Exports, Export Destinations, and Skills*

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Abstract

This paper explores the links between exports, export destinations and skill utilization by firms. We identify two mechanisms behind these links, which we integrate into a unified theory of export destinations and skills. First, exporting to high-income countries with higher valuation for quality leads to quality upgrades that are skill-intensive (Verhoogen, 2008). Second, exporting requires services such as distribution, transportation, and advertising, activities that are also intensive in skilled labor (Matsuyama, 2007). Depending on the characteristics of the source country (such as income, language), the theories suggest a skill-bias in export destinations: firms that export to high-income destinations hire more skills and pay higher wages than firms that export to middle-income countries or that sell domestically. We test the theory using a panel of Argentine manufacturing firms. The data cover the period 1998-2000 and span the Brazilian currency devaluation of 1999. We use the exogenous changes in exports and export destinations brought about by this devaluation in a major export partner to identify the causal effect of exporting and of exporting to high-income countries on skill utilization. We find that Argentine firms exporting to high-income countries hired a higher proportion of skilled workers and paid higher average wages than other exporters (to non high-income countries) and domestic firms. Instead, we cannot identify any causal effect of exporting per se on skill utilization.

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1 Introduction

In this paper, we investigate whether the destination of exports, rather than the mere act of exporting, affects firm behavior. While it has already been established that exporters outperform non-exporters (they pay higher wages, they are more productive, and they are larger), the causal effect of exporting is less evident. Often, the evidence supports a story of selection. Exporting allows firms to take advantage of their inherent good attributes, such as productivity, but the act of exporting itself does not necessarily affect firm behavior (Bernard and Jensen, 1995; Bernard and Jensen, 1999; Bernard, Jensen, Redding and Schott, 2007; Clerides, Lach, and Tybout, 1998). In other instances, exporting does affect behavior. The evidence in Bustos (2011) and the theory of Matsuyama (2007) suggest that what matters is exporting per se, with exporters adopting better technologies and utilizing more skilled labor. In turn, the evidence in Bastos and Silva (2010), Görg, Halpern and Muraközy (2010), Hummels and Skiba (2004), Manova and Zhang (2011), Martin (2010) and Verhoogen (2008) suggests that certain features of the country of destination, such as income, quality valuation, distance, and transport costs, affect firm decisions. Our analysis shows that exporting to high-income destinations affects firm behavior, but exporting does not.

We elaborate upon a theory of how exports and export destinations affect the utilization of skilled labor, and we document those features using a panel of manufacturing firms from Argentina. Traditional theories of international trade often take a relatively simple view of the production process in which the production of goods is carried out by combining factors (labor, capital) and a technology. Recent trade models, including Feenstra and Hanson (1996), Matsuyama (2007), Verhoogen (2008), and Grossman and Rossi-Hansberg (2008), internalize some of the complexities of modern production processes by assuming that the production of goods comprises the combination of activities such as various manufacturing tasks, marketing, distribution, foreign trade activities and exporting services. These tasks differ in their skill intensity so that the act of "exporting" becomes a skilled intensive activity, even when the act of "manufacturing" is unskilled-intensive. Moreover, we argue here that the act of "exporting to high-income destinations" may require technologies and tasks that are yet more skill-intensive. In consequence, economies that trade with high-income countries will utilize relatively higher levels of skills and will pay higher wages than economies that are either closed or specialized in trade with middle- or low-income countries.

