The Extensive Margin of Exporting Goods:
A Firm-level Analysis*

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December 30, 2007

Preliminary draft.

Abstract
We examine three-dimensional panel data for Brazilian manufacturing exporters, their products and destinations. The data show that (i) the distribution of the exporters’ number of goods (the exporter scope) is robust within destinations and approximately Pareto with most firms selling only one or two goods, and (ii) that the exporter scope is positively associated with average sales per good within destinations but not across destinations. We present a heterogeneous-firm model with product choice that explains these regularities and retains key predictions of previous trade models. The model explains the regularities with dis-economies of scope in product-entry costs on the distribution side.

Keywords: International trade; heterogeneous firms; multi-product firms; firm and product panel data; Brazil

JEL Classification: F12, L11, F14

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1 Introduction

Most exports are shipments by multiproduct firms.1 We examine the extensive margin of introducing goods at export destinations to learn about determinants of trade flows and the nature of market-entry costs. We present a heterogeneous-firm model with product choice, and consistent empirical evidence, in which distribution-related costs determine exporter behavior at the extensive margin of adding goods. These distribution-related product-entry costs are repeated at every destination and offer the key explanation for empirically observed regularities in exporter behavior.

We use three-dimensional panel data for Brazilian exporters, their destination markets and their products.2 We decompose total exports into the common extensive margin for the market-entry of firms and sales per firm. Our data allow us to further decompose sales per firm into the extensive margin of product-entry with goods and the remaining intensive margin of sales per good. We focus our investigation on the novel extensive margin of product-entry with additional goods. Two important regularities emerge from our data. First, the probability distribution of the average exporter’s number of goods per destination (the exporter scope at the destination) is remarkably robust across destination markets and resembles a Pareto distribution when firms are ranked by total sales. Second, the firms’ average sales per good at the intensive margin (their average product scale) strictly increases with exporter scope worldwide, and destination by destination. The average-product scale distribution is approximately Pareto in the upper tail. We explain these regularities with a heterogenous-firm model, where firms draw their productivity from a Pareto distribution and make choices at the three margins: entry by destination, exporter scope by destination, and product scale by good and destination. On the distribution side, firms face repeated product-entry costs by destination.

Specifically, exporters first incur a market-entry cost upon shipment of the first unit of the first good. Then, upon introduction of an additional good at a destination, the exporter incurs an additional fixed product-entry cost that strictly increases in exporter scope at the destination. Both cost components are related to distribution, not production, and important to match the data regularities. Consumers in every country

1Bernard, Jensen and Schott (2005) document for U.S. trade data in the year 2000, for instance, that firms that export more than five products at the HS 10-digit level make up 30 percent of exporting firms but account for 97 percent of all exports. In our Brazilian exporter data for 2000, 25 percent of all manufacturing exporters ship more than ten products at the HS 6-digit level and account for 75 percent of total exports.

2Evidence on Brazil is arguably informative for our understanding of a typical country’s world export behavior. While Brazil ranks among the top 30 exporting countries in the world, its exports per capita are close to the world median. World trade flow (WTF) data for the year 2000, the final WTF year, show Brazil’s total exports at the 88th percentile worldwide (top 27th out of 205). In terms of exports per capita, Brazil ranks at the 48th percentile (top 100th out of 192). Exporter behavior in Brazil is nevertheless strikingly similar to that in leading export countries such as France (Eaton, Kortum and Kramarz 2004) and the U.S. (Bernard, Redding and Schott 2007).
have nested Dixit-Stiglitz preferences over firms’ product mixes and the firms’ individual products (similar to Allanson and Montagna 2005, Agur 2007). The model implies that exporter scope and total exports strictly increase with the firm’s productivity and that they are both Pareto distributed. We show in the model that fixed product-entry costs must be strictly convex in exporter scope at every destination to match the empirical finding that average product scale is positively associated with exporter scope at every destination. Under strictly convex product-entry costs, average product scale strictly increases with the firm’s productivity and is Pareto distributed. The intuition is that a firm starts with higher sales per product for the first product that it introduces in a market. As the firm adds more products, demand for its inframarginal products drops until the last added product’s marginal profit equals the product-entry cost for that last product. So, unless the marginal cost of product-entry strictly increases with the firm’s scope (which is the case for strictly convex product-entry costs), the constant elasticity of substitution across the firm’s products would imply that average sales per product do not increase with productivity—contrary to the empirical evidence. A constant elasticity of demand with respect to additional goods under nested Dixit-Stiglitz utility, and a constant elasticity of product-entry costs with respect to exporter scope, together imply that exporter scope and total exports are Pareto distributed under Pareto distributed productivity.

The model is a tractable extension of the Melitz (2003) model to the multi-product setting. In the limit of our model, as product-entry costs become arbitrarily convex in scope, our Pareto shape parameter in the total exports distribution converges to the Eaton, Kortum and Kramarz (2005) shape parameter and our decomposition of the total-exports response to trade costs along three margins converges to the two margins in the Chaney (2007) version of Melitz (2003).

We carefully address the empirical concern whether firm-level explanations, and not repeated distribution-related product-entry costs, drive the observed positive association between average product scale and exporter scope (such as product-adoption in production or worldwide branding, say; see also Bernard, Redding and Schott 2006). We use our three-dimensional panel data for exporters and their products and destinations and uncover a negative association between firm-level worldwide scope and average product scale. This evidence is not consistent with a positive scope-scale association at the firm level. Within each destination market, however, there is a positive association between the firm’s scope and its average product scale, and this repeated positive association dominates the aggregate data. In our model, distribution-side diseconomies of scope, under product-entry costs that are convex in scope within every destination, explain the observed exporter behavior.

The paper has four more sections. Section 2 discusses the three-dimensional panel data on Brazilian exporters, their products and destinations, and documents main facts. (Details on complementary data sources are relegated to the Appendix.) Section 3 presents our theoretical model. Section 4 turns to empirical analysis that helps evaluate
important implications of the model. Section 5 concludes.

2 Data

Our main data source is a three-dimensional panel of Brazilian exporters, their destination countries, and their export products at the Harmonized-System 6-digit level. We combine the exporter data with worldwide bilateral trade information from outside sources (for details on the outside sources see Appendix A).

The exporter data derive from the universe of Brazilian customs declarations for merchandise exports in the year 2000. The pristine NCM product codes are 8-digit numbers, of which the first six digits coincide with the first six digits in the Harmonized System. We aggregate the data to the firm, year and Harmonized-System 6-digit level.

At the firm level, the data exhibit market-access patterns broadly similar to the French firm-destination data in Eaton et al. (2004) and the U.S. firm-destination-product data in Bernard et al. (2007). Similar to Eaton et al. (2004), for instance, firm entry into destinations explains around 70 percent of Brazil’s exports covariation with gravity-equation variables across destinations. In contrast to the French and U.S. data, however, the Brazilian data do not cover domestic sales. This restricts our analysis to export-market access.

To relate our data to product-market information for destination countries and their sectors, we map the Harmonized System 6-digit codes to ISIC revision 2 at the two-digit level and link our data to World Trade Flow (WTF) data for the year 2000 (Feenstra, Lipsey, Deng, Ma and Mo 2005). The link between our data and WTF also provides us with an estimate of the coverage of Brazil’s self-reported exports declarations. In 2000, our SECEX data for manufactured merchandise sold by Brazilian firms from any sector, including commercial intermediaries, covers 95.9 percent of Brazilian exports in WTF. The small discrepancy might be related to underreported Brazilian exports, which WTF may uncover as imports elsewhere, or to valuation differences because of differently reports exchange rate fluctuations and transportation costs.

For our analysis, we remove commercial intermediaries from the data, and only keep manufacturing firms who report their direct export shipments to SECEX. This sample restriction makes our findings most closely comparable to Eaton et al. (2004) and Bernard et al. (2007) but we lose many observations, mainly because of the importance of commercial intermediaries for export processing, partly because of missing sector information, and partly because of manufacturing firms’ resales of non-manufactured goods. After restricting the sample to manufactured merchandise exported directly by Brazilian manufacturers, our sample covers 81.7 percent of the WTF manufactures exports.

