).

Given that unions prefer a higher wage to a higher employment level, a marginal change in the union’s bargaining strength will have a greater impact upon a firm’s cost function than

\(^9\)Firms in \( B \) charge a higher relative markup provided that \( \eta < \rho \).
upon its output, and by implication, upon the price level. This is understandable, since there is a limit to the extent to which a firm can pass its higher labor costs on to the consumers in the form of higher prices. B-based firms are therefore forced to charge lower markups when unions are strong than when they are weak.

For a given level of output, profits are increasing with the markup charged by the firm. Hence, there will be upward pressure on $\theta_B^*$ relative to $\theta_A^*$ when markups are high (unions are weak) and downward pressure on $\theta_B^*$ relative to $\theta_A^*$ when markups are low (unions are strong). This is the markup effect (ME).

To see the ME more clearly it is more useful to consider the absolute rather than the relative markup. Define $\mu_i = p_i - c_i$ as the absolute markup charged by a firm based in country $i$. Given the price and marginal cost functions derived earlier, we can write

$$
\mu_A(\theta) = \frac{b}{\theta(\sigma - 1)}, \quad \mu_B(\theta) = \frac{2b(1 - \eta)}{\theta(\sigma - 1)}.
$$

Although both markups depend upon the degree of product level competition (as captured by $\sigma$), their ratio depends solely upon the union’s bargaining strength:

$$
\frac{\mu_B(\theta)}{\mu_A(\theta)} = 2(1 - \eta). \quad (1.2)
$$

An increase in the union’s strength raises the gap between $w_B$ and $w_A$, and forces firms in $B$ to lower their relative markups.

The ME highlights the importance of the union’s bargaining strength, $\eta$. Output, however, depends upon both labor costs and product market characteristics. Although it is possible for firms in $B$ to entirely offset their higher labor costs through higher markups for certain values of $\eta$, their ability to do so rapidly diminishes once products become more substitutable. A loss of market share requires a reduction in $w_B$ in order for unionized firms to remain profitable, as is evident from equation (1.1).

---

10 Eaton et al. (2011b) obtain a similar result.
A fall in $w_B$ lowers the cost differential between unionized and non-unionized firms. This enables unionized firms to also lower the price differential between them and their counterparts in $A$ for higher values of $\sigma$. This is the *product differentiation effect* (PDE). We can capture the PDE by writing the demand of a $B$ variety relative to an $A$ variety for two firms with a similar productivity draw, holding the demand shifters constant:

$$\frac{y_B(\theta)}{y_A(\theta)} = \frac{D_B}{D_A} \left( \frac{p_A}{p_B} \right)^{\sigma} = \frac{D_B}{D_A} \left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma}.$$  \hfill (1.3)

Notice that absent changes in the demand shifters, the above ratio is independent of $\eta$.\(^{11}\) Irrespective of the strength of the union in $B$, an increase in $\sigma$ lowers $p_B/p_A$, thereby shifting consumer demand towards varieties produced by $B$-based firms. If the reduction in $p_B$ exceeds the fall in $c_B$ when $\sigma$ rises, then an increase in product market competition lowers profits for $B$-based firms. This discourages entry in $B$ relative to $A$, thereby placing downward pressure on the ratio $\theta^*_B/\theta^*_A$. The opposite is true if production costs fall more than prices.

The ME and PDE exert opposing pressures on both survival cut-offs, thereby impacting the size of the average firm as well as the propensity of firms to enter the export market. I have heretofore considered the two effects in isolation. In reality we should expect a negative correlation between $\eta$ and $\sigma$; greater product differentiation increases a firm’s market share, thereby also increasing the surplus to bargain over with the union. Hence, there exists a tension between these two forces at any combination of $(\eta, \sigma, \tau)$, which is at the core of the model’s predictions.

To capture this tension we can derive a relationship between $\eta$ and $\sigma$ at which the two effects offset each other. This occurs when the relative markup is equal to the inverse of relative demand:\(^{12}\)

$$\frac{p_B - c_B}{p_A - c_A} = \frac{y_A}{y_B}. \quad \hfill (1.4)$$

\(^{11}\)In order to illustrate the mechanisms at work, I abstract away from changes in the demand shifters. As will be shown in section 1.4, these mechanisms remain in play even after allowing for the endogenous determination of the demand shifters.

\(^{12}\)If we ignore differences in the demand shifters, then $\pi_B = \pi_A$ when $y_B(p_B - c_B) = y_A(p_A - c_A)$. This generates equation (1.4).
The above identity holds whenever \(2(1 - \eta) = \left(\frac{2\sigma}{2\sigma - 1}\right)^\sigma\). It is evident that there exists a unique value of \(\eta\) at which these two forces are equalized. Denoting this value by \(\hat{\eta}\) we can solve for it solely in terms of \(\sigma\):

\[
\hat{\eta} = 1 - \frac{1}{2} \left(\frac{\rho}{\gamma}\right)^\sigma.
\]

\(\rho\) and \(\gamma\) are defined in section 3.3 of this chapter.\(^{13}\) Both are functions of \(\sigma\) and reflect the different wage-setting processes in the two countries.

When it comes to relating the predictions of the model towards aspects that are observable, it would be more useful to consider the cost gap between the two countries rather than the union’s bargaining strength, which is unobservable. From equation (1.1), \(w_B/w_A\) can be expressed entirely in terms of \(\eta\) and \(\sigma\). Since \(\hat{\eta}\) is a function of \(\sigma\), there exists a threshold labor cost gap for each value of \(\sigma\) at which the gap is considered to be large. We can express it as

\[
\omega = \left. \frac{w_B}{w_A} \right|_{\eta = \hat{\eta}} = \frac{\sigma - 1 + 2\hat{\eta}}{\sigma - 1} = \frac{\sigma + 1 - (\rho/\gamma)^\sigma}{\sigma - 1}.
\] (1.5)

When \(w_B/w_A < \omega\) the ME dominates. By contrast, the PDE begins to dominate once the labor cost gap \(w_B/w_A\) crosses that threshold. Notice that \(\omega\) is decreasing in \(\sigma\). For a given labor cost gap value, it is therefore more likely that the PDE will dominate in industries with greater product market competition.\(^{14}\)

The above discussion demonstrates the fundamental manner in which my model differs from that of HI and EEM. In HI, search frictions do alter the markup for both countries, akin to the manner in country \(A\) in this model. The markup functions are the same for both countries, however, since the source of the labor market distortion is the same. EEM, by contrast, do not model the manner in which a minimum wage alters the pricing decisions of firms. Hence, all

\(^{13}\)Notice that \(\hat{\eta} < \rho\). Thus, the ME and PDE are equalized even while firms in \(B\) continue to charge a higher relative markup (see footnote 9). \(\rho/\gamma = 2\sigma/(2\sigma - 1)\).

\(^{14}\)Although the present model considers only a single manufacturing sector, it would be straightforward to extend it to a setting with numerous manufacturing sectors that differ by \(\eta\) and \(\sigma\). Broda and Weinstein (2006) estimate values for \(\sigma\) for a number of manufacturing industries. Their estimates of \(\sigma\) range from 1.2-22.1, demonstrating significant variation in product market competition across manufacturing industries (see Table V in their paper). In the context of the present chapter, a value of \(\sigma = 1.2\) would generate a value of \(\omega = 1.45\). By contrast, a value of \(\sigma = 22.1\) translates to a value of \(\omega = 1.02\).
firms continue to charge the standard CES markup. The tension between the ME and PDE is therefore absent from both models.

**Survival Cutoffs**

Solving the free-entry condition for both countries simultaneously yields the cutoffs:

\[
\theta^*_A = \left[ \frac{f}{f_e} \left( \frac{\sigma - 1}{k + 1 - \sigma} \right) \frac{1 - \Gamma^2}{1 - \Lambda_A} \right]^{\frac{1}{k}}, \quad \theta^*_B = \left[ \frac{f}{f_e} \left( \frac{\sigma - 1}{k + 1 - \sigma} \right) \frac{1 - \Gamma^2}{1 - \Lambda_B} \right]^{\frac{1}{k}},
\]

where

\[\Lambda_A = \delta \pi^{-k} \Gamma, \quad \Lambda_B = \delta \pi^{-k} \Gamma, \quad \Gamma = \tau^{-k} \left( \frac{f}{f_x} \right)^{\frac{k+1-\sigma}{2\sigma}},\]

and

\[\delta = 2(1 - \eta) \left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma} = \text{ME} \times \text{PDE}.\]  \hspace{1cm} (1.7)

\(\delta\) is the term that captures the tension between the ME and the PDE, which drives a wedge between the two survival cutoffs. An increase in \(\delta\) raises \(\theta^*_B\) and lowers \(\theta^*_A\). A more thorough discussion is postponed until section 4. Note that when \(w_B/w_A = \omega\) the ME and PDE exactly offset each other, and \(\delta = 1\).

**Export market cutoff**

It has been widely documented that only a small fraction of firms export.\(^{15}\) In order for the model to replicate this feature it is necessary to impose restrictions upon the parameters to ensure that \(\theta^*_i < \theta^*_{i,x} \forall i\). This is accomplished by requiring that the wage differential lie within the following interval: \(w_B/w_A \in (\omega, \overline{\omega})\). Both \(\omega\) and \(\overline{\omega}\) are defined in Appendix A.2. When \(w_B/w_A = \omega\) the restriction reduces to the one present in Melitz (2003): \(f < \tau^{\sigma-1}f_x\).

\(^{15}\)Helpman (2006) summarize the empirical research on this subject.
1.3.5 Worker’s Problem

All workers are initially unemployed and must choose one of two career paths. One approach is to seek employment in the production of capital. This guarantees employment at a wage of 1. An alternative is to search for employment in the manufacturing sector. Employment is not guaranteed, however, due to labor market imperfections. Workers that are successful in obtaining employment receive a wage strictly greater than one. Those who do not find employment earn 0. Let $J$ denote the mass of workers seeking employment in the manufacturing sector, and $L \leq J$ denote total employment in manufactures. In equilibrium, a marginal worker must be indifferent between the expected value of the two alternatives, hence $1 = \frac{wL}{J}$. This implies that $J = wL$, and $K = N - wL$ is the mass of workers producing capital.

1.3.6 Aggregation

The aggregation procedure is facilitated by the definition of two measures of average-weighted productivity (AWP). The first measure is the AWP of all firms operating in country $i$:

$$\tilde{\Theta}_A = \left[ \int_{\theta_A^*}^{\infty} \theta^{\sigma-1} G(\theta) + \tau^{1-\sigma} \frac{M_{B,x}}{M_A} \left( \frac{2\sigma - 1}{2\sigma} \right) \int_{\theta_{B,x}}^{\infty} \theta^{\sigma-1} G(\theta) \right]^{rac{1}{\sigma-1}}, \quad (1.8)$$

and

$$\tilde{\Theta}_B = \left[ \int_{\theta_B^*}^{\infty} \theta^{\sigma-1} G(\theta) + \tau^{1-\sigma} \frac{M_{A,x}}{M_B} \left( \frac{2\sigma}{2\sigma - 1} \right) \int_{\theta_{A,x}}^{\infty} \theta^{\sigma-1} G(\theta) \right]^{rac{1}{\sigma-1}}, \quad (1.9)$$

with $M_i$ denoting the mass of active producers based in country $i$ and $M_{i,x}$ is the mass of country $i$ firms that export. The price index and aggregate expenditure on manufactures can then be written as $P = M^{\frac{1}{\sigma-1}} p(\tilde{\Theta})$ and $E = Mr(\tilde{\Theta})$.\footnote{Different firm averages are analogously defined.}

---

\footnotetext[16]{It is assumed that workers cannot readily switch into the homogeneous good sector if they do not find employment in the manufacturing sector. HI, among many others, impose a similar assumption.}

\footnotetext[17]{I impose the restriction that $b > 1$. Otherwise, no workers would choose to search in the manufacturing sector.}

\footnotetext[18]{Please refer to Appendix A.3 for the derivations and closed-form solutions.}

\footnotetext[19]{Please refer to Appendix A.3 for the derivations and closed-form solutions.}
The second measure of productivity is the AWP level of all firms whose production occurs in country $i$:

$$
\Theta_A = \left[ \int_{\theta_A}^{\infty} \theta^{\sigma-1} dG(\theta) + \frac{M_{A,x}}{M_A} D_A \int_{\theta_{A,x}}^{\infty} \theta^{\sigma-1} dG(\theta) \right]^{\frac{1}{\sigma-1}}, \quad (1.10)
$$

and

$$
\Theta_B = \left[ \int_{\theta_B}^{\infty} \theta^{\sigma-1} dG(\theta) + \frac{M_{B,x}}{M_B} D_B \int_{\theta_{B,x}}^{\infty} \theta^{\sigma-1} dG(\theta) \right]^{\frac{1}{\sigma-1}}. \quad (1.11)
$$

Suppressing country subscripts, aggregate manufacturing employment, output and firm revenues can be expressed as $L = Ml(\bar{\Theta})$, $Y = My(\bar{\Theta})$ and $R = Mr(\bar{\Theta})$, respectively.

The mass of firms in each country is obtained by solving the capital market clearing condition, which is $K_i + TB_i = bL_i$. As stated earlier (see section 3.5 of this chapter), $K_i$ is the total amount of capital that is produced by country $i$’s workforce. $TB_i = R_{i,x} - R_{-i,x}$ is country $i$’s trade balance in manufactures. Since trade imbalances in manufactures are repaid in terms of capital (see section 3.2 of this chapter), a trade deficit in manufactures leads to an outflow of capital. This can affect equilibrium outcomes by discouraging entry, reducing the optimal employment decisions of active firms, or both. Solving for the capital market clearing condition in both countries simultaneously provides us with closed-form solutions for $M_A$ and $M_B$, which are presented in Appendix A.5. This completes the characterization of the equilibrium.

1.4 Analysis

I summarize the main parametric assumptions of the model before discussing its predictions:

**Assumption 1:** Productivity is Pareto distributed with shape parameter $k > \sigma - 1$. Also, the labor cost gap $w_B/w_A$ lies within the range $(\underline{\omega}, \bar{\omega})$.  

17
1.4.1 Survival cutoffs

In the model of HI the country with a more flexible labor market (i.e., lower labor costs) always has a higher survival cutoff whereas in the model of EEM the country with a more rigid labor market always has a higher survival cutoff. As hinted in section 3.4 of this chapter, lower unit labor costs guarantee neither a higher nor a lower survival cut-off with institutional heterogeneity and export market barriers. Rather, whether $\theta^*_A/\theta^*_B$ is greater than or less than one depends on the magnitude of the cost differential as well as the degree of product differentiation within the industry. When the cost differential is ‘low’ (i.e., $w_B/w_A < \omega$) higher markups charged by $B$-based firms outweigh their higher marginal costs. Consequently, entry is encouraged in $B$ and $\theta^*_B > \theta^*_A$. The opposite is the case when the cost differential is ‘large’ (i.e., $w_B/w_A > \omega$). The ME and PDE exactly offset each other at $w_B/w_A = \omega$, which is defined in equation (1.5). When that occurs the cutoffs are identical.

At any combination of the labor cost gap and $\sigma$, the relative strength of the two forces varies with $\tau$. If the labor cost gap is small, a reduction in trade barriers shifts demand towards imported varieties in both markets proportionately. Since unionized firms charge a significantly higher markup, they benefit more from trade liberalization. Hence, the gap between $\theta^*_B$ and $\theta^*_A$ rises even further. By contrast, if the labor cost gap is large a reduction in trade barriers further magnifies the cost disadvantage of $B$-based firms. This places upward pressure on $\theta^*_A/\theta^*_B$. Thus, the impact of changes in $\tau$ on $\theta^*_A/\theta^*_B$ depends on whether the wage ratio is above or below $\omega$. These results are summarized in Lemma 1 below:

**Lemma 1:** Let the conditions of Assumption 1 hold. Then, lower labor costs do not necessarily generate a higher or a lower cutoff.

1. When the labor cost gap is high relative to the markup ratio (i.e., when $w_B/w_A > \omega$), $\theta^*_A > \theta^*_B$.

2. When the labor cost gap is low relative to the markup ratio (i.e., when $w_B/w_A < \omega$,
\[ \theta_A^* < \theta_B^*. \]

3. Trade liberalization raises \( |\theta_A^* - \theta_B^*| \) for all values of \( w_B/w_A \neq \omega \).

### 1.4.2 Fraction of active firms that export

In HI firms based in the country with a more flexible labor market are more likely to enter the export market.\(^{20}\) Their result holds in the present setting only if \( w_B/w_A > \omega \). By contrast when firms in \( B \) can profitably charge a very high markup, \( B \) will have a larger fraction of firms that export. Trade liberalization at any value of \( w_B/w_A \neq \omega \) raises the gap in the fraction of firms that export between the two countries:

**Proposition 1:** Let the conditions of Assumption 1 hold. Define \( \beta_i \) as the fraction of country i’s firms that export. Then, lower labor costs do not guarantee that a larger proportion of firms enter the export market. \( \beta_B > \beta_A \) when \( w_B/w_A < \omega \). Only when \( w_B/w_A > \omega \) is \( \beta_A > \beta_B \).\(^{21}\)

Since \( w_B/w_A \) is more likely to be greater than \( \omega \) in more competitive industries (i.e., higher \( \sigma \) industries), Proposition 1 implies that a trade liberalization agreement between a country with a unionized labor force and one without will result in different industry-level outcomes depending upon the strength of the union and industry characteristics. Hence, if a country with a unionized labor force trades with a country with a non-unionized labor force, firms based in the former would be more likely to enter the export market in industries with fewer competitors. The opposite would be the case in industries with greater product market competition. Further reductions in trade barriers will accentuate those differences.

Proposition 1 complements the findings of Cuñat and Melitz (2012), who find that countries with more flexible labor markets are more likely to specialize in industries with greater volatility.\(^{21}\)

\(^{20}\)The reader will recall that EEM dispense with fixed and variable trade costs. Hence, all firms export in their model, and a direct comparison of their results with mine is not possible.

\(^{21}\)Please refer to Appendix A.1 for greater detail.
These are the industries that tend to generate a larger amount of innovative activity. The latter is positively correlated with greater product market competition, as confirmed by recent empirical studies such as Aghion et al. (2005) at the firm level and Alesina et al. (2005) at the industry level.\footnote{Both papers also review prior papers that found a positive relationship between product market competition and R&D. The interested reader can refer to them for further references.}

Though Proposition 1 tells us how the gap between $\beta_A$ and $\beta_B$ varies with $\tau$, it is silent on how the actual values are effected by a change in trade costs. In the Melitz (2003) model with Pareto-distributed productivity trade liberalization always raises the fraction of firms that export. This result carries over to the HI formulation of labor market frictions. In order to determine how trade liberalization impacts the propensity of firms in either country to export I define two critical values of $w_B/w_A$: $\omega_1 < \omega < \omega_2$.\footnote{Expressions for both are available in Appendix A.2.} Provided that $f_x > f$, $\omega_1$ and $\omega_2$ both fall within the range specified in Assumption 1, i.e., $\omega_1 > \underline{w}$ and $\omega_2 < \bar{w}$ (see Figure 1.1 below). I therefore impose this assumption.\footnote{This is a rather innocuous assumption and is assumed by many authors. Felbemayr et al. (2011) calibrate their model to match certain features of the data, and obtain $f_x > f$.}

**Assumption 2:** $f_x > f$.

\[
\begin{array}{cccccccc}
1 & \omega & \omega_1 & \omega & \omega_2 & \bar{w} & w_B/w_A \\
\end{array}
\]

Figure 1.1: Critical values of $w_B/w_A$

Since the fraction of exporting firms depends upon the values of the two cut-offs it is first necessary to establish how they vary for different values of $\tau$. Differentiating both with respect to $\tau$ gives us the following result:

**Lemma 2:** Let the conditions of Assumptions 1 and 2 hold. Then,
1. Trade liberalization lowers $\theta^*_B$ when $w_B/w_A \in (\omega_2, \overline{\omega})$. When $w_B/w_A = \omega_2$, $\theta^*_B$ is invariant to changes in $\tau$. Trade liberalization raises $\theta^*_B$ for all other values of $w_B/w_A$.

2. Trade liberalization lowers $\theta^*_A$ when $w_B/w_A \in (\omega, \omega_1)$. When $w_B/w_A = \omega_1$, $\theta^*_A$ is invariant to changes in $\tau$. Trade liberalization raises $\theta^*_A$ for all other values of $w_B/w_A$.

Lemma 2 overturns one of the primary results of Melitz (2003) and all subsequent papers based upon his model. Instead of raising the cut-off, trade liberalization has the potential to lower it. In his model, trade liberalization makes the export market more attractive, which raises ex-ante profits, thereby stimulating entry and raising the domestic cutoff. In the present setting trade liberalization can make one country’s firms worse off in the domestic market if either the ME or the PDE is sufficiently strong. Since the loss of the domestic market share is not compensated by an increase in the foreign market share, entry is discouraged.

If trade liberalization lowers the domestic cutoff and raises the foreign cutoff, it will naturally led to a reduction in the fraction of firms that export. Such is indeed the case:

**Proposition 2:** Let the conditions of Assumptions 1 and 2 hold. Then, trade liberalization need not raise the fraction of firms that export. When $w_B/w_A \in (\omega, \omega_1)$, trade liberalization lowers the fraction of A firms that export. When $w_B/w_A \in (\omega_2, \overline{\omega})$, trade liberalization lowers the fraction of B firms that export.\(^{25}\)

Another standard feature of Melitz-type models is that trade liberalization raises the average-weighted productivity of surviving firms; a reduction in trade barriers relocates market share towards the most productive firms, while forcing the least productive firms out of the market. Given Lemma 2 and Proposition 2, we now know that this need not be the case. Consequently, trade liberalization between two countries with asymmetric labor market institutions also has

\(^{25}\)See Appendix A.4 for proof.
the potential to lower the average productivity of locally-based firms:

**Proposition 3:** Let the conditions of Assumptions 1 and 2 hold. Then, if \( w_B / w_A < \omega_1 \), trade liberalization lowers \( \bar{\Theta}_A \). When \( w_B / w_A > \omega_2 \) trade liberalization lowers \( \bar{\Theta}_B \).

Propositions 2 and 3 are both novel results that have not been found in earlier papers. They imply that if either the ME or the PDE is sufficiently strong then it can overwhelm the productivity enhancing impact of trade liberalization. This is more likely to occur when the fraction of firms that export is significantly higher in one country than in another.

![Figure 1.2: Impact of \( \tau \) on \( \omega_1 \) and \( \omega_2 \).](image)

Unlike \( \omega \), which depends solely upon \( \sigma \), \( \omega_1 \) and \( \omega_2 \) both vary with \( \tau \), as illustrated in Figure 1.2. Whenever \( w_B / w_A \neq \omega \) a reduction in variable trade costs increases the gap between the two cutoffs, thereby altering the relative profitability of the domestic and foreign markets. Given that markets with a higher survival cutoff are more difficult to penetrate, the return to exporting is decreasing if the survival cutoff abroad is higher than the one at home. Depending on which side of \( \omega \) we are on therefore, a change in trade costs alters the level at which the labor cost gap between the two countries can be considered to be ‘small.’ Hence, a reduction in trade barriers narrows the range \([\omega_1, \omega_2]\), thereby making it more likely that the results predicted by
Propositions 2 and 3 hold.\(^ {26}\)

### 1.4.3 Labor costs, trade costs, and export sales

Let \(\varepsilon_{a,b}\) represent the elasticity of \(a\) with respect to changes in \(b\). In the absence of labor market frictions, CES preferences generate the following result: \(\varepsilon_{y_x,\tau} > \varepsilon_{p_x,\tau} = 1\), where \(y_x\) and \(p_x\) are a firm’s export output and price, respectively. When trade costs fall all exporting firms lower their prices proportionately. With CES preferences, this results in a disproportionate increase in demand for their products, resulting in higher export revenues for all exporting firms.\(^ {27}\) My model retains the standard CES feature that \(\varepsilon_{p_x,\tau} = 1\) for all firms in both countries. The same cannot be said as it pertains to demand, and by implication, to revenues.

The elasticity of demand with respect to trade costs can be written as

\[
\varepsilon_{y_{i,x},\tau} = \left| \sigma \varepsilon_{p_{i,x},\tau} - \varepsilon_{D_{-i},\tau} \right|
\]

where \(\varepsilon_{D_{-i},\tau}\) captures the impact of changes in trade costs on the demand shifter in the export market. Since \(\varepsilon_{p_{i,x},\tau} = 1\) for both set of exporters, we can express the elasticity of demand with respect to iceberg trade costs for a \(B\)-based firm as

\[
\varepsilon_{y_{B,x},\tau} = \left| \sigma - \frac{(\sigma - 1)\Gamma \left[ \delta^{-\frac{\pi_{A2}}{\pi_{A1}}}(1 + \Gamma^2) - 2\Gamma \right]}{\left(1 - \delta^{-\frac{\pi_{A2}}{\pi_{A1}}}(1 + \Gamma^2) \right)} \right|. \tag{1.12}
\]

The above is greater than one if \(|\varepsilon_{D_{A,\tau}}| < \sigma - 1\), an inequality that holds only as long as \(w_B/w_A < \omega_2\). When the wage-gap crosses this threshold, a higher markup charged by a unionized firm cannot offset its higher labor costs. Whereas a reduction in \(\tau\) lowers its export costs somewhat, it is insufficient to offset the fall in the foreign demand shifter due to an increase in \(\theta_A^*\). Consequently, trade liberalization lowers the export revenue of a \(B\)-based exporter.

\(^{26}\) \(\omega_1\) is decreasing in \(\tau\), whereas \(\omega_2\) is increasing in \(\tau\) as long as Assumption 2 holds. See Appendix A.2 for a sketch of the proof.

\(^{27}\) Such is not the case when preferences are quasi-linear, as recently shown by Spearot (2013).
since \( \varepsilon_{y_{B,x},\tau} < \varepsilon_{p_{B,x},\tau} \). This discourages export market entry, thereby generating the results of Propositions 2 and 3.

A similar situation arises for an A exporter when \( w_B/w_A \in (\omega, \omega_1) \). The elasticity of demand with respect to trade costs for A exporters is

\[
\varepsilon_{y_{A,x},\tau} = \left| \frac{\sigma - (\sigma - 1)\Gamma \left[ \delta \sigma\tau (1 + \Gamma^2) - 2\Gamma \right]}{(1 - \delta \sigma\tau \Gamma) (1 - \Gamma^2)} \right| .
\]

(1.13)

This exceeds unity only if \( w_B/w_A > \omega_1 \). Otherwise, trade liberalization lowers export sales for A exporters.

**Proposition 4:** Let the conditions of Assumptions 1 and 2 hold. Then, trade liberalization has the potential to lower export sales for existing exporters. A reduction in \( \tau \) lowers export sales for B-based exporters when \( w_B/w_A \in (\omega_2, \omega) \), and lowers export sales for A-based exporters when \( w_B/w_A \in (\omega, \omega_1) \).