There are various reasons why the act of exporting by developing countries may demand skills, even when the production process is relatively intensive in the use of unskilled labor. A leading recent theory is provided by Verhoogen (2008), who develops a model where exporting allows for quality upgrading—an activity that demands skilled labor. This idea can be extended to accommodate models where vertical differentiation includes associated services such as labeling or customer support and where the provision of these services is a skilled-intensive activity. Note that exporting per se does not necessarily lead to quality upgrading. Firms in a country like Argentina—the target country in the empirical work—may choose to produce the same level of quality to sell internally than to sell to neighboring markets like Brazil. By contrast, exporting to high-income countries with higher valuation for quality (e.g., the U.S.) does lead to higher quality products and to higher skill use. In other words, our claim is that "where you export" matters.[1]

Matsuyama (2007) proposes another reason why export destinations may require varying levels of skills. He advances a model of "skilled-bias globalization" in which international trade activities use resources and are relatively skilled-intensive. These activities, which include international marketing and commercialization, transportation and distribution, and advertising (as in Arkolakis, 2010), require expertise in international businesses, languages, foreign technologies, and in the social idiosyncrasies of foreign markets. In Matsuyama's model, the technologies to supply goods depend on whether firms sell domestically or abroad. In our setting, we allow for a modified Matsuyama argument where the technology to supply goods may also depend on the destination of exports: for a country like Argentina, the activities needed to access high-income countries may require more skills than those activities needed to access neighboring markets.

We test our hypothesis using a panel of Argentine manufacturing firms, the Encuesta Nacional Industrial, ENI (National Industrial Survey). The surveys include information on sales, wage bill, employment of production and non-production workers, and other general characteristics of the firms (such as industry affiliation, type of ownership, and plant age). Using confidential information, we matched the firms in the ENI with administrative customs data available for 1998, 1999 and 2000. The result is a combination of typical information from industrial surveys with information on export values and export destinations at the firm level. In other words, we know, for each firm in the panel, whether the firm exported, how much it exported, and where it exported to.

Our 1998-2000 data span the Brazilian devaluation of 1999, which provides a nice setting for identification. Brazil is a major trade partner of Argentina, and the 1999 devaluation had a large

[1] Our theory is thus related to the argument in Hausmann, Hwang and Rodrik (2007), who claim that "what you export" matters. If goods are differentiated by export destination, then "what you export" and "where you export" are clearly interrelated.

impact on Argentine exporters. The Brazilian devaluation generated exogenous variability in the export destinations of Argentine firms as some switched Brazil for high-income countries (and also the domestic market). We use an instrumental variables strategy to exploit these exogenous changes to identify the role of exports and of the composition of exports in the determination of the skill composition of employment in Argentine firms. Moreover, since we work with a panel, we can match, for a given firm, the behavioral changes in terms of skill utilization with the exogenous changes in its export composition induced by the Brazilian devaluation.

We find that, for Argentine firms, exporting to high-income countries matters, but exporting per se does not. Firms that tend to export more to high-income countries use more skills and pay higher average wages than firms that do not export at all or export instead to middle-income countries. The reason is that the local markets in Argentina are similar to the export markets in middle-income countries and thus it is only possible to observe differences in outcomes for firms exporting to high-income countries. Further, we use the information on exports to different destinations to explore which features of those destinations are likely to drive the results. Our evidence strongly supports the quality valuation story of Verhoogen (2008). We instead only find partial support for the modified Matsuyama (2007) required-services argument.

The remainder of the paper is organized as follows. In Section 2, we integrate the various channels linking the choice of skilled labor utilization with the act of exporting and with the act of exporting to high-income destinations. In Sections 3 and 4 we discuss our empirical model and identification strategy, and we present the results. Section 5 concludes.

2 An Integrated Theory of Skills and Export Destinations

This section presents a simple partial equilibrium model that integrates two broad mechanisms linking exports and skill composition at the firm-level: quality valuation (Verhoogen, 2008) and exporting-related required services (Matsuyama, 2007).[2] We first describe the demand side and the structure of production in a generic market. We then discuss how these mechanisms depend on features of the export destinations.

[2]The literature on trade and quality is growing steadily. See Manasse and Turrini (2001), Hummels and Skiba (2004), Hummels and Klenow (2005), Hallak (2006), Verhoogen (2008), Hallak (2010), Hallak and Schott (2011), Hallak and Sivadasan (2009), Khandelwal (2010), Kugler and Vergoohen (2011), and Fajgelbaum, Grossman and Helpman (2009), among others. Our model combines elements from various papers. Matsuyama (2007) was the first to highlight the role of activities that are inherent to the act of exporting in the theory of trade and comparative advantage.