As Table 1 shows (column 6), our resulting sample includes 10,215 manufacturing

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3Our novel concordance will become available at url econ.ucsd.edu/muendler/brazil shortly.
<table>
<thead>
<tr>
<th></th>
<th>USA</th>
<th>Argentina</th>
<th>China</th>
<th>OECD</th>
<th>non-OECD</th>
<th>World</th>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
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<td># of Firms (M)</td>
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<td>4,590</td>
<td>463</td>
<td>5,041</td>
<td>8,590</td>
<td>10,215</td>
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<td># of Destinations (N)</td>
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<td>1</td>
<td>1</td>
<td>23</td>
<td>141</td>
<td>170</td>
</tr>
<tr>
<td># of HS-6 goods (G)</td>
<td>2,144</td>
<td>2,814</td>
<td>609</td>
<td>2,772</td>
<td>3,535</td>
<td>3,717</td>
</tr>
<tr>
<td># of Observations (MNH)</td>
<td>10,775</td>
<td>21,623</td>
<td>1,438</td>
<td>36,359</td>
<td>124,811</td>
<td>162,570</td>
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<tr>
<td>Destination share in Total exp.</td>
<td>.257</td>
<td>.144</td>
<td>.007</td>
<td>.559</td>
<td>.441</td>
<td>1</td>
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<tr>
<td>Firm shares in Total exports</td>
<td>Single-prod. firms</td>
<td>.123</td>
<td>.086</td>
<td>.373</td>
<td>.142</td>
<td>.069</td>
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<tr>
<td></td>
<td>Multi-prod. firms’ top product</td>
<td>.662</td>
<td>.555</td>
<td>.525</td>
<td>.625</td>
<td>.572</td>
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<tr>
<td></td>
<td>Multi-prod. firms’ other prod.</td>
<td>.215</td>
<td>.359</td>
<td>.102</td>
<td>.233</td>
<td>.359</td>
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<tr>
<td>Median Total exports (Td(m))</td>
<td>.120</td>
<td>.068</td>
<td>.072</td>
<td>.137</td>
<td>.064</td>
<td>.089</td>
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<td>Median Exporter scope (Gd(m))</td>
<td>1</td>
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<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Median Avg. prod. scale (zd(m))</td>
<td>.068</td>
<td>.031</td>
<td>.047</td>
<td>.070</td>
<td>.027</td>
<td>.037</td>
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<tr>
<td>Mean Total exports (td)</td>
<td>3.170</td>
<td>1.192</td>
<td>.748</td>
<td>4.217</td>
<td>1.928</td>
<td>3.720</td>
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<tr>
<td>Mean Exporter scope (Gd)</td>
<td>3.495</td>
<td>4.711</td>
<td>3.106</td>
<td>3.933</td>
<td>5.190</td>
<td>5.278</td>
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<tr>
<td>Mean Avg. prod. scale (zd)</td>
<td>.907</td>
<td>.253</td>
<td>.241</td>
<td>1.072</td>
<td>.372</td>
<td>.705</td>
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</tbody>
</table>

Note: Aggregate regions (world, OECD, non-OECD) treated as single destinations, collapsing product shipments to different countries into single product shipment. Products at the Harmonized-System 6-digit level. Exports in US$ million fob. Non-OECD includes all non-members in 1990; OECD includes all OECD members in 1990. The U.S. is Brazil’s top export destination in 2000, Argentina second to top (with a .836 share in total exports to MERCOSUR), and China 20th to top. Firms’ mean product scale (zd in US$ million fob) is the scope-weighted arithmetic mean of exporters’ average product scales.

Firms with shipments of 3,717 manufacturing goods at the 6-digit Harmonized System level to 170 foreign destinations, and a total of 162,570 exporter-destination-product observations. Multi-product exporters dominate. They ship more than ninety percent of all exports, and their single top-selling products account for sixty percent of all exports worldwide.

To analyze export behavior, we decompose a firm φ’s total exports \( t_{d\phi} \) from Brazil to destination market \( d \) into the firm’s number of goods sold at \( d \) (the exporter scope) \( G_{d\phi} \) and the firm’s average sales per export good in \( d \) (the average product scale) \( z_{d\phi} \equiv t_{d\phi}/G_{d\phi} \):

\[
    t_{d\phi} = \sum_{g=1}^{G_{d\phi}} p_{d\phi g} x_{d\phi g} = G_{d\phi} z_{d\phi},
\]

where \( p_{d\phi g} \) is the price of product \( g \) and \( x_{d\phi g} \) its export quantity. To calculate summary

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4We remove export records with zero value, which include shipments of commercial samples but also potential reporting errors, and lose 408 of initially 162,978 exporter-destination-product observations. Our results on exporter scope do not materially change when including or excluding zero-shipment products from the product count.
medians and means of these variables for aggregate regions in Table 1 (columns 4 through 6), we treat the aggregate region as if it were a single destination and collapse all product shipments to different countries within the same aggregate region into a single product shipment. In all subsequent data treatments, in contrast, we will analyze these variables country by country, consistent with our main hypothesis that distribution-side determinants of trade matter repeatedly destination by destination.

The median exporter is a relatively small exporter, with sales to the rest of the world totalling around US$ 90,000 (column 6). The mean exporter, in contrast, sells around US$ 3.7 million abroad, more than 40 times as much as the firm at the median. Exporter scope and average product scale exhibit similar differences between mean and median. The firm at the median sells two products worldwide, but the mean scope per firm is 5.3 products. The firm at the median has a product scale of around US$ 40,000 per product, but the mean product scale per exporter is US$ 700,000, or around 20 times as high as that for the median firm.\(^5\)

The importance of the top-selling product at multi-product exporters and the mean–median difference patterns repeat across destinations. To investigate the robustness across countries, we select Brazil’s top two export destinations (U.S. and Argentina) and its 20th largest export market (China), as well as two destination aggregates—OECD and non-OECD countries. Our theory emphasizes the importance of exporting behavior within destinations, and single countries are our main object of investigation. Within single countries, the mean firm’s exports exceed the median firm’s exports by similarly large factors, between 10 (in China, Brazil’s top 20th export destination in 2000) and 26 (in the U.S., Brazil’s top export destination). While total exports to OECD countries are more than twice as large as exports to all non-OECD countries, the exporter distributions look alike in OECD and non-OECD countries. Exports of the mean firm exceed the exports of the median firm by a factor of about 30 for both the non-OECD and the OECD aggregates. The regularities are consistent with the idea that systematic features of distribution costs or exporter characteristics, or both, determine export behavior.

Brazilian exporters exhibit market access patterns similar to those of French exporters (Eaton et al. 2004). Following Eaton et al. (2004), total exports \(T_{sd}\) from source country \(s\) (Brazil, France) to destination market \(d\) can be decomposed into: \(M_{sd} \bar{t}_{sd}\), where \(M_{sd}\) is the number of source country \(s\)’s exporters with shipments to destination country \(d\), and \(\bar{t}_{sd}\) are these exporters’ average sales in destination country \(d\). The same total exports \(T_{sd}\) can also be decomposed into: \(\lambda_{sd} T_d\), where \(\lambda_{sd}\) is the market share

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5The means in Table 1 are calculated as follows. Brazil’s total exports \(T_d\) are decomposed into \(T_d = M_d \bar{G}_d \bar{z}_d\), where \(M_d\) is the number of exporters to destination \(d\), \(\bar{G}_d = \sum_{\phi=1}^{M_d} G_d(\phi)/M_d\) is the exporters’ mean exporter scope, and \(\bar{z}_d = t_d/\bar{G}_d\) is their goods’ mean product scale. Equivalently, \(\bar{z}_d\) is the weighted arithmetic mean of \(z_d(\phi)\) over all \(\phi\), with weights \(G_d(\phi): \bar{z}_d = \sum_{\phi=1}^{M_d} G_d(\phi) z_d(\phi)/[\sum_{\phi=1}^{M_d} G_d(\phi)] = t_d/\bar{G}_d.\) Scope weighting is necessary for the mean scope and the mean product scale to yield total exports when multiplied.
of source country $s$’s exports in destination $d$, and $T_d$ is the market size of destination country $d$ (manufacturing absorption). By definition, $M_{sd}\tilde{t}_{sd} = \lambda_{sd}T_d$. We regress the log number of firms on the log of $\lambda_{sd}T_d$ to inspect how these market characteristics are associated with the market presence of additional firms $M_{sd}$ (as opposed to additional sales per firm $\tilde{t}_{sd}$).\footnote{We aggregate the SECEX exporter data to 16 SIC industries as in Eaton et al. (2004) for this purpose and link the data to destination information from WTF (Feenstra et al. 2005) and Unido Industrial Statistics (UNIDO 2005). The regression sample contains 67 destinations in the Brazilian data (excluding the domestic Brazilian market), whereas there are 113 destinations in the French data (including the domestic French market). Gomes and Ellery Jr. (2007) present similar regressions for a sub-sample of SECEX exporters linked to firm survey data (Pesquisa Industrial Anual) in 1999.}

$$\ln M_{sd} = -5.710 + .719 \ln \lambda_{sd} + .626 \ln T_d.$$  

The $R^2$ is 0.833.\footnote{Standard errors in parentheses. Because of the identity connecting the variables, a regression of $\ln \tilde{t}_{sd}$ on the log of $\lambda_{sd}T_d$ yields coefficients of 1 minus the ones reported above.} Firm presence explains most of the variation in Brazilian exports, but is somewhat less important than in France. Given market size and industry bias, a higher Brazilian (French) market share $\lambda_{sd}$ in a destination typically reflects 72 (88) percent more firms selling there and 28 (12) percent more sales per firm. Given market share, larger market size $T_d$ is associated with 63 (62) percent more firms and 37 (38) percent more sales per firm.

Brazilian exporters’ average sales $\tilde{t}_{sd}$ to a destination industry can be decomposed further into $\tilde{t}_{sd} = \bar{G}_d \bar{z}_d$, where $\bar{G}_d$ is the exporters’ mean exporter scope, and $\bar{z}_d = \tilde{t}_{d}/\bar{G}_d$ is their goods’ mean product scale. We regress the log mean exporter scope on the log of $\lambda_{sd}T_d$ to examine how market characteristics are related to exporter scope (as opposed to $M_{sd}\bar{z}_{sd}$, the market presence of additional firms and additional product scale per good and firm):

$$\ln \bar{G}_d = 2.324 + .087 \ln \lambda_{sd} - .058 \ln T_d.$$  

The $R^2$ is 0.281. Neither market share nor market size are statistically significant predictors of exporter scope at conventional levels.\footnote{Standard errors in parentheses. The $R^2$ drops to .212 when including $\ln M_{sd}$ and industry-fixed effects but coefficients become statistically significant at conventional levels except for market size, while magnitudes change little.} Our model will allow for small variation in exporter scope across destinations. Though exporter scope has little explanatory power for exports in descriptive regressions, its association with scale by destination provides important insight into market access costs.