Though the finding that trade liberalization can lower export sales for one set of exporters is similar to that of Spearot (2013), the mechanism is different. In both models a reduction in trade costs lowers both the price charged by an exporting firm, as well as the demand shifter. When the fall in the former cannot compensate for the fall in the latter, trade liberalization reduces export sales. In Spearot’s paper trade liberalization enables less productive exporters to increase their export sales, and previous non-exporters to enter the export market. This makes competition fiercer abroad, thereby lowering the demand shifter. With CES preferences, the fall in the demand shifter comes not from the entry of foreign firms, but rather from the entry of domestic firms, which is motivated by the potential of higher export profits.
1.4.4 Trade liberalization and labor market churning

Propositions 2-4 illustrate the conditions under which the predictions of the standard Melitz (2003) model will not hold. This has important implications. The primary contribution of the Melitz framework is to identify the firms that benefit and lose from trade liberalization. In his model, trade liberalization raises the survival cutoff and relocates market share towards the most productive firms. The most productive firms expand whereas the least productive firms are forced to exit. In the absence of full employment the relocation of market share also generates a significant amount of labor market churning, an issue examined by Davis and Harrigan (2011). This is a time-consuming procedure, which should result in some workers being unemployed for a period of time. In addition, since workers relocate from less-productive towards more-productive firms, trade liberalization could increase within-sector wage inequality, since the latter pay higher wages. Helpman et al. (2011) provide evidence for this for Brazil, and summarize similar findings for different countries by other authors.

Consider now what happens in the present framework when the labor cost gap between the two countries is large, as is the case when comparing labor costs in the US with those in Europe. Whereas the outcome in country A resembles the one predicted by Melitz (2003), such is not the case in country B. If \( \theta_B^* \) falls due to trade liberalization then the least productive firms would not be pressured to exit the market, and the most productive firms would not expand as much as they do in country A. In such a scenario the gains and losses from trade would be less pronounced at the firm level in B. Trade liberalization would therefore have a

28Bernard et al. (2007) also address the intra- and inter-sectoral relocation of workers due to a reduction in trade costs. Their model contains full employment, however.

29A related channel through which trade liberalization can impact wage inequality is by increasing the value of past work experience at exporting firms. Firms seeking to enter the export market (or new export destinations) due to a reduction in trade costs will seek to hire such workers, and may be willing to pay them a premium for their experience. See Molina and Muendler (2009) for empirical evidence.

30Labor costs in Europe are significantly higher than in the US, particularly in countries with strong unions. For example, in 2008 the average hourly cost of a production worker in manufacturing exceeded the cost of a comparable American worker by 65% in Belgium, 32% in France, 45% in Germany, and 35% in Sweden, all of which have strong unions. By contrast, labor costs in the UK, which has relatively weaker unions, were only 4% higher than in the US. Source: Bureau of Labor Statistics. ichcaesuppt1_1.txt

31Or, alternatively if \( \theta_B^* \) were to rise only slightly, then the proportion of firms that is forced to exit the market would be significantly smaller than the corresponding proportion in country A.
considerably smaller impact on the labor market in $B$ (i.e., Europe) than in $A$ (i.e., the US).\textsuperscript{32}

If trade liberalization has a smaller impact upon workers in countries with strong unions than in countries with weak unions, we should expect the latter to view trade liberalization less favorably than the former. This corresponds with the evidence regarding the views of Americans and Europeans towards trade liberalization. The Pew Research Center conducts annual opinion polls in a number countries in order to gage the public’s views on a variety of topics, among them free trade. They consistently find that Americans are less supportive of free trade than Europeans. In 2011, the percentage of Americans that viewed free trade favorably was 67\%, whereas 29\% viewed it unfavorably. By comparison, the corresponding numbers for respondents in France, Germany, and the UK were 83-16, 95-4 and 87-9, respectively.\textsuperscript{33} The present model provides a potential explanation for these divergent views.

1.4.5 Comparative advantage, trade flows and output

I have thus far examined a two-country two-sector model with the international labor cost gap being greater in one of the sectors. This structure resembles that of Copeland (1989), Davidson et al. (1999) and Helpman and Itskhoki (2010). All three papers find that the country with a more flexible labor market develops a comparative advantage in the industry whose cost structure is more sensitive to labor market frictions. It therefore becomes a net exporter of products produced in that industry. Gibbons et al. (2005) find that labor market regulations and rent-sharing arrangements have a greater impact on the cost structure of firms in labor-intensive industries like manufacturing. Consequently, we should expect countries with more flexible labor markets to be net exporters of manufacturers. Such is clearly not the case in the data. Although there are no doubt macroeconomic factors — such as differences in interest rates, savings rates, etc. — which account for some of the discrepancy between the theory and

\textsuperscript{32}This is consistent with Bernard et al. (2007), who find that creative destruction due to trade liberalization is more pronounced in comparative advantage rather than comparative disadvantage industries.

\textsuperscript{33}These numbers do not vary significantly from year to year. Source: Pew Research Center, Key Indicators Database. \url{http://www.pewglobal.org/database/?indicator=16&survey=13&response=Goodthing&mode=chart}
the evidence, my model sheds further light on why such a prediction need not materialize even in the absence of any differences in macroeconomic variables.

In the present model country A does have a comparative advantage in manufactures. When labor market institutions are heterogeneous, however, comparative advantage need not result in a trade surplus. Instead, there exist combinations of $w_B/w_A$, $\sigma$, and $\tau$ at which either country may be a net-exporter of differentiated varieties. I show in Appendix A.6 that A is a net-exporter of differentiated varieties for all values of $w_B/w_A \leq \omega$. This implies that the value of $w_B/w_A$ at which trade in differentiated varieties is balanced must be greater than $\omega$. It is possible, therefore, for B to be a net-exporter of differentiated varieties even for some values of $w_B/w_A > \omega$. That is, when labor market institutions vary across trading partners it is possible to run a trade surplus in a comparative disadvantage industry. Moreover, this is possible even if the country with higher labor costs has a smaller fraction of firms that enter the export market than its trading partner.

Just as the trade balance is not a perfect reflection of comparative advantage, so it is not indicative of relative employment and output levels. In Appendix A.7 I show that even though B is a net-exporter of differentiated varieties when $w_B/w_A = \omega$, aggregate employment and sectoral output are both higher in A.

**Proposition 5:** Let the conditions of Assumption 1 hold. Then, when trading partners have different labor market structures

1. it is possible to be a net-exporter of varieties in a comparative disadvantage industry, and

2. sectoral employment and output may both be higher in the country that is a net-importer of differentiated varieties.

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34 The value of $w_B/w_A$ at which trade is balanced is implicitly defined by equation (A.10) in Appendix A.6. A closed-form solution for it does not exist, however.
1.5 Conclusion

Trade economists have devoted a considerable amount of attention to the impact of labor market institutions on trade outcomes over the past several decades. However, the literature on heterogeneous firms has largely neglected institutional heterogeneity when examining labor market frictions. It has been argued that this omission has caused trade economists to overlook some of the mechanisms through which differences in labor market institutions impact firms in an open economy. Such was the purpose of this chapter. This chapter contains the first examination of the implications of trade liberalization between two countries with asymmetric labor markets in the presence of both fixed and variable export costs as well as firm heterogeneity. I studied the impact of trade liberalization between a country with a unionized labor force and one without.

The model identifies two countervailing forces that determine equilibrium outcomes: the markup effect and the product differentiation effect. These two forces arise because different labor market institutions result in different marginal cost, pricing and markup functions. The interaction of these two forces at different levels of labor union strength and product differentiation is what determines how a change in trade costs will impact firms. I have found that either country can have a larger fraction of firms that enter the export market. I have also shown that it is possible for trade liberalization to lower export sales for existing exporters if either of the two effects is sufficiently strong. Lastly, I have shown that with heterogeneous labor market institutions it is possible to run a trade surplus in a comparative disadvantage industry.

The chapter’s main contribution is to show the conditions under which the results of Melitz (2003) — the basis for all subsequent work on heterogeneous firms — can be overturned. This suggests a fruitful avenue for future research. In particular, the main mechanism that generates the results of this model is the different markup function across the two countries. However, it retains the standard CES feature that all firms within a given country are impacted proportionately. Such is not the case in a richer framework, as in Arkolakis (2010), or in
a setting with quasi-linear preferences as in Melitz and Ottaviano (2008). In both models, smaller exporters benefit the most from trade liberalization. It would therefore be interesting to re-examine some of the issues in this paper within either of these two settings.
Chapter 2

The Role of Regional Portfolios in the Affiliate Location Decision of Multinational Firms

2.1 Introduction

The affiliate location decision of multinational corporations (MNCs) is among the most widely-researched topics in international trade. Previous studies have either restricted attention to manufacturing affiliates, or ignored how a firm’s entry decision in one country is shaped by its actions elsewhere. Both approaches are problematic. Consider the operations of French tire manufacturer Michelin in South America. It owns wholesale subsidiaries in Argentina, Chile and Peru, which are supplied from its production sites in Brazil and Colombia, not from the headquarters in France.¹ Michelin is not unique in supplying its wholesale subsidiaries from nearby manufacturing subsidiaries. Inter-affiliate trade has implications for our understanding of the role of wholesale affiliates.

The international trade literature has presupposed that wholesale affiliates are a form of exporting by the parent company, not a form of foreign direct investment (FDI). If that is the case, then a firm’s choice between an affiliate for wholesale purposes and an affiliate for manufacturing purposes should be governed by the proximity-concentration trade-off — the latter ought to be preferred relative to the former in more distant markets, all else equal. Using

¹See section 6 of this chapter for an overview of Michelin’s South American operations.
hand-collected data on the foreign activities of 163 publicly traded French MNCs in 58 countries in 2010, I do not find evidence in support of this prediction. Rather, I find that the opposite is true once I control for a host country’s geography.

This seemingly odd finding is attributable to third-country effects on a firm’s affiliate location decision. To illustrate how third-country effects can produce the ‘wrong’ sign on the distance coefficient, I set-up a three-country model in which a firm can supply a target country from either the headquarters or from a nearby manufacturing affiliate. Crucially, a manufacturing affiliate is reliant upon imported intermediates from the parent company, as in Irarrazabal et al. (2013) and Keller and Yeaple (2013). Consequently, the marginal cost of a manufacturing affiliate is increasing with distance from the parent company, albeit at a slower pace than the marginal cost of exporting. The model predicts that establishing a manufacturing affiliate in one country increases the probability that the firm will establish a wholesale affiliate in a nearby market if the wholesale affiliate can be profitably supplied from the manufacturing affiliate rather than from the parent company. In such a setting, a wholesale affiliate is no longer simply a means of exporting by the parent company. Furthermore, since the marginal cost of manufacturing affiliates is increasing in distance, the model predicts that a firm is more likely to establish a wholesale affiliate relative to a manufacturing affiliate in a more distant market conditional on having a manufacturing site in geographic proximity.

How does a country’s geography affect the impact of distance on a firm’s choice between a manufacturing and a wholesale affiliate? Since firms are more likely to establish manufacturing affiliates in larger countries, a country with larger neighbors is more likely to be in geographic proximity to a firm’s manufacturing affiliates. A marginal increase in distance between this country and that of the parent company reduces the expected profits from establishing another manufacturing affiliate, thereby making a wholesale affiliate the preferred form of FDI.

The data confirms the predictions of the three-country model. A firm is found to be more likely to establish an affiliate in a country that is close to its manufacturing affiliates; an additional manufacturing affiliate within a 2000 km radius of a perspective host country lowers
the probability of staying out relative to establishing a wholesale affiliate by between 38-44%. It also increases the probability that the firm will establish a wholesale affiliate relative to the probability of establishing a manufacturing affiliate in the target country by about 25%.\(^2\) Both results are robust to the inclusion of numerous controls. Furthermore, I find that controlling for a firm’s operations in geographic proximity yields a negative correlation between distance and a firm’s preference for a manufacturing affiliate relative to a wholesale affiliate — without even controlling for the host country’s geography. A one standard deviation increase in distance is found to reduce the probability that a firm establishes a manufacturing affiliate relative to the probability of it establishing a wholesale affiliate by 25%. These results are consistent with the notion that the primary purpose of many wholesale affiliates is to facilitate exports from neighboring manufacturing affiliates rather than from the parent, a finding that is at odds with the conventional view of wholesale affiliates. My findings therefore uncover an additional factor that influences the manner in which firms organize their global operations.

My results also help explain the nature of export-platform FDI. According to Ramondo et al. (2013), export-platform FDI is very large. In 1999, the foreign affiliates of US MNCs active in a manufacturing sector earned $372 billion from export sales to countries other than the US. By means of comparison, total US manufactured exports that year were $629 billion.\(^3\) However, nearly two-thirds of the export-platform affiliate sales were to other affiliates belonging to the same parent company. The present chapter enables us to understand why inter-affiliate trade accounts for the bulk of export-platform affiliate sales. Such insights are obscured in a framework that regards FDI as confined exclusively to manufacturing affiliates.

This chapter contributes to a number of strands of the trade literature. Among them is the burgeoning literature on wholesale affiliates. Hanson et al. (2001) report that wholesale affiliates were responsible for nearly a quarter of the total revenue generated by US MNCs abroad in 1998. Similarly, wholesale affiliates belonging to German MNCs generated about 2/3

\(^2\)I focus on a 2000 km radius for the baseline results. Alternative radii yield similar results.

\(^3\)US export data is obtained from the International Trade Administration (ITA). See [http://tse.export.gov/TSE/HTMLOnlyTableDisplay.aspx?COL=2&DESC=true](http://tse.export.gov/TSE/HTMLOnlyTableDisplay.aspx?COL=2&DESC=true).
of the revenue that manufacturing affiliates did in 2001 (Krautheim, 2013).\textsuperscript{4} However, papers that focus on wholesale affiliates typically regard them as simply a form of exporting by the parent, and ignore the importance of third country effects.\textsuperscript{5}

I also contribute to the literature on third country effects on FDI. Important early contributions to this literature have been made by Baltagi et al. (2007, 2008), Blonigen et al. (2007) and Chen (2008). Those papers typically use aggregate data, which cannot distinguish between different forms of FDI, however. To the best of my knowledge, the only studies of this issue that use micro data are Antrás and Foley (2011) and Chen (2011). The former confines the empirical analysis to a single region (Southeast Asia), while the latter focuses on vertical production linkages between manufacturing affiliates. Both abstract from consideration of wholesale affiliates.

The rest of this chapter is organized as follows. Section 2 presents the baseline two country model. Section 3 discusses the data sources and presents the estimation results for the baseline model. Section 4 outlines the alternative three-country model, which is tested in section 5. In section 6 I present case study evidence that French MNCs strategically locate their wholesale affiliates in geographic proximity to their manufacturing affiliates. I conclude in section 7.

### 2.2 Baseline Two-Country Model

#### 2.2.1 Setup

Consider a monopolist based in a source country $S$ that has the property rights to a single product. In order to produce the product the firm needs to complete two tasks. One task must be performed by the headquarters whereas the second task can be performed by labor located anywhere. Let $h$ denote the amount of headquarter services in production and $l$ denote the amount of labor employed in production. The two combine to generate output in the following

\textsuperscript{4}Based on author’s calculations of total sales for both types of affiliates as provided in Table 1 of Krautheim (2013).

\textsuperscript{5}Yamawaki (1991), Head and Ries (2001), Krautheim (2013) and Felbermayr and Jung (2011) all regard a wholesale affiliate as a method of exporting by the parent firm.
manner:

\[ q = \bar{\phi} h^\alpha l^{1-\alpha}, \quad (2.1) \]

with \( \bar{\phi} \) denoting the firm’s productivity. Given the production structure, the firm faces the following marginal cost from domestic production:

\[ C_S = \frac{1}{\phi}, \quad (2.2) \]

with \( \phi = \bar{\phi} \left( \frac{\omega_h}{\alpha} \right)^\alpha \left( \frac{\omega_l}{1-\alpha} \right)^{1-\alpha} \) being a transformed measure of productivity and \( \omega_h \) and \( \omega_l \) being the (exogenous) wages paid for headquarter and labor services, respectively.

### 2.2.2 Modes of Foreign Market Access

In addition to serving the domestic market, the firm can also serve a foreign market called \( K \), where it faces the following demand for its product: \( q = b D \sigma^{-\sigma} \). \( p \) denotes the firm’s price, \( \sigma > 1 \) denotes the price elasticity of demand, while \( D \) is an exogenous demand shifter. \( b \) is a taste parameter that will be discussed in greater detail below. There are three ways of serving country \( K \): exporting through an arm’s-length intermediary, establishing a wholesale affiliate, and establishing a manufacturing affiliate. Each of these approaches results in different fixed and variable costs, thereby generating different profit streams.\(^6\)

**Exporting Through an Intermediary**

One way of penetrating the foreign market is to export through an intermediary.\(^7\) There is an exogenous mass of identical export intermediaries that can deliver the firm’s product to the foreign market. For simplicity, the fixed costs associated with matching with an intermediary

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\(^6\)Irrespective of how this firm chooses to serve the foreign market, it is assumed that it will always serve the home market through domestic production. Vertical FDI is thereby ruled out.

\(^7\)Akerman (2013), Bernard et al. (2010, 2013), Blum et al. (2010, 2012), and Ahn et al. (2011b) provide empirical evidence that export intermediaries play a key role in facilitating exports.
are normalized to zero, ensuring a perfectly competitive intermediation market. Consequently, intermediaries have no bargaining power and earn zero profits in equilibrium. An advantage of exporting through an intermediary is that the firm does not have to commit resources to establish a presence abroad or to conduct extensive market research. A drawback of this approach is that the firm relinquishes control over the foreign marketing decisions. Instead, as documented by the International Trade Administration, this is left to the intermediary. Export intermediaries typically handle a large set of products, and frequently alter their product mix (see Akerman, 2013; Bernard et al., 2013). Hence, an intermediary has no incentive to extensively market any individual product. Lack of extensive product promotion prevents consumers from learning about the attributes of the product fully, and undermines their confidence in the product. This is captured by the taste parameter $b$ which takes on the value of $\delta < 1$ when the firm exports indirectly.

Delivering the product to country $K$ is subject to shipping costs that are borne by the producer. These costs are modeled in the standard iceberg form, and are denoted by $\tau > 1$. The marginal cost of exporting is therefore

$$C_X = \frac{\tau}{\phi} = \tau C_S. \quad (2.3)$$

Given the demand and cost structures, exporting at arm’s-length yields the following profits

$$\pi_X = \delta AC_X^{1-\sigma}, \quad \text{with} \quad A = \frac{1}{\sigma} \left( \frac{\sigma - 1}{\sigma} \right)^{\sigma-1} D. \quad (2.4)$$

---

8 The results of this chapter are robust to the inclusion of fixed costs of matching with an intermediary. See also footnote 12.

9 The ITA reports that firms exporting at arm’s length typically do not control the marketing or pricing decisions for their products abroad. See chapter 5 of its Basic Guide to Exporting, [http://export.gov/basicguide/eg_main_017244.asp](http://export.gov/basicguide/eg_main_017244.asp).

10 Bernard et al. (2013) report that Italian intermediaries routinely alter their product mix from year to year. In a given year, Italian intermediaries drop 53% of products that they exported outside of the EU the previous year.

11 Blum et al. (2010, 2012) find evidence for negative assertive matching between exporters and Chilean import intermediaries. The focus of this chapter is on multinational firms, which tend to be large firms. Consequently, multinational firms that choose to export at arm’s length are likely to match with a small intermediary. Such an intermediary is unlikely to have the resources necessary to extensively market the firm’s product abroad in a manner that the producer would be able to if it committed the necessary resources.
Wholesale FDI

An alternative way of exporting is to establish a wholesale affiliate in country $K$. The drawback of this manner of exporting is that it entails the payment of a fixed cost of $F_W$, which is paid in units of final output. The benefit of exporting directly, however, is that the firm can retain control over the marketing and pricing decisions. A wholesale affiliate also enables the firm to respond to consumer queries faster and more efficiently (see Oldenski, 2012), which positively affects consumers’ perception of the product’s quality. Hence, $b = 1$ when the firm exports directly to country $K$. A direct presence abroad does not mitigate the costs of shipping the product there from the headquarters. Consequently, the marginal cost from wholesale FDI is the same as from arm’s length exporting, i.e., $C_X$. Total profits from wholesale FDI are therefore

$$\pi_W = AC_X^{1-\sigma} - F_W. \quad (2.5)$$

Manufacturing FDI

The third option available to the firm is to establish a production site in country $K$. This incurs a fixed cost of $F_M > F_W$ units of final output. Akin to wholesale FDI, manufacturing FDI enables the firm to retain control over the pricing and marketing of its product, resulting in $b = 1$. In addition to the fixed cost, multinational production is also associated with variable trade costs due to headquarter services in production (see equation (2.1)). Shipping the input produced by headquarter services $h$ to country $K$ is subject to iceberg trade costs $\tau$. As in Irarrazabal et al. (2013) and Keller and Yeaple (2013), the intermediate is shipped from the parent to the affiliate at marginal cost. Assuming that the cost of labor is the same in both

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12 An alternative approach to interpreting the parameter $b$ is to view it as the share of the producer’s surplus that is kept by the firm. When the intermediary export market is not perfectly competitive, an intermediary can extract a portion of the surplus from the firm. By contrast, a firm that is in control of its exports retains the entire surplus. Such a feature was included in an earlier version of the chapter. Its omission does not alter any of the results.

13 It is recognized that the variable trade cost associated with intermediates are lower than those associated with final goods. Nevertheless, I do not distinguish between the two in order to avoid adding additional notation. My approach has no bearing on the results.
countries, the marginal cost function for a manufacturing affiliate is

\[ C_M = \frac{\tau^\alpha}{\phi} = \tau^\alpha C_S. \]  

(2.6)

Total profits from manufacturing FDI are therefore

\[ \pi_M = AC_M^{1-\sigma} - F_M. \]  

(2.7)

### 2.2.3 Empirical Predictions of Baseline Model

Since the three ways of serving country \( K \) are substitutes, the firm will choose only one of them in equilibrium. Given that there are no fixed costs associated with arm’s-length exporting, the firm will choose that option unless its profits are large enough to justify incurring the fixed costs associated with establishing an affiliate abroad. The productivity cut-off for establishing a wholesale affiliate is

\[ \Phi_W = \tau \left[ \frac{F_W}{A(1-\delta)} \right]^{\frac{1}{\alpha - 1}}, \]  

(2.8)

which is the value of \( \phi \) at which profits from arm’s-length exporting (equation (2.4)) and wholesale FDI (equation (2.5)) are equalized. If the firm’s productivity is below that threshold then it serves country \( K \) through an export intermediary. If \( \phi \) is above \( \Phi_W \), however, than the firm will establish an affiliate in \( K \). Whether it is a wholesale affiliate or a manufacturing one depends on the extent to which the firm’s productivity is greater than \( \Phi_W \). Letting \( T = \tau^{(1-\alpha)(\sigma-1)} > 1 \), we can denote the productivity level at which profits from wholesale FDI (equation (2.5)) are equal to profits from manufacturing FDI (equation (2.7)) by

\[ \Phi_M = \tau \left[ \frac{F_M - F_W}{A(T-1)} \right]^{\frac{1}{\alpha - 1}}. \]  

(2.9)

If \( \phi \in [\Phi_W, \Phi_M] \), then the firm will choose to access country \( K \) through wholesale FDI. It will opt for manufacturing FDI if \( \phi \geq \Phi_M \).
Suppose that the firm’s productivity is drawn from a Pareto distribution with the following
distribution function: \( G(\phi) = 1 - \phi^{-z} \).\(^{14}\) It is then possible to express the probability of the firm
opting for one of the three means of serving market \( K \) in terms of the productivity thresholds \( \Phi_W \) and \( \Phi_M \). These probabilities are summarized in Table 2.1.\(^{15}\) Given the probabilities

displayed in Table 2.1 we can obtain the following testable predictions concerning the impact
of distance on FDI. The probability that the firm will opt for either form of FDI into market
\( K \) relative to the probability that it will choose not to engage in FDI is

\[
\frac{\Pr[\text{FDI into } K]}{\Pr[\text{No FDI in } K]} = \frac{\Pr[\phi \geq \Phi_W]}{\Pr[\phi \leq \Phi_W]} = \frac{1}{\Phi_W - 1}.
\] (2.10)

Combining equation (2.10) with equation (2.8) yields the by now well-known adverse impact
of distance on FDI:

**Prediction B1:** *All else equal, the probability that a firm will establish an affiliate in a foreign
market is decreasing with that market’s distance from the source country.*

Prediction B1 is consistent with the findings of Chen and Moore (2010), Irarrazabal et al.
(2013), Keller and Yeaple (2013) and Yeaple (2009) that distance discourages FDI. The afore-
mentioned papers, however, did not consider the role of distance on the form of FDI chosen by
the firm. Given the probabilities in Table 2.1 it is possible to show that the probability that

\(^{14}\)A Pareto distribution is a close approximation to the size distribution of firms observed in the data. See

\(^{15}\)All three options are realistic in equilibrium if \( \Phi_M > \Phi_W > 1 \), which is satisfied provided that \( \frac{1-\delta}{\gamma-1} F_M > F_W > \frac{A(1-\delta)}{\gamma-1} \).
the firm will establish a wholesale affiliate relative to the probability that it will establish a manufacturing affiliate in country $K$ is:

$$\frac{\Pr \left[ \text{Wholesale FDI} \right]}{\Pr \left[ \text{Manufacturing FDI} \right]} = \frac{\Pr \left[ \Phi_W \leq \phi \leq \Phi_M \right]}{\Pr \left[ \phi \geq \Phi_M \right]} = \left( \frac{\Phi_M}{\Phi_W} \right)^z - 1.$$  \hspace{1cm} (2.11)

Combining equation (2.11) with equations (2.8) and (2.9), it is possible to obtain the following result:

**Prediction B2:** *All else equal, a firm is more likely to establish a manufacturing affiliate relative to a wholesale affiliate in a country that is more distant from the source country.*

The intuition behind both predictions is straightforward. The marginal cost of accessing country $K$ rises with distance. This reduces the firm’s expected profits from serving the market, and discourages it from paying the fixed cost necessary to establish an affiliate in $K$. This gives rise to Prediction B1, which states that a firm is less likely to establish an affiliate in a more distant market. Although the marginal cost of a wholesale affiliate and a manufacturing affiliate are both increasing in distance, the latter rises at a lower rate. Consequently, as in Krautheim (2013), a firm is more likely to substitute away from wholesale FDI and towards manufacturing FDI in more distant countries.

Although empirical support for both predictions B1 and B2 has been found by previous authors, the two propositions have never been tested in a single empirical framework. Moreover, whereas numerous authors have documented the negative impact of distance on FDI (Prediction B1), Krautheim (2013) is the only paper to have tested Prediction B2 using data on German firms. However, Krautheim (2013) did not directly test the impact of distance on the form of FDI chosen by German firms. Rather, he tested whether German MNCs on aggregate were more likely to establish a greater number of affiliates for manufacturing purposes relative to the number of affiliates for wholesale purposes in more distant countries. Since large MNCs typically own multiple affiliates in the same country, his results do not necessarily confirm
2.3 Testing the Baseline Model

2.3.1 Data

I now proceed to test the mechanisms underlying Predictions B1 and B2 using a unique, hand collected dataset on the operations of publicly traded French multinationals in 2010. The focus is on the entry decisions of these firms in 58 countries (see Table 2.2 for the list of countries).\(^\text{16}\) The construction of the dataset proceeded in three stages. First, I obtained a list of publicly traded French multinationals whose primary business is a manufacturing industry from Mergent Online.\(^\text{17}\) This survey frame was supplemented by a list of firms obtained from CreditRiskMonitor’s Worldwide Directory of Public Companies. A listing of each firm’s foreign affiliates in 2010 was then obtained from each firm’s annual financial report for that year.\(^\text{18}\) Lastly, each firm’s operations in a given country were then classified as being either

<table>
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<tr>
<th>Country 1</th>
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<th>Country 5</th>
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<tr>
<td>China(^\text{a})</td>
<td>Greece</td>
<td>Lithuania</td>
<td>Portugal</td>
<td>Switzerland</td>
<td></td>
</tr>
</tbody>
</table>

\(^{a}\) I treat China and Hong Kong as one country.