Let products be both horizontally and vertically differentiated and allow preferences to be non-homothetic in order to capture the notion that high income countries value high quality goods more than low income countries.[3] We adopt a multinomial logit utility specification as in Verhoogen (2008) where consumers in high income countries have a lower marginal utility of income and thus are willing to pay a premium for a good of a given quality. The utility that consumer i in country of destination c derives from purchasing product j depends on a vertical differentiation parameter, denoted by θ, its price, denoted by p, and a random deviation that follows a type-I extreme value distribution, denoted by ϵ. Utility is given by

$$(1) \quad U_{ij}^c = \theta_j^c - \alpha^c p_j^c + \epsilon_{ij}^c.$$

These assumptions yield the well–known multinomial–logit aggregate demand function

$$(2) \quad x_j^c(p_j^c, \theta_j^c) = \frac{M^c}{W^c} \exp(\theta_j^c - \alpha^c p_j^c),$$

where M^c is the number of consumers in country c, or market size, and W^c is an index that summarizes the characteristics of all available products in that market (i.e. $W^c = \sum_{z \in Z^c} \exp(\theta_z^c - \alpha^c p_z^c)$, where Z^c is the set of available products). The parameter α^c can be interpreted as the marginal utility of income, or the inverse valuation of quality; it dictates the relative importance of θ and p in the utility function. Thus, $1/\alpha^c$ captures quality valuation, as in Verhoogen (2008).[4]

On the supply side, there are J monopolistically-competitive firms in the source country, each producing a differentiated product.[5] Each firm can ship its product to multiple destinations. Exporting to destination c has an associated fixed cost given by F^c. Firms can choose the level

[3] For simplicity, we do not consider differences in preferences among consumers in a given country.

[4] The utility function in (1) can be derived from a utility function defined over the vertically differentiated products and a homogeneous numeraire product. Utility from choosing variety j and consuming $y^c - p_j^c$ units of the numeraire good is $V_{ij}^c = u(y^c - p_j^c, \theta_j^c) + e_{ij}^c$, where y^c denotes income in country c. Utility from spending all income in the numeraire is $V_{i0}^c = u(y^c, 0) + e_{i0}^c$ (the vertical differentiation component is normalized to zero without loss of generality). If p_j^c is small enough relative to income, the difference in utilities can be approximated by $V_{ij}^c - V_{i0}^c = [\partial u(y^c,0)/\partial\theta]\theta_j^c - [\partial u(y^c,0)/\partial y]p_j^c + [e_{ij}^c - e_{i0}^c]$, which, after rearranging terms, yields $[V_{ij}^c - V_{i0}^c]/[\partial u(y^c,0)/\partial\theta] = \theta_j^c - [\partial u(y^c,0)/\partial y]/[\partial u(y^c,0)/\partial\theta]p_j^c + [e_{ij}^c - e_{i0}^c]/[\partial u(y^c,0)/\partial\theta]$. This yields the utility function in (1) with $U_{ij}^c = [V_{ij}^c - V_{i0}^c]/[\partial u(y^c,0)/\partial\theta]$, $\alpha^c = [\partial u(y^c,0)/\partial y]/[\partial u(y^c,0)/\partial\theta]$, and $\epsilon_{ij}^c = [e_{ij}^c - e_{i0}^c]/[\partial u(y^c,0)/\partial\theta]$. The normalization with respect to the 'outside option' does not affect the choice probabilities. Notice that the primitive preferences are the same across countries of destination and that the parameter α^c varies across countries through differences in income. We assume that α^c is not affected by changes in income induced by exchange rate movements.