Figure 1 plots the firms’ total exports against their total-exports percentile and exporter scope against the exporter-scope percentile for Brazil’s top two export markets, the U.S. and Argentina. Except for the small firms, total exports in the upper panel...
Figure 1: Total Sales and Exporter Scope Distributions

exhibit an approximate Pareto distribution. In this paper, we strive to explain the approximate Pareto shape of the distribution (for an explanation of deviant small-firm behavior in the lower tail see Arkolakis 2006). Exporter scope in the lower panel is a discrete variable but the overall shape of the distribution is similar to that of a Pareto variable.

Figure 2 illustrates the common relationship between the firm distribution of total exports and mean scope and scale across the same six export markets as in Table 1. All axes have a logarithmic scale. We group firms by their total exports percentile along the horizontal axis. At the origin of the horizontal axis, we plot the mean scope and mean product scale per firm for all firms in the sample, that is we plot the means that we also report in Table 1. Then we step one percentile to the right along the horizontal axis and restrict the sample to the firms in the top 99 percentiles of total exports. The figure depicts the mean scope and the mean product scale for this higher-up exporter group.\(^9\) We continue to move up in the total-exports ranking of firms, percentile by

\(^9\)Formally, we calculate total exports \(t_d(\phi_1)\) at the first percentile of firms. We consider only the

Note: Left-most observations are all exporters; at the next percentile are exporter observations with shipments in the top 99 percentiles; up to the right-most observations with exporters whose shipments are in the top percentile. Aggregate regions include only destinations with more than 100 firms; destinations ranked by total exports and lumped into groups of ten destinations for which unweighted means over distributions are shown (70 countries in world, 20 OECD, 49 non-OECD). Products at the Harmonized-System 6-digit level. Non-OECD includes all non-members in 1990; OECD includes all OECD members in 1990. Firms’ mean product scale ($z_d$ in US$ thousand fob) is the scope-weighted arithmetic mean of exporters’ average product scales.

Figure 2: Scope, Average Scale and the Total Exports Distribution
percentile, depicting the mean scope and the mean product scale for higher and higher-
percentile groups of firms, until we reach the group of firms in the top (100th) percentile
of total exports.

Both log mean scope and log mean scale increase roughly linearly with the percentile
in the three individual export markets U.S., Argentina and China (except for the high
percentiles in China where mean product scale levels off) and, on average, in the ag-
gregate regions (OECD, non-OECD, world) for ten-country groups. The simultaneous
increase in both scope and scale with the firm’s percentile in total exports implies that
scope and scale are positively related. The regularity across markets is consistent with
the idea that firms’ choices of scope and scale are positively associated within every
destination market. We now turn to a model of exporting that is consistent with the
evidence, and then revisit the data to evaluate the implied relationships.

3 A Model of Exporter Scope and Product Scale

We present a model of heterogeneous firms that offer one or multiple products. Firms
incur destination-specific market entry costs that depend on the number of products
they offer at a destination. Consumers in every country have nested preferences over
firms’ product mixes and the firms’ individual products.

3.1 Consumers

There are $N$ countries. When we consider an export destination, we label the country
with $d$. The source country of an export shipment receives the label $s$. There is a
measure of $L_d$ consumers at destination $d$. Consumers have symmetric preferences
with a constant elasticity of substitution $\sigma$ over a continuum of varieties. In our multi-
product setting, a conventional “variety” becomes the composite product

$$X_{sd}(\omega) \equiv \left[ \int_0^{G_{sd}(\omega)} x_{sdg}(\omega)^{\frac{\varepsilon}{\varepsilon-1}} dg \right]^{\frac{\varepsilon-1}{\varepsilon}}$$

that a seller $\omega$ from country $s$ offers for sale at destination $d$. In marketing terminology,
the composite product is a firm’s product mix. The elasticity of substitution across
goods in the product mix $\varepsilon$ is constant and $G_{sd}$ is the measure of goods. We assume
that every product mix is uniquely made by a single firm, but a firm may ship different
product mixes to different destinations.

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top 99 percent of firms $\phi'$ whose exports exceed the first-percentile threshold $t_d(\phi') > t_d(\phi_1)$. For
these $M'_d$ firms in the top 99 percentiles, we calculate the mean scope $\sum_{\phi'=1}^{M_d} G_d(\phi')/M'_d$ and the
scope-weighted mean product scale $\sum_{\phi'=1}^{M_d} G_d(\phi')z_d(\phi')/\left[\sum_{\phi'=1}^{M_d} G_d(\phi')\right]$. Scope weighting is necessary
for the mean scope and the mean product scale to yield total exports when multiplied (see footnote 5).
We repeat these calculations for total exports $t_d(\phi_p)$ at every percentile $p$. 
The set of product mixes shipped from source country \( s \) to destination \( d \) is \( \Omega_{sd} \). So the consumer’s utility is
\[
\left( \sum_{s=1}^{N} \int_{\omega \in \Omega_{sd}} \left[ \int_{0}^{G_{sd}(\omega)} x_{sdg}(\omega)^{\frac{\varepsilon}{\varepsilon-1}} \, dg \right] \frac{\varepsilon}{\varepsilon-1} \frac{\sigma-1}{\sigma} \, d\omega \right)^{\frac{\sigma}{\sigma-1}} \text{ where } \varepsilon > 1, \sigma > 1. \tag{1}
\]
This nested utility function is also used by Allanson and Montagna (2005) to study implications of the product life-cycle for market structure, and by Agur (2007) to analyze trade patterns in a two-country heterogeneous-firm model with a continuum of products. The specification generalizes monopolistic-competition models of trade (such as Krugman 1980).\(^{10}\) For preferences to be well defined, we require that \( \varepsilon > 1 \) and \( \sigma > 1 \). Subsequent derivations do not materially differ if we assume that products within a product mix are more substitutable among each other than with outside goods (\( \varepsilon > \sigma > 1 \)), or less substitutable.

Every consumer receives per-capita income \( y_d = w_d + \pi_d \), where \( w_d \) is the wage for labor, inelastically supplied to producers in country \( d \), and \( \pi_d = \sum_{c=1}^{N} \pi_{dc} / L_d \) is the consumer’s share in total profits earned by its producers. Country \( d \)’s total income is \( y_d L_d \). The consumer’s first-order conditions of utility maximization imply a product demand
\[
x_{sdg}(\omega) = \left( \frac{p_{sdg}(\omega)}{P_{sd}(\omega; G_{sd})} \right)^{-\varepsilon} X_{sd}(\omega; G_{sd}), \tag{3}
\]
given the firm’s product mix \( X_{sd}(\omega; G_{sd}) \) and the product-mix price \( P_{sd}(\omega; G_{sd}) \):
\[
X_{sd}(\omega; G_{sd}) \equiv \left[ \int_{0}^{G_{sd}(\omega)} x_{sdg}(\omega)^{\frac{\varepsilon}{\varepsilon-1}} \, dg \right]^{\frac{1}{\varepsilon-1}} \text{ and } P_{sd}(\omega; G_{sd}) \equiv \left( \int_{0}^{G_{sd}(\omega)} p_{sdg}(\omega)^{1-\varepsilon} \, dg \right)^{\frac{1}{1-\varepsilon}}.
\]
The first-order conditions also imply a product-mix demand
\[
X_{sd}(\omega; G_{sd}) = \left( \frac{P_{sd}(\omega; G_{sd})}{P_d} \right)^{-\sigma} X_d, \tag{4}
\]
\(^{10}\)There is a counterpart to (1) in discrete product space, where consumers at \( d \) have preferences
\[
\left( \sum_{s=1}^{N} \int_{\omega \in \Omega_{sd}} \left[ \sum_{g=1}^{G_{sd}(\omega)} x_{sdg}(\omega)^{\frac{\varepsilon}{\varepsilon-1}} \right] \frac{\varepsilon}{\varepsilon-1} \frac{\sigma-1}{\sigma} \, d\omega \right)^{\frac{\sigma}{\sigma-1}} \text{ where } \varepsilon > 1, \sigma > 1. \tag{2}
\]
and \( \Omega_{sd} \) is the set of product mixes shipped from \( s \) to \( d \). Atkeson and Burstein (2007) adopt a similar nested CES form in a heterogenous-firms model of trade but do not consider multi-product firms. A discrete number of products facilitates empirical work with product-level data, and we have re-derived our main results for function (2). To compare our model’s implications directly to related heterogeneous-firm models, however, we present the continuous version of the product space. We could make the elasticities of substitution country-specific (\( \varepsilon_{d} \) and \( \sigma_{d} \), and all our results would continue to apply. We keep the elasticities the same across destinations to simplify notation and to emphasize that our results do not depend on preference assumptions.
where

\[ X_d \equiv \left( \sum_{s=1}^{N} \int_{\Omega_{sd}} X_{sd}(\omega; G_{sd})^{\frac{\sigma-1}{\sigma}} \, d\omega \right)^{\frac{\sigma}{\sigma-1}} \quad \text{and} \quad P_d \equiv \left( \sum_{s=1}^{N} \int_{\Omega_{sd}} P_{sd}(\omega; G_{sd})^{1-\sigma} \, d\omega \right)^{\frac{1}{1-\sigma}}. \]

So, the demand for firm \( \omega \)'s product \( g \), produced in country \( s \) and sold to country \( d \), is

\[ x_{sdg}(\omega) = \left( \frac{p_{sdg}(\omega)}{P_{sd}(\omega; G_{sd})} \right)^{-\varepsilon} \left( \frac{P_{sd}(\omega; G_{sd})}{P_d} \right)^{-\sigma} \frac{y_d L_d}{P_d} \]  

with \( P_d X_d = y_d L_d \).