\(^{16}\)The 58 countries examined accounted for nearly 95% of French outbound FDI in 2006 (the final year for which there is data on all countries). Source: OECD Globalization database, [http://stats.oecd.org/Index.aspx?DatasetCode=FDI_FLOW_PARTNER#](http://stats.oecd.org/Index.aspx?DatasetCode=FDI_FLOW_PARTNER#).

\(^{17}\)Mergent Online contains data on both active and inactive corporate entities that account for 95% of total stock market value.

\(^{18}\)Every publicly traded multinational firm lists its foreign holdings in its annual financial report. Most firms make their annual reports available in the finance section of the parent’s website. Annual reports can also be
manufacturing or wholesale.\textsuperscript{19} A firm is considered to engage in manufacturing in a given country if the parent owns at least one production site in the country.

A number of different data sources were used in order to classify a firm’s affiliates as engaging in either manufacturing or in wholesale. The primary resource is a firm’s annual financial reports. Many firms give a detailed breakdown of their foreign operations in their financial statements, including the location of their production sites. A number of firms also provide this information on the parent’s or the affiliate’s website. I also rely upon national business directories; many countries provide a searchable database of business entities registered within their borders, which provide information on an establishment’s main line of business. Additional sources of information include Factiva, Hoover’s, and ISI Emerging Markets. Factiva is a database operated by Dow Jones that provides balance sheet data and lists the primary business activity of a large number of companies throughout the world, including both parent companies as well as subsidiaries. Hoover’s is operated by Dun & Bradstreet and provides information similar to that of Factiva. Lastly, ISI Emerging Markets is operated by Euromoney Institutional Investor. It provides information similar to Factiva and Hoover’s, though its focus is restricted to emerging markets such as Eastern Europe, Latin America and Southeast Asia.

2.3.2 Summary Statistics

The sample is comprised of 2115 affiliates belonging to 163 firms whose primary business is a manufacturing industry. 1102 of these are manufacturing affiliates and 1013 are wholesale affiliates. This breakdown reveals that wholesale affiliates are nearly as common as manufacturing affiliates, suggesting that wholesale FDI is a highly prevalent form of foreign market access for French MNCs. Among the 163 firms in the sample, 132 operate at least one manufacturing affiliate and 136 firms operate at least one wholesale affiliate.\textsuperscript{20} 105 firms operate at least one affiliate of both types.

\textsuperscript{19}I omit all holding and financial companies.
\textsuperscript{20}All 163 firms operate at least one production facility in France.
Table 2.3 presents summary statistics. The average firm owns nearly 13 affiliates in total, suggesting that the firms in the sample are quite large, which is to be expected since the sample is comprised of publicly traded firms only. As is common in firm level datasets, the data is heavily skewed towards the most globally-engaged firms; nearly a quarter of the 2115 foreign affiliates in the sample belong to just the 10 most globally-engaged firms.21 This is evident in Figure 2.1 which plots the kernel density estimates for the distribution of the number of affiliates established by the firms in the sample. Notice that all three distributions have long tails with the mass concentrated on the left. That means that most of the firms in the sample own a small number of affiliates, whereas a small minority own many affiliates.

Table 2.3: Summary Statistics on Affiliate Ownership

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Affiliates</td>
<td>12.98</td>
<td>13.36</td>
<td>1.42</td>
</tr>
<tr>
<td>Number of Manufacturing Affiliates</td>
<td>6.76</td>
<td>8.95</td>
<td>2.21</td>
</tr>
<tr>
<td>Number of Wholesale Affiliates</td>
<td>6.21</td>
<td>7.89</td>
<td>1.82</td>
</tr>
</tbody>
</table>

21The 10 most globally-engaged firms are (in alphabetical order): Air Liquide, Compagnie de Saint-Gobain, Danone, L’Oréal, LVMH Moët Hennessy-Louis Vuitton, Michelin, Pernod Ricard, Sanofi-Aventis, Schneider Electric, and Sequana.
FDI of both forms is also heavily concentrated in a small number of destinations, as can be seen in Figure 2.2 and Tables 2.4 and 2.5. Figure 2.2 provides the kernel density plots for the number of countries that the firms in the sample enter on aggregate, as well as broken down by form of entry. As in Figure 2.1, the mass of the distribution is concentrated on the left, although the tails are considerably shorter. Table 2.4 presents the 15 most popular destinations for FDI on aggregate in terms of the number of entrants, as well as a breakdown of the most popular destinations for manufacturing FDI and wholesale FDI. It is not uncommon for some countries to receive a large amount of manufacturing FDI and a small amount of wholesale FDI, and vice versa. For example, whereas Japan, Norway and Singapore are popular destinations for wholesale FDI, they are not among the main recipients of manufacturing FDI. Conversely, Brazil, India, Poland and the US receive a disproportionate amount of manufacturing FDI relative to wholesale FDI. Not all countries fall within one of these two categories, however. Rather, countries such as the Czech Republic, Russia and Switzerland attract both forms of FDI in roughly equal proportions.

Figure 2.2 and Table 2.4 suggest that manufacturing FDI is more heavily concentrated in the top destinations than wholesale FDI. This is apparent in Table 2.5 which presents summary
Table 2.4: 15 Most Popular Destinations for FDI

<table>
<thead>
<tr>
<th>Rank</th>
<th>All Affiliates</th>
<th>Manufacturing Affiliates</th>
<th>Wholesale Affiliates</th>
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<tr>
<td></td>
<td>Country</td>
<td>No. of Firms</td>
<td>Country</td>
</tr>
<tr>
<td>1</td>
<td>US</td>
<td>112</td>
<td>US</td>
</tr>
<tr>
<td>2</td>
<td>UK</td>
<td>98</td>
<td>Spain</td>
</tr>
<tr>
<td>3</td>
<td>Spain</td>
<td>97</td>
<td>China</td>
</tr>
<tr>
<td>4</td>
<td>Germany</td>
<td>95</td>
<td>UK</td>
</tr>
<tr>
<td>5</td>
<td>Italy</td>
<td>85</td>
<td>Germany</td>
</tr>
<tr>
<td>6</td>
<td>China</td>
<td>82</td>
<td>Italy</td>
</tr>
<tr>
<td>7</td>
<td>Belgium</td>
<td>75</td>
<td>Brazil</td>
</tr>
<tr>
<td>8</td>
<td>Poland</td>
<td>64</td>
<td>Poland</td>
</tr>
<tr>
<td>9</td>
<td>Brazil</td>
<td>59</td>
<td>Canada</td>
</tr>
<tr>
<td>10</td>
<td>Nether., Switz.</td>
<td>57</td>
<td>India</td>
</tr>
<tr>
<td>11</td>
<td>Japan</td>
<td>51</td>
<td>Mexico</td>
</tr>
<tr>
<td>12</td>
<td>Canada, Mexico</td>
<td>50</td>
<td>Belgium</td>
</tr>
<tr>
<td>13</td>
<td>Czech Republic</td>
<td>49</td>
<td>Romania</td>
</tr>
<tr>
<td>14</td>
<td>Australia</td>
<td>46</td>
<td>S. Africa, Switz.</td>
</tr>
<tr>
<td>15</td>
<td>India</td>
<td>45</td>
<td>Czech Rep., Russia</td>
</tr>
</tbody>
</table>

statistics for the number of affiliates established in the average country in total, as well as a breakdown by affiliate type. Although all three distributions are heavily skewed, the skewness

Table 2.5: Summary Statistics on Number of Affiliates by Country

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Affiliates</td>
<td>36.47</td>
<td>26.00</td>
<td>1.12</td>
</tr>
<tr>
<td>Number of Manufacturing Affiliates</td>
<td>19.00</td>
<td>16.97</td>
<td>1.34</td>
</tr>
<tr>
<td>Number of Wholesale Affiliates</td>
<td>17.47</td>
<td>11.68</td>
<td>0.81</td>
</tr>
</tbody>
</table>

of the number of wholesale affiliates is 0.81 compared to a skewness of 1.34 for the number of manufacturing affiliates. This suggests that the well-known deviations from the ‘pecking-order’ suggested by heterogeneous firms models of international trade should be more pronounced when it comes to wholesale affiliates than for manufacturing affiliates.\(^{22}\)

\(^{22}\)See Yeaple (2009) for a discussion of the deviation from the pecking order observed in the affiliate location decisions of US MNCs.
2.3.3 Gravity Variables

The firm-level dataset is complemented by the gravity variables that have been shown to influence a firm’s affiliate location decision. Population and real PPP-adjusted GDP are obtained from the World Economic Outlook database of the IMF. Both are used to obtain each country’s real per-capita GDP. Data on bilateral distance as well as dummy variables indicating that the host borders France, was once colonized by it, or where French is an official language were obtained from CEPII (Mayer and Zignago, 2011). I use data on GDP and distance to construct each country’s surrounding market potential. Similar to Blonigen et al. (2007),

\[ SMP_i = \sum_{j \neq i, F} \frac{GDP_j}{d_{ij}}, \]

is the distance-weighted sum of the GDPs of all countries in the world other than \( i \) and France. \( SMP_i \) reflects the alternative investment options for a firm in geographic proximity to country \( i \). Holding \( GDP_i \) constant, an increase in \( SMP_i \) makes country \( i \) a less attractive destination relative to its neighbors.

Table 2.6: Summary of Macro Variables and Data Sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data Source</th>
<th>Average</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>WDI</td>
<td>26.38</td>
<td>1.41</td>
</tr>
<tr>
<td>GDP per Capita</td>
<td>WDI</td>
<td>9.45</td>
<td>0.80</td>
</tr>
<tr>
<td>Distance</td>
<td>CEPII</td>
<td>7.96</td>
<td>1.09</td>
</tr>
<tr>
<td>SMP</td>
<td>WDI, CEPII</td>
<td>23.55</td>
<td>0.45</td>
</tr>
<tr>
<td>Import Freedom</td>
<td>Doing Business</td>
<td>0.93</td>
<td>0.71</td>
</tr>
</tbody>
</table>

In addition to distance, I also control for various trade restrictions that countries put in place that impose a burden on importing. The World Bank’s Doing Business database contains three types of non-tariff import restrictions: (i) the number of days that it takes to import a container, (ii) the number of documents necessary to import a container, and (iii) the monetary cost of importing a container. Bernard et al. (2013) point out that these three indicators are correlated. Hence, I follow their approach by using the primary factor derived from principal component analysis of these three variables. The constructed variable is called Import Freedom,

---

23 Yeaple (2009) finds that a country’s distance from the US, a dummy variable denoting that English is its main language, its GDP and its per-capita GDP can explain nearly three-quarters of the variation in the number of firms investing in a given country as well as their aggregate sales there.
with lower value indicating more restrictive import regulations. Table 2.6 provides summary statistics for all continuous gravity variables.

2.3.4 Estimation Strategy

To recap, the baseline model outlined in Section 2 makes the following empirical predictions:

1. All else equal, a firm is less likely to establish an affiliate in a more distant country.

2. All else equal, a firm is more likely to establish a manufacturing affiliate rather than a wholesale affiliate in a more distant country.

These predictions are based on equations (2.10) and (2.11). Both equations have a common element: the productivity cut-off for the establishment of a wholesale affiliate, $\Phi_W$. Hence, the two predictions can be tested within a single empirical framework through multinomial logit estimation. In every country $i$, each firm $f$ is observed as being in one of three states of the world: (i) having a manufacturing affiliate, (ii) having a wholesale affiliate, and (iii) not having an affiliate of either sort. Let $E \in \{\emptyset, W, M\}$ denote the firm's entry decision, where $E = \emptyset$ denotes that the firm chooses not to establish any affiliate, whereas $E = W$ and $E = M$ denote that the firm enters by establishing a wholesale or a manufacturing affiliate, respectively. Setting $E = W$ as the base outcome gives us the following two logit regressions:

$$
\ln \left( \frac{\Pr[E_{fi} = M]}{\Pr[E_{fi} = W]} \right) = \beta_i \Pi + \alpha_f + u_{fi},
$$

$$
\ln \left( \frac{\Pr[E_{fi} = \emptyset]}{\Pr[E_{fi} = W]} \right) = \delta_i \Gamma + \rho_f + \varepsilon_{fi}.
$$

$G_i$ is a vector of gravity variables for country $i$ with $\Pi$ and $\Gamma$ being vectors of corresponding parameter estimates. $\alpha_f$ and $\rho_f$ denote firm fixed effects for each regression, which control for unobservable firm characteristics such as productivity. The first part of equation (2.12) informs us as to how a change in the independent variables impacts the probability of a firm establishing
a manufacturing affiliate relative to a wholesale one (the inverse of equation (2.11)). The second part of equation (2.12) presents the impact of the explanatory variables on the probability of a firm not establishing an affiliate of either type relative to the probability of it establishing a wholesale affiliate (the inverse of equation (2.10)).

The coefficient estimates from multinomial logit estimation inform us as to how a change in a covariate impacts the logarithm of the odds ratio. The odds ratio is simply the probability of one event occurring relative to the probability of an alternative taking place. Table 2.7 presents the probabilities observed in the data of each option being chosen as well as the odds ratio for each option relative to $E = W$ as the base outcome. A positive coefficient in the first regression means that an increase in the regressor increases the log odds of $M$ being chosen relative to $W$. A positive coefficient in the second regression means that an increase in the value of the regressor raises the log odds of $\emptyset$ being chosen relative to $W$. When discussing the impact of a covariate, I focus on the odds ratio rather than the log odds.

<table>
<thead>
<tr>
<th>Observed Firm Decision</th>
<th>Probability</th>
<th>Odds (Relative to Est. Wholesale Affiliate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Affiliate</td>
<td>0.117</td>
<td>$0.117/0.107 = 1.093$</td>
</tr>
<tr>
<td>Wholesale Affiliate</td>
<td>0.107</td>
<td>$0.107/0.107 = 1.000$</td>
</tr>
<tr>
<td>No Affiliate</td>
<td>0.776</td>
<td>$0.776/0.107 = 7.252$</td>
</tr>
</tbody>
</table>

### 2.3.5 Estimation Results

The international trade literature has commonly assumed that wholesale affiliates are a form of exporting by the parent company, and not a form of FDI. Such was the assumption underlying the baseline model. To the best of my knowledge, the only test of this hypothesis was conducted by Krautheim (2013). Conditioning solely on a host country’s distance from Germany, Krautheim (2013) found that German firms are more likely to establish manufacturing subsidiaries over wholesale subsidiaries in more distant countries. His findings are consistent
with the view that wholesale affiliates are simply a form of exporting by the parent company.\footnote{Recall that the proximity-concentration trade-off framework suggests that firms prefer manufacturing FDI relative to exporting in more distant countries to economize on transportation costs.} Table 2.8 examines whether Krauhteim’s findings can be generalized to firms outside of Germany. The top panel of Table 2.8 presents the impact of the explanatory variables on a firm’s choice between a manufacturing and a wholesale affiliate whereas the bottom panel looks at the impact of those variables on the firm’s choice between not conducting FDI of either sort and establishing a wholesale affiliate.

Column (1) examines the impact of distance on the entry decision of French firms without controlling for any other country characteristics. The sign on the coefficient estimates are consistent with the findings of Krautheim (2013) and with the predictions of the baseline model: firms are less likely to conduct FDI in more distant countries, and are more likely to opt for manufacturing FDI if they choose to enter. A one standard deviation increase in a country’s distance from France increases the odds of staying out by about 50%, and increases the odds of establishing a manufacturing affiliate over a wholesale affiliate by about 20%. These findings are consistent with the predominant view that wholesale affiliates are primarily established to facilitate exporting by the parent company.

The results from column (1) are susceptible to omitted variable bias, since I have not included controls for other variables that have been found to impact a multinational firm’s affiliate location decision. I do so in columns (2)-(4). In column (2) I condition for trade freedom and in column (3) I condition for the other standard gravity variables — GDP, GDP per capita, contiguity, common language and colonial history.\footnote{Krautheim (2013) did not condition on the other gravity variables such as GDP, per-capita GDP, SMP, etc.} Distance remains a significant impediment to FDI, as a one standard deviation increase in distance from France increase the odds of staying out of the market by over 50%. By contrast, distance exhibits no statistically significant effect on the choice between a wholesale and a manufacturing affiliate once the other gravity variables are included in column (3).

The impact of distance on a firm’s choice regarding the form of FDI becomes yet more
## Table 2.8: Impact of Gravity Variables on Entry Decision

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\ln \frac{Pr[E=M]}{Pr[E=W]}): (log) probability of entering through a manufacturing affiliate relative to entering through a wholesale affiliate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance(_i,FR)</td>
<td>0.165***</td>
<td>0.127**</td>
<td>-0.102</td>
<td>-0.247**</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.051)</td>
<td>(0.069)</td>
<td>(0.099)</td>
</tr>
<tr>
<td>Import Freedom(_i)</td>
<td>-0.294***</td>
<td>-0.173**</td>
<td>-0.120</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.081)</td>
<td>(0.084)</td>
<td></td>
</tr>
<tr>
<td>GDP(_i)</td>
<td></td>
<td></td>
<td>0.375***</td>
<td>0.363***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.070)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>GDP per Capita(_i)</td>
<td></td>
<td></td>
<td>-0.410***</td>
<td>-0.410***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.090)</td>
<td>(0.090)</td>
</tr>
<tr>
<td>Contiguity(_i,FR)</td>
<td></td>
<td></td>
<td>0.174</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.185)</td>
<td>(0.189)</td>
</tr>
<tr>
<td>French(_i)</td>
<td></td>
<td></td>
<td>0.090</td>
<td>0.213</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.213)</td>
<td>(0.219)</td>
</tr>
<tr>
<td>Colony(_i,FR)</td>
<td></td>
<td></td>
<td>0.805***</td>
<td>0.663***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.206)</td>
<td>(0.203)</td>
</tr>
<tr>
<td>SMP(_i)</td>
<td></td>
<td></td>
<td></td>
<td>-0.500**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.232)</td>
</tr>
<tr>
<td>(\ln \frac{Pr[E=Ø]}{Pr[E=W]}): (log) probability of no affiliate being established relative to entering through a wholesale affiliate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance(_i,FR)</td>
<td>0.377***</td>
<td>0.312***</td>
<td>0.398***</td>
<td>0.449***</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.055)</td>
<td>(0.071)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>Import Freedom(_i)</td>
<td>-0.489***</td>
<td>-0.267***</td>
<td>-0.284***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.069)</td>
<td>(0.068)</td>
<td></td>
</tr>
<tr>
<td>GDP(_i)</td>
<td></td>
<td></td>
<td>-0.654***</td>
<td>-0.652***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.050)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>GDP per Capita(_i)</td>
<td></td>
<td></td>
<td>-0.318***</td>
<td>-0.317***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.086)</td>
<td>(0.085)</td>
</tr>
<tr>
<td>Contiguity(_i,FR)</td>
<td></td>
<td></td>
<td>-0.818***</td>
<td>-0.785***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.170)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>French(_i)</td>
<td></td>
<td></td>
<td>0.253</td>
<td>0.234</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.194)</td>
<td>(0.198)</td>
</tr>
<tr>
<td>Colony(_i,FR)</td>
<td></td>
<td></td>
<td>0.136</td>
<td>0.157</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.203)</td>
<td>(0.200)</td>
</tr>
<tr>
<td>SMP(_i)</td>
<td></td>
<td></td>
<td></td>
<td>0.152</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.181)</td>
</tr>
</tbody>
</table>

### Notes
1) *** p < 0.01, ** p < 0.05, * p < 0.1. 2) All regressions include firm fixed effects. 3) Robust standard errors are clustered at the firm level.
perplexing in column (4). Including the surrounding market potential variable makes the coefficient on distance in the top panel significant again — but flips its sign from positive to negative! Increasing a country’s distance from France by one standard deviation makes it about 24% less likely that a firm will establish a manufacturing affiliate in the country relative to a wholesale affiliate, all else equal.

Why does distance appear to have an effect opposite of the one predicted by Prediction B2? One possible explanation pertains to the impact of GDP and SMP on the affiliate location decision of multinational firms. French MNCs are found to be significantly less likely to establish manufacturing affiliates relative to wholesale affiliates in countries with larger neighbors; all else equal, a one standard deviation increase in SMP lowers the odds of establishing a manufacturing affiliate relative to a wholesale affiliate by about 18%. Notice also that a firm is significantly more likely to establish an affiliate in a country with a higher GDP — a one standard deviation increase in GDP raises the odds of establishing a manufacturing affiliate relative to a wholesale affiliate by 62%. The two results are connected. A country’s SMP is increasing in the GDP’s of its neighbors. Since a firm is more likely to establish a manufacturing affiliate in a country with a large GDP, it is also more likely to have manufacturing affiliates in geographic proximity to a country with a large SMP. Since manufacturing affiliates are commonly used as export platforms to serve nearby countries (Antràs and Foley, 2011; Bilir et al., 2013; Ramondo et al., 2013), a firm with manufacturing affiliates in geographic proximity to a given market no longer needs to supply that market from France. As I will now proceed to show in a three-country extension of the baseline model, export-platform affiliate sales alter the relationship between distance and the form of FDI chosen by the firm.

2.4 A Three-Country Model of Regional Portfolios

In this section I outline a three-country extension of the baseline model. The main modification comes from its view of the purpose of wholesale affiliates. If wholesale affiliates are simply a form of exporting — or ‘export-supporting FDI’ to use the parlance of Krautheim (2013) —
then there is every reason to expect that firms will opt for a manufacturing affiliate over a wholesale affiliate in more distant countries as is predicted by standard models based on the proximity concentration trade-off. As we saw from the regression results in Table 2.8, however, this view is soundly rejected by the data. If, on the other hand, we regard wholesale affiliates as part of a multinational firm’s regional portfolio, then it becomes apparent that the impact of distance on a firm’s choice between a wholesale and a manufacturing affiliate is no longer governed by the proximity-concentration trade-off.

Before describing the three-country model, it is useful to examine the operations of the French company Bic as it will illustrate the mechanisms at work. Bic is among the world’s most famous manufacturers of stationary products. Figure 2.3 displays the location of its manufacturing and wholesale affiliates in 2010.26 Even a cursory glance at Figure 2.3 reveals that the baseline model is missing an important element. Bic’s manufacturing affiliates are scattered throughout the world. Consequently, most potential markets are closer to at least one manufacturing affiliate than they are to the parent company. Since it is cheaper to supply Argentina from Brazil than from France, establishing a manufacturing affiliate in Brazil increases potential export profits in Argentina. This increases Bic’s incentive to establish a wholesale

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26This picture is based upon the information provided in Bic’s 2010 registration document. It can be downloaded from: [http://www.bicworld.com/img/pdf/BIC_RegDoc2010_31MAR11_4.7Mo0.pdf](http://www.bicworld.com/img/pdf/BIC_RegDoc2010_31MAR11_4.7Mo0.pdf)
affiliate in Argentina in order to be in charge of the marketing and distribution of the firm’s products. Hence, as can be seen from the map in Figure 2.3, most of Bic’s manufacturing affiliates are surrounded by wholesale affiliates. Given that Bic can supply the Argentine market from Brazil, a manufacturing presence in the latter reduces the benefits from establishing an additional manufacturing site in the former. Consequently, while Bic has a manufacturing presence in every region of the world, it does not have too many manufacturing sites in any single region. As I will now proceed to show, a three-country extension of the baseline model can replicate these results and provide an explanation for the seemingly wrong coefficient on distance in Table 2.8.

2.4.1 Geography

Consider again the monopolist based in country $S$. In addition to serving country $K$, this firm can now serve an additional country called $L$. For the sake of tractability it is assumed that the two foreign markets are alike in all respects except for their distance from $S$. Let country $K$ be the more proximate market, such that $\tau_L > \tau_K$, with $\tau_i$ denoting the distance between country $i$ and $S$. In order to focus on the use of manufacturing affiliates as export platforms, it is assumed that countries $K$ and $L$ are closer to each other than either one is to $S$. The distance between them is denoted by $t$.

2.4.2 Export-Platform Affiliate Sales

As in the baseline model, the firm has three ways of accessing each market: exporting through an intermediary, establishing a wholesale affiliate, or establishing a manufacturing affiliate. In addition, if the firm has a manufacturing affiliate in $K$, then it can use it to supply country $L$ if doing so is more cost-effective than exporting from the headquarters.\footnote{Given that $K$ is the more lucrative market, the firm will never find it profitable to operate a manufacturing affiliate in $L$ without operating one in $K$ as well. Hence, while exporting from a manufacturing affiliate in $L$ to $K$ is a feasible option, it is one that will never be chosen in equilibrium and is therefore ignored.} Since manufacturing affiliates are reliant upon intermediates imported from the parent company, $t < \tau_L$ does not
ensure that a foreign production site will be used as an export platform. To understand why, it is necessary to compare the marginal cost of exporting to country \(L\) from the headquarters with the marginal cost of exporting to \(L\) from a manufacturing affiliate in \(K\). The former is \(\tau_L C_S\), whereas the latter is \(tC_M^K\), where \(C_M^K = \tau_K C_S\) is the marginal cost of a manufacturing affiliate in \(K\). Given this marginal cost structure, a necessary condition for export-platform affiliate sales to be a profitable option is for

\[
t < \frac{\tau_L}{\tau_K}.
\]  

(2.13)

It will be assumed that \(K\) and \(L\) are sufficiently proximate to each other such that equation (2.13) is satisfied.

The presence of third country effects does not alter the firm’s choice between arm’s-length exporting and establishing a wholesale affiliate in the more lucrative market \(K\). Consequently, \(\Phi_W^K\) is as defined in equation (2.8). Third country effects do alter the firm’s choice between a manufacturing and a wholesale affiliate in country \(K\), since an establishment of a manufacturing site in \(K\) enables the firm to increase its profits in \(L\). If the firm establishes a wholesale affiliate in \(K\) and serves \(L\) through an intermediary, it earns total profits of

\[
A(\tau_K C_S)^{1-\sigma} + \delta A(\tau_L C_S)^{1-\sigma} - F_W.
\]  

(2.14)

Since the establishment of a manufacturing affiliate in \(K\) reduces the firm’s marginal cost for serving \(L\), the total profits from manufacturing FDI are

\[
A(C_M^K)^{1-\sigma} + \delta A(tC_M^K)^{1-\sigma} - F_M.
\]  

(2.15)

The firm is indifferent between the two if both approaches yield the same profits. Such is the
case if the firm’s productivity is equal to

\[
\Phi^K_M = \tau_K \left[ \frac{F_M - F_W}{A \left( T_K (1 + \delta t^{1-\sigma}) - 1 - \delta \left( \frac{\tau_K}{\tau_L} \right)^{\sigma-1} \right)} \right]^{\frac{1}{\sigma-1}}. \tag{2.16}
\]

The firm will establish a manufacturing affiliate in \(K\) if \(\phi > \Phi^K_M\). In that case, it will still supply \(L\) through an intermediary, but the exports will originate from the manufacturing affiliate in \(K\), not from the parent company in \(S\).