[5] We assume that the number of firms is fixed, as in Chaney (2008) and Arkolakis (2010). Arkolakis, Demidova, Klenow, and Rodriguez-Clare (2008) show that this assumption yields the same results as free entry in the model of Melitz (2003).

of vertical differentiation of their products and, moreover, they can tailor the level of vertical differentiation to each specific country of destination (thus, θ_j^c is indexed by j and c). Intuitively, vertical differentiation involves physical product quality, packaging, and services such as advertising, customer support, and timely delivery, which can be differentiated by country of destination. By choosing the level of vertical differentiation, firms shift their residual demands. The degree to which a residual demand is shifted depends on the quality valuation parameter $1/\alpha^c$, which gives firms the option to provide more vertical differentiation in destinations where it is valued more highly.

We assume that reaching consumers in country c involves a second set of services and tasks, such as marketing research, communication with clients or intermediaries, transportation, and distribution. These services, akin to the variable costs of Matsuyama (2007), are related to the exporting technology and do not affect the value that consumers attach to a firm's product; nor is its level chosen by the firms. We refer to these services as "required services," and we denote the level of required services to reach consumers in country c by τ^c. Note that in Matsuyama (2007), τ is independent of the destination market. Our modified Matsuyama hypothesis allows instead for differences in the level of required services by country of destination. These differences arise from geographic location (through transportation costs), from cultural and linguistic distance, from differences in social norms and idiosyncracies, and from differences in business models. A similar idea emerges from the case studies of Argentine exporters in Artopoulos, Friel and Hallak (2011). They identify "embeddedness" in foreign businesses as a prerequisite for successful exporting to developed countries. Being familiar (embedded) with business and social practices in the destination country creates intrinsic knowledge about the destination markets (such as detailed information about consumer trends or about the main features of different distributors) and this knowledge is essential for exporting.

To study the relationship between the provision of vertical differentiation and required services, the decision to export to different destinations, and the skill composition of employment, we adopt several simplifying assumptions. First, labor is the only input and there are two types of workers, skilled and unskilled. Second, wages are fixed (e.g., they are determined in the production of larger homogeneous goods sectors). Without loss of generality we normalize the wage of unskilled workers to one and denote the wage of skilled workers by w. Third, we assume that there is no direct substitution (except through the choice of quality) between skilled and unskilled workers. Finally, we assume that the provision of vertical differentiation and of required services is, as in Verhoogen

(2008) and Matsuyama (2007), intensive in skilled workers. To formalize this, we assume that delivering one unit of final product of quality θ_j^c to country c requires a_j units of unskilled labor and $b_j((\theta_j^c)^\beta + \tau^c)$ units of skilled labor, with $\beta > 1$.[6] Note that since parameters a_j and b_j vary at the firm level, we allow for two sources of firm heterogeneity as in Hallak and Sivadasan (2009).

For each destination, firms choose prices p_j^c and the level of vertical differentiation θ_j^c to maximize profits given by $\pi_j^c = [p_j^c - a_j - b_j(\tau^c + (\theta_j^c)^\beta)w]x^c(p_j^c, \theta_j^c) - F^c$.[7] The solutions for p_j^c and θ_j^c, which are independent across destinations, are given by

$$(3) \quad p_j^c = a_j + b_j\tau^c w + b_j w \left(\frac{1}{\alpha^c b_j \beta w}\right)^{\frac{\beta}{\beta-1}} + \frac{1}{\alpha^c},$$

$$(4) \quad \theta_j^c = \left(\frac{1}{\alpha^c b_j \beta w}\right)^{\frac{1}{\beta-1}}.$$

The vertical differentiation parameter θ_j^c is decreasing in the marginal utility of income (α^c)—firms choose to provide a higher level of quality when it is valued more highly —and it is independent of τ_j^c. Price is increasing in τ^c, reflecting the higher unit cost implied by a higher τ^c, and decreasing in α^c, reflecting both the higher unit cost implied by the higher optimal quality and the fact that firms can extract more surplus from consumers when they are willing to pay more for their products. Once prices and quality are chosen, firms compare variable profits with the destination-specific fixed costs and decide which markets to enter.