### 3.2 Firms

There is a continuum of firms that differ ex ante only in their worldwide unique productivity scalar \( \phi \). Each firm is located in a single source country \( s \). Firm \( \phi \) manufactures every one of its products with the same constant-returns-to-scale technology \( q_{sdg}(\phi) = \phi \ell \), independent of \( s, d \) and \( g \), where \( \ell \) is employment contracted at the source country’s wage \( w_s \). When exported, a product incurs a standard iceberg trade cost so that \( \tau_{sd} > 1 \) units must be shipped from \( s \) for one unit to arrive at destination \( d \). We assume that \( \tau_{ss} = 1 \) for domestic sales.

We call an exporter’s measure of goods \( G_{sd} \) shipped to destination \( d \) the exporter scope at destination \( d \). We call the sales \( p_{sdg} x_{sdg} \) of a firm’s individual product \( g \) the product scale at destination \( d \), where \( p_{sdg} \) is the product’s price. A firm maximizes its profits by choosing its scope \( G_{sd} \) for every destination \( d \) and the scale \( p_{sdg} x_{sdg} \) for every product \( g \) at destination \( d \). Firms with a given productivity \( \phi \) from a given country \( s \) face an identical optimization problem.

In order to sell in a market, a firm has to incur a fixed market-entry cost \( \gamma_i \kappa_d \) in terms of destination-country labor units.\(^{11}\) The market-entry cost has an industry-specific component \( \gamma_i \) and a destination-specific component \( \kappa_d \). In addition, a firm must pay a scope-dependent product-entry cost at every sales destination. This product-entry cost increases in an exporter’s offered scope

\[ F_d(G_{sd}) = \gamma_i \gamma_d (G_{sd})^{\delta} / \delta \quad \text{where} \quad \gamma_i \gamma_d > 0, \delta > 0, \]  

at destination \( d \), also in terms of destination-country labor units. If \( \delta > 1 \), the product-entry cost is a convex function of the firm’s offered scope. The product-entry cost has the same industry-specific component \( \gamma_i \) as in market-entry cost and a potentially different destination-specific component \( \gamma_d \).

\(^{11}\)In continuous product space with nested CES utility, every firm would otherwise export to all destinations worldwide. No fixed market-entry cost is needed in the discrete product-space version of our model where the firm’s first good causes a nontrivial fixed product-entry cost.
The firm’s profit maximization problem in a given destination market $d$ is

$$
\pi_{sd}(\phi) = \max_{G_{sd}, p_{sdg}} \int_0^{G_{sd}} \left( p_{sdg} - \tau_{sd} \frac{w_s}{\phi} \right) (p_{sdg} - \varepsilon \frac{(P_{sd}(\phi; G_{sd}))^{\varepsilon-\sigma}}{(P_d)^{1-\sigma}} y_d L_d \, dg \right.

- w_d \gamma_i \kappa_d - w_d \gamma_i \gamma_d \frac{(G_{sd})^\delta}{\delta}

) ^{\varepsilon-\sigma} \right) \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1}

) \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1} y_d L_d \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1} \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1}

$$

by demand (5), where $\pi_{sd}(\phi)$ denotes maximized profits. In general, product-mix price $P_{sd}(\phi; G_{sd})$ is a function of $G_{sd}$ so that a firm takes into account how every single product competes with the neighboring products in the firm’s product mix at a destination. In continuous product space, however, there is no competition within the product mix.

The first-order condition with respect to price $p_{sdg}$ yields optimal product price $p_{sdg}(\phi) = \bar{\varepsilon} \tau_{sd} w_s / \phi$ with a constant markup over marginal cost $\bar{\varepsilon} \equiv \varepsilon / (\varepsilon - 1) > 1$ for $\varepsilon > 1$. So, firm $\phi$ optimally chooses to sell every product in its product mix at destination $d$ for the same price, and therefore also with the same quantity. Given $G_{sd}$, optimal product scale is therefore the same for every product $g$,

$$
G_{sd}(\phi) = \left[ \frac{\bar{\sigma} y_d L_d \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1}}{w_d \gamma_i \kappa_d - w_d \gamma_i \gamma_d \frac{(G_{sd})^\delta}{\delta}} \right]^{1/\sigma}

$$

where $\bar{\sigma} \equiv (\sigma - 1)/(\varepsilon - 1)$. The composite elasticity term $\bar{\sigma} \equiv (\sigma - 1)/(\varepsilon - 1)$ satisfies $\bar{\sigma} < 1$ iff $\varepsilon > \sigma > 1$ (that is iff products within the product mix are closer substitutes among each other than with outside goods).

Taking the first derivative of the scale-optimized profit function with respect to $G_{sd}$ and setting it to zero, we find the optimal exporter scope for a firm from $s$ that sells to $d$,

$$
G_{sd}(\phi) = \left[ \frac{\bar{\sigma} y_d L_d \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{\sigma-1}}{w_d \gamma_i \kappa_d - w_d \gamma_i \gamma_d \frac{(G_{sd})^\delta}{\delta}} \right]^{1/\sigma}

$$

For a well-defined profit-maximum to exist, profits must be concave in $G_{sd}$ at the optimal $G_{sd}(\phi)$. Equivalently, product-entry costs must not be too concave and satisfy

\[12\] In discrete product space, the markup varies with exporter scope by destination. This is the result of a crowding-out effect by which a firm’s product competes with all neighboring products in the product mix if $\varepsilon > \sigma$. Variable markups make the discrete product-space version more plausible at the expense of foregoing analytic solutions in several instances.
\[ \delta > \bar{\sigma}. \] Otherwise, firms would choose an infinite exporter scope.\(^{13}\) So, more productive firms sell more products in a market. Using (8) in the zero-profit condition \( \pi_{sd}(\phi) = 0 \), the minimum optimal scope \( G_d^* \) of any firm in country \( d \) is

\[ G_d^* = \left( \frac{\delta \bar{\sigma}}{\delta - \bar{\sigma} \gamma_d} \right)^{1/\frac{\sigma}{1-\sigma}}. \] (9)

This minimum optimal scope solely depends on destination-specific elasticities and cost parameters at \( d \). The minimum optimal scope is independent of industry and independent of the country’s size \( L_d \) and per-capita income \( y_d \).

Similarly, there is a productivity threshold for exporting from \( s \) to \( d \). Using (9) in (8), the productivity threshold \( \phi_{isd}^* \) for a firm in industry \( i \) from source country \( s \) to sell at \( d \) is

\[ \phi_{isd}^* = \left( \frac{y_d L_d}{\gamma_{i\varepsilon}} \right)^{-\frac{1}{\sigma-1}} \left( \frac{w_d \gamma_d}{\bar{\sigma}} \right)^{\frac{1}{\sigma-1}} \left( \frac{\delta w_d \kappa_d}{\delta - \bar{\sigma}} \right)^{\frac{1}{\sigma-1}} \left( \frac{1 - \bar{\sigma}}{1 - \delta} \right)^{\frac{1}{\sigma-1}} \bar{\varepsilon} \tau_{sd} w_s \phi_{isd}. \] (10)

The productivity threshold for exporting to \( d \) decreases in destination-market expenditure \( y_d L_d \), it increases in the scope-cost parameter \( w_d \gamma_d \) and in the fixed market-entry cost \( w_d \kappa_d \) (because \( \delta > \bar{\sigma} \)), and it increases in the firm’s marginal cost \( \tau_{sd} w_s \). A firm at \( s \) with productivity \( \phi_{isd}^* \) is treated as selling to \( d \).

Using (9) and (10), the optimal exporter scope (8) for shipments from source country \( s \) to country \( d \) can also be expressed as

\[ G_{sd}(\phi) = G_d^* \left( \frac{\phi}{\phi_{isd}^*} \right)^{\frac{2-\frac{1}{\sigma}}{2-\frac{1}{\sigma}}}. \] (11)

in terms of the minimum optimal scope and the productivity threshold, and conditional on the firm’s exporting from \( s \) to \( d \) (\( \phi \geq \phi_{isd}^* \)). Note that optimal exporter scope at destination \( d \) is a function of firm \( \phi \)’s ranking relative to the least productive competitor from the same source country \( s \), \( \phi / \phi_{isd}^* \). So data for a single source country suffice for empirical tests.

Similarly, multiplying the optimal product scale (7) by the optimal measure of products (8), and using productivity threshold (10), yields a firm’s optimal total exports

\[ t_{sd}(\phi) \equiv G_{sd}(\phi) p_{sdg}(\phi) x_{sdg}(\phi) = \left[ \left( y_d L_d \right)^{\delta} \left( \frac{w_d \gamma_d \gamma_d}{\bar{\sigma}} \right)^{-\bar{\sigma}} \left( \frac{\phi P_d}{\bar{\varepsilon} \tau_{sd} w_s} \right)^{\delta (\sigma-1)} \right]^{\frac{1}{\frac{\sigma}{1-\sigma}}} \]

\[ = \left( \frac{\delta}{\delta - \bar{\sigma}} \right)^{\frac{1}{\sigma-1}} \left( \frac{\phi}{\phi_{isd}^*} \right)^{\delta (\sigma-1)} \] (12)

\(^{13}\)Derivation shows that the second-order condition is equivalent to \( \delta > \bar{\sigma} \). The reason is that the ratio between the marginal revenue and the marginal cost of adding a product is proportional to \((G_{sd})^{\frac{\sigma-1}{1-\sigma}}\). Suppose \( \delta < \bar{\sigma} \). Then the marginal-revenue-to-marginal-cost-ratio tends to positive infinity as the measure of products goes to positive infinity.
in terms of the productivity threshold and conditional on the firm’s exporting from \( s \) to \( d \) (\( \phi \geq \phi^*_{isd} \)). More productive firms have larger total sales to a market because \( \delta > \bar{\sigma} \).