Suppose now that the firm has a manufacturing affiliate in \(K\) and is contemplating whether to establish a wholesale affiliate in \(L\) or to continue exporting at arm’s-length. The former option yields profits of

\[
\pi^L_W = A \left( tC^K_M \right)^{1-\sigma} - F_W, \tag{2.17}
\]

whereas the latter option yields profits of

\[
\pi^X = \delta A \left( tC^K_M \right)^{1-\sigma}. \tag{2.18}
\]

The firm is just indifferent between the two if its productivity level \(\phi\) is equal to

\[
\Phi^L_W = t^{\alpha} \left[ \frac{F_W}{A(1 - \delta)} \right]^{\frac{1}{\sigma-1}}. \tag{2.19}
\]

If \(\phi \leq \Phi^L_W\), then the firm exports to \(L\) through an intermediary. Otherwise, it establishes an affiliate in \(L\) in addition to its affiliate in \(K\).

\[\text{28Wholesale FDI and manufacturing FDI exist as realistic options in equilibrium provided that } \Phi^K_M > \Phi^K_W, \text{ which is the case if } F_M > \frac{F_W}{1 - \frac{\tau_K}{\tau_L} (1 + \delta t^{1-\sigma}) - \delta \left[ 1 + \left( \frac{\tau_K}{\tau_L} \right)^{\sigma-1} \right]} \text{. It is assumed that the parameters of the model satisfy this inequality.}\]

\[\text{29This is the sequence of events provided that } \left( \frac{\tau_K}{\tau_L} \right)^{\sigma-1} > \frac{1 - \frac{\tau_K}{\tau_L} \left( \frac{F_M - F_W}{F_W} \right)}{t^{\alpha} \left( \frac{F_M - F_W}{F_W} \right)} \text{ where } T_K = t^{(1-\alpha)(\sigma-1)}. \text{ That is, if the productivity cut-off for manufacturing FDI into } K \text{ is lower than the productivity cut-off of wholesale FDI into } L.\]

54
The final option available to the firm is to establish a manufacturing affiliate in L in addition to its production site in K. Such an affiliate would operate with a marginal cost of

\[ C_{LM}^L = \tau_L^\alpha C_S, \quad (2.20) \]

and generate profits of

\[ \pi_{LM}^L = A\left(C_{LM}^L\right)^{1-\sigma} - F_M. \quad (2.21) \]

Combining (2.17) and (2.21), we can see that the firm is indifferent between the two forms of FDI in L only if its productivity level is equal to

\[ \Phi_{LM}^L = t\tau_K^\alpha \left[ \frac{F_M - F_W}{A\left(\frac{t\tau_K^\alpha}{t\tau_L^\alpha}\right)^{\sigma-1} - 1} \right]^{\frac{1}{\sigma-1}}. \quad (2.22) \]

As long as \( \phi \) lies within the range \([\Phi_{LM}^L, \Phi_{LM}^W]\), the firm prefers to serve country L via a wholesale affiliate. It will establish a duplicate manufacturing site in L only if \( \phi \geq \Phi_{LM}^L \).

### 2.4.3 Empirical Predictions of the Three-Country Model

We can now compare the empirical predictions of the three-country model with those of the baseline model. In a standard two-country framework, the firm is always more likely to establish a manufacturing affiliate relative to a wholesale affiliate in the more distant country L. In a three-country setting, however, the opposite is true when equation (2.13) holds. By establishing a manufacturing affiliate in country K, the firm reduces the cost of supplying nearby markets. This increases the incentive to establish a wholesale affiliate in order to be in control over the marketing and pricing decisions for the product. At the same time, a manufacturing affiliate in K reduces the incentive to establish a duplicate production site in country L, because such a site would require the importation of headquarter services from the parent. Hence, for a given

\[ ^{30}\Phi_M^L > \Phi_W^L \text{ if } F_M > F_W \frac{\left(\frac{t\tau_K^\alpha}{t\tau_L^\alpha}\right)^{\sigma-1} - 1}{1-\sigma}, \text{ which is assumed to hold.} \]
distance between $S$ and $K$, a marginal increase in $\tau_L$ raises the marginal cost of a potential manufacturing affiliate in $L$ relative to the marginal cost of importing the product from the production site in $K$. This discourages the firm from establishing a manufacturing site in $L$ when it has a manufacturing site in the nearby market $K$.

More formally, let $\lambda_L$ denote the odds that the firm will establish a wholesale affiliate in country $L$ relative to not establishing any affiliate there in a three-country setting. From (2.10) and (2.19), we get

$$\lambda_L = \frac{1}{(t^{\alpha_K})^z \left[ \frac{F_W}{A(1-\delta)} \right]^{\sigma-1} - 1}. \quad (2.23)$$

Letting $\hat{\lambda}_L$ denote the comparable odds ratio in the absence of third-country effects gives

$$\hat{\lambda}_L = \frac{1}{\tau_L^z \left[ \frac{F_W}{A(1-\delta)} \right]^{\sigma-1} - 1}. \quad (2.24)$$

If the inequality in (2.13) is satisfied, then $\lambda_L > \hat{\lambda}_L$. Hence, the firm is more likely to establish an affiliate in a country in geographic proximity to an existing manufacturing site. This is the entry effect resulting from export-platform affiliate sales.

**Prediction T1:** Establishing a manufacturing affiliate in country $K$ increases the odds of a firm establishing a wholesale affiliate relative to not conducting FDI of any kind in country $L$ when equation (2.13) holds.

In addition to influencing the decision to conduct FDI, a nearby manufacturing affiliate also transforms the firm’s preference between manufacturing and wholesale FDI. To see this, let $\theta_L$ denote the odds that the firm establishes a wholesale affiliate relative to a manufacturing
affiliate in country $L$ in the three-country framework. We can express $\theta_L$ as

$$
\theta_L = \left[ \frac{F_M - F_W}{F_W} \frac{1 - \delta}{\left( \frac{\tau_K}{\tau_L} \right)^{\sigma-1} - 1} \right]^{\frac{1}{\sigma-1}} - 1.
$$

(2.25)

Let $\hat{\theta}_L$ denote the comparable odds ratio in a two-country framework. Using equations (2.8) and (2.9), we get

$$
\hat{\theta}_L = \left[ \frac{F_M - F_W}{F_W} \frac{1 - \delta}{T_L - 1} \right]^{\frac{1}{\sigma-1}} - 1.
$$

(2.26)

It is straightforward to verify that $\theta_L > \hat{\theta}_L$, meaning that the firm is more likely to opt for a wholesale affiliate relative to a manufacturing affiliate if it has a manufacturing affiliate nearby that can be used as an export platform. This is the substitution effect.

**Prediction T2:** Establishing a manufacturing affiliate in country $K$ increases the odds of a firm establishing a wholesale affiliate relative to a manufacturing subsidiary in country $L$ when equation (2.13) holds.

The baseline model predicted that an increase in distance from the source country shifts the firm’s preference away from wholesale FDI and towards manufacturing FDI. We saw from the regression results in Table 2.8 that such an hypothesis is soundly rejected by the data. The three-country model illustrates why. Let $\theta_K$ denote the odds that the firm establishes a wholesale affiliate relative to a manufacturing affiliate in $K$. Given (2.8) and (2.16), we can express this odds ratio as follows:

$$
\theta_K = \left[ \frac{F_M - F_W}{F_W} \frac{1 - \delta}{T_K \left( 1 + \delta t_1^1 - \sigma \right) - 1 - \delta \left( \frac{\tau_K}{\tau_L} \right)^{\sigma-1}} \right]^{\frac{1}{\sigma-1}} - 1.
$$

(2.27)

Exploiting the inequality in (2.13), it is possible to show that $\theta_L > \theta_K$. This means that the firm is more likely to establish a wholesale affiliate rather than a manufacturing affiliate in the
more distant country $L$.

**Prediction T3:** If equation (2.13) holds, then the odds of establishing a wholesale affiliate relative to a manufacturing affiliate are higher in the more distant market $L$ than in the more nearby market $K$. Moreover, an increase in $\tau_L$ increases the odds of establishing a wholesale affiliate in $L$ even further.

Prediction T3 is more likely to hold for destinations that are close to a firm's existing manufacturing sites. Notice that the productivity cut-off for wholesale FDI into country $L$ — $\Phi^L_W$ — is independent of $\tau_L$. Such is the case because changes in the direct distance between $L$ and $S$ play no role in the firm’s profits from establishing a wholesale affiliate in $L$ when it has a manufacturing site in a nearby market $K$. By contrast, an increase in $\tau_L$ does affect the firm’s profits from manufacturing FDI, since the headquarters would have to supply the manufacturing affiliate with headquarter services. Hence, in the presence of third-country affects, a nearby manufacturing affiliate alters the impact of distance on the firm’s choice between a manufacturing and a wholesale affiliate in a manner consistent with the results from Table 2.8.

### 2.5 Testing the Three-Country Model

#### 2.5.1 Empirical Strategy

In order to test Predictions T1-T3 it is necessary to control for a firm’s operations in geographic proximity for each of the 58 destinations. In the single-product firm model outlined above, a sole production site in a nearby country is sufficient to generate the results outlined in Predictions T1-T3. Most multinational firms, however, produce multiple products, and rarely produce their entire product range within a single foreign market. Instead, multinational firms typically produce their products in a group of countries within a given region. For example, the French cosmetics manufacturer L’Oréal’s produces luxury products in Japan, but not in China. The
reverse is true for consumer products. Similarly, it produces dermatological products in Canada but not in the US, while both luxury and consumer products are produced in the US but not in Canada. A similar example abounds in the tire industry, as Michelin produces tires for heavy equipment trucks in Brazil and tires for small trucks and passenger cars in Colombia. Nor is such an approach confined to firms that produce relatively light products such as cosmetics or tires. The Argentine affiliate of automobile manufacturer Peugeot produces models such as the Berlingo van which are not produced by its Brazilian affiliate. However, its Brazilian affiliate produces the Hoggar concept car, which the Argentine affiliate does not. Hence, a single production site nearby may not necessarily impact a firm’s entry decision into a neighboring country, particularly for firms that produce a large number of varieties. However, as the number of products that a firm produces in geographic proximity rises, so does the incentive to establish a wholesale affiliate in the target country in order to coordinate the exports of the various nearby manufacturing affiliates. Such an incentive is particularly strong since the alternative would be to retain multiple export intermediaries, which is costly. Consequently, the variable of interest is the firm’s manufacturing operations in close geographic proximity to a given host country.

33 There exist several explanations as to why firms choose to produce different products in a number of nearby locations. One explanation could be the desire to avoid the cannibalization of sales (see Baldwin and Ottaviano, 2001). An alternative explanation could be coordination costs involved in producing multiple products that lower the per-product efficiency of the firm/affiliate (see Nocke and Yeaple, 2013). A third explanation could be due to country-specific idiosyncratic demand shocks that a firm vary across products, akin to the model of Bernard et al. (2011). Due to lack of data, I do not test for the validity of these competing explanations.
34 Realistically, a firm would need to contract with multiple intermediaries if it wishes to export different products to a given country from a number of different production sites. This is consistent with the findings of Bernard et al. (2013) and Blum et al. (2010) that export intermediaries specialize in a narrow range of countries.
To construct this variable, I define the following three terms:

\[ c(i; j) : \text{indicator that } i \text{ and } j \text{ are contiguous}, \]
\[ d(i; j, FR) : \text{indicator that } \tau_{ij} \leq \tau_{iFR}, \]
\[ r(i; j) : \text{indicator that } j \text{ is within a specified radius of } i. \]

Let \( n(i) \) be the set of countries \( j \) that: (i) border \( i \), (ii) are closer to \( i \) than is France, and (iii) are within a specified radius of \( i \). That is, \( n(i) = c(i; j) \cup (d(i; j, FR) \cap r(i; j)) \). Let \( m_f(j) \) be a dummy variable denoting whether firm \( f \) has a manufacturing affiliate in country \( j \). The variable of interest is \( M_f(n(i)) = \sum_{j \in n(i)} m_f(j) \). In the estimation results below I focus on a radius of 2000 km.\(^{35}\)

Table 2.9 provides summary statistics for the variable \( M_f(n(i)) \) when the radius considered is 2000 km. The average firm has 0.96 affiliates within a 2000 km radius of the average destination for the entire sample. Conditional on entry, however, the average firm has 1.76 affiliates within a 2000 km radius of the average destination. This suggests that FDI tends to be geographically concentrated at the firm level.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>All observations</td>
<td>0.96</td>
<td>2.00</td>
<td>9454</td>
</tr>
<tr>
<td>All affiliates</td>
<td>1.76</td>
<td>2.92</td>
<td>2115</td>
</tr>
<tr>
<td>All manufacturing affiliates</td>
<td>1.99</td>
<td>3.19</td>
<td>1102</td>
</tr>
<tr>
<td>All wholesale affiliates</td>
<td>1.51</td>
<td>2.56</td>
<td>1013</td>
</tr>
</tbody>
</table>

The estimation procedure must also account for the possibility that the variable \( M_f(n(i)) \) is endogenous. The dependent variable is the firm’s entry decision in country \( i \). If this decision is made simultaneously with the firm’s entry decisions into all countries \( j \neq i \), then \( M_f(n(i)) \) would be correlated with the error term, resulting in biased coefficient estimates of \( M_f(n(i)) \).

\(^{35}\)2000 km is roughly the distance between Japan and China or between Hungary and Russia. Among the 58 countries, the average country has 8.53 countries that are (i) border it, (ii) are within a 2000 km radius of it, and (iii) are closer to it than is France. The median country has 4 such countries.
Such estimates would most likely be biased downwards. The downward bias stems from the fact that the demand for a firm’s products within a region varies across firms due to unobservable firm-country specific characteristics, that manifest themselves in idiosyncratic demand shocks across firm-country pairs. Consequently, a pair of firms is likely to respond differently to the establishment of a manufacturing affiliate in a given country.\footnote{It is well known that firms do not follow a strict hierarchy in terms of the destinations that they serve (Yeaple, 2009; Eaton et al., 2011a). Eaton et al. (2011a) and Crozet et al. (2012) argue that one of the causes for this are firm-country specific idiosyncratic demand shocks. Bernard et al. (2011) argue that such demand shocks vary even across products within firms.} A second source of attenuation bias for $M_f(n(i))$ is that the constructed variable does not discriminate between manufacturing affiliates located in different countries. However, it is reasonable to presume that manufacturing affiliates in some nearby countries would exert a greater effect on a firm’s entry decision in a given target country than others. This is evidenced by the operations of Michelin in South America. Since the production decisions for the region are made in Brazil (see section 6 of this chapter), the presence of a manufacturing affiliate in Brazil has a greater effect on a firm’s entry decision in nearby countries than the manufacturing affiliate in Colombia. Controlling for endogeneity addresses both sources of attenuation bias.

I address endogeneity using a control function, which entails a two-stage estimating procedure. In the first stage, I regress the endogenous variable $M_f(n(i))$ on an exogenous instrument $V_f(n(i))$ and the other explanatory variables:

$$M_f(n(i)) = \delta_0 + \delta_1 V_f(n(i)) + Z'_i \Delta + \alpha_f + \mu_{fi}.$$  

(2.29)

I then recover the residuals, $\hat{\mu}_{fi}$, and include them in the second stage multinomial logit regression along with $M_f(n(i))$. This approach provides consistent parameter estimates (see
Wooldridge, 2010). The regression of interest, therefore is

\[ \ln \left( \frac{\Pr[E_{fi} = M]}{\Pr[E_{fi} = W]} \right) = \beta_0 + \beta_1 M_f(n(i)) + G_i \Pi + \alpha_f + \hat{\mu}_{fi} + u_{fi}, \]

(2.30)

\[ \ln \left( \frac{\Pr[E_{fi} = \emptyset]}{\Pr[E_{fi} = W]} \right) = \delta_0 + \delta_1 M_f(n(i)) + G_i \Gamma + \rho_f + \hat{\mu}_{fi} + \varepsilon_{fi}, \]

with \( \hat{\mu}_{fi} \) being the residual from the first stage regression.

What remains is to obtain an exogenous variable \( V_f(n(i)) \) that is correlated with \( M_f(n(i)) \). Recall that \( m_f(i) \) has earlier been defined as a dummy variable indicating whether firm \( f \) has a manufacturing affiliate in country \( j \). I regress \( m_f(i) \) on firm and country fixed effects and obtain the residual from this regression. Let \( \hat{\nu}_f(i) \) denote this residual. \( \hat{\nu}_f(i) \) captures aspects that are unique to a particular firm-country match. Consequently, it corrects for simultaneity and unobservable firm-region characteristics. \( \hat{\nu}_f(i) \) is then used to to construct \( \bar{V}_f(n(i)) \) in the same manner that \( M_f(n(i)) \) was constructed. That is, \( \bar{V}_f(n(i)) = \sum_{j \in n(i)} \hat{\nu}_f(j) \), where \( n(i) \) is the set of all countries that (i) border country \( i \), (ii) are within a specified radius of country \( i \), and (iii) are closer to country \( i \) than is France. Lastly, I use the monotonic transformation \( V_f(n(i)) = \exp \left( \bar{V}_f(n(i)) \right) \) as the instrument. The instrument is found to be quite significant in the first stage, regardless of the radius used, with F-statistics above 50.

2.5.2 Estimation Results

Table 2.10 presents the main estimation results of the chapter. The first three columns present the regression results from estimating equation (2.30) without controlling for endogeneity, whereas the last three columns present the control function estimation results. We can see that \( M_f(n(i)) \) is statistically significant, large in absolute value, takes on the expected sign for both trade-offs, and is robust to the inclusion of country fixed effects. French MNCs are found to be highly likely to establish affiliate in countries that are close to their manufacturing sites. The affiliates established in such countries are more likely to be for wholesale purposes
rather than for manufacturing purposes. An additional manufacturing affiliate in geographic proximity reduces the odds of a firm establishing a manufacturing affiliate relative to a wholesale affiliate in the target country by about 25%, while reducing the odds of no affiliate being established relative to a wholesale affiliate being established by between 38-44%. These results are consistent with Predictions T1 and T2.

Table 2.10 presents the estimation results for the case when the radius used for constructing $M_f(n(i))$ was set at 2000 km. Since the cut-off is rather arbitrary, it is fair to ask whether the results hold for other radii. Figure 2.4 plots the coefficient estimates of $M_f(n(i))$ along with the 95% confidence intervals with the radius varying from 1500-5000 km.\(^{37}\) As can be seen, $M_f(n(i))$ continues to exert a comparable effect on both trade-offs facing French MNCs at other radii.

Columns (1) and (4) provide the counterpart to column (3) in Table 2.8. Notice that conditioning on a firm’s manufacturing operations in geographic proximity yields a negative correlation between distance and the odds of establishing a manufacturing affiliate relative to a wholesale affiliate, consistent with Prediction T3. A one standard deviation increase in distance from France reduces the odds of establishing a manufacturing affiliate relative to a wholesale affiliate, consistent with Prediction T3. A one standard deviation increase in distance from France reduces the odds of establishing a manufacturing affiliate relative to a wholesale affiliate, consistent with Prediction T3. A one standard deviation increase in distance from France reduces the odds of establishing a manufacturing affiliate relative to a wholesale affiliate, consistent with Prediction T3.

\(^{37}\) Full estimation results for varying radii are available from the author upon request.
## Table 2.10: Impact of Nearby Manufacturing Affiliates on Firm Entry Decision

<table>
<thead>
<tr>
<th>Variables</th>
<th>Regular Estimation</th>
<th>Control Function Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>( M_f(n</td>
<td>i) )</td>
<td>-0.160***</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.101)</td>
</tr>
<tr>
<td>Distance(_i,FR)</td>
<td>-0.191**</td>
<td>-0.259***</td>
</tr>
<tr>
<td></td>
<td>(0.079)</td>
<td>(0.095)</td>
</tr>
<tr>
<td>Import Freedom(_i)</td>
<td>-0.186**</td>
<td>-0.185**</td>
</tr>
<tr>
<td></td>
<td>(0.083)</td>
<td>(0.085)</td>
</tr>
<tr>
<td>GDP(_i)</td>
<td>0.317***</td>
<td>0.295***</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>( \ln \text{Pr}[E = M</td>
<td>E = W] ): (log) probability of entering through a manufacturing affiliate relative to entering through a wholesale affiliate</td>
<td></td>
</tr>
<tr>
<td>( M_f(n</td>
<td>i) )</td>
<td>-0.185***</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.099)</td>
</tr>
<tr>
<td>Distance(_i,FR)</td>
<td>0.296***</td>
<td>0.157*</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td>(0.083)</td>
</tr>
<tr>
<td>Import Freedom(_i)</td>
<td>-0.273***</td>
<td>-0.276***</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>GDP(_i)</td>
<td>-0.705***</td>
<td>-0.757***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.052)</td>
</tr>
<tr>
<td>( \ln \text{Pr}[E = \emptyset</td>
<td>E = W] ): (log) probability of no affiliate being established relative to entering through a wholesale affiliate</td>
<td></td>
</tr>
<tr>
<td>( M_f(n</td>
<td>i) )</td>
<td>-0.328***</td>
</tr>
<tr>
<td></td>
<td>(0.089)</td>
<td>(0.089)</td>
</tr>
<tr>
<td>Distance(_i,FR)</td>
<td>-1.055***</td>
<td>-1.496***</td>
</tr>
<tr>
<td></td>
<td>(0.172)</td>
<td>(0.221)</td>
</tr>
<tr>
<td>Import Freedom(_i)</td>
<td>0.058</td>
<td>-0.133</td>
</tr>
<tr>
<td></td>
<td>(0.190)</td>
<td>(0.197)</td>
</tr>
<tr>
<td>GDP(_i)</td>
<td>0.245</td>
<td>0.292</td>
</tr>
<tr>
<td></td>
<td>(0.207)</td>
<td>(0.207)</td>
</tr>
<tr>
<td>( \mu_{f,i} )</td>
<td>0.411**</td>
<td>0.663***</td>
</tr>
<tr>
<td></td>
<td>(0.191)</td>
<td>(0.211)</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.42</td>
<td>0.47</td>
</tr>
<tr>
<td>Log Pseudolikelihood</td>
<td>-3773.42</td>
<td>-3765.80</td>
</tr>
<tr>
<td>Observations</td>
<td>9,454</td>
<td>9,454</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01, ** p < 0.05, * p < 0.1. 2) All regressions include firm fixed effects. 3) Robust standard errors are clustered at the firm level.
wholesale affiliate by about 25%. These results are obtained even without the inclusion of SMP. We can see from column (5) that the inclusion of SMP has a small impact on the coefficient estimate on distance. Moreover, the coefficient estimate on SMP is small in absolute value and is statistically insignificant. Both results are in marked contrast to what was found in Table 2.8.

Although firms are more likely to establish wholesale affiliates relative to manufacturing affiliates in more distant countries, that does not mean that the decision to establish a manufacturing affiliate is more sensitive to trade barriers than the decision to establish a wholesale affiliate. From Table 2.10 we can see that a one standard deviation increase in import freedom reduces the odds of establishing a manufacturing affiliate relative to a wholesale affiliate by 11%. This confirms that wholesale affiliates are more reliant on imported products than manufacturing affiliates. This is to be expected given that a wholesale affiliate imports all of its products, whereas a manufacturing affiliate produces at least part of the products that it sells.

The inclusion of $M_f(n(i))$ also alters the estimated impact of a host country’s geography on a firm’s decision to establish an affiliate there and on the type of affiliate that it establishes. Recall that without conditioning on the firm’s operations in geographic proximity, a country’s SMP had a sizeable impact on a firm’s choice between a manufacturing and a wholesale affiliate in a given country (see Table 2.8). From columns (2) and (5) of Table 2.10, however, we can see that a host country’s geography has virtually no impact on a firm’s choice between a manufacturing and a wholesale affiliate once $M_f(n(i))$ is included among the regressors. On the other hand, a host country’s surrounding market potential does have a strong impact on a firm’s decision to enter the country once we condition on $M_f(n(i))$. A one standard deviation increase in SMP raises the odds of not conducting FDI in the country relative to establishing a wholesale affiliate by 42%.

One explanation for this finding could be capacity constraints. Blum et al. (2013) and Vannoorenberghe (2012) have shown that manufacturing firms have finite capacity. Due to capacity constraints, a manufacturing affiliate is more likely to direct its exports to larger nearby
markets. Capacity constraints also serve to limit the affiliate’s exports to smaller markets in the region. Hence, the parent company has a greater incentive to establish wholesale affiliates in larger nearby countries at the expense of smaller countries in geographic proximity. Thus, a larger surrounding market potential makes a perspective host country a less attractive avenue for FDI, thereby accounting for the positive and highly significant coefficient estimate for SMP.

It should be noted that the coefficient estimates on SMP have relatively large standard errors throughout. Such is the case because a true measure of a country’s surrounding market potential should account for trade barriers other than distance, such as tariff rates and non-tariff import restrictions. Regional trade agreements, therefore, are likely to impact a host country’s effective surrounding market potential. Estimation results from Table 2.10 suggest, therefore, that a true assessment of the impact of regional trade agreements on the amount of inward FDI that a country receives as well as on its composition needs to properly account for third-country effects on a firm’s affiliate location decision.

### 2.6 Evidence on Regional Portfolios

The regression results from Table 2.10 indicate that firms are more likely to locate their wholesale affiliates in geographic proximity to their manufacturing affiliates. This suggests that the primary purpose of many wholesale affiliates is to serve as conduits for the exports of nearby manufacturing affiliates, not those of the parent company. It also suggests that inter-affiliate trade is economically important. While figures on inter-affiliate trade for France are difficult to obtain, there is evidence that inter-affiliate trade is indeed economically important for US MNCs and account for the lion’s share of export-platform affiliate sales. According to Ramondo et al. (2013), exports to third-countries accounted for 30% of the revenues earned by majority-owned foreign affiliates of US MNCs in manufacturing. Nearly two-thirds of these sales were to other affiliates belonging to the same parent company. That is, inter-affiliate trade accounts for 20% of the revenues earned by manufacturing affiliates. While these figures confirm that inter-affiliate trade is a key component of the earnings of multinational firms, it
does not necessarily suggest that inter-affiliate trade is confined to affiliates in the same region. In this section I will present case study evidence for three French MNCs — Bonduelle, Michelin and Nexans — that inter-affiliate trade is common for affiliates in geographic proximity to each other. The sources from which this evidence is drawn are presented in the Appendix to this chapter.

2.6.1 Bonduelle

Bonduelle is a French MNC that produces processed vegetables. Its North American operations display features that are consistent with a regional portfolio. In 2010, Bonduelle operated a manufacturing affiliate in Canada and a wholesale affiliate in the United States. As one would expect, the wholesale affiliate in the US was primarily supplied by the manufacturing affiliate in Canada, not by the parent company. In fact, intra-firm exports to the US accounted for nearly 30% of the total value of the Canadian affiliate’s output. Such a strategy is not confined to parts of the world that are distant from France. To the contrary, Bonduelle adopts a similar approach in Eastern Europe, which are served primarily from its production sites in Hungary and Russia.

2.6.2 Michelin

Evidence for regional portfolios can also be gleaned from Michelin’s South American operations. As mentioned in the introduction, Michelin has a manufacturing affiliate in Brazil. That affiliate is responsible not only for supplying the firm’s wholesale affiliates in the region, but also for the firm’s marketing operations.

2.6.3 Nexans

From the examination of Bonduelle’s operations we know that the establishment of regional portfolios for a number of affiliates within geographic proximity is an activity that is not confined to the Western Hemisphere. Looking at the operations of another French MNC — Nexans —
reveals that it is a practice that is adopted to parts of Europe that are close to France. Nexans is a French electrical cable manufacturer. In 2010 it was the world’s largest cable manufacturer in terms of revenues with manufacturing plants in 40 countries.\textsuperscript{38} Among the countries in which it operated manufacturing affiliates that year were Belgium and Sweden. Both affiliates were part of Nexans’ regional portfolio for the Low Countries and Scandinavia, respectively. The manufacturing affiliate in Belgium was responsible not only for the local market but also for supplying the wholesale affiliate in the Netherlands, while the manufacturing affiliate in Sweden was responsible for coordinating Nexans’ operations in the Baltic and Scandinavian countries.