Given the optimal solution for price and vertical differentiation, the relative demand for skilled workers employed in the production of goods that are shipped to country c (S_j^c) is

$$(5) \quad S_j^c = \frac{b_j}{a_j}\left[\tau^c + \left(\frac{1}{\alpha^c b_j \beta w}\right)^{\frac{\beta}{\beta-1}}\right].$$

Equation (5) delivers the basic relationship between export destinations and skill utilization that

[6] To preserve Matsuyama's Ricardian features, we assume linearity in the provision of required services, such as transportation costs, while decreasing returns to scale in the provision of vertical differentiation, such as quality of service. This latter assumption reflects the fact that shifting the demand function becomes increasingly more difficult as quality increases. From a technical standpoint, this assumption is needed because θ_j^c is a choice variable. The skilled labor requirements could also be written as $b_j(\tau^c + \theta_j^c)^\beta$. This alternative assumption yields very similar predictions. At the same time, we assume that the cost of providing vertical differentiation in one market is independent of the level of vertical differentiation provided by the same firm in other markets. This assumption is in line with the constant marginal cost assumption in the number of units and with independence of preferences across markets (by which shifting the demand function in one country does not become increasingly more costly as demand is shifted in other markets).

[7] The monopolistic competition assumption implies that firms do not affect the index W^c.

stems from our theory. Since firms need to provide the required services τ^c because of technological requirements, and the provision of these services is skilled intensive, S_j^c is increasing in τ^c. Since firms provide services to increase quality when these services are more valuable to consumers, and since quality provision is intensive in skills, S_j^c is decreasing in α^c. Differences in τ^c and α^c across destinations create differences in the skill utilization of domestic firms.

To study the role of these differences in τ^c and α^c, we work with three markets: the domestic market (D), high income destinations (H), and low income destinations (L). We start with the quality valuation mechanism (Verhoogen, 2008). The marginal utility of income is decreasing in income, and thus is lower in the high-income market than in the low-income market ($\alpha_H < \alpha_L$). In equilibrium, firms choose a higher level of vertical differentiation in high income destinations ($\theta_j^H > \theta_j^L$) which in turn implies that exporting to high-income markets is more skill-intensive than exporting to low income markets ($S_j^H > S_j^L$). The quality valuation mechanism does not provide a general prediction regarding skill intensity for exports vis-à-vis domestic sales. The relative skill use depends on the income level of the domestic market. For a middle-income source country like Argentina (the target country in our empirical analysis), we assume that $\alpha_D = \alpha_L$, which yields $S_j^H > S_j^L = S_j^D$. This shows that, ceteris paribus, exporters to high-income destinations utilize more skills than both other exporters and domestic producers.[8]

The "required services" mechanism of Matsuyama (2007) implies that reaching consumers abroad is more costly than reaching domestic consumers. Because τ captures exporting services, it is zero for domestic shipments ($\tau^D = 0$) and positive for export markets ($\tau^H > 0$, $\tau^L > 0$). This implies $S_j^H > S_j^D$ and $S_j^L > S_j^D$. The required services are related to the exporting technology, instead of demand, and are thus not directly related to income. As a result, the channel does not provide a prediction regarding S_j^H and S_j^L. In the case of Argentina, low and middle-income markets in South America (Brazil, Uruguay, Paraguay, Chile) are geographically close, and share the same or similar languages, similar cultural heritage, and similar business models. On the other hand, exporting to most high-income destinations (U.S., Germany, U.K.) requires higher transport costs, English speaking managers, and more able managers and entrepreneurs to adopt foreign business

[8]In the presence transport costs, this result needs to be qualified to accommodate the shipping -the-good-apples-out argument of Hummels and Skiba (2004). In particular, if transport costs are non-proportional then high-priced, high-quality goods become relatively cheaper in high-transport-cost markets, which will thus disproportionately demand higher-quality goods. It is possible for two countries with the same valuation of quality (the same α) to have different demands for quality. If, as we discuss in the empirical section, high-transport-cost countries are also high-income countries, then domestic firms will disproportionately ship higher quality goods to those markets but not necessarily because of lower α but rather because of higher (non-proportional) transport costs.

practices.[9] This implies that, for Argentina, $\tau^H > \tau^D$ and that as a result $S_j^H > S_j^L > S_j^D$. This result establishes the second link between export destinations and skills.