Finally, firm \( \phi \)'s optimal average product scale is

\[
 z_{sd}(\phi) = \frac{t_{sd}(\phi)}{G_{sd}(\phi)} = \left[ \left( \frac{1}{\sigma} \varepsilon w_d \gamma_i \gamma_d \right)^{\frac{\varepsilon - \sigma}{\varepsilon - \tau}} \left( \frac{\phi P_d}{\varepsilon \tau_{sd} w_s} \right)^{(\delta - 1)(\sigma - 1)} \right]^{\frac{1}{\varepsilon - \sigma}}
\]

conditional on the firm’s exporting from \( s \) to \( d \) (\( \phi \geq \phi^*_{isd} \)).

We summarize these findings in

**Proposition 1** Suppose product-entry costs are not too concave (\( \delta > \bar{\sigma} \equiv (\sigma - 1)/(\varepsilon - 1) \)). Then for all \( s, d \in \{1, \ldots, N\} \)

- there exists a productivity threshold \( \phi^*_{isd} > 0 \) such that exporter scope \( G_{sd}(\phi) > 0 \) and shipments \( x_{sdg}(\phi) > 0 \) for all products \( g \in [0, G_{sd}(\phi)] \) iff \( \phi \geq \phi^*_{isd} \);

- exporter scope \( G_{sd}(\phi) \) strictly increases in \( \phi \) for \( \phi \geq \phi^*_{isd} \);

- average product scale \( z_{sd}(\phi) \) strictly increases in \( G_{sd}(\phi) \) and in \( \phi \) for \( \phi \geq \phi^*_{isd} \) iff \( \delta > 1 \) (convex product-entry costs in scope).

Whereas the optimal scope increases with the firm’s productivity, optimal scale per product increases in productivity only if product-entry costs are convex (\( \delta > 1 \)).\(^{14}\) The intuition is that a firm starts with higher sales per product for the first product that it introduces in a market. The firm adds more products to its scope as long as the additional revenue exceeds the cost of introducing that product. As the firm adds more products, demand for its inframarginal products drops until the last added product’s marginal profit equals the product-entry cost for that last product. So, unless the marginal cost of product-entry increases with the firm’s scope (which is the case if \( \delta > 1 \)), a constant elasticity of substitution across the firm’s products implies that average sales per product do not increase with productivity.\(^{15}\)

\(^{14}\)If \( \sigma > \varepsilon > 1 \) (products within the product mix are closer substitutes with outside goods than among each other), then \( \delta > \sigma > 1 \) must be satisfied for an optimum in exporter scope to exist.

\(^{15}\)The prediction that exporter scope and product scale are positively associated is also consistent with other frameworks. Bernard et al. (2006) propose a model with a product-specific productivity component and a firm-specific productivity component (“ability”) where more “able” firms adopt a wider product scope. If the firm and product-specific productivity components are drawn from independent Pareto distributions, however, then it can be shown that scale and firm size are independent in their framework, in contrast to Proposition 1 and the empirical regularities in Figure 2.
3.3 Scope, average-scale and total-exports distributions

We revisit our three main exporter statistics—exporter scope $G_{sd}$, total exports $t_{sd}$, and average product scale $z_{sd} = t_{sd}/G_{sd}$—and derive their relationship to the firm’s percentile in the productivity distribution. Motivated by the approximate Pareto shape of observed total exports and exporter scope, we consider the firms’ productivity to be Pareto.\[\text{16}\]

A firm’s productivity in source country $s$ is drawn from a Pareto distribution with a source-country dependent location parameter $b_s$ and a worldwide shape parameter $\theta$ over the support $[b_s, +\infty)$ for $s = 1, \ldots, N$. The cumulative distribution function of productivity is $F_s(\phi) = 1 - (b_s/\phi)^\theta$, and the density $f_s(\phi) = \theta (b_s/\phi)^{\theta+1}$. More advanced countries have a higher $b_s$ threshold ($b_s$ is also the mode of the Pareto distribution). The mean, median, variance and skewness of the Pareto distribution strictly decrease in the shape parameter $\theta$.

By the properties of the Pareto distribution, the conditional density of firms from source country $s$ with at least one shipment to destination $d$ is

$$\mu_{sd}(\phi) = \begin{cases} \theta (\phi_{isd}^*)^\theta / (\phi)^{\theta+1} & \text{if } \phi \geq \phi_{isd}^*, \\ 0 & \text{otherwise}. \end{cases}$$

So the productivity distribution of active firms with at least one shipment from $s$ to $d$ is Pareto with the same shape parameter $\theta$ but with a source and destination specific location parameter $\phi_{isd}^*$. The Pareto distribution carries over to exporter scope $G_{sd}$, total exports $t_{sd}$, and average product scale $z_{sd} = t_{sd}/G_{sd}$.

**Proposition 2** Suppose that the distribution of firm productivity is Pareto with shape parameter $\theta$ and that product-entry costs are not too concave ($\delta > \bar{\sigma} \equiv (\sigma - 1)/(\varepsilon - 1)$). Then

- the distribution of exporter scope is Pareto with shape parameter $\theta (\delta - \bar{\sigma})/(\sigma - 1)$ and location parameter $G_d^*$ given by eq. (9);
- the distribution of total exports is Pareto with shape parameter $\theta (\delta - \bar{\sigma})/[(\delta - 1)(\sigma - 1)]$ and location parameter $\delta \varepsilon w_d \gamma_i \kappa_d / (\delta - \bar{\sigma})$;
- the distribution of average product scale is Pareto with shape parameter $\theta (\delta - \bar{\sigma})/[((\delta - 1)(\sigma - 1))$ and location parameter $(G_d^*)^{\delta - 1} \varepsilon w_d \gamma_i \kappa_d / (\delta - \bar{\sigma})$, where $G_d^*$ is given by eq. (9), if product-entry cost are strictly convex in exporter scope ($\delta > 1$).

**Proof.** The statements follow directly from the following property of the Pareto distribution. For a Pareto distributed random variable $\phi$ with shape parameter $\theta$ and location parameter $\phi_{isd}^*$, the transformed random variable $x = A(\phi)^B$ is Pareto distributed with

\[\text{16}\]Theoretical results that give rise to Pareto distributed productivity across firms include Kortum (1997), Luttmer (2007), Arkolakis (2007).
with shape $\theta/B$ and location $A(\phi^*_sd)^B$: applying the change of variables theorem to $\phi(x) = (x/A)^{1/B}$ and $\mu(\phi)$ from (14) shows that 
\[
\int_a^b \mu(\phi) \, d\phi = \int_{x(a)}^{x(b)} \mu(\phi(x)) \phi'(x) \, dx = \int_{x(a)}^{x(b)} (\theta/B) [A(\phi^*_sd)^B]^{\theta/B}/(x)^{\theta/B+1} \, dx.
\]

The statements in proposition 2 are closely related to Figure 2. By the properties of the Pareto distribution, the probability that an active firm is at the $(1-Pr)$-th percentile in the productivity distribution or above, attaining a productivity of at least $\phi_0$, is

$$1 - Pr = 1 - F_{sd}(\phi_0) = \left(\frac{\phi_0}{\phi^*_sd}\right)^{-\theta}.$$ 

This implies that the exporter scope $G_{sd}(1-Pr)$ of firms at the $(1-Pr)$-th percentile or above is

$$G_{sd}(1-Pr) = G^*_d \cdot \left(1 - Pr\right)^{-\frac{\sigma-1}{(\delta - \bar{\sigma})\sigma}}$$ 

by (11). Figure 2 plots average exporter scope $G_{sd}(1-Pr) = A_G (1-Pr)^{-1/\theta_G}$ in logs, after reverting the horizontal axis, where the power is the negative of the inverse of the Pareto shape parameter $\theta_G = \theta(\delta - \bar{\sigma})/(\sigma - 1)$. Note that, if the market-entry cost for the first shipment $\gamma_i K_d$ and the product-entry cost parameter $\gamma_i \gamma_d$ vary proportionally across destinations, the exporter-scope distribution is identical across countries.

Total exports $t_{sd}(1-Pr)$ of firms at the $(1-Pr)$-th percentile or above are

$$t_{sd}(1-Pr) = \frac{\delta \varepsilon w_d \bar{\gamma}_i K_d}{\delta - \bar{\sigma}} \cdot \left(1 - Pr\right)^{-\frac{\sigma-1}{\delta - \bar{\sigma}\sigma}}$$ 

by (12), where $\bar{\gamma}_i$ is the firm-average cost parameter across all industries. The power (the negative of the inverse of the Pareto shape parameter) generalizes the power $-(\sigma-1)/\theta$ in Eaton et al. (2005). As introducing additional good becomes infinitely costly to the firm in the limit $(\delta \rightarrow \infty)$, our shape parameter converges to the Eaton et al. (2005) shape parameter.