\section*{2.7 Conclusion}

The international trade literature has recently recognized that a multinational firm’s investment decisions in a pair of nearby countries are interdependent. Papers such as Blonigen et al. (2007) have studied whether the amount of inbound FDI a country receives depends on the amount received by neighboring countries, while Baltagi et al. (2008), Chen (2008) and Antràs and Foley (2011) have looked at the impact of trade liberalization on FDI at the firm, industry and national level. A different strand of the literature has recognized that multinational firms own a large number of affiliates abroad that are engaged in activities such as distribution, wholesale and retail and do not manufacture their own products. Important contributions include papers by Head and Ries (2001), Hanson et al. (2001), and Krautheim (2013).

Heretofore, wholesale affiliates have been regarded as simply a form of exporting by the parent company rather than as an integral feature of a multinational firm’s regional strategy. The present chapter is the first to emphasize that this is not correct. Using hand-collected data on the foreign operations of publicly traded French MNCs in 2010, I showed that — conditional on a country’s geography — firms are more likely to establish an affiliate for wholesale rather than manufacturing purposes in countries that are more distant from France. This result is

exactly the opposite of what is predicted by standard two-country international trade models. I have also shown that a three-country model which allows for inter-affiliate trade can replicate this result. The three-country model also predicts that MNCs are likely to locate their wholesale affiliates in geographic proximity to their manufacturing affiliates, a proposition that is confirmed by the data.

My findings highlight the channels through which trade policies can impact FDI flows. Given that manufacturing affiliates have finite capacity, they are likely to be used as an export-platform for only a limited set of countries in geographic proximity. Consequently, a trade liberalization agreement with a nearby country that is a large recipient of manufacturing FDI can also attract FDI in the form of a wholesale affiliate. At the same time, trade liberalization agreements with source countries can also stimulate inward FDI in the form of manufacturing affiliates, since they are reliant on imported headquarter services.

This chapter also draws attention to the impact of non-tariff trade barriers on FDI. The bureaucratic and time delays associated with getting imported containers through customs have previously been found to have a significant impact on international trade flows (see Djankov et al., 2010). I show that non-tariff customs barriers also affect a multinational firm’s affiliate location decision; a one standard deviation increase in importing freedom is associated with a 20% increase in the probability that a multinational firm will establish an affiliate in a given target country. To put this result in perspective, reducing a target country’s distance from France by 50% is also associated with a 20% increase in the probability that a multinational firm will conduct FDI in the target country, all else equal. Higher customs costs discourage the establishment of wholesale affiliates more than the establishment of manufacturing affiliates. Consequently, improving the efficacy of customs clearance can make a country a more lucrative destination for FDI. This effect is likely to be stronger for countries that — due to their geography — are attractive targets for the establishment of wholesale affiliates.
Chapter 3

New Exporters during the Great Recession: Is the Large Fixed Cost Story Marginal?

3.1 Introduction

Each year a large number of firms start exporting. Those that survive past the first year rapidly expand their foreign sales, and account for much of their country’s subsequent export growth (Bernard et al., 2009a; Eaton et al., 2008). Given the long run importance of new exporters, it is of interest to determine the factors that inhibit export market entry. According to standard international trade models firms are required to make an upfront payment in the form of a fixed cost to enter the export market. This fixed cost has been estimated to be very large by a number of authors, and provides an explanation as to why only a small minority of firms export.¹

Recently, trade economists have uncovered a number of stylized facts that are inconsistent with this hypothesis, placing it under increased scrutiny.² Since firms typically postpone large investment projects during uncertainty — which rises in recessions — the Great Recession

¹Most firms cannot afford to pay the large fixed cost, resulting in low export market participation rates. See Bernard et al. (2012) and Helpman (2006) and the references therein for the evidence on export market participation rates. For estimates of the fixed cost, see Alessandria and Choi (2007, 2013), Das et al. (2007), Eaton et al. (2011a), Impullitti et al. (2013), and Morales et al. (2011).

²See Arkolakis (2013), Békés and Muraközy (2012), Buono and Fadinger (2012), and Freund and Pierola (2010). I discuss some of these stylized facts below.
provides a natural experiment to assess the validity of the large fixed cost hypothesis.\(^3\) Due to the high levels of uncertainty during the Great Recession, one would expect to have seen fewer new exporters during this period.\(^4\) Using transactions-level data for Peruvian exporters from 2005-09, I find no evidence of reduced entry. Given that gross domestic investment in Peru fell by 22.2% during the Great Recession (ECLAC, 2009), continued entry into exporting is inconsistent with the large fixed cost story.

An alternative explanation for low export market participation rates lies with marginal costs. International trade models typically assume that firms have a constant marginal cost and are fully informed about the demand for their product(s) abroad prior to entry. Empirical evidence, however, indicates that firms have increasing marginal costs and face a great deal of uncertainty about foreign demand and their own ability to operate efficiently in foreign markets.\(^5\)\(^,\)\(^6\) The former creates a trade-off between production for the domestic and export markets. The latter implies that the returns to exporting are ex-ante unclear, since it is believed that firms can resolve their export market uncertainty only by testing the waters. Hence, exporting is believed to come with clear costs but uncertain returns, a cost-benefit trade-off that can deter many firms from exporting even if the fixed cost of exporting is not uniformly large. Under these conditions, a temporary marginal cost shock reduces the opportunity cost of exporting, and can prompt some prospective exporters to test out foreign markets — provided that the requisite investment is low. In this chapter, I find evidence for this mechanism. I show that continued entry during the Great Recession can be explained by two temporary marginal cost shocks: an inventory draw down and a fall in shipping costs.

\(^3\)See Bernanke (1983), Dixit and Pyndick (1994) and Bloom (2009) for the impact of uncertainty on investment as well as the correlation between recessions and uncertainty.

\(^4\)There was a great deal of apprehension about future macroeconomic policies and fears of protectionist measures during the Great Recession. See Baldwin and Evenett (2009), Bloom et al. (2012) and Bown (2009).

\(^5\)For evidence on increasing marginal costs, see Ahn and McQuoid (2012), Blum et al. (2013), Nguyen and Schaur (2012), Soderbery (2013) and Vannoorenbergh (2012).

\(^6\)Johanson and Vahlne (1977) were among the first to note that firms acquire the necessary skills to customize their product to foreign tastes and manage supply lines only after they start exporting. Prior to entry, the firm’s ability to carry out these tasks efficiently is very much in doubt. Aspects of their argument have since then been discussed by Albornoz et al. (2012), Buono and Fadinger (2012) Eaton et al. (2013), Freund and Pierola (2010), and Roberts and Tybout (1997).
A sudden economic downturn leaves firms with excess inventories. Holding inventories is particularly costly during a recession, as they tie up a firm’s cash flows. The situation is further exacerbated by recessions that are accompanied by a reduction in bank lending, as was the case for Peru.\(^7\) The need to rapidly offload inventories also creates an opportunity. A temporary reduction in domestic demand along with the need to sell off inventories can prompt some prospective exporters to test out foreign markets provided that the requisite entry cost is low. One would expect this effect to be more pronounced in industries in which firms hold larger inventories. The data are supportive of this proposition, as the entry cohort during the Great Recession was skewed towards firms operating in sectors with large inventories relative to the pre-crisis years. Using the inventory turnover rate as an inverse measure of average inventory holdings within a manufacturing industry, I find that a one standard deviation reduction in the inventory turnover rate is associated with an 8% increase in the number of export relationships established by new exporters during the Great Recession relative to the pre-crisis years.\(^8\) To put this result in perspective, the average country included in the sample suffered a 1.9% decline in its GDP during the Great Recession. Such a recession is estimated to reduce the number of new exporters’ foreign relationships by 4.6%.

The second temporary marginal cost shock arising out of the Great Recession was a sharp fall in shipping rates associated with an excess capacity in the shipping industry (UNCTAD, 2012). Using data on Peruvian firms’ shipping expenses to the US as well as an index of foreign markets’ integration into global shipping routes, I construct a measure of shipping costs faced by Peruvian exporters which varies at the product-destination-year level. This index indicates that the cost of shipping for Peruvian firms fell by 20% on average during the Great Recession. I then use the constructed measure of shipping costs to show econometrically that shipping

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\(^7\)See Paravisini et al. (2013). Along with Brazil and Chile, Peru is among the countries that are most integrated into international financial markets in Latin America. Consequently, its financial system was hard hit by the Great Recession, resulting in a significant reduction in the amount of lending provided by banks to the private sector (ECLAC, 2009).

\(^8\)The inventory turnover rate is defined as the cost of goods sold divided by inventory holdings. An export relationship is defined as the export of an HS4 product to a foreign market by one firm. Hence, a firm that exports two HS4 products to the same country is regarded as having established two export relationships.
costs deter export market participation more for firms selling homogeneous goods rather than for firms selling differentiated goods. In light of this result, one would expect to have seen relatively greater entry on the part of the former during the Great Recession. I find this to be the case. In the pre-crisis period, an export transaction undertaken by a new exporter was nearly five times more likely to involve differentiated goods rather than homogeneous ones. During the Great Recession, this factor fell to three, an economically and statistically significant decline.

The inventory draw down and fall in shipping costs represent marginal cost shocks that were temporary in nature. Such shocks cannot enable export market entry in the presence of large fixed costs whose payment is spread out over multiple periods. My findings therefore suggest that the fixed costs of entering foreign markets are not as large as previous estimates would suggest, at least for Peruvian firms contemplating whether to export.

**Relationship to the Literature**

The emergence of firm-level datasets in the 1990s revealed that only a small minority of firms export, stimulating considerable research into the reasons behind low export market participation rates. Over time, large fixed costs emerged as the prevalent explanation. The fixed cost of exporting encompasses expenses that are commonly believed to be borne by new exporters, such as the cost of researching a foreign market, customizing the firm’s product(s), searching for buyers, and establishing supply chains abroad. Yet no direct evidence exists on the magnitude of such costs. Instead, the existence of a fixed cost large enough to deter entry by most firms is largely inferred from the fact that a firm’s export status is persistent (Bernard and Jensen, 2004b; Moxnes, 2010; Roberts and Tybout, 1997). However, as Buono and Fadinger (2012) point out, state dependence need not be indicative of large fixed costs as it can also be reconciled with learning models of the type presented by Akhmetova and Mitaritonna (2013) and Eaton et al. (2013). Even the large structural estimates for the fixed cost found by Das et al. (2007) and Morales et al. (2011) have failed to settle the debate.
The emergence of yet more detailed micro datasets in the 2000s has brought to light empirical regularities that are at odds with the large fixed cost story. Arkolakis (2013) has noted that models with large fixed costs predict that new exporters should be larger than firms exiting the export market.\(^9\) That is not borne out in the data.\(^{10}\) Furthermore, Békés and Muraközy (2012), Buono and Fadinger (2012), and Freund and Pierola (2010) argue that a framework with large fixed costs fails to explain why many new exporters exit the export market after only one year.\(^{11}\) Some of the authors that have questioned the large fixed cost hypothesis have suggested that it is possible to test out foreign markets without a large upfront investment by exporting through intermediaries (e.g., Akhmetova and Mitaritonna, 2013).\(^{12}\) My findings contribute to this literature, as continued export market entry during the Great Recession is inconsistent with the notion that all prospective exporters are required to pay a large entry cost.

This chapter also contributes to the growing literature on new exporters. Research on this subject was prompted by the findings of Eaton et al. (2008) that Colombian firms that began exporting after 1996 accounted for almost half of Colombia’s export growth between 1996 and 2005. Subsequent authors have established that Colombian firms are not the exception, as similar patterns have been found for Peruvian (Freund and Pierola, 2010), Portuguese (Amador and Opromolla, 2013), Turkish (Cebeci and Fernandes, 2013) and US (Bernard et al., 2009a).

\(^9\)Estimates of the fixed cost of exporting are typically derived from dynamic models with a one-time entry cost and a per-period continuation cost. The entry cost is estimated to be large (see footnote 1), whereas the continuation cost is estimated to be very small. Hence, established exporters ought to remain in the market unless their export sales are so low that they cannot even cover the small continuation costs. By contrast, entrants ought to have sales high enough to justify incurring the large entry cost. See Impullitti et al. (2013) for a general equilibrium model with all of these features.

\(^{10}\)Arkolakis (2013) uses data on Brazilian exporters. Similar patterns are evident for Colombian, Portuguese and US exporters. See Eaton et al. (2008), Amador and Opromolla (2013) and Bernard et al. (2009a), respectively.

\(^{11}\)Akhmetova and Mitaritonna (2013) along with Cebeci and Fernandes (2013) offer similar criticisms. Buono and Fadinger (2012) find that nearly a fifth of the export relationships established by French firms are destroyed each year. They argue that such high destruction rates are inconsistent with the notion that firms are required to incur large fixed costs in order to establish an export relationship. While Bernard and Jensen (2004b) argue that state dependence in a firm’s exporter status is suggestive of large fixed costs, they do document high exit rates among US exporters as well. In a given year, nearly 13% of the exporters in their sample cease exporting.

\(^{12}\)Exporting through an intermediary enables a firm to reach foreign consumers without incurring the cost of establishing a distribution network or searching for prospective buyers. See Ahn et al. (2011b), Akerman (2013), Bernard et al. (2013) and Blum et al. (2012) for evidence on the importance of export intermediaries.
entrants.\textsuperscript{13} Whereas previous papers have focused on aggregate entry, survival and expansion patterns, I extend the literature by assessing the impact of a global economic downturn on the decision to enter the export market.

The importance of temporary marginal cost shocks in shaping a firm’s export market performance found in this chapter have implications beyond the literature on new exporters. Until recently, export market entry costs have primarily been regarded as global in nature rather than country-specific, which suggests that established exporters can enter and exit additional destinations at no cost. Moxnes (2010), however, has found that entry costs are primarily country-specific. High country-specific entry costs are hard to reconcile with repeated entry and exit into new markets on the part of established exporters (Buono and Fadinger, 2012; Freund and Pierola, 2010; Lawless, 2009). Repeated trials in new destinations by established exporters is, however, consistent with the notion advanced in this chapter that export market entry costs are much lower than commonly believed. It also prompts questions as to how established exporters respond to temporary marginal cost shocks: do they primarily choose to increase their sales in their existing markets or do they attempt to expand to other markets. An examination of this issue would provide us with greater insight about firms’ export market expansion decisions. Greater understanding of this issue has important implications for trade policy, given that a big portion of long-run trade growth is driven by the expansion of established exporters into new destinations (Amador and Opromolla, 2013; Bernard et al., 2009a).

Lastly, this chapter is related to recent empirical work on exporters facing rising marginal costs. Using data on exporters in a broad range of countries, Ahn and McQuoid (2012), Blum et al. (2013), Nguyen and Schaur (2012), Soderbery (2013) and Vannoorenberghe (2012) have shown that firms face a trade-off between production for the domestic and the export market. These papers largely emphasize the role of temporary demand shocks in influencing

\textsuperscript{13}In an older paper not directly dealing with new exporters, Bernard and Jensen (2004a) found that new exporters were responsible for nearly 40\% of the growth rate in US exports from 1987-92.
the proportion of output that established exporters sell abroad. By contrast, I focus on temporary marginal cost shocks in influencing the decision to enter the export market.

The rest of this chapter is organized as follows. Section 2 describes the data and presents an overview of the aggregate impact of the Great Recession on Peruvian exporters. Section 3 presents a brief discussion on how increasing marginal costs affect the decision to enter the export market. Section 4 explores the role of inventory holdings on entry during the Great Recession, while Section 5 looks at shipping costs. I conclude in Section 6.

### 3.2 Data Description and Aggregate Patterns

#### 3.2.1 Firm Level Data

I use firm-level data for Peru to assess the impact of the Great Recession on new exporters. The data employed in this chapter are transaction-level customs data for the period 2005-09. The sources for the data are detailed in the appendix of Cebeci et al. (2012) and in Freund and Pierola (2012). The data was collected by the Trade and International Integration Unit of the World Bank Research Department, as part of their efforts to build the Exporter Dynamics Database. For each firm, the dataset contains information on the firm’s sales (in US dollars) of a 6-digit HS product to a given destination, along with the quantity shipped (in kilograms). I aggregate the data up to the 4-digit HS level and omit exports of mineral products, i.e. HS chapters 25-27.

Peruvian exporters exhibit many of the patterns common to exporters in other countries: most exporters sell a small number of products to a few destinations and account for only a small share of total exports while a small minority of multi-product firms that export to numerous destinations generate the vast majority of aggregate export sales. This can be seen from Table C.1 in the Appendix, which compares the composition of Peruvian exporters with

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14 Ahn and McQuoid (2012) do examine the differential impact of capacity constraints on the performance of new exporters, but abstract from the decision to enter the export market.
those in seven other countries.\textsuperscript{15}

### 3.2.2 Peruvian Exports During the Great Recession

The impact of the Great Recession on international trade flows has been well-documented. Between 2008 and 2009, world GDP contracted by 5.3\% while global merchandise trade flows fell by 22.3\%.\textsuperscript{16} Peru’s export industry was not left unscathed by the Great Recession. Figure 3.1 plots Peru’s total manufacturing exports from 2005 until 2009. After a period of sustained growth from 2005-08, Peru’s manufacturing exports fell by over 20\% in 2009.\textsuperscript{17}

![Figure 3.1: Peru’s Manufacturing Exports, 2005-09. Data are in logs.](image)

Panel (a) of Figure 3.2 shows that much of the trade collapse for Peru is attributable to a sharp drop in the sales of incumbent exporters.\textsuperscript{18} Total manufacturing exports of incumbent firms declined by almost 25\% between 2008 and 2009. The trade contraction did not lead to a mass exit of established exporters, however. To the contrary, Panel (b) of Figure 3.2 shows that the number of incumbents inched up slightly in 2009 relative to 2008 due to continued

\begin{itemize}
\item \textsuperscript{15}Bernard et al. (2009b) report similar figures for US exporters.
\item \textsuperscript{16}Both figures are in nominal terms and are based on data obtained from the World Development Indicators. See Bems et al. (2013) and Levchenko et al. (2010) for summaries of the literature on the trade collapse along with a review of its potential causes.
\item \textsuperscript{17}Bolivia, Brazil and Colombia are the only South American countries that experienced an even sharper contraction in their manufacturing exports in 2009. By means of comparison, the US’ manufacturing exports fell by 17\% in 2009 (WTO, 2010).
\item \textsuperscript{18}An incumbent in year $t$ is a firm that has been exporting since at least year $t - 2$.
\end{itemize}
entry. Akin to their counterparts in Belgium (Beherens et al., 2013), France (Bricongne et al., 2012), Germany (Wagner, 2012) and Turkey (Cebeci and Fernandes, 2013), Peruvian incumbents responded to the Great Recession by reducing their export sales rather than ceasing to export altogether. The fact that most incumbent firms remained in the export market is consistent with international trade models in which the fixed cost of entering the export market is very high but the continuation cost is very low. The discrepancy between the entry and the continuation costs generates hysteresis in a firm’s export status.

3.2.3 Export Market Entry During the Great Recession

The evidence heretofore is broadly supportive of the view that large fixed costs and low continuation costs help explain why very few firms export. This is not the complete picture, however, as can be seen from Figure 3.3. Panel (a) of Figure 3.3 displays the total exports of new exporters while Panel (b) displays the total number of new exporters from 2005-09. The Great Recession and the accompanying trade collapse did not discourage Peruvian firms from enter-

---

19 A firm that is an entrant in year $t - 2$ and survives beyond the first year is counted as an incumbent in year $t$.


21 A new exporter in year $t$ is defined as a firm that did not export at all in year $t - 1$ but exports to at least one destination in year $t$. Throughout this chapter I use the terms ‘new exporter’ and ‘entrant’ interchangeably.
ing the export market in 2009. Robust entry on the part of Peruvian firms during the Great Recession is inconsistent with the notion that all prospective exporters are required to pay a large entry cost, especially given that the sudden decline in manufacturing output in Peru led to heightened uncertainty and caused firms to cut back on investment (ECLEC, 2009).\textsuperscript{22} The response of Peruvian firms to the Great Recession is not an outlier, as Cebeci and Fernandes (2013) find similar patterns for Turkish firms.\textsuperscript{23}

Table 3.1 compares the geographic and product scope of entry cohorts from 2005-09. Neither appears to have been affected by the Great Recession. In both the pre-crisis period (2005-08) as well as in 2009, the average entrant exported a little over 3 HS4 products to about 1.3 countries.

One possible explanation for these patterns is that new Peruvian exporters in 2009 entered markets that were unaffected by the Great Recession, such as Australia, China, India and South Korea. That is unlikely to have been the case, because none of these markets were among the main destinations for new exporters at any time from 2005-09. This is confirmed by Table 3.2, which displays the ten most popular export market destinations for Peruvian entrants

\textsuperscript{22}ECLEC (2009) reports that gross domestic investment fell by 22.2\% in Peru during the first three quarters of 2009.

\textsuperscript{23}Akin to most other countries, Turkey’s exports declined sharply as a result of the Great Recession, falling by over 20\% in nominal terms between 2008 and 2009.
Table 3.1: Export Performance by the Average Entrant, 2005-09

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Countries</th>
<th>Number of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1.27</td>
<td>3.88</td>
</tr>
<tr>
<td>2006</td>
<td>1.28</td>
<td>3.48</td>
</tr>
<tr>
<td>2007</td>
<td>1.30</td>
<td>3.33</td>
</tr>
<tr>
<td>2008</td>
<td>1.26</td>
<td>3.09</td>
</tr>
<tr>
<td>2009</td>
<td>1.30</td>
<td>3.13</td>
</tr>
</tbody>
</table>

during this time period. The top ten markets account for the bulk of the export relationships established by entrants and their total export sales. Notice that, by and large, the top ten destinations are unchanged from year to year. Hence, Peruvian entrants in 2009 did not choose destinations different from entrants in prior years. Furthermore, seven of the top ten entry markets in 2009 were hard hit by the Great Recession, with Bolivia, Colombia and Ecuador being the only countries to avoid a recession.24

Table 3.2: Top 10 Export Destinations for Entrants

<table>
<thead>
<tr>
<th>Rank</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United States</td>
<td>United States</td>
<td>United States</td>
<td>United States</td>
<td>United States</td>
</tr>
<tr>
<td>2</td>
<td>Chile</td>
<td>Chile</td>
<td>Chile</td>
<td>Venezuela</td>
<td>Venezuela</td>
</tr>
<tr>
<td>3</td>
<td>Venezuela</td>
<td>Venezuela</td>
<td>Venezuela</td>
<td>Chile</td>
<td>Chile</td>
</tr>
<tr>
<td>4</td>
<td>Ecuador</td>
<td>Ecuador</td>
<td>Ecuador</td>
<td>Ecuador</td>
<td>Ecuador</td>
</tr>
<tr>
<td>5</td>
<td>Spain</td>
<td>Colombia</td>
<td>Spain</td>
<td>Colombia</td>
<td>Colombia</td>
</tr>
<tr>
<td>6</td>
<td>Bolivia</td>
<td>Spain</td>
<td>Colombia</td>
<td>Bolivia</td>
<td>Bolivia</td>
</tr>
<tr>
<td>7</td>
<td>Colombia</td>
<td>Bolivia</td>
<td>Bolivia</td>
<td>Spain</td>
<td>Spain</td>
</tr>
<tr>
<td>8</td>
<td>Mexico</td>
<td>Mexico</td>
<td>Mexico</td>
<td>Mexico</td>
<td>Mexico</td>
</tr>
<tr>
<td>9</td>
<td>Germany</td>
<td>Italy</td>
<td>Germany</td>
<td>Italy</td>
<td>Costa Rica</td>
</tr>
<tr>
<td>10</td>
<td>Italy</td>
<td>Germany</td>
<td>Canada, Italy</td>
<td>Canada</td>
<td>Canada</td>
</tr>
</tbody>
</table>

---

24 Based on GDP growth data obtained from the World Development Indicators. Actually, Colombia and Ecuador were not exceptional. Both managed to avoid negative GDP growth in 2009 partly due to the importance of the non-manufacturing sectors in both countries. Manufacturing output did decline in both countries that year. (Data on manufacturing output was obtained from CEPALSTAT, ECLAC’s database).
An Econometric Analysis of Entry into Exporting

I now turn to an econometric analysis of the entry patterns of Peruvian firms. To reduce the number of outliers, I limit the sample to countries that were served by at least 10 entrants on aggregate from 2005-09. Omitting countries on which the Penn World Table, Version 7.1 (Heston et al., 2012) does not have macroeconomic data leaves me with 62 countries.\(^{25}\) Similarly, I include only the HS4 products that were exported by at least 10 entrants on aggregate between 2005 and 2009, leaving me with 252 HS4 products. The sample, therefore, consists of a balanced panel of 78,120 observations (5 years × 62 countries × 252 products), with observations at the year-country-HS4 level. Summary statistics are presented in Table C.3 in the Appendix.

The first question that I address is whether the number of export relationships established by the 2009 entry cohort was markedly different from that of previous cohorts.\(^{26}\) To do so I regress the number of entrants that export an HS4 product to a given destination on year, country and product fixed effects. Not every product is exported to every country in every year, as entry is observed in only 11,257 of the 78,120 cases. To account for the large number of zeros in the data, I use a Poisson pseudo-maximum likelihood (PML) estimator, as suggested by Santos Silva and Tenreyro (2006, 2011). The regression to be estimated is

\[
E \left[ \text{Number of Entrants}_{ijt} | \mathbf{x} \right] = \exp (\beta + \alpha_i + \gamma_j + \delta_t),
\]

with \(E\) being the expectations operator, \(\mathbf{x}\) denoting the full matrix of covariates, and \(i, j,\) and \(t\) denoting products, countries, and time, respectively.\(^{27}\) The coefficient estimates for the year fixed effects are presented in Table 3.3. Each coefficient relates the average number of export relationships established in a given year to the number established in the base year, which is 2009. While the number of export relationships established by the 2009 entry cohort was on

\(^{25}\)The list of countries is presented in Table C.2 in the Appendix.

\(^{26}\)An export relationship is defined as the export of an HS4 product to a foreign destination. Thus, a firm that exports two different HS4 products to the same destination is considered to have established two export relationships.

\(^{27}\)Standard errors are clustered at the country-HS4 level to account for correlation among the observations within countries and products over time.


Table 3.3: Number of Entrants, 2005-09

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y2005</td>
<td>0.156***</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
</tr>
<tr>
<td>Y2006</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
</tr>
<tr>
<td>Y2007</td>
<td>-0.006</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
</tr>
<tr>
<td>Y2008</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
</tr>
<tr>
<td>Product Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Importing Country Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.669</td>
</tr>
<tr>
<td>Products</td>
<td>252</td>
</tr>
<tr>
<td>Countries</td>
<td>62</td>
</tr>
<tr>
<td>Years</td>
<td>5</td>
</tr>
<tr>
<td>Observations</td>
<td>78,120</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01. 2) Robust standard errors are clustered at the country-HS4 level. 3) Omitted year: 2009.

average slightly lower than in 2005, it is not significantly different from the slope coefficients for the years 2006-08.

Continued entry during the Great Recession does not necessarily contradict the hypothesis that large fixed costs are the primary barrier to export market participation. Such is the case due to the widespread use of intermediaries by exporting firms (see footnote 12). Arm’s-length exporting enables firms to penetrate foreign markets without establishing their own distribution networks or searching for buyers directly, thereby circumventing many of the expenses that are believed to be captured by the fixed cost of exporting. Hence, continued entry during the Great Recession may be due to a larger portion of entrants deciding to export through intermediaries.