Finally, average product scale for firms at the $(1-Pr)$-th percentile or above is

$$z_{sd}(1-Pr) = \frac{\varepsilon w_d \bar{\gamma}_i \gamma_d}{\sigma} \left(G^*_d\right)^{\delta-1} \cdot (1-Pr)^{-\frac{\sigma-1}{\delta - \bar{\sigma}\sigma}}$$ 

by (13), where $\bar{\gamma}_i$ is the firm-average cost parameter across all industries. Figure 2 plots average product scale $z_{sd}(1-Pr) = A_z (1-Pr)^{-1/\theta_z}$ in logs, after reverting the horizontal axis, where $\theta_z = \theta(\delta - \bar{\sigma})/[(\delta - 1)(\sigma - 1)]$. Note that variation in $\gamma_i K_d$ and $\gamma_i \gamma_d$ across destinations affects the average product scale distribution even if $\gamma_i K_d$ and $\gamma_i \gamma_d$ change proportionally (in contrast to the exporter-scope distribution). Higher entry costs for larger markets, as in Eaton et al. (2004) and Arkolakis (2006), are consistent with such variation.
3.4 Margin Decompositions

The measure of firms from \( s \) who choose to ship to \( d \) is \( M_{sd} \leq J_s \), where \( J_s \) is the measure of potential entrants who have received a productivity draw at no cost.

**Total exports.** Summing the firms’ total exports (12) over all firms with shipments from \( s \) to \( d \), we find

\[
T_{sd} = J_s \left( \frac{b_s}{\phi_{isd}} \right)^\theta \int_{-\infty}^{+\infty} \frac{\delta \varepsilon w_d \gamma_i \kappa_d}{\delta - \bar{\sigma}} \left( \frac{\phi}{\phi_{isd}} \right)^{\frac{\delta-1}{\delta-\bar{\sigma}}} \mu_{sd}(\phi) \, d\phi
\]

\[
= J_s \left( \frac{b_s}{\phi_{isd}} \right)^\theta \cdot \frac{\delta \varepsilon w_d \gamma_i \kappa_d}{\delta [\theta - (\sigma - 1)] - \theta \sigma}
\]

and require that

\[
\delta > \frac{\theta \bar{\sigma}}{\theta - (\sigma - 1)}
\]

for average exports per firm \( \bar{t}_{sd} \) to be well defined.

The market share of country \( s \)’s exports in country \( d \)’s total consumption is

\[
\lambda_{sd} \equiv \frac{T_{sd}}{\sum_{i=1}^{D} t_{cd}} = \frac{J_s \left( \frac{b_s}{\phi_{isd}} \right)^\theta}{\sum_{i} J_i \left( \frac{b_i}{\phi_{cd}} \right)^\theta} = \frac{J_s \left( \frac{b_s}{\phi_{isd}} \right)^\theta \tau_{sd} w_s^{-\theta}}{\sum_{i} J_i \left( \frac{b_i}{\phi_{cd}} \right)^\theta \tau_{cd} w_i^{-\theta}}
\]

by average total exports (17) and the productivity threshold (10). It is remarkable that the elasticity of trade with respect to trade costs is \(-\theta\), exactly as in Eaton and Kortum (2002). Moreover, the model is reminiscent of the finding in Eaton et al. (2004) that France’s exports to destinations are predominantly explained by the measure of active exporters \( J_s \left( \frac{b_s}{\phi_{isd}} \right)^\theta \), and only to a small extent by the exports per firm. We find a similar pattern for Brazilian exporters.

**The Extensive Margin of Exporting Goods and Trade Costs.** To relate the extensive margin of goods to earlier heterogeneous-firm models of trade, we analyze the common comparative-statics experiment of a change in trade costs. We decompose the change in total exports from a source country to a destination into two extensive margins—the entry of firms and the introduction of goods—and the remaining intensive margin of sales per good. This extends the analysis in Chaney (2007), who studies a model of monopolistic competition with only one extensive margin—the entry of firms—and the composite intensive margin of sales per firm. We decompose the intensive margin of sales per firm further into a firm’s number of goods and the sales per good.
Total exports from country $s$ to $d$ are

$$T_{sd} = J_s \int_{\phi_{sd}^*}^{\infty} G_{sd}(\phi) x_{sdg}(\phi) f_s(\phi) d\phi.$$ 

Consider the response of total exports to a change in trade costs. Applying Leibniz rule yields

$$\frac{\partial \ln T_{sd}}{\partial \ln \tau_{sd}} = \frac{\tau_{sd}}{T_{sd}} \left( \int_{\phi^*}^{+\infty} \frac{\partial G_{sd}(\phi)}{\partial \tau_{sd}} x_{sdg}(\phi) g_t(\phi) d\phi \right.$$

$$+ \int_{\phi^*}^{\infty} G_{sd}(\phi) \frac{\partial x_{sdg}(\phi)}{\partial \tau_{sd}} g_t(\phi_{sd}) d\phi + \frac{\partial \phi_{sd}^*}{\partial \tau_{sd}} G_{sd}(\phi_{sd}^*) x_{sdg}(\phi_{sd}^*) g(\phi_{sd}^*) \right),$$

and, after substitution of the optimality conditions,

$$\frac{\partial \ln T_{sd}}{\partial \ln \tau_{sd}} = \left[ \theta - \delta \left( \frac{\sigma - 1}{\delta - \bar{\sigma}} \right) \right] - \frac{\sigma - 1}{\delta - \bar{\sigma}} - (\delta - 1) \frac{\sigma - 1}{\delta - \bar{\sigma}}.$$ 

As introducing more than one good becomes infinitely costly in the limit ($\delta \to \infty$), firms turn into single-product exporters and the elasticities converge to those in the Chaney (2007) model. At the other extreme, when $\delta$ approaches $\bar{\sigma}$, responses at the extensive margin of introducing goods become very important. The margin of sales per good is now different by a multiplicative factor $(\delta - 1)/ (\delta - \bar{\sigma})$. The extensive margin of introducing goods is augmented while the extensive margin of firm entry is diminished accordingly. But the overall elasticity of trade remains $-\theta$.

4 An Empirical Evaluation of Model Implications

We evaluate three main aspects of the model. In our first evaluation, we query the model prediction that an exporter’s local scope repeats across its export destinations and that it is fully predicted by the exporter’s global characteristics relative to its source-country competitors. We then investigate how average product scale and exporter scope are related to uncover the implied scope elasticity of product-entry costs in two ways. Our second evaluation compares the exporters’ average-product-scale distribution to the exporter-scope distribution after ranking the exporters by their total

\textsuperscript{17}We assume that marginal changes in $\tau_{sd}$ do not affect the general equilibrium of the model (marginal new trade flows are considered small compared to the size of the source and destination countries).
exports within destinations. This provides a test of the model prediction that log average product scale and log exporter scope linearly increase in firms’ log total-exports percentiles and yields an estimate for the scope elasticity of product-entry costs. In our third evaluation, we impose no ranking on the exporters and revisit the relationship between average product scale and exporter scope in the pristine data to check consistency. This third evaluation also affords us with a test of the model prediction that exporter scope and average product scale are associated within every destination market because of repeated local product-entry costs. We document the sources of the scope-scale association through a decomposition of the scale-scope covariation into cross-firm, cross-destination and within firm-and-destination covariation.

**Prediction: Firm-level determinants of exporter scope are identical across destinations.** We take the natural log of optimal exporter scope \( (8) \) and augment the relationship by a disturbance \( \eta_{d\phi} \),

\[
\ln G_{d\phi} = \ln G\phi_d^* + \frac{\sigma-1}{\sigma-2} \ln (1 - \Pr_d) + \eta_{d\phi}.
\]

We estimate the relationship with linear regression for a single source country (and consequently drop \( s \) from the notation). By (12) and the properties of the Pareto distribution, \( \ln (\phi/\phi_d^*) \) is proportional to a firm’s log percentile in local exports among its source-country competitors at \( d \). So we use a Brazilian exporter’s local log percentile \( 1 - \Pr_d \) in total exports compared to its Brazilian competitors at destination \( d \) to measure \( \ln (\phi/\phi_d^*) \). We use destination indicators to estimate \( \ln G\phi_d^* \) by destination. The regression allows us to assess whether the firms’ scope-rank relationship is systematically related across destinations.
Table 3: Linear Fits of Scope and Average Scale Distributions

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<th>(R^2)</th>
<th>Log exports/product</th>
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<td>-.389</td>
<td>.502</td>
<td>-.507</td>
<td>(.012)</td>
<td>(.013)</td>
<td>2.305</td>
</tr>
<tr>
<td></td>
<td>-.456</td>
<td>.419</td>
<td>-.415</td>
<td>(.013)</td>
<td>(.013)</td>
<td>1.910</td>
</tr>
<tr>
<td></td>
<td>-.417</td>
<td>.402</td>
<td>-.469</td>
<td></td>
<td></td>
<td>2.123</td>
</tr>
</tbody>
</table>


Note: Ordinary-least-squares regressions of firms’ mean scope at given percentile or above and firms’ mean product scale (the scope-weighted arithmetic mean of exporters’ average product scales \(\bar{z}_d\) in US$ thousand fob) at given percentile or above on log percentile \(\ln(1 - Pr)\) and a constant, using one hundred percentile observations per destination (Figure 2). Aggregate regions include only destinations with more than 100 firms (70 countries in world, 21 OECD, 49 non-OECD); destination observations weighted by total exports. Non-OECD includes all non-members in 1990; OECD includes all OECD members in 1990. Products at the Harmonized-System 6-digit level.