I cannot test directly whether the 2009 entry cohort was more prone towards arm’s-length exporting than entry cohorts from 2005-08 since I lack data on the mode of exporting. However, it is possible to infer whether the use of intermediaries was more widespread in 2009 than in prior years by examining entrants’ sales. Firms exporting through intermediaries typically earn
lower sales, all else equal, than firms exporting directly since intermediaries typically charge a markup over the wholesale price. Hence, if the 2009 entry cohort was more likely to export at arm’s-length, one would expect to see a reduction in average sales.\textsuperscript{28} To determine if that was the case, I regress the sales of the average entrant on year, country and product fixed effects:

\[
\text{Log Real Sales per Entrant}_{ijt} = \beta + \alpha_i + \gamma_j + \delta_t + u_{ijt}. \tag{3.2}
\]

Export sales are observed only if at least one firm exports product \(i\) to destination \(j\). Consequently, an OLS estimation that does not control for selection may yield biased coefficient estimates. I use a Heckman selection correction to mitigate this problem.\textsuperscript{29} The independent variables in the first-stage selection regression are the three fixed effects along with the excluded variable which is the Number of Entrants\(_{ij,t-1}^\text{\text{-}1}\).\textsuperscript{30} The use of the lag of the number of entrants is motivated by the supposition that the products exported by entrants and the destinations that entrants export to are similar from year to year (see Table 3.2). While the lag of the number of entrants can be correlated with the decision to enter, it is unlikely to have a causal effect on the sales earned by the present year’s entrants.

Table 3.4 presents the estimation results for the coefficients on the year fixed effects from the second-stage regression along with the correlation coefficient (\(\rho\)).\textsuperscript{31,32} Notice that \(\rho\) is

\textsuperscript{28}One might expect to have seen a reduction in average sales in 2009 in general due to a global recession. However, as will be shown in Table 3.5, the GDP of the importing country has no statistically significant impact on the sales earned by the average entrant. This is likely due to composition affects. On the one hand, GDP growth leads to higher sales by all entrants. On the other hand, GDP growth also induces entry on the part of less productive firms, which exerts a downward pressure on the sales of the average entrant. The two affects cancel each other out.

\textsuperscript{29}A Heckman selection correction involves a two-stage procedure. In the first stage, I estimate a probit regression with the dependent variable being a dummy indicating whether at least one Peruvian entrant exported product \(i\) to country \(j\) in year \(t\). The results of the first stage regression can be used to recover the inverse Mills ratio, which is included in the second stage OLS regression to control for sample selection. A significant coefficient on the inverse Mills ratio indicates that sample selection is a problem.

\textsuperscript{30}The inverse Mills ratio is correlated with the independent variables from the first stage probit regression since it is constructed using the results from that regression. Hence, at least one variable from the selection regression needs to be excluded from the second stage OLS regression to avoid multicollinearity.

\textsuperscript{31}\(\rho\) measures the correlation between the standard errors in the probit regression and the second stage OLS regression. Sample selection is not a problem if \(\rho\) is statistically no different from zero.

\textsuperscript{32}The number of observations in Table 3.3 is 10,963 rather than 11,257 because the IMF does not provide GDP deflator data for Cuba and Puerto Rico, forcing me to omit observations for both.
Table 3.4: Sales per Entrant, 2005-09

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y2005</td>
<td>-0.420***</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
</tr>
<tr>
<td>Y2006</td>
<td>-0.442***</td>
</tr>
<tr>
<td></td>
<td>(0.065)</td>
</tr>
<tr>
<td>Y2007</td>
<td>-0.223***</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
</tr>
<tr>
<td>Y2008</td>
<td>-0.074</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
</tr>
<tr>
<td>Product Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Importing Country Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>ρ</td>
<td>-0.236***</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
</tr>
<tr>
<td>Log Pseudolikelihood</td>
<td>-43,308</td>
</tr>
<tr>
<td>Observations</td>
<td>10,963</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01. 2) Robust standard errors are clustered at the country-HS4 level. 3) Coefficient estimates are from a second stage Heckman selection regression. 4) Omitted year: 2009.

statistically different from zero, indicating that failing to account for selection can result in biased estimates.\(^{33}\) Akin to Table 3.3, the coefficient estimates on the year fixed effects should be interpreted as being relative to the base year, which is 2009. It is readily evident that the average entrant in 2009 earned slightly higher export sales than the average entrant from previous years. The difference is statistically significant for all of the pre-crisis years aside from 2008. This is inconsistent with the supposition that continued entry was due to a greater reliance on export intermediaries than in prior years.

One possible explanation for the results displayed in Tables 3.3 and 3.4 is that the decision to enter the export market and the size of the initial shipment is made many periods in advance and therefore should not be affected by business cycle fluctuations abroad. If that were the case, then continued export market entry on the part of Peruvian firms during the Great Recession

\(^{33}\)The coefficient estimate on the excluded variable was positive and strongly significant in the selection regression, with a z-statistic of 26.67. Coefficient estimates from the selection regression are omitted, but are available from the author upon request.
Table 3.5: Does Economic Growth Affect the Export Market Entry Decision?

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimation:</th>
<th>Poisson PML</th>
<th>Heckman Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of Entrants $_{ijt}$</td>
<td>Sales per Entrant $_{ijt}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>GDP$_{jt}$</td>
<td>2.435***</td>
<td>2.439***</td>
<td>0.244</td>
</tr>
<tr>
<td></td>
<td>(0.248)</td>
<td>(0.248)</td>
<td>(0.624)</td>
</tr>
<tr>
<td>$\times$ Y2009</td>
<td></td>
<td>0.0004</td>
<td>-0.037</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.012)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>HS4 Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>$\rho$</td>
<td>-</td>
<td>-</td>
<td>-0.234***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.025)</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.669</td>
<td>0.669</td>
<td>-</td>
</tr>
<tr>
<td>Log Pseudolikelihood</td>
<td>-</td>
<td>-</td>
<td>-43,301</td>
</tr>
<tr>
<td>Observations</td>
<td>78,120</td>
<td></td>
<td>10,963</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01. 2) Robust standard errors are clustered at the country-HS4 level. 3) Coefficient estimates for Sales per Entrant are from a second stage Heckman selection regression.

should not be puzzling. To determine if the composition of the entry cohort is affected by business cycle fluctuations in export markets, I re-estimate regressions (1) and (2) by including each importing country’s real PPP-adjusted GDP.$^{34,35}$ Due to the inclusion of country fixed effects, the coefficient on GDP informs us as to how the outcome of interest is affected by changes in GDP over time within a country rather than the impact of cross-country differences in market size.

Table 3.5 presents the coefficient estimates. The results from the Poisson PML regressions clearly reject the notion that the decision to enter the export market is acyclical. In column (1), the coefficient estimate for GDP is positive and strongly significant, with an elasticity of 2.4. In other words, a 1% growth in GDP is associated with a 2.4% increase in the number of entrants across the 252 products, on average. In 2009, the average country in the sample suffered a 1.94% decline in GDP. Given the elasticity of 2.4, that should have resulted in a 4.6%

$^{34}$Real PPP-adjusted GDP data is obtained from the Penn World Table, Version 7.1 (Heston et al., 2012).

$^{35}$When re-estimating regression (2), I use GDP, the three fixed effects, and the lag of the number of entrants as the independent variables in the selection regression.
reduction in the number of entrants across the 252 products, on average. Put in perspective, had the number of export relationships that are established by new exporters declined by 4.6% in 2009 relative to 2008, then the coefficient estimate on the 2008 year dummy in Table 3.3 should have been approximately 0.045 instead of -0.003. This means that—relative to the pre-crisis years—new exporters in 2009 established about 5% ‘too many’ export relationships given the decline in foreign GDP. By contrast, it appears that the sales of the average entrant are uncorrelated with GDP growth. This is most likely driven by composition affects, as economic growth leads to higher sales for all entrants but also attracts less productive firms.

It is conceivable that — for whatever reason — the decision to enter the export market was uncorrelated with changes in GDP abroad in 2009. To control for such a possibility, I have also included the interaction of GDP with a 2009 year dummy. Estimation results are presented in columns (2) and (4) of Table 3.5. The coefficient estimate on GDP should now be interpreted as the impact of GDP growth on the outcome of interest for the pre-crisis period 2005-08 while the interaction term is the differential impact of GDP in 2009. Both interaction terms are statistically insignificant, and, more importantly, are close to zero. We can therefore reject the hypothesis that the decision to enter the export market was uncorrelated with changes in foreign demand during the Great Recession.

To summarize, I find that the Great Recession caused a severe contraction in Peru’s exports. However, the Great Recession appears to have had no effect on export market entry although the number of export relationships established by entrants is strongly correlated with GDP growth in the export market. The 2009 entry cohort bears close resemblance to entry cohorts of previous years in terms of the number of entrants and the number of export relationships that these entrants establish in their first year. These results seem highly surprising, given the drop in private sector investment in Peru during the Great Recession. If export market entry requires the firm to make a large irreversible investment with an uncertain return, then

\[ \exp \hat{\beta}_{08} - 1 = n_{08} - n_{09} \]
\[ \exp \hat{\beta}_{09} - 1 \approx 0.046, \quad \text{or} \quad \hat{\beta}_{08} \approx 0.045. \]

\[ \text{Let } n_{09} \text{ denote the logarithm of the number of export relationships established in 2009 and } n_{08} \text{ denote the logarithm of the number of export relationships established in 2008. Since } \exp \hat{\beta}_{08} - 1 = n_{08} - n_{09}, \text{ a 4.6}\% \text{ decline in the number of export relationships established between 2008 and 2009 should yield a coefficient on } \exp \hat{\beta}_{08} - 1 \approx 0.046, \text{ or } \hat{\beta}_{08} \approx 0.045. \]
the Great Recession should have increased the option value of delaying the investment. The entry patterns shown above are clearly inconsistent with this hypothesis, suggesting that large entry costs are not the primary factor explaining the entry-into-exporting decisions of Peruvian non-exporters.

### 3.3 Marginal Cost Structure and the Costs of Exporting

An alternative explanation for why most firms serve only the domestic market is that firms operate with an increasing marginal cost. International trade models typically assume that a firm faces a constant marginal cost of production. Hence, it does not face a trade-off between producing for the local market and for the export market. The assumption that firms have a constant marginal cost greatly simplifies the algebra, especially in general equilibrium models with heterogeneous firms. Micro-data for Chilean (Ahn and McQuoid, 2012; Blum et al., 2013), Danish (Nguyen and Schaur, 2012), French (Vannoorenberghe, 2012), Indonesian (Ahn and McQuoid, 2012) and Thai exporters (Soderbery, 2013) casts doubt upon the validity of this assumption. All of the aforementioned papers find that firms have marginal costs that increase with the amount of output produced. A rising marginal cost implies that exporting does affect a firm’s domestic operations, as export sales come at the expense of domestic profits.\(^{37}\)

While the costs from exporting are clear, the benefits are not, since prospective exporters are typically uncertain about the demand for their product line abroad, and about their capacity to successfully manage foreign supply chains (Johanson and Vahlne, 1977).\(^{38}\) Hence, entering the export market carries a cost with an uncertain return, which will deter entry on the part of less productive firms.

The aforementioned papers on increasing marginal costs emphasize the importance of phys-

\(^{37}\) The interested reader can refer to section 2 of Appendix C for a brief comparison of firm-level predictions in the presence of both constant and increasing marginal costs.

\(^{38}\) Akhmtova and Mitaritonna (2013), Albornoz et al. (2012), Buono and Fadinger (2012) and Eaton et al. (2013) contend that initial uncertainty about foreign markets is essential to explaining (i) why most new export relationships begin with very low export values, (ii) why a large number of new export relationships are destroyed within one year, and (iii) why surviving export relationships grow at a rapid pace from the second year onward.
ical capacity constraints. Finite capacity implies that a firm responds to a favorable (negative) shock abroad by increasing (lowering) export sales and reducing (increasing) domestic sales. Capacity constraints can therefore prompt export market entry when the source country experiences a recession while the rest of the world does not, provided that the fixed costs of entry are not exorbitant. The Great Recession, however, impacted most of Peru’s potential export markets, especially the main markets used by entrants, as shown in Table 3.2. Hence, capacity constraints cannot explain the observed entry patterns for 2009. Temporary marginal cost shocks, however, provide a better explanation. A temporary marginal cost shock reduces the costs of exporting while enabling a firm to learn about foreign markets and its own ability. Since the shock is temporary, firms are likely to take advantage of it only if the fixed cost of exporting is low.\footnote{New exporters often begin with very low export sales (Eaton et al., 2008), which are not sufficient to cover large fixed costs of the sort frequently estimated by the literature during their first year operating abroad. (For example, Morales et al. (2011) estimate the fixed cost to be equivalent to 20\%-40\% of the export sales of the average exporter). Hence, the payment of a large entry cost can be justifiable if the firm can spread out the payment over a number of periods. If the firm has a constant marginal cost, then continuing to operate abroad after the temporary marginal cost shock has dissipated can be profitable. Such is not the case for firms with an increasing marginal cost. Consequently, firms with a rising marginal cost are likely to be deterred from entering the export market in response to a temporary marginal cost shock unless the fixed cost of entry can be repaid over one period.} The Great Recession brought about two marginal cost shocks in its wake: an inventory adjustment and a fall in shipping costs. In the next two sections I will examine the impact of both shocks on entry during this period.

3.4 Inventories and New Exporters

3.4.1 Inventory Adjustment in Peru during the Great Recession

Inventories are one of the causes of rising marginal costs. Holding inventories is costly even during economic booms as they tie up a firm’s cash flows and divert resources that can be used in production. Inventories are an even greater burden in times of an economic downturn, when firms need to cut costs in response to lower sales and reduced lending on the part of financial
institutions. Consequently, firms add to their inventory stock during booms and attempt to offload inventories during contractions. Such was the experience of Peruvian firms during the Great Recession. Peru had the fastest growing manufacturing sector in Latin America between 2005 and 2008, with output rising at an average annual rate of 8.8%. During the same time period, gross fixed capital formation in the manufacturing sector grew at an average annual rate of 30%. The Great Recession resulted in a sharp reversal in both trends; manufacturing output fell by 6.9% and gross fixed capital formation fell by over 20%. An inventory draw down was among the main causes, as Peruvian firms reduced their inventory holdings by $1.9 billion on aggregate (measured at constant 2005 prices).

How can an inventory draw down impact export market entry? Consider a Peruvian firm that is contemplating entering the export market. If the firm decides to enter the export market, then it is likely to see a reduction in profits from its domestic operations due to a rising marginal cost. Due to uncertainty about foreign demand and the firm’s own ability to operate abroad, entry will not be profitable for many firms during economic booms. An economic downturn alters the cost-benefit analysis for firms with large inventories, who need to offload their excess inventory holdings to increase cash flows. Offloading all excess inventories domestically can be difficult for firms with large inventories, particularly at a time of lower domestic demand. Paradoxically, therefore, a downturn creates the opportunity to both test the demand for the firm’s products abroad, as well as the firm’s ability to operate in a foreign market, albeit under less than ideal conditions.

To examine whether continued export market entry during the Great Recession is at least in part attributable to an inventory adjustment it is necessary to construct a measure of inventory holdings for firms in different sectors. The measure I use is the standard inventory turnover rate

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40 Paravisini et al. (2013) report that Peru witnessed a sudden capital outflow during the Great Recession, resulting in a reduction in bank lending. See also ECLAC (2009).
41 See Bils and Kahn (2000) and the references therein.
42 Brazil, Honduras and Mexico were the only Latin American countries to experience an even greater decline in their manufacturing output during the Great Recession. Data on manufacturing output and gross fixed capital formation was obtained from CEPALSTAT. All figures are in real terms.
43 In its report on the state of Peru’s economy during the Great Recession, ECLAC (2009) notes that an “(a)ggressive inventory adjustment” was largely responsible for the fall in private investment.
(ITR), which is defined as the cost of goods sold divided by inventory holdings, and provides an *inverse* measure of inventory holdings. The inventory turnover rate was constructed using data obtained from Compustat. I began by obtaining data on the cost of goods sold and inventory holdings for all of the firms listed by Compustat for period 2001-07. 2007 is chosen as the cutoff to ensure that the variable is not affected by the recession. I first calculated the inventory turnover rate for each firm over the sample period, and then used the median value across all firms within the same 3-digit NAICS sector to construct the sectoral measure. Although the inventory turnover rate was constructed using data largely on US firms, identification is still possible provided that the ranking of sectors by inventory turnover is the same for Peru. There is reason to believe that this is the case, since this variable captures aspects pertaining to the production process. The use of sectoral indicators constructed using data on US firms for estimation on data for other countries is common in the international trade and macro literature. Chor and Manova (2012) and Rajan and Zingales (1998), among others, adopt a similar approach.

### 3.4.2 Impact of Inventory Holdings on Entry

To empirically assess the contribution of inventory holdings on entry during the Great Recession I estimate the following regression using Poisson PML:

$$
E(\text{Number of Entrants}_{ijt} | \mathbf{x}) = \exp(\beta_0 + \beta_1 \text{ITR}_i + \beta_2 \text{ITR}_i \times Y2009 + \mathbf{x}'_{1,ijt} \Gamma + \alpha_i + \gamma_j + \delta_t),
$$

where $\mathbf{x}_{1,ijt}$ is a matrix of covariates other than the inventory turnover rate and the year, country and sector dummies. The coefficient of interest is $\beta_2$. While $\beta_1$ captures the impact of the inventory turnover rate on entry during the years 2005-08, $\beta_2$ captures the differential affect for 2009. A significant estimate for $\beta_2$ indicates that inventory holdings had a disproportionate impact on the number of export relationships established by new exporters during the Great Recession relative to the pre-crisis years. Given that the inventory turnover rate is an inverse
measure of inventory holdings, a negative value for $\beta_2$ would indicate increased export market participation among firms operating in industries with larger inventories in 2009 relative to 2005-08.

Table 3.6 displays the results from estimating equation (3.3). Column (1) displays the results from a regression of the number of entrants on the inventory turnover rate, the GDP of the importing country, the interaction of both with a 2009 year dummy, along with year, country and sector fixed effects.\textsuperscript{44} The coefficient estimate on inventory turnover rate is not significant at standard levels, nor is there any reason to expect it to be in the steady state of 2005-08, as is explained below. In contrast, the interaction term is highly significant and takes on the expected sign; a one standard deviation reduction in the inventory turnover rate is associated with an 8.2% increase in the number of export relationships established in 2009 relative to the pre-crisis period. In other words, 2009 witnessed increased entry among firms operating in industries with larger inventory holdings relative to the 2005-08 period across destinations even after controlling for changes in GDP.

It is possible that the results in column (1) are misleading, since the inventory turnover rate may be correlated with other product or sector characteristics that were affected by the Great Recession. In columns (2)-(5) I conduct robustness checks by controlling for additional product and sector features which other authors have found to have had an influence on the trade collapse during the Great Recession.\textsuperscript{45} Since trade in durable goods declined substantially more than trade in non-durables during the Great Recession (Bems et al., 2011; Levchenko et al., 2010), I include a control for whether an HS4 product is durable. Columns (2) and (5) reveal that the Great Recession discouraged entry on the part of firms selling durable goods. In the pre-crisis years there is no discernable difference in the number of export relationships established by producers of durables and non-durables once the remaining sector and product

\textsuperscript{44}Given that there are 20 3-digit NAICS industries and 252 HS4 products, each NAICS industry corresponds to multiple HS4 products. Consequently, the inventory turnover rate is identified even in the presence of HS4 fixed effects. The same is true for the other product and sector characteristics included in columns (2)-(5) of Table 3.6.

\textsuperscript{45}The data sources for these additional controls are discussed in Appendix C.
Table 3.6: Impact of Inventory Holdings on Entry

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Turnover Rate$_i$</td>
<td>-0.911</td>
<td>1.864***</td>
<td>-1.073**</td>
<td>-5.051***</td>
<td>-5.327***</td>
</tr>
<tr>
<td></td>
<td>(0.609)</td>
<td>(0.541)</td>
<td>(0.485)</td>
<td>(1.267)</td>
<td>(0.889)</td>
</tr>
<tr>
<td>× Y2009</td>
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<td><strong>-0.200</strong>*</td>
<td><strong>-0.251</strong>*</td>
<td><strong>-0.273</strong>*</td>
<td><strong>-0.268</strong>*</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.065)</td>
<td>(0.073)</td>
<td>(0.081)</td>
<td>(0.084)</td>
</tr>
<tr>
<td>GDP$_{jt}$</td>
<td>2.439***</td>
<td>2.439***</td>
<td>2.439***</td>
<td>2.439***</td>
<td>2.439***</td>
</tr>
<tr>
<td></td>
<td>(0.247)</td>
<td>(0.245)</td>
<td>(0.247)</td>
<td>(0.247)</td>
<td>(0.245)</td>
</tr>
<tr>
<td>× Y2009</td>
<td>0.0004</td>
<td>0.0004</td>
<td>0.0004</td>
<td>0.0004</td>
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</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.011)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>Durable Goods$_i$</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>(0.430)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>× Y2009</td>
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<td></td>
<td></td>
<td><strong>-0.323</strong>*</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
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<td></td>
<td></td>
<td>(0.043)</td>
</tr>
<tr>
<td>Consumer Goods$_i$</td>
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<td></td>
<td>-0.160</td>
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<tr>
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<td>(0.323)</td>
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<td></td>
<td></td>
<td>(0.323)</td>
</tr>
<tr>
<td>× Y2009</td>
<td>0.033</td>
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<td></td>
<td></td>
<td>0.176***</td>
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<td>(0.055)</td>
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<td>(0.055)</td>
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<tr>
<td>Financial Dependence$_i$</td>
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<td></td>
<td></td>
<td><strong>-2.920</strong>*</td>
<td><strong>-2.954</strong>*</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.577)</td>
<td>(0.377)</td>
</tr>
<tr>
<td>× Y2009</td>
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<td>-0.013</td>
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<td>(0.019)</td>
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<td>Yes</td>
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<td>HS4 Fixed Effects</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.671</td>
<td>0.675</td>
<td>0.671</td>
<td>0.672</td>
<td>0.675</td>
</tr>
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<td>Observations</td>
<td>78,120</td>
<td>78,120</td>
<td>78,120</td>
<td>78,120</td>
<td>78,120</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01, ** p < 0.05. 2) Robust standard errors are clustered at the country-HS4 level.
characteristics are controlled for (see column (5)). During the Great Recession, however, an export relationship established by new exporters was 27% less likely to involve durable goods relative to non-durables.\textsuperscript{46} This confirms that the findings of Bems et al. (2011) and Levchenko et al. (2010) extend to new Peruvian exporters.

The decline in durable goods trade during the Great Recession could be a consequence of the fact that the production of durable goods is more vertically integrated, leaving this sector particularly vulnerable to a disruption in supply chains (Bems et al., 2011). To account for such possible disruptions, I also distinguish between final consumer goods on the one hand, and capital and intermediate goods on the other. Although I do not find evidence that new exporters were disproportionately less likely to export intermediate goods in 2009 relative to the pre-crisis years in column (3), I do find such evidence in column (5). The interaction of the consumer goods indicator with the crisis year dummy is positive and significant, indicating that new exporters were less likely to be integrated into vertical production networks during the Great Recession.

Lastly, I control for the reliance of firms within a 3-digit NAICS manufacturing sector on external finance. The inclusion of this variable is motivated by the arguments put forth by Ahn et al. (2011a) and Chor and Manova (2012) that credit constraints were primarily responsible for the trade collapse, and the findings of Paravisini et al. (2013) that Peruvian banks reduced US dollar-denominated lending during the Great Recession due to a capital outflow. Firms reliant on outside financing are considerably less likely to enter the export market. A 10% increase in the average dependence on external financing within a manufacturing sector is found to reduce the number of export relationships established by nearly 30%. I do not find evidence that this impact was magnified by the Great Recession, however. The coefficient estimate on the interaction term is close to zero in both columns (4) and (5). Hence, while

\textsuperscript{46}Given the results in column (5), the number of export relationships established by new exporters selling durable goods was $(\exp^{0.009 - 1}) \times 100\% = 0.9\%$ greater than the number of export relationships established by new exporters selling non-durables during the pre-crisis years. During the Great Recession, the number of export relationships established by new exporters selling durable goods was $(\exp^{0.009 - 0.323 - 1}) \times 100\% = -26.9\%$ higher (i.e., 26.9\% lower) than the number of export relationships established by new exporters selling non-durables.
credit constraints are a barrier to export market participation, there is no indication that it had an outsized influence on the export market entry decision for Peruvian firms during the Great Recession. This is consistent with the findings of Paravisini et al. (2013).47

The main conclusion from Table 3.6 is that the interaction of the inventory turnover rate with the 2009 year dummy remains negative and significant even after controlling for a large number of possible alternative explanations. Moreover, the coefficient estimate remains stable even with the inclusion of these additional controls.

The estimated differential impact of a one standard deviation reduction in the inventory turnover rate on the number of export relationships established by new exporters in 2009 relative to the pre-crisis years ranges from 6.8%-9.3%. How significant is this finding? In Section 2.3, I noted that the average export destination suffered a 1.9% decline in its GDP in 2009 relative to 2008. Given the estimated impact of GDP growth, such a decline should have lead to 4.6% drop in the number of export relationships established by new exporters. In other words, the estimated differential impact of a one standard deviation increase in inventory holdings during the Great Recession on the dependent variable is nearly one and a half to twice the size (in magnitude) as the estimated impact of the decline in GDP during this period.

While Table 3.6 is clear about the differential impact of inventory holdings during the Great Recession on the number of export relationships established by entrants, it provides ambiguous predictions as to the overall impact of inventory holdings on export market participation. The coefficient estimate on the inventory turnover rate for the control (2005-08) period oscillates from positive to negative in columns (1)-(3) before stabilizing in column (4) once I control for financial dependence. Table C.4 in the Appendix provides an explanation. Firms with large inventories also tend to be heavily reliant on external financing. This is not surprising given that holding inventories ties up a firm’s internally generated cash flows, which prompts firms with large inventories to seek outside funding. Since financially dependent firms are less likely to export, it is not possible to obtain a precise link between inventory holdings and

47Paravisini et al. (2013) have found that credit constraints have a negligible impact on the extensive margin and a greater impact on the intensive margin of international trade flows.
export market participation without controlling for financial dependence. This explains the lack of stability for the coefficient estimate in columns (1)-(3). Only after accounting for their financial dependence, do we find that — all else equal — firms with large inventories tend to be more likely to enter the export market in the control period.

3.5 Shipping Costs and Product Differentiation

The Great Recession has drawn a great deal of attention from international trade economists due to the ‘trade collapse.’ In spite of the vast literature on the impact of the Great Recession on international trade flows, one aspect has been overlooked: the impact of the Great Recession on shipping costs. That impact is shown in Figure 3.4. Panel (a) depicts the percentage change in the supply of and demand for container shipping from 2000-2012. Notice that 2009 was the only year in which the demand for container shipping declined from the year before. While demand declined by 9%, the supply of container shipping grew by 5% in 2009 relative to 2008. Unsurprisingly, therefore, shipping costs plunged during the Great Recession. Panel (b) of Figure 3.4 presents the New ConTex Index, which is a standard index of global shipping rates. Shipping rates were fairly stable from October 2007 until the beginning of the Great Recession in the fall of 2008. Shipping rates then plunged in late 2008, and remained low for the entirety

The fall in shipping costs was a temporary marginal cost shock with the potential to impact the decision to enter the export market. Akin to an inventory adjustment, lower shipping costs should not affect the entry decision for all prospective exporters equally. Such is the case because some firms’ profits are more sensitive to changes in the cost structure than others. More specifically, firms charging higher markups over their marginal cost are less likely to be impacted by changes in shipping costs than firms charging low markups. Markups are typically lower for producers of relatively homogenous goods than for producers of relatively differentiated ones. Consequently, one would expect producers of relatively homogeneous goods to be more affected by changes in shipping costs than producers of more differentiated goods.\(^48\) This is consistent with the findings of Berthelon and Freund (2008) that distance (a common proxy for shipping costs) has a greater impact on the exports of homogeneous goods than on the exports of differentiated products.\(^49\)

To determine if a fall in shipping costs affected the makeup of the 2009 entry cohort it is first necessary to obtain data on transportation costs faced by Peruvian firms that vary across products, years and countries. Unfortunately, actual data on shipping rates are difficult to obtain. Consequently, I construct an index of shipping costs in the following manner. First, I obtain an approximation of the shipping rates that Peruvian exporters face when selling to the US using the US import file created by the Foreign Trade Division of the US Census Bureau. The dataset includes information on the customs value of imports as well as the customs, insurance and freight (c.i.f.) values. In keeping with the literature, I define the freight cost faced by Peruvian firms exporting product \(i\) to the US in year \(t\) as the c.i.f. markup over the

\(^{48}\) This is true even in a standard international trade model with CES preferences and constant markups, since the markup is decreasing with the elasticity of substitution. Moreover, in such a model firms selling less differentiated products are more sensitive to changes in trade costs.

\(^{49}\) Moreover, producers of differentiated products can circumvent some of the shipping costs by purposely misstating the price of their product on customs declarations. Firms producing homogeneous products do not have the ability to do so due to greater certainty about the value of their products. See Javorcik and Narciso (2008).
export shipment:

\[
\text{freight cost}_{it}^{\text{US}} = \left( \frac{\text{c.i.f.}}{\text{customs value}} \right)_{it} - 1.50
\]

Column (2) of Table 3.7 provides a yearly summary of the costs of shipping to the US. Notice that freight costs were lower in 2009, on average, than in any of the previous years. In fact, average shipping costs in 2009 declined by 20% relative to 2008.

Table 3.7: Shipping Costs, Yearly Average 2005-09

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of Shipping to US</th>
<th>Rescaled by LSC Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.107</td>
<td>-5.826</td>
</tr>
<tr>
<td>2006</td>
<td>0.093</td>
<td>-5.847</td>
</tr>
<tr>
<td>2007</td>
<td>0.096</td>
<td>-5.908</td>
</tr>
<tr>
<td>2008</td>
<td>0.105</td>
<td>-5.945</td>
</tr>
<tr>
<td>2009</td>
<td>0.084</td>
<td>-6.141</td>
</tr>
</tbody>
</table>

The above procedure provides me with a measure of freight costs that vary at the HS4-year level. Using it to proxy for freight costs for destinations other than the US is problematic since the actual cost differs across destinations for the same HS4 product. Among the reasons for cross-country differences in shipping costs is that countries differ in terms of their integration into international shipping routes. Whereas port cities such as Hong Kong, Rotterdam and Singapore are well integrated into international shipping routes (Hummels, 2007), other destinations are less so, which affects the freight cost. To correct for cross country differences, I divide the cost of shipping to the US by the Liner Shipping Connectivity (LSC) Index. Constructed by UNCTAD, the LSC Index provides an indicator of a country’s integration into global shipping networks. Rescaling the cost of shipping to the US by the LSC Index provides

\[50\] Besedeš and Prusa (2006) and Rauch (1999) among others adopt a similar approach to measuring shipping costs.

\[51\] Full summary statistics are presented in Table C.3 in the Appendix.

\[52\] A full description of the LSC Index is available at: [http://data.worldbank.org/indicator/IS.SHP.GCNW.XQ](http://data.worldbank.org/indicator/IS.SHP.GCNW.XQ). The LSC Index exhibits great variation, even for countries in close proximity to each other. For example, the LSC value for Poland in 2009 was 9.21, whereas the index value in neighboring Germany was 84.30.
me with a measure of transportation costs which varies at the year-country-HS4 level. Yearly averages are presented the third column of Table 3.7. Notice once more that the transportation costs are, on average, lower in 2009 than in any prior year.

I begin by confirming that shipping costs exert a greater impact on the entry decision for firms producing homogeneous goods relative to those producing differentiated ones. To do so, I estimate the following regression through Poisson PML:

\[
E[\text{Number of Entrants}_{ijt} | \mathbf{x}] = \exp \left( \beta_0 + \beta_1 \text{Differentiated Good}_i + \beta_2 \text{Shipping Cost}_{ijt} + \beta_3 \text{Differentiated Good}_i \times \text{Shipping Cost}_{ijt} + \beta_4 \text{GDP}_{jt} + \alpha_i + \gamma_j + \delta_t \right). \tag{3.4}
\]

The coefficients of interest are \( \beta_2 \) and \( \beta_3 \). \( \beta_2 \) informs us of the impact of shipping costs on the number of export relationships established by firms exporting homogeneous products, while \( \beta_3 \) informs us of the differential impact of shipping costs on firms exporting differentiated products.\(^{53}\) Table 3.8 presents the estimation results.\(^{54}\) As expected, shipping costs are a greater deterrent to export market participation for firms selling homogeneous goods. A one standard deviation increase in shipping costs lowers the number of export relationships established by new exporters selling homogeneous goods by nearly 49%. By contrast, the number of export relationships established by entrants selling differentiated products falls by a statistically insignificant 3.6%.

The results from Table 3.8 suggest that a fall in transportation costs in 2009 should have increased entry on the part of firms selling homogeneous goods relative to firms selling differentiated goods. To examine if that was the case, I estimate the following regression through Poisson PML:

\(^{53}\)An indicator of whether a product is differentiated or homogeneous was obtained from David Hummels' website [http://www.krannert.purdue.edu/faculty/hummelsd/datasets.asp] and is based on the classification used in Hummels and Klenow (2005). Their classification is based on an earlier one constructed by Rauch (1999).

\(^{54}\)The inclusion of the differentiated goods dummy reduces the sample size because Hummels and Klenow (2005) could not match the initial classification of Rauch (1999) to every HS code (see footnote 17 in their paper). The sample size is further reduced because some of the 62 countries that comprise the full sample are not covered by the LSC Index.
### Table 3.8: Impact of Shipping Costs on the Composition of an Entry Cohort

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of Entrants&lt;sub&gt;ijt&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiated Goods&lt;sub&gt;i&lt;/sub&gt;</td>
<td>3.265***</td>
</tr>
<tr>
<td></td>
<td>(0.710)</td>
</tr>
<tr>
<td>Shipping Costs&lt;sub&gt;ijt&lt;/sub&gt;</td>
<td>-0.403***</td>
</tr>
<tr>
<td></td>
<td>(0.093)</td>
</tr>
<tr>
<td>Shipping Costs&lt;sub&gt;ijt&lt;/sub&gt; × Differentiated Goods&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.373***</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
</tr>
<tr>
<td>GDP&lt;sub&gt;jt&lt;/sub&gt;</td>
<td>2.179***</td>
</tr>
<tr>
<td></td>
<td>(0.307)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>HS4 Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.670</td>
</tr>
<tr>
<td>Observations</td>
<td>40,338</td>
</tr>
</tbody>
</table>

**Notes:** 1) *** p < 0.01. 2) Robust standard errors are clustered at the country-HS4 level.

\[
E \left[ \text{Number of Entrants}_{ijt} | \mathbf{x} \right] = \exp \left( \beta_0 + \beta_1 \text{Differentiated Good}_i + \beta_2 \text{Differentiated Good}_i \times \text{Y2009} + \mathbf{x}'_{ijt} \Gamma + \alpha_i + \gamma_j + \delta_t \right). \quad (3.5)
\]

Given the results from Table 3.8, we expect \( \beta_1 \) to be positive and significant. The coefficient of interest is the interaction term \( \beta_2 \). It is expected to be negative and significant, which would indicate that the 2009 entry cohort had a greater share of firms selling homogeneous goods relative to the pre-crisis years.

Table 3.9 presents the regression results for equation (3.5). \( \beta_1 \) and \( \beta_2 \) are both significant and take on the expected signs. In both the control and treatment periods, new exporters are considerably more likely to export differentiated products than homogenous ones. However, we can see that the share of homogeneous goods in the export relationships established by new exporters is considerably larger in 2009 than in the period from 2005-08. In the pre-crisis years, an export relationship involving a new exporter is about 8.8 times more likely to
Table 3.9: Product Differentiation and Entry During the Great Recession

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Entrants_{ijt}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiated Goods_{i}</td>
<td>2.282***</td>
<td>2.802***</td>
<td>2.258***</td>
<td>0.181</td>
<td>1.720***</td>
</tr>
<tr>
<td></td>
<td>(0.431)</td>
<td>(0.316)</td>
<td>(0.428)</td>
<td>(0.531)</td>
<td>(0.448)</td>
</tr>
<tr>
<td>× Y2009</td>
<td>-0.499***</td>
<td>-0.449***</td>
<td>-0.492***</td>
<td>-0.509***</td>
<td>-0.414***</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.074)</td>
<td>(0.070)</td>
<td>(0.072)</td>
<td>(0.077)</td>
</tr>
<tr>
<td>Inventory Turnover Rate_{i}</td>
<td>1.892***</td>
<td>1.881***</td>
<td>1.702***</td>
<td>-4.803***</td>
<td>-5.315***</td>
</tr>
<tr>
<td></td>
<td>(0.539)</td>
<td>(0.537)</td>
<td>(0.334)</td>
<td>(1.412)</td>
<td>(0.873)</td>
</tr>
<tr>
<td>× Y2009</td>
<td>-0.320***</td>
<td>-0.281***</td>
<td>-0.330***</td>
<td>-0.339***</td>
<td>-0.312***</td>
</tr>
<tr>
<td></td>
<td>(0.086)</td>
<td>(0.086)</td>
<td>(0.091)</td>
<td>(0.099)</td>
<td>(0.106)</td>
</tr>
<tr>
<td>GDP_{jt}</td>
<td>2.274***</td>
<td>2.274***</td>
<td>2.274***</td>
<td>2.274***</td>
<td>2.274***</td>
</tr>
<tr>
<td></td>
<td>(0.281)</td>
<td>(0.281)</td>
<td>(0.282)</td>
<td>(0.281)</td>
<td>(0.281)</td>
</tr>
<tr>
<td>× Y2009</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Durable Goods_{i}</td>
<td>-0.505</td>
<td></td>
<td>-1.648***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.470)</td>
<td></td>
<td>(0.561)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>× Y2009</td>
<td>-0.135**</td>
<td></td>
<td>-0.178***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0573)</td>
<td></td>
<td>(0.054)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Goods_{i}</td>
<td>-0.136</td>
<td></td>
<td>-0.153</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.316)</td>
<td></td>
<td>(0.316)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>× Y2009</td>
<td>0.037</td>
<td></td>
<td>0.128*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td></td>
<td>(0.067)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Dependence_{i}</td>
<td></td>
<td></td>
<td>-2.823***</td>
<td>-2.955***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.472)</td>
<td>(0.372)</td>
<td></td>
</tr>
<tr>
<td>× Y2009</td>
<td>-0.014</td>
<td></td>
<td>-0.005</td>
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<td></td>
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<td></td>
<td>(0.023)</td>
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<td>(0.022)</td>
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</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>HS4 Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.658</td>
<td>0.659</td>
<td>0.658</td>
<td>0.659</td>
<td>0.658</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01, ** p < 0.05, * p < 0.1. 2) Robust standard errors are clustered at the country-HS4 level.
involve a differentiated product than a homogeneous one. By contrast, an export relationship is only 4.9 times more likely to involve a differentiated product rather than a homogenous one in 2009. Including the additional product and sector characteristics affects the size of the coefficient estimates but does not change the underlying result. Given the full set of controls in column (5), we can see that differentiated goods were 4.6 times more likely than homogeneous goods to be involved in a foreign transaction undertaken by a new exporter from 2005-08. In 2009, however, differentiated goods were only 2.7 times as likely to be involved in a foreign transaction than homogeneous goods. This decline is both statistically as well as economically significant.\textsuperscript{55,56}

\section*{3.6 Conclusion}

Many countries have government agencies tasked with promoting exports and do so using a variety of subsidies to exporters.\textsuperscript{57} Such agencies and policies indicate the importance that governments attach to export growth. Recent research indicates that a large portion of long-run export growth is generated by new exporters. Eaton et al. (2008) have shown that Colombian firms that entered the export market between 1996 and 2005 were responsible for 47\% of Colombia’s total export growth and for 70\% of export growth in Colombia’s top ten export markets over the course of that decade. Similarly, Amador and Opromolla (2013) have shown

\textsuperscript{55}Note that the inclusion of the differentiated goods dummy does not affect the earlier findings on inventory holdings, durables, intermediate goods and the role of financial dependence (see section 4.2 of this chapter).

\textsuperscript{56}It is conceivable that these results are not driven solely by changes in shipping costs but also by changes in GDP. While homogeneous goods are sold on organized exchanges, differentiated goods are not (Rauch, 1999). Consequently, buyers and sellers of differentiated goods face higher search costs than buyers and sellers of homogeneous goods (Besedes and Prusa, 2006). Search costs tend to be smaller in ‘denser,’ i.e., larger markets. A recession which reduces the size of the market can thereby discourage entry on the part of firms selling differentiated products. Since search costs comprise a key component of the entry cost that prospective exporters are believed to incur, reduced entry on the part of firms selling differentiated goods during the Great Recession would be consistent with the notion that large entry costs are the primary deterrent to export market participation. In Appendix C, I test whether the number of export relationships established by new exporters selling differentiated goods is more sensitive to changes in GDP than the number of export relationships established by new exporters selling homogeneous goods. I find no evidence that this is the case. The results are presented in Table C.5.

\textsuperscript{57}For example, the Export-Import Bank provides US exporters with financial support, while Export Development Canada performs a similar function for Canadian exporters. See Das et al. (2007) and the references therein for a discussion of tax subsidies for exporting firms provided by Colombia and other developing countries.
that nearly one-third of Portugal’s export growth from 1995-2005 was due to new exporters, while net entry into exporting accounts for about a quarter of US export growth from 1993-2003 (Bernard et al., 2009a). Given the economic importance of new exporters and the fact that many governments design policies aimed at encouraging export growth, it is important to understand the barriers to export market participation for firms contemplating entering the export market.

The dominant hypothesis in the international trade literature as to why only a small minority of firms export is that entry into exporting requires the payment of a large fixed cost. This hypothesis has recently come under increased scrutiny, as large fixed costs are inconsistent with the fact that firms enter into and exit from export markets at a high frequency. Some of the critics of the large fixed cost hypothesis have suggested that it is possible for prospective exporters to test out foreign markets without incurring large upfront payments. In this chapter I have used the Great Recession as a natural experiment to assess which of the two approaches is closer to the mark using transactions-level data for Peru. Despite the global economic downturn, heightened economic uncertainty and a sharp drop in private sector investment in Peru, I find no reduction in export market entry. This is in spite of the fact that entry is found to be highly pro-cyclical.

I show that continued entry can be explained by two temporary marginal cost shocks. A large-scale inventory adjustment in Peru led to increased entry among firms operating in industries with larger inventory holdings. The sharp drop in shipping costs also led to increased entry on the part of producers of relatively homogeneous goods, which are the firms that are most impacted by changes in shipping costs.

My findings demonstrate that Peruvian firms who are near the margin of the decision about whether to export respond to temporary marginal cost shocks. This is consistent with the arguments put forth by Akhmetova and Mitaritonna (2013), Békés and Muraközy (2012), Buono and Fadinger (2012) and Freund and Pierola (2010) that it is possible to enter the export market for brief periods without incurring large upfront costs. This suggests that more research
is needed into the role of marginal costs vs. fixed costs for understanding the many extensive margins of trade.
Bibliography


Appendix to Chapter 1

A.1 Demand shifters and Proposition 1

The demand shifters in the two countries can be written as:

\[ D_A = f(2\sigma - 1) \left( \frac{2\sigma - 1}{\sigma - 1} \frac{b}{\theta^*_A} \right)^{\sigma-1}, \quad D_B = f \left( \frac{\sigma}{1 - \eta} \right) \left( \frac{2\sigma - 1}{\sigma - 1} \frac{b}{\theta^*_B} \right)^{\sigma-1}. \]

Their ratio is \( D_A/D_B = \delta (\theta^*_B/\theta^*_A)^{\sigma-1} \).

The export market cut-offs are obtained by setting export revenues equal to the fixed cost of exporting, \( f_x \). This gives us the following cut-offs:

\[ \theta^*_{A,x} = \frac{\tau}{\rho} \left[ (2\sigma - 1) \frac{f_x}{D_B} \right]^{\frac{1}{\sigma-1}}, \quad \theta^*_{B,x} = \frac{\tau}{\gamma} \left[ \frac{\sigma}{1 - \eta} \frac{f_x}{D_A} \right]^{\frac{1}{\sigma-1}}. \]

Note that \( \theta^*_{i,x} \) depends on \( D_{-i} \), which in turn depends on \( \theta^*_{-i} \).

When productivity is Pareto-distributed, the fraction of country \( i \) firms that export is \( (\theta^*_i/\theta^*_{i,x})^k \). We can express both ratios in terms of the cut-offs and the fixed and variable costs as

\[ \beta_A = \tau^{-k} \left( \frac{f}{\delta f_x} \right)^{\frac{k}{\sigma-1}} \left( \frac{\theta^*_A}{\theta^*_{A,x}} \right)^k, \quad \beta_B = \tau^{-k} \left( \frac{\delta f}{f_x} \right)^{\frac{k}{\sigma-1}} \left( \frac{\theta^*_B}{\theta^*_{B,x}} \right)^k. \]

Combining \( \beta_A \) and \( \beta_B \) with Lemma 1 gives us the results of Proposition 1.

A.2 Critical values of \( w_B/w_A \)

Let \( \tilde{f} = f/f_x \). In order for \( \theta^*_{i,x} > \theta^*_{i} \) \( \forall i \), it is necessary for \( \eta \in (\eta, \eta) \), where

\[ \eta = 1 - \frac{1}{2} \left( \frac{2\sigma}{2\sigma - 1} \right)^{\frac{1}{\sigma-1}} \left[ \frac{1 + \Gamma^2 \tilde{f}}{\Gamma (1 + \tilde{f})} \right]^{\frac{\sigma+1}{\sigma}}, \quad \eta = 1 - \frac{1}{2} \left( \frac{2\sigma}{2\sigma - 1} \right)^{\frac{1}{\sigma-1}} \left[ \frac{1 + \frac{\Gamma}{1 + \Gamma^2 \tilde{f}}}{\frac{\Gamma}{1 + \Gamma^2 \tilde{f}}} \right]^{\frac{\sigma+1}{\sigma}}. \]

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Substituting both into the function defining $w_B/w_A$ gives us

$$\varpi = \frac{\sigma + 1 - \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{1 + \Gamma^2 f}{\Gamma(1 + f)}\right)^{\frac{\varpi - 1}{\varpi + 1}}}{\sigma - 1}, \quad \text{and} \quad \bar{\varpi} = \frac{\sigma + 1 - \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{(1 + f)^2}{1 + \Gamma^2 f}\right)^{\frac{\bar{\varpi} - 1}{\bar{\varpi} + 1}}}{\sigma - 1}. \quad (A.1)$$

It is straightforward to verify that both $\beta_A$ and $\beta_B$ are less than 1 as long as $\varpi < \omega < \bar{\omega}$.

The critical values of $w_B/w_A$ mentioned in section 4 correspond to the case when $\eta$ is equal to the following values:

$$\eta_1 = 1 - \frac{1}{2} \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{1 + \sigma^2}{2\Gamma}\right)^{\frac{\varpi - 1}{\varpi + 1}} \quad \text{and} \quad \eta_2 = 1 - \frac{1}{2} \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{2\Gamma}{1 + \Gamma^2}\right)^{\frac{\varpi - 1}{\varpi + 1}},$$

respectively. Substituting into $w_B/w_A$ gives us

$$\omega_1 = \frac{\sigma + 1 - \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{1 + \Gamma^2 f}{2\Gamma}\right)^{\frac{\varpi - 1}{\varpi + 1}}}{\sigma - 1}, \quad \text{and} \quad \omega_2 = \frac{\sigma + 1 - \left(\frac{2\sigma}{2\sigma - 1}\right)^{\sigma} \left(\frac{2\Gamma}{1 + \Gamma^2}\right)^{\frac{\varpi - 1}{\varpi + 1}}}{\sigma - 1}. \quad (A.2)$$

It is straightforward to verify that both $\omega < \omega_1$ and $\omega > \omega_2$ as long as $\bar{f} < 1$. We can also see that a reduction in $\tau$ lowers $(1 + \Gamma^2)/(2\Gamma)$, thereby raising $\omega_1$ and lowering $\omega_2$.

### A.3 Aggregation

As is well-known, with CES preferences the aggregate price index in country $i$ can be written as $P_i = \left[ \int_{\Omega_i} p_{ij}^{-\sigma} d\theta \right]^{1/\sigma}$. With $M_A$ domestic producers in country $A$ and $M_{B,x} \subset M_B$ producers exporting to $A$ from $B$, the price index for country $A$ can be written as

$$P_A = \left[ M_A \int_{\theta_A^*}^{\infty} (\theta \rho)^{\sigma - 1} dG(\theta) + \tau^{1-\sigma} M_{B,x} \int_{\theta_{B,x}^*}^{\infty} (\theta \gamma)^{\sigma - 1} dG(\theta) \right]^{\frac{1}{\sigma}}.$$

Letting $\tilde{\Theta}_A = \left[ \int_{\theta_A^*}^{\infty} \theta^{\sigma - 1} dG(\theta) + \tau^{1-\sigma} M_{B,x} \left(\frac{2\sigma - 1}{2\sigma}\right)^{\sigma - 1} \int_{\theta_{B,x}^*}^{\infty} \theta^{\sigma - 1} dG(\theta) \right]^{\frac{1}{\sigma - 1}}$, we can write $P_A = M_A^{\frac{1}{\sigma}} P_A \left( \tilde{\Theta}_A \right)$. Using the Pareto distribution for the productivity draws enables us to solve for $\tilde{\Theta}_A$:

$$\tilde{\Theta}_A = \left( \frac{k}{k + 1 - \sigma} \right) \left[ 1 + \tau^{-k} M_B \left(\frac{2\sigma - 1}{2\sigma}\right)^{\sigma - 1} \left(\frac{\delta f}{f_x}\right)^{\frac{\sigma - 1}{\sigma + 1}} \left(\frac{\theta_B}{\theta_A}\right)^k \right]^{\frac{1}{\sigma - 1}} \theta_A^*.$$

Employing a similar procedure for country $B$ gives us equation (1.9) in the main text. Given
the Pareto distribution, we can solve for it as

\[ \tilde{\Theta}_B = \left( \frac{k}{k+1-\sigma} \right) \left[ 1 + \tau^{-k} \frac{M_A}{M_B} \left( \frac{2\sigma}{2\sigma-1} \right)^{\sigma-1} \left( \frac{f}{\delta f_x} \right)^{\frac{k+1-\sigma}{\sigma-1}} \left( \frac{\theta_A}{\theta_B} \right)^k \right] \frac{1}{\sigma-1} \theta_B^* . \]

A second measure of average productivity takes into account only those firms that are headquartered in country \( i \). It is obtained by considering either aggregate employment or aggregate revenues of all firms based in country \( i \). Aggregate employment in manufacturing for country \( A \) can be written as

\[ L_A = M_A D_A \rho \sigma \left[ \int_{\theta_A}^{\infty} \theta^{-1} dG(\theta) + \frac{M_{A,x} D_B}{M_A} \int_{\theta_{A,x}}^{\infty} \theta^{-1} dG(\theta) \right] . \]

Letting \( \overline{\Theta}_A = \left[ \int_{\theta_A}^{\infty} \theta^{-1} dG(\theta) + \frac{M_{A,x} D_B}{M_A} \int_{\theta_{A,x}}^{\infty} \theta^{-1} dG(\theta) \right] \frac{1}{\sigma-1} \), we can write \( L_A = M_A l_A (\overline{\Theta}_A) \).

\[ \overline{\Theta}_B = \left[ \int_{\theta_B}^{\infty} \theta^{-1} dG(\theta) + \frac{M_{B,x} D_B}{M_B} \int_{\theta_{B,x}}^{\infty} \theta^{-1} dG(\theta) \right] \frac{1}{\sigma-1} \] is derived in a similar manner. Given a Pareto distribution for the productivity draws, it is possible to solve for both values as follows:

\[ \overline{\Theta}_A = \left( \frac{k}{k+1-\sigma} \right)^{\frac{1}{\sigma-1}} \left[ 1 + L_A \left( \frac{\theta_A}{\theta_B} \right)^k \right] \frac{1}{\sigma-1} \theta_A^* \] and \( \overline{\Theta}_B = \left( \frac{k}{k+1-\sigma} \right)^{\frac{1}{\sigma-1}} \left[ 1 + \Lambda_B \left( \frac{\theta_B}{\theta_A} \right)^k \right] \frac{1}{\sigma-1} \theta_B^* . \]

Note that \( \overline{\Theta}_A = \overline{\Theta}_B \) when \( w_B/w_A = \omega \) (see Lemma 1 in the main text).

### A.4 Proof of Proposition 2

Expressions for \( \beta_A \) and \( \beta_B \) are provided in Appendix 1. Substituting (1.5) into \( \beta_A \): \( \beta_A = \frac{f (\Lambda + \Gamma)}{1-\Lambda} \). Differentiating with respect to \( \tau \), we can see that a reduction in variable trade costs lowers \( \beta_A \) if and only if \( \delta < \left( \frac{1+\Gamma^2}{2\tau} \right)^{\frac{k+1}{k}} \), i.e., when \( \eta < \eta_1 \), or as long as \( w_B/w_A < \omega_1 \).

Similarly, \( \beta_B \) can be written as \( \beta_B = \frac{f (\Lambda_B + \Gamma)}{1-\Lambda_B} \). We can see that the above is falling in \( \tau \) only as long as \( \delta > \left( \frac{2\tau}{1+\Gamma^2} \right)^{\frac{1}{k-1}} \), or as long as \( w_B/w_A < \omega_2 \). Once \( w_B/w_A \) crosses this threshold, a marginal increase in \( \tau \) raises \( \beta_B \).