Prediction: Log average product scale and log exporter scope linearly increase in firms’ log total-exports percentiles. We take the natural logs of (15)
and (16) and fit the relationships

\[
\ln G_{d,1-(Pr)} = \ln G_{d}^{*} - \frac{\sigma - 1}{(\delta - \sigma)\theta} \ln(1 - Pr) + \eta_{d,1-(Pr)}^{G},
\]

\[
\ln z_{d,1-(Pr)} = \left[ \ln \left( \frac{\epsilon_{w,d} \gamma_{d} \gamma_{d}}{\delta} \right) + (\delta - 1) \ln G_{d}^{*} \right] - \frac{(\delta - 1)(\sigma - 1)}{(\delta - \sigma)\theta} \ln(1 - Pr) + \eta_{d,1-(Pr)}^{z},
\]

where \(\eta_{d,1-(Pr)}^{G}\) and \(\eta_{d,1-(Pr)}^{z}\) are potentially percentile-specific disturbances, using ordinary least squares destination by destination on one hundred percentile observations each. A firm’s percentile is its local rank in total exports at the destination across all industries. These regressions fit curves for individual countries as in Figure 2, and an average relationship for the country aggregates. Note that the ratio between the log-percentile coefficient in the first and second regression is \(1/(\delta - 1)\) and provides an estimate of the scope elasticity of product-entry costs.

Table 3 reports the coefficient estimates. The goodness of fit is close to one in the regressions for the three individual destinations U.S., Argentina and China (except the average-product-scale regression for China) and consistent with log-linear relationships (column 1 through 3). In these three countries, the coefficient in the exporter-scope regression is around -.5 and implies that the Pareto shape parameter of exporter scope is around 2. Similarly, the coefficient in the average-product-scale regression of about -.4 implies that the Pareto shape parameter of average product scale is around 2.5. The ratio of the two regression coefficients implies a scope-elasticity of product-entry costs \(\delta\) of around 1.7. So, product-entry costs are convex in scope. The degree of convexity is remarkably similar across these three destinations.

To summarize the average Pareto shape parameters over many export destinations, we look across the seventy destinations (21 OECD, 49 non-OECD) with more than 100Brazilian exporters, pool the countries, and run a total-exports weighted regression of log mean scope and log mean product scale at or above a percentile on the log percentile. Countries that attract less total exports than the U.S., Argentina and China exhibit a somewhat higher estimate for the convexity of product-entry costs, resulting in an average scope elasticity of product-entry costs of around 2.3 in OECD countries, 1.9 in non-OECD countries and 2.1 around the world (column 6). Our model leads us to expect this. More convex product-entry costs in a country result in lower total exports in the model.

**Prediction:** The average-product-scale and exporter-scope association is explained by within-destination variation. Figure 2 illustrates, and results in Table 3, document that average-product-scale and exporter-scope are positively associated. The remarkably stable scope-elasticity of product-entry costs across destinations raises the empirical concern, however, that the regularity may not be driven by repeated destination-market dis-economies of scope, as in the model, but in fact by firm-wide determinants such production choices. To query this issue, we decompose the covariation...
Table 4: Decomposition of Product Scale and Exporter Scope Correlations

<table>
<thead>
<tr>
<th>Log Exp./prod.</th>
<th>Firm data&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Firm-destination data&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Firm-destination-product data&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>OLS Dest. FE</td>
<td>Ind. &amp; dest. FE</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Log # Products</td>
<td>.341 (.022)**</td>
<td>-.160 (.011)**</td>
<td>.072 (.011)**</td>
</tr>
<tr>
<td>Obs.</td>
<td>10,215</td>
<td>46,208</td>
<td>76,964</td>
</tr>
<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>.023</td>
<td>.004</td>
<td>-.182</td>
</tr>
</tbody>
</table>

Note: Products at the Harmonized-System 6-digit level; product-group fixed effects at the Harmonized-System 2-digit level. Constant not reported. R<sup>2</sup> is within fit for industry FE regressions. Correlation coefficient between industry fixed effects and log number of products. Standard errors in parentheses: * significance at ten, ** five, *** one percent.

We take the natural log of optimal average product scale (13) as a function of optimal exporter scope and augment the relationship by a disturbance \(\eta_{d\phi}\)

\[
\ln z_{d\phi} = \ln z_{d\phi} + (\delta - 1) \ln G_{d\phi} + \eta_{d\phi}.
\]

We estimate the relationship with linear regression, and let industry and destination fixed effects capture \(\gamma_i\) and \(w_d\gamma_d\). Bernard et al. (2006) take firm-level means across destinations to estimate a comparable relationship

\[
\ln z_{\phi} = \ln z_{\phi} + (\delta - 1) \ln G_{\phi} + \eta_{\phi},
\]

where dots indicate the means over destinations (the averaged-out indexes) and the bar indicates the mean over industries.<sup>18</sup> Table 4 shows the regression result on the means in column 1. Similar to Bernard et al. (2006), the regression coefficient for log scale on scope is significantly positive.

<sup>18</sup>Bernard et al. (2006) report a product-level version of the regression equation, where product scale

\[
\ln z_{g\phi} = \ln z_{g\phi} + (\delta - 1) \ln G_{\phi} + \eta_{g\phi}
\]

is not averaged by firm. The regressor \(\ln G_{\phi}\) does not vary by product, however, so that the coefficient on log exporter scope is implicitly re-weighted towards large-scope firms. Our main interest is a decomposition of the covariation between average scale and scope as in (13) by source.
To query the source of this positive covariation between log scale and scope, we turn to firm and destination data as in (19). In the absence of any decomposition, the overall correlation between average product scale and exporter scope is negative (column 2). Removing the contribution of the covariation between the destination-means of product scale $\ln z_\phi$ and exporter scope raises the coefficient estimate (and the fit) slightly (column 3). So destinations with lower product scale are typically also destinations with higher exporter scope $\ln G_\phi$, consistent with lower product-entry costs $\gamma_i^e \gamma_d$ at destinations where market-entry cost $\gamma_i^e \kappa_d$ are higher.

Removing the covariation between the industry’s mean product scale across its destinations $\ln z_d$ and the industry’s mean scope across destinations $\ln G_d$, from the regression raises the coefficient estimate finally into the positive range (column 3). So industries with high exporter scope worldwide are typically also industries with low product scale worldwide (as reflected in the negative correlation coefficient between industry-fixed effects and the log number of products in the final row of Table 4).\(^19\) This decomposition of the covariation between log scale and scope shows that the sole source of the positive scale-scope covariation worldwide (in column 1) is the repeated positive scale-scope relationship by destination and by industry (column 4). The destination effects in the scale-scope relationship are in turn correlated with common gravity-equation predictors in an expected way (see Table 5 in the appendix).

The single source of positive covariation within destinations and firms in the data is consistent with a version of our model where product-entry costs convexly increase in exporter scope. Note that firms need to incur these product-entry costs repeatedly market by market. The coefficient in column 4 of around .1 implies dis-economies of scope with a scope-elasticity of product-entry costs $\delta$ of around 1.1. So, product-entry costs are convex in scope also by this measure but the degree of convexity is considerably smaller than in the regressions of Table 3, where the ranking of firms by total exports imposed additional structure.

A final empirical concern is that firms may more frequently adopt product types that offer high product scale so that the positive scale-scope association would be driven by product selection and not by dis-economies of scope. We therefore decompose the covariation between log scale and scope further into sources of covariation within product groups (at the Harmonized System 2-digit level) and across product groups. Columns 5 through 7 in Table 4 show that the positive association between log scale and scope becomes even more pronounced. Dis-economies of scope for product-entry by destination are significantly higher within product groups (column 7) than across (column 4 where across and within product-group variation is not decomposed). The product-

\(^{19}\)Our model allows for an industry-specific market-entry and product-entry cost component but does not link it to other fundamentals of the model. So, an explanation for the systematic negative scale-scope association at the global industry-level remains beyond our model. It is conceivable that firm- or industry-level economies of scope (from production, from global firm brands, or from global industry reputation) give rise to a negative scale-scope association, just as dis-economies of scope give rise to a positive association at every destination in our model.
group effects in the scale-scope relationship are in turn correlated with measures for the products’ degree of differentiation in an expected way (see Table 6 in the appendix). So it is not the firms’ adoption of high-scale products across product groups but a strong positive scale-scope association within product groups that accounts for the positive scale-scope relationship. The positive covariation within destinations, industries and their product groups in the data is fully consistent with our model where dis-economies of scope stem from repeated product-entry costs product-market by product-market and firm by firm.

5 Conclusion

The extensive margin of introducing additional export goods offers new insight into exporter behavior. Data on the universe of exporters in Brazil, their sales destinations and individual products, document that an exporter’s number of products (the exporter scope) and the exporter’s average sales per product (the product scale) are jointly Pareto distributed in the upper tails and positively associated destination by destination. To be consistent with the data, a model needs to account for the repeated positive association between scale and scope within every destination. We introduce a heterogeneous-firm model where exporters face a repeated product-entry cost that convexly increases in the exporter’s scope in every destination market. The model predicts main features of the data. The model also preserves main predictions of prior heterogeneous-firm models of trade such as a single elasticity of exporting and the extensive margin of firm entry. The empirical evidence and the model show that, beyond production-side explanations, distribution-side features such as dis-economies of scope in product-market access are salient determinants of exporter behavior.
Appendix

A Data

Exporter data. The Brazilian customs office SECEX \textit{(Secretaria de Comércio Exterior)} collects and compiles export reports by product code at the plant, month and NCM (\textit{Nomenclatura Comum do Mercosul}) level. NCM coincides with the Harmonized System at the 6-digit level. We aggregate the data to the firm, year and Harmonized-System 6-digit level. This facilitates comparisons to other Brazilian and international data sources.\footnote{The aggregation is comparable to export-country studies at the six-digit Harmonized System level such as Feenstra (1994) or Hummels and Klenow (2005), and to firm-level studies such as Eaton et al. (2004).}

Concordances. We map destination information from Brazilian country codes into the international ISO system. In the Brazilian data there are 6-digit product codes in the 999000s, for which there exist no corresponding Harmonized System entries. These codes are not closely related to traded merchandize and include entries such as On-board aircraft consumption of combustibles or Merchandize for non-financial rental. We remove the codes from the data. To compare our data to sector-level product-market information by destination country, we map the Harmonized System 6-digit codes to \textit{ISIC revision 2} at the two-digit level.\footnote{Our novel concordance will become available at \texttt{url econ.ucsd.edu/muendler/brazil} shortly.}

Trade flow data by industry and destination. We link the product and destination information from SECEX to \textit{WTF} \textit{(World Trade Flow)} data for the year 2000 (Feenstra et al. 2005). We extract sector-level trade flow statistics in current US$ for Brazil’s export destination markets and map the \textit{SITC Rev. 2} 4-digit sector information to the \textit{SITC Rev. 2} 2-digit level, and then to the 2-digit \textit{ISIC revision 2} level for combination with SECEX.