### A.5 Trade balance in manufacturing and mass of active firms

From the perspective of country \( A \), the trade balance is given by \( R_{A,x} - R_{B,x} \), where \( R_{i,x} \) is the total value of \( i \)'s exports. This is equal to:

\[ TB_A = \tau^{-k} \left( \frac{k}{k+1-\sigma} \right) \left[ M_A f (2\sigma-1) \delta \left( \frac{f}{\delta f_x} \right)^{\frac{k+1-\sigma}{\sigma-1}} \left( \frac{\theta_A}{\theta_B} \right)^k - M_B 2\sigma f \left( \frac{2\sigma-1}{2\sigma} \right)^{\sigma} \left( \frac{f}{f_x} \right)^{\frac{k+1-\sigma}{\sigma-1}} \left( \frac{\theta_B}{\theta_A} \right)^k \right] . \]
Solving for the capital market clearing condition in both countries simultaneously gives us the relative mass of producing firms in each country:

\[
\frac{M_A}{M_B} = \frac{(\sigma - 1 + \eta) + (3\sigma - 1 + \eta) \frac{\delta \sigma}{\tau^\sigma} \left( \frac{M_B}{M_A} \right)^{\frac{k+1-\sigma}{\sigma-1} \left( \frac{\theta_B}{\theta_A} \right)^k}}{(1 - \eta) \left[ 2(\sigma - 1) + \frac{6\sigma - 4}{\delta \tau^\sigma} \left( \frac{f}{s_f} \right)^{\frac{k+1-\sigma}{\sigma-1} \left( \frac{\theta_B}{\theta_A} \right)^k} \right]}. \tag{A.4}
\]

The mass of active producers in each country is

\[
M_A = \frac{N}{f \left( \frac{k}{k+1-\sigma} \right)} \left[ 2(\sigma - 1) + \frac{4\sigma - 3}{\delta \tau^\sigma} \left( \frac{f}{s_f} \right)^{\frac{k+1-\sigma}{\sigma-1} \left( \frac{\theta_B}{\theta_A} \right)^k} - \frac{M_B}{M_A} \frac{\delta \sigma}{\tau^\sigma} \left( \frac{\theta_B}{\theta_A} \right)^k \right], \tag{A.5}
\]

\[
M_B = \frac{N}{f \left( \frac{k}{k+1-\sigma} \right)} \left[ \left( \frac{\sigma - 1 + \eta}{1 - \eta} \right) \frac{\delta \sigma}{\tau^\sigma} \left( \frac{\theta_B}{\theta_A} \right)^k - \tau^{-k} \frac{M_B}{M_A} \frac{2\sigma - 1}{\sigma} \left( \frac{f}{s_f} \right)^{\frac{k+1-\sigma}{\sigma-1} \left( \frac{\theta_B}{\theta_A} \right)^k} \right]. \tag{A.6}
\]

### A.6 Trade balances

I first show that when \( \eta = \hat{\eta} \), \( B \) must run a trade surplus. Let \( \eta^* \) denote the value of \( \eta \) at which trade is balanced. When trade is balanced, the trade balance equation (A.3) is equal to 0, and the ratio of firms in \( A \) to \( B \) is

\[
\frac{M_A}{M_B}_{\eta=\eta^*} = \frac{\delta^{2k}}{\delta^k} \left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma - 1} \left( \frac{\theta_B}{\theta_A} \right)^{2k}, \tag{A.7}
\]

Whenever \( \frac{M_A}{M_B} \) falls below this value, \( B \) runs a trade surplus. When \( \eta = \hat{\eta} \), the right-hand side simplifies to \( (\frac{2\sigma - 1}{2\sigma})^{\sigma - 1} \).

Equation (A.4) defines \( \frac{M_A}{M_B} \) for arbitrary values of \( \eta \). Setting \( \eta = \hat{\eta} \) in (A.4), we can show that \( M_A \) is too small relative to \( M_B \) in order for trade to balance. That is, (A.4) is strictly smaller than the ratio in (A.7) evaluated at \( \eta = \hat{\eta} \). Hence, \( B \) must run a trade surplus at \( \eta = \hat{\eta} \).

I now show that trade cannot be balanced \( \forall \eta \leq \hat{\eta} \). When trade is balanced, \( K = bL \). Since \( K = N - bL \), the mass of firms in each country is

\[
M_A = \frac{N}{2b \theta_A (\Theta_A)}, \quad M_B = \frac{(\sigma - 1)N}{2b(\sigma - 1 + \eta^*)l_B (\Theta_B)}. \tag{A.8}
\]

Thus,

\[
\left. \frac{M_A}{M_B} \right|_{\eta=\eta^*} = \left( \frac{\sigma - 1 + \eta^*}{\sigma - 1} \right) \left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma} \left[ 1 + \frac{\delta^{k-1} \Gamma \left( \frac{\theta_B}{\theta_A} \right)^k}{\delta} \right] \left[ 1 + \frac{\delta^{-k} \Gamma \left( \frac{\theta_B}{\theta_A} \right)^k}{\delta} \right] \frac{1}{\delta}. \tag{A.9}
\]

In order for trade to be balanced, (A.9) must equal to (A.7). Equating the two and rear-
ranging:
\[
\delta \frac{k}{\sigma - 1} \Gamma \left( \frac{\theta^*_B}{\theta^*_A} \right)^k + \delta \frac{2k}{\sigma - 1} \left( \frac{\theta^*_B}{\theta^*_A} \right)^{2k} = \left( \frac{\sigma - 1 + \eta^*}{\sigma - 1} \right) \left( \frac{2\sigma - 1}{2\sigma} \right) \left[ 1 + \delta \frac{k}{\sigma - 1} \Gamma \left( \frac{\theta^*_B}{\theta^*_A} \right)^k \right]. 
\]  
(A.10)

Notice that the above cannot hold when \( \eta = \hat{\eta} \), because the left-hand side is strictly greater than the right-hand side. We can see this by showing that \( 1 + \Gamma > (1 + \Gamma) \left( \frac{\sigma - 1 + \hat{\eta}}{\sigma - 1} \right) \left( \frac{2\sigma - 1}{2\sigma} \right) \) since \( \frac{\sigma - 1 + \hat{\eta}}{\sigma - 1} \frac{2\sigma - 1}{2\sigma} < 1 \). A necessary condition for trade to balance is
\[
\delta \frac{k}{\sigma - 1} \Gamma \left( \frac{\theta^*_F}{\theta^*_H} \right)^k + \delta \frac{2k}{\sigma - 1} \left( \frac{\theta^*_F}{\theta^*_H} \right)^{2k} < 1 + \delta \frac{k}{\sigma - 1} \Gamma \left( \frac{\theta^*_F}{\theta^*_H} \right)^k \Leftrightarrow \delta \frac{2k}{\sigma - 1} \left( \frac{\theta^*_F}{\theta^*_H} \right)^{2k} < 1,
\]
which can only hold when \( \eta > \hat{\eta} \). Hence, trade in differentiated varieties is unbalanced \( \forall \eta \leq \hat{\eta} \), or when \( w_B/w_A \leq \omega \).

I have established that \( B \) runs a trade surplus at \( w_B/w_A = \omega \), and that \( TB \neq 0 \) at any \( w_B/w_A < \omega \). Since the trade balance equation is continuous, it must be the case that \( B \) runs a trade surplus \( \forall w_B/w_A \leq \omega \).

## A.7 Industry aggregates when \( w_B/w_A = \omega \)

To compare manufacturing aggregates in the two countries when \( w_B/w_A = \omega \) it is necessary to establish the following result:

**Lemma 3:** Let the conditions of Assumption 1 hold, and let \( w_B/w_A = \omega \). Then,
\[
\left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma} < \frac{M_A}{M_B} < \left( \frac{2\sigma - 1}{2\sigma} \right)^{\sigma - 1}. \]

Relative employment is \( L_A/L_B = \left( \frac{M_A}{M_B} \right) \left[ l_A \left( \Theta_A \right) \right] / \left[ l_B \left( \Theta_B \right) \right] \). Evaluated at \( \eta = \hat{\eta} \), the above becomes
\[
\left. \frac{L_A}{L_B} \right|_{\eta=\hat{\eta}} = \frac{M_A}{M_B} \left( \frac{2\sigma}{2\sigma - 1} \right)^{\sigma} > 1, \tag{A.11}
\]
where the inequality follows from Lemma 3. Given that output is proportional to employment, it is straightforward to verify that \( Y_A > Y_B \) when \( w_B/w_A = \omega \).

\[58\] This is obtained by substituting \( \eta = \hat{\eta} \) into (A.4).
Appendix to Chapter 2

Information on Bonduelle’s North American operations was obtained from a press release issued on March 9, 2012. Figure B.1 highlights the relevant part. Information on the firm’s operations in Eastern Europe was obtained from a press release issued on January 1, 2012. Figure B.2 presents the press release and highlights the relevant part.

Information on Michelin’s operations in South America was obtained from the website of its Argentine and Brazilian subsidiaries. The relevant parts are presented and highlighted in Figure B.3. Panel (a) was downloaded from the firm’s Brazilian subsidiary, whereas panel (b) was downloaded from the firm’s Argentine subsidiary.

Figures B.4 and B.5 focus on the operations of Nexans. The first figure is taken from the group’s Dutch affiliate. The second figure focuses on the operations of Nexans’ Swedish affiliate.

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62 Link: http://www.michelin.com.ar/wps/portal/?ut/p/kcxml/04_Sj9SPykssyOxPLMmMz0vM0Y_QjzKLN4i3dAPJgFku-pGoIsam6CKOcAFFj_zcVH1v_QD9gtzQ01hyROUAE1oM8A!!/delta/base64xml/L3dJdyEvUUd3QndNQSEvNE1VRS82XzBfOOUY!?channelId=84772f94426c5010VgnVCM1000001e65600aRCRD. Downloaded on Oct. 12, 2012.

63 It was downloaded on Oct. 3, 2012 from http://www.nexans.nl/eservice/Netherlands-nl_NL/navigate_148356/Nexans_Nederland.html.

64 Both were downloaded on Oct. 11, 2012. The picture in Panel (a) was downloaded from http://www.nexans.se/eservice/Sweden-en/navigate_153122/Nexans_in_Sweden.html, while the one in Panel (b) was downloaded from http://www.nexans.se/eservice/Sweden-en/navigate_153128/Locations.html.
Bonduelle announces the acquisition of Almens frozen vegetables sites in the United States

09/03/2012 – Bonduelle announces the acquisition of Almens frozen vegetables sites in the United States.

The Bonduelle Group has announced the acquisition by its North American subsidiary, Bonduelle North America, of three processing plants and a packaging centre for frozen vegetables belonging to the American firm Almens.

The transaction, which consists in the purchase of the Group’s assets, could be concluded at the end of March, following authorisation by the US Competition Authorities, and concerns four of the five Almens frozen vegetable industrial sites – Bergen, Osfield, Brockport (State of New York) and Fairview (Wisconsin) – assuring the jobs of 400 permanent employees. It includes the Chilli Ripe and Garden Classic brands as well as the right to use the Almens and Veg-All brand names for a period of 18 months.

Almens is a family business created in 1925 in Arkansas (its head office is in Siloam Springs), which originally specialised in canned vegetables. In 2006 Almens entered the frozen vegetable segment by acquiring the Birds Eye industrial sites dedicated to the distributor’s own brand products. In 2011 the Almens Group’s sales of frozen vegetables represented a volume of around 150,000 T in the USA, with 40% going to the General Public, 25% to Foodservice and 35% to Industrial sales.

Until now, Bonduelle North America (head office in Montreal), the leader in canned and frozen vegetables in Canada under distributors’ own brands and under its own labels (Bonduelle, Arctic Gardens, etc.) with over 600,000 T of vegetables grown in Quebec and Ontario, exported 30% of its production to the United States, mainly as frozen produce via the Foodservice networks. This acquisition will not only allow it to reinforce the growth of its sales but will also be advantageous in terms of exchange rate risks (better balance of productions and sales in US dollars) and the balancing of climate-related risks.

The Bonduelle Group, whose head office is situated in Villeneuve d’Ascq in northern France, is the world leader in prepared vegetables (canned, frozen, dehydrated, bagged salads in sachets and defrosters produce). It operates 42 productive sites in Western Europe, Poland, Hungary, Russia, Canada and Brazil, generates a turnover of €1,726 million and employs 7,250 permanent employees.

With this acquisition, the Bonduelle Group becomes one of the main players in prepared vegetables in North America and purifies its growth outside of the European Union.

Bonduelle concludes negotiations regarding the acquisition of Coubanskie Conservi in Russia

19/01/2012 – Bonduelle concludes negotiations regarding the acquisition of Coubanskie Conservi in Russia.

The Bonduelle Group has today announced the conclusion of negotiations regarding the acquisition of the agro-industrial and commercial assets of French co-operative CECAB in Russia and in the countries of the Confederation of Independent States (CIS). This acquisition, whose plan had been announced in October, should take effect in the first quarter of 2012 for the start of the sowing season thus assuring the 2012 harvest. It is however still subject to the agreement of the Russian competition authorities.

Since the middle of the 1990s, Bonduelle has had a commercial presence in Russia and in central and eastern European countries, where it enjoys a leading position in canned vegetables.

Bonduelle supplies its markets in the region from three factories: two in Hungary (40%); and one in Russia (60%), in Novolitarovskii in Krasnodar Krai in the south-west of the country, which is currently operating at maximum capacity.

To supply this factory, which went into service in 2004, the Bonduelle Group has incorporated the agricultural production of raw materials with a long-term leasing-and-operation deal on two agricultural co-operatives, or kolchikzes, of over 3,000 hectares, entirely irrigated. This autonomous production, two-thirds self-sufficient, is complemented by external cultivation contracts.

In 2007 the CECAB group, which has been present in Russia since 2001, invested in the construction of a factory in Timachevsk, 30 kilometres from the Bonduelle plant.

To supply it with agricultural raw materials, the CECAB group is operating a 6,000-hectare kolchikze for which it has signed a long-term lease.

This acquisition by Bonduelle, the amount of which has not been announced, aims to:
- take over the commercial assets of the CECAB group in Russia, i.e. sales of canned vegetables under the D’Aucy and Globus brands (acquired in 2007),
- rapidly bring the CECAB kolchikzes up to maximum vegetable-growing capacity by increasing the production capacity of the Timachevsk factory,
- enable obvious synergies, logistical and other, resulting from the geographical proximity of the two agro-industrial plants, both of which are in Krasnodar Krai (province of Kuban in the south-west of Russia).
Michelin’s presence in Brazil began in 1927 with the start of operations of its commercial office in São Paulo. In 1981 he was installed the first Michelin factory in the country, in the neighborhood of Campo Grande (RJ), for the production of tires for trucks and buses. Today the company is present in the country with five factories in two industrial units and two Plants Processing of Natural Rubber.

**shares and company guidelines for South America are coordinated in Brazil.** The Group’s share of Michelin South America is strategic, especially in terms of potential market. The Brazil Michelin manufactures and sells tires, tubes and flaps, exporting its products mainly to other countries in South America such as Argentina, Colombia, Chile, Venezuela and Peru. At 2015, investments are expected in the house of 800 million euros - which will bring expansion of factories, more employment opportunities and strengthening the market share of Michelin in all segments.

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**Organization**

Michelin South America and Central America is organized into Product Lines and Tactics Operational Entities, responsible for development, marketing, production and sales of tires in South and Central America.

The planning and management of product lines, as well as all the administrative support - through corresponding Group Services - are made in the administrative headquarters, located in the city of Rio de Janeiro.

Michelin has several subsidiaries, installed in various countries of the continent. Besides Colombia and Brazil, has commercial agencies in Argentina, Chile, Peru, Ecuador, Venezuela and Panama.

Michelin sells in South and Central America, tires for trucks and buses (PL), cars and trucks (TC), mining and public works (GC), tires for agricultural equipment (AG) and tires for two-wheeled vehicles (motorcycles and bicycles). It also exports tires to other countries in the region and eventually to Europe, Asia, United States and Canada.

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Figure B.3: Operations of Michelin South America
Figure B.4: English translation of the website of the Dutch affiliate of Nexans.
Figure B.5: Operations of Nexans’ Swedish Affiliate
Appendix to Chapter 3

C.1 Supplementary Tables and Data Sources

In section 2.1 of this chapter I mentioned that Peruvian exporters exhibit the standard patterns that have been found for exporters in other countries: most exporters operate in a small number of markets abroad and account for a small portion of total exports. Table C.1 presents evidence in support of this. The figures presented are averages for 2006-08, and are based on Table 2 of Cebeci et al. (2012).

Table C.1: Comparison of Composition of Exporting Firms

<table>
<thead>
<tr>
<th>Country</th>
<th>Products per Exporter</th>
<th>Destinations per Exporter</th>
<th>Share of Top 5% of Exporters in Total Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>9.3</td>
<td>6.8</td>
<td>84</td>
</tr>
<tr>
<td>Chile</td>
<td>4.5</td>
<td>3.4</td>
<td>94</td>
</tr>
<tr>
<td>Colombia</td>
<td>4.9</td>
<td>2.8</td>
<td>81</td>
</tr>
<tr>
<td>Spain</td>
<td>4.7</td>
<td>4.0</td>
<td>86</td>
</tr>
<tr>
<td>Mexico</td>
<td>6.7</td>
<td>2.1</td>
<td>91</td>
</tr>
<tr>
<td>Norway</td>
<td>5.2</td>
<td>3.4</td>
<td>93</td>
</tr>
<tr>
<td>Peru</td>
<td>7.2</td>
<td>2.6</td>
<td>92</td>
</tr>
<tr>
<td>Sweden</td>
<td>6.5</td>
<td>4.3</td>
<td>92</td>
</tr>
</tbody>
</table>

Between 2005 and 2009 Peruvian entrants exported to over 130 countries in their first year. Many of these countries were served by only a handful of entrants. To reduce the number of outliers, I drop all countries that were served by less than 10 entrants on aggregate during the time period, which leaves 64 countries. Omitting 2 countries on which the Penn World Table does not provide macro data (Aruba and Netherlands Antilles) leaves 62 countries, which are displayed in Table C.2.

In sections 4 and 5 of this chapter, I used a number of product and sector characteristics aside from inventory holdings and an indicator whether a good is differentiated or
Table C.2: List of Countries

<table>
<thead>
<tr>
<th>Argentina</th>
<th>Ecuador</th>
<th>Japan</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>El Salvador</td>
<td>Korea</td>
<td>Spain</td>
</tr>
<tr>
<td>Austria</td>
<td>Finland</td>
<td>Mexico</td>
<td>Sweden</td>
</tr>
<tr>
<td>Bahamas</td>
<td>France</td>
<td>Netherlands</td>
<td>Switzerland</td>
</tr>
<tr>
<td>Belgium</td>
<td>Germany</td>
<td>New Zealand</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Bolivia</td>
<td>Greece</td>
<td>Nicaragua</td>
<td>Thailand</td>
</tr>
<tr>
<td>Brazil</td>
<td>Guatemala</td>
<td>Norway</td>
<td>Trinidad &amp; Tobago</td>
</tr>
<tr>
<td>Canada</td>
<td>Haiti</td>
<td>Panama</td>
<td>Turkey</td>
</tr>
<tr>
<td>Chile</td>
<td>Honduras</td>
<td>Paraguay</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>China</td>
<td>Hong Kong</td>
<td>Philippines</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Colombia</td>
<td>Hungary</td>
<td>Poland</td>
<td>United States</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>India</td>
<td>Portugal</td>
<td>Uruguay</td>
</tr>
<tr>
<td>Cuba</td>
<td>Indonesia</td>
<td>Puerto Rico</td>
<td>Venezuela</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Ireland</td>
<td>Romania</td>
<td>Vietnam</td>
</tr>
<tr>
<td>Denmark</td>
<td>Israel</td>
<td>Russia</td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>Italy</td>
<td>Singapore</td>
<td></td>
</tr>
</tbody>
</table>

homogeneous. To distinguish between durables and non-durables, I use the Bureau of Labor Statistics’ (BLS) classification of manufacturing industries into these two categories, obtained from: [http://www.bls.gov/ces/cessuper.htm](http://www.bls.gov/ces/cessuper.htm). To distinguish between consumer goods on the one hand, and capital and intermediate goods on the other, I use the classification compiled by Hummels and Klenow (2005) and obtained from David Hummels’ website, [http://www.krannert.purdue.edu/faculty/hummelsd/datasets.asp](http://www.krannert.purdue.edu/faculty/hummelsd/datasets.asp). To control for cross-sector differences in reliance on external credit I use the fraction of total capital expenditures that are not funded by cash flows from operations, which is obtained from Table 2 of the appendix of Chor and Manova (2012). Table C.3 presents the summary statistics for all continuous variables, while Table C.4 presents the correlation among the different product and sector characteristics.

Table C.3: Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Entrants</td>
<td>0.441</td>
<td>2.729</td>
</tr>
<tr>
<td>Sales per Entrant</td>
<td>6.618</td>
<td>2.732</td>
</tr>
<tr>
<td>Inventory Turnover Rate</td>
<td>1.449</td>
<td>0.341</td>
</tr>
<tr>
<td>Cost of shipping to US</td>
<td>0.097</td>
<td>0.112</td>
</tr>
<tr>
<td>Shipping Costs</td>
<td>-5.934</td>
<td>1.216</td>
</tr>
<tr>
<td>GDP</td>
<td>26.343</td>
<td>1.578</td>
</tr>
<tr>
<td>Financial Dependence</td>
<td>0.145</td>
<td>1.673</td>
</tr>
</tbody>
</table>
Table C.4: Correlation Among Different Product Characteristics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inv. T/O Rate</td>
<td>1</td>
<td>-0.27</td>
<td>-0.07</td>
<td>0.04</td>
<td>-0.65</td>
</tr>
<tr>
<td>Diff. Goods</td>
<td>1</td>
<td>0.40</td>
<td></td>
<td>0.02</td>
<td>-0.04</td>
</tr>
<tr>
<td>Durables</td>
<td>1</td>
<td>0.32</td>
<td></td>
<td></td>
<td>-0.13</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>1</td>
<td>0.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Dep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Most of the product characteristics appear to be weakly correlated with each other. Worryingly, however, the inventory turnover rate appears to be correlated with financial dependence. To determine if there are potential problems, I have regressed the inventory turnover rate on financial dependence. The R-Squared was 0.41. I have also regressed the inventory turnover rate on all of the other product characteristics. The R-Squared from this regression was 0.49. This corresponds to a variance inflation factor that is lower than 2 and suggests that multicollinearity among the product characteristics is not a significant problem.

As mentioned in Section 5 of this chapter, one alternative explanation as to why exporters of homogeneous goods comprise a disproportionate share of entrants during the Great Recession is that the entry decision of exporters of differentiated goods is more sensitive to an economic downturn. To test whether this is the case, I perform the following regression through Poisson PML:

\[
E[\text{Number of Entrants}_{ijt} | x] = \exp \left( \beta_0 + \beta_1 \text{Differentiated Good}_i + \beta_2 \text{GDP}_{jt} + \beta_3 \text{Differentiated Good}_i \times \text{GDP}_{jt} + \alpha_i + \gamma_j + \delta_t \right). \quad (C.1)
\]

The coefficient of interest is \( \beta_3 \), which captures the differential impact of changes in GDP on new exporters selling differentiated goods. A positive and significant coefficient would indicate that producers of differentiated goods are more sensitive to business cycle fluctuations abroad than producers of homogeneous goods. Table C.5 presents the coefficient from a Poisson PML estimation of equation (C.1). Notice that \( \beta_3 \) small and statistically insignificant. Hence, a drop in demand cannot explain the change in the composition of the entry cohort in 2009.
Table C.5: Economic Growth and Entry by Exporters of Differentiated Goods

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of Entrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiated Goods</td>
<td>1.549 (1.095)</td>
</tr>
<tr>
<td>GDP</td>
<td>2.286*** (0.271)</td>
</tr>
<tr>
<td>GDP × Differentiated Goods</td>
<td>-0.029 (0.035)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>HS4 Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>Yes</td>
</tr>
<tr>
<td>Pseudo R-Squared</td>
<td>0.657</td>
</tr>
<tr>
<td>Observations</td>
<td>59,210</td>
</tr>
</tbody>
</table>

Notes: 1) *** p < 0.01. 2) Robust standard errors are clustered at the country-HS4 level.

C.2 Comparison of Constant Marginal Cost Models with Increasing Marginal Cost Models

To understand why models with a constant marginal cost may over-estimate the fixed cost of exporting, let us compare the basic predictions of models with a constant and an increasing marginal cost. Consider a standard model based on Melitz (2003). Consumers in both the domestic and the foreign market have constant elasticity of substitution (CES) preferences, with $\sigma > 1$ denoting the elasticity of substitution between horizontally differentiated varieties. Firms therefore face the following demand function for their product in country $j$: $q_j = A_j p_j^{-\sigma}$, with $A_j$ being the demand shifter in country $j$, which depends on total consumer income and the price index. Let $\phi$ denote the productivity level of a given firm, and $q = \phi n$ the production function, with $n$ denoting units of labor inputs. Given this demand and cost structure, the firm will earn the following variable profits

$$\pi = \begin{cases} 
A_d^{\frac{1}{\sigma}} q_d^{\frac{\sigma-1}{\sigma}} - \frac{q_d}{\phi} & \text{if the firm does not export,} \\
A_d^{\frac{1}{\sigma}} q_d^{\frac{\sigma-1}{\sigma}} - \frac{q_d}{\phi} + A_x^{\frac{1}{\sigma}} q_x^{\frac{\sigma-1}{\sigma}} - \frac{\tau q_x}{\phi} & \text{if the firm exports,}
\end{cases} \quad (C.2)$$

with $\tau > 1$ denoting variable trade costs, and $d$ and $x$ denote the domestic and export markets, respectively.\(^\text{65}\) Solving the firm’s optimization problem gives us the following variable profit function:

$$\pi = A_d \phi^{\sigma-1} \gamma + I_x A_x \left( \frac{\phi}{\tau} \right)^{\sigma-1} \gamma, \quad \gamma = \frac{1}{\sigma} \left( \frac{\sigma - 1}{\sigma} \right)^{\sigma-1}, \quad (C.3)$$

with $I_x$ being an indicator function which equals one if the firm exports. Notice that exporting

\(^{65}\)For convenience, the wage paid to workers is normalized to one.
does not affect a firm’s domestic operations, as a firm with a productivity level of $\phi$ will earn variable domestic profits of $A_d\phi^{\sigma-1}$, irrespective of whether it exports.

A rising marginal cost implies that exporting does affect a firm’s domestic operations. To understand why let us modify the production function in the following manner: $q = \phi n^{\frac{1}{b}}$ with $b > 1$. Given this production function, exporting does affect a firm’s domestic profits because the firm will only export a fraction $\delta$ of its total output $q$. Hence, the potential variable profit streams are:

$$\pi = \begin{cases} A_d^\frac{1}{\sigma} q^{\sigma-1} - \left( \frac{q}{\phi} \right)^b & \text{if the firm does not export}, \\ A_d^\frac{1}{\sigma} (\delta q)^{\sigma-1} + A_x^\frac{1}{\sigma} \left[ \frac{(1-\delta)q}{\tau} \right]^{\sigma-1} - \left( \frac{q}{\phi} \right)^b & \text{if the firm exports}. \end{cases}$$

Solving the firm’s profit maximization problem gives the following variable profit functions for firms that produce solely for the domestic market and for firms that export, respectively:

$$\pi = \begin{cases} \left[ A_d^b \phi^{(\sigma-1)} \left( \frac{\sigma-1}{\rho} \right)^{\sigma-1} \right]^{\frac{1}{\sigma}} \left( \frac{\rho}{\sigma} \right)^{\frac{1}{\sigma}} & \text{if the firm does not export}, \\ \left[ (A_d + \tau^{1-\sigma} A_x)^b \phi^{(\sigma-1)} \left( \frac{\sigma-1}{\rho} \right)^{\sigma-1} \right]^{\frac{1}{\sigma}} \left( \frac{\rho}{\sigma} \right)^{\frac{1}{\sigma}}, & \text{if the firm exports}, \end{cases}$$

with $\rho = \sigma(b - 1) + 1$. Notice now that exporting strictly lowers a firm’s domestic sales.\(^{66}\)

---

\(^{66}\)Whereas a firm that only serves the domestic market sells its entire output domestically, an exporting firm sells only a fraction $\delta = \frac{A_d}{A_d + \tau^{1-\sigma} A_x}$ of its output in the domestic market. It is straightforward to show that the quantity supplied to the domestic market is lower if the firm exports.