Output data by industry and destination. We obtain manufacturing output by destination country and manufacturing industry for 2000 from the \textit{Unido} Industrial Statistics Database at the 2-digit \textit{ISIC revision 2} level in current US$ (UNIDO 2005). We map the Harmonized System 6-digit codes to \textit{ISIC revision 2} at the two-digit level for this purpose.

Country and geographic data by destination. National accounts information for host-country regressors comes from the World Bank’s World Development Indicators and the IMF’s International Financial Statistics (population, GDP, consumption

20
21
26
expenditure and household consumption expenditure in current US$). We use CEPII bilateral geographic data; the data include the mean distance between Brasília and foreign capital cities (km), common borders with Brazil and a common language with Brazil (Portuguese-speaking Angola, China Macão SAR, Guinea Bissau, Mozambique and Portugal).

**Goods data.** We calculate Balassa (1965) comparative-advantage measures for Brazilian goods from UN Comtrade trade data for the year 2000 at the ISIC rev. 2 4-digit level. Good $h$’s Balassa advantage is

$$BADV_h = \frac{X_{Brazil}^h}{\sum_k X_{Brazil}^k} \frac{\sum_k X_{World}^k}{X_{World}^h},$$

where $X_h$ are exports. Note that this index measures revealed comparative advantage from international comparisons of exports data, and is blind to possible sources of advantage. Any explanation of comparative advantage is consistent with this measure. We first map the ISIC rev. 2 information to the Harmonized System 6-digit level and then aggregate to the Harmonized System 2-digit level by taking the unweighed average across 6-digit goods in the Brazilian data.

We use the Rauch (1999) classification of goods by degree of differentiation under Rauch’s conservative definition. We first map Rauch’s SITC Rev. 2 4-digit sector information to the Harmonized System 6-digit level and then aggregate to the Harmonized System 2-digit level by taking the unweighed average across 6-digit goods in the Brazilian data.

We reuse the WTF data for the year 2000 (Feenstra et al. 2005) to obtain goods-level measures of typical import destinations. For this purpose, we drop Brazilian exports and imports from the WTF data and calculate for the rest of the world the number of destinations to which goods at the SITC Rev. 2 4-digit level ship, and what import values they exhibit worldwide, in the OECD and Mercosur (Argentina, Paraguay, Uruguay). We map the SITC Rev. 2 4-digit sector information to the Harmonized System 6-digit level and then aggregate to the Harmonized System 2-digit level by taking the unweighed average across 6-digit goods.

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22From www.cepii.fr/anglaisgraph/bdd/distances.htm.
23We use Rauch’s revision 2 from 2007 (available at www.econ.ucsd.edu/~jrauch/intltrad)
Table 5: Correlates of Destination Effects on Product Scale and Exporter Scope

<table>
<thead>
<tr>
<th></th>
<th>Destination Eff. on Product Scale</th>
<th>Destination Eff. on Exp. Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>from Log Exports/prod. regressions</td>
<td>from Log # Products regressions</td>
</tr>
<tr>
<td></td>
<td>Dest. FE only</td>
<td>Dest. FE &amp; scope</td>
</tr>
<tr>
<td>Mean Log Market size</td>
<td>-0.002</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Log Population</td>
<td>0.243</td>
<td>0.243</td>
</tr>
<tr>
<td></td>
<td>(0.063)**</td>
<td>(0.063)**</td>
</tr>
<tr>
<td>Log GDP per cap.</td>
<td>0.154</td>
<td>0.153</td>
</tr>
<tr>
<td></td>
<td>(0.058)**</td>
<td>(0.058)**</td>
</tr>
<tr>
<td>Log Distance</td>
<td>0.067</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>(0.181)</td>
<td>(0.180)</td>
</tr>
<tr>
<td>Common borders</td>
<td>-0.531</td>
<td>-0.525</td>
</tr>
<tr>
<td></td>
<td>(0.362)</td>
<td>(0.359)</td>
</tr>
<tr>
<td>Common language</td>
<td>-0.561</td>
<td>-0.558</td>
</tr>
<tr>
<td></td>
<td>(0.393)</td>
<td>(0.390)</td>
</tr>
<tr>
<td></td>
<td>(1.706)**</td>
<td>(1.695)**</td>
</tr>
<tr>
<td>Obs.</td>
<td>106</td>
<td>106</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.359</td>
<td>.358</td>
</tr>
</tbody>
</table>


Note: Aggregation to exports by firm and destination. Regressions of destination fixed effects on destination-level predictors, where destination fixed effects on product scale in column 1 are from a destination fixed effects regression with no additional controls, in column 2 from a destination fixed effects regression controlling for scope (log # products, see column 2 in Table 4) and in column 3 from a destination fixed effects regression controlling for scale and firm fixed effects (see column 3 in Table 4). Destination fixed effects on exporter scope in column 4 are from a destination fixed effects regression with no additional controls, in column 5 from a destination fixed effects regression controlling for scale (log exports/product) and in column 6 from a destination fixed effects regression controlling for scale and firm fixed effects. Mean log market size is average sectoral absorption over ISIC rev. 2 industries at destination level. Standard errors in parentheses: * significance at ten, ** five, *** one percent.
<table>
<thead>
<tr>
<th>Product Eff. on Product Scale</th>
<th>Product Eff. on Exporter Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>from Log Exports/prod. regressions</td>
<td>from Log # Products regressions</td>
</tr>
<tr>
<td>Prod. FE only &amp; scope</td>
<td>Prod. FE only &amp; scope</td>
</tr>
<tr>
<td>Prod. FE, &amp; scope</td>
<td>Prod. FE, &amp; scope</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Comparative adv.</td>
<td>.451</td>
</tr>
<tr>
<td>-</td>
<td>(.143)**</td>
</tr>
<tr>
<td>Reference priced</td>
<td>-1.348</td>
</tr>
<tr>
<td>-</td>
<td>(1.058)</td>
</tr>
<tr>
<td>Differentiated</td>
<td>-1.750</td>
</tr>
<tr>
<td>-</td>
<td>(.977)**</td>
</tr>
<tr>
<td>Log ww. # Dest.</td>
<td>-1.218</td>
</tr>
<tr>
<td>-</td>
<td>(1.029)</td>
</tr>
<tr>
<td>-</td>
<td>(56.702)</td>
</tr>
<tr>
<td>Log OECD Imp.</td>
<td>.312</td>
</tr>
<tr>
<td>-</td>
<td>(.306)</td>
</tr>
<tr>
<td>No Mercosur imp.</td>
<td>-1.650</td>
</tr>
<tr>
<td>-</td>
<td>(2.510)</td>
</tr>
<tr>
<td>Log Mercos. Imp.</td>
<td>-.001</td>
</tr>
<tr>
<td>-</td>
<td>(.256)</td>
</tr>
<tr>
<td>Const.</td>
<td>1.824</td>
</tr>
<tr>
<td>-</td>
<td>(5.460)</td>
</tr>
<tr>
<td>Obs.</td>
<td>91</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.256</td>
</tr>
</tbody>
</table>

*Log of nonzero imports, times indicator of nonzero imports (one less no-imports indicator).


Note: Aggregation to exports by firm, destination, product group (Harmonized System 2-digit level). Regressions of product fixed effects at the Harmonized-System 2-digit level on product-level predictors, where product fixed effects on product scale in column 1 are from a product fixed effects regression with no additional controls, in column 2 from a product fixed effects regression controlling for scope (log # products) and in column 3 from a product fixed effects regression controlling for scope as well as destination and firm fixed effects (see column 6 in Table 4). Product fixed effects on exporter scope in column 4 are from a product fixed effects regression with no additional controls, in column 5 from a product effects regression controlling for scale (log exports/product) and in column 6 from a product fixed effects regression controlling for scale as well as destination and firm fixed effects. Balassa (1965) comparative-advantage for Brazil from UN Comtrade trade data for 2000 at the ISIC Rev. 2 level: product $h$'s comparative advantage is $BADV_h \equiv \frac{T_h^{Brasil}}{\sum_k T_k^{Brasil}}/\frac{T_h^{World}}{\sum_k T_k^{World}}$, where $T_h$ are worldwide imports. Goods classification by degree of differentiation from Rauch (1999), conservative definition, revision 2 (2007): share of Harmonized-System 6-digit goods at the Harmonized-System 2-digit level; omitted benchmark category is homogeneous goods (traded on an organized exchange). Worldwide product-group imports exclude Brazil as importer and exporter. Standard errors in parentheses: * significance at ten, ** five, *** one percent.
References