Our model is also useful to clarify a few specific issues related to the empirical strategy in section 3. In the data, we do not observe S_j^c, the level of skills used to serve different destinations, at the firm level. Instead, we observe the aggregate skill composition (S_j) and the level of sales by country of destination. Thus, we need to be able to establish differences in S_j^H, S_j^L, and S_j^D from changes in these observable variables. To see how we do this, note first that relative demand for skilled workers at the firm level can be written as a weighted average of the relative demands for skilled workers employed in the production and delivery of goods that are shipped to each of the three destinations:

$$(6) \quad S_j = S_j^D \frac{x_j^D}{x_j} + S_j^L \frac{x_j^L}{x_j} + S_j^H \frac{x_j^H}{x_j},$$

where $x = x^D + x^L + x^H$ is total firm sales (including domestic sales and exports to different destinations). Since $S^H > S^L$ and $S^H > S^D$, the higher the share of exports destined to high income countries is, the higher the relative demand for skilled labor becomes (controlling for the share of exports in total sales). Note also that firms exporting to high income countries will incur a higher wage bill since skilled labor earns a higher wage than unskilled labor.[10]

Second, as we will shortly discuss, our empirical strategy exploits exogenous changes in exports and in export destinations of Argentine firms brought about by a Brazilian devaluation that took place in 1999. In our model, the Brazilian devaluation causes a decrease in demand in low-income markets (because Brazilian demand declines), without affecting market conditions in high-income destinations. As a result, some exporters to low income foreign markets will exit (eventually retrenching into local markets) and exporters to high income markets will sell less in low income markets. This implies that the share of exports to high income markets will increase and so will the utilization of skills, as per equation (6). Note that this is a within-firm composition effect, where a weighted average (total skill utilization) changes due to changes in the participation of

[9] Note that some low-income destinations such as China, India or Africa are geographically and culturally far from Argentina (but may share instead more similar business practices and models). These destinations amount to a small share of exports, however.

[10] There are other mechanisms that could in principle explain a positive link between exporting to high-income countries and wages in a country like Argentina. One explanation is "profit sharing" in a model of fair wages (Egger and Kreickemeier, 2009; Amiti and Davis, 2011). It is also possible that exporting to developed countries is associated with higher wages to reduce labor turnover. Another theory due to Yeaple (2005) argues for higher wages due to scale economies attached to exporting (to different destinations).

each destination in total sales. This corresponds to changes in the weights with constant S_j^c in equation (6).

In a more general model, the devaluation of the low income country's currency could also boost exports into high income markets. This can happen if, for instance, there are increasing marginal costs with joint production or capacity constraints. In this setting, production shipped to Brazil affects the costs incurred in production shipped to, for instance, the U.S. (and vice-versa). As a result, when Brazil devalues, shipments to Brazil contract, and this reduces production costs to U.S., so that exports to the U.S. can actually increase. In this case, the increase in the share of high-income markets will be twofold, first because of a decrease in exports to Brazil, and second because of an absolute increase in exports to the U.S.

3 Empirical Analysis

We now turn to our empirical analysis. We describe the data, introduce the regression model and the identification strategy, and present the main findings on exports, export destinations and skill utilization in Argentina.

3.1 The Data

We use two main sources of data in our analysis: a firm survey and administrative customs information. The firm survey is the "Encuesta Nacional Industrial" (ENI) or National Industrial Survey. The ENI is a panel of manufacturing plants and collects information on sales, value added, input use, employment of production workers, employment of non-production workers, total wage bill, and industry affiliation at the 3-digit level of the ISIC Revision 2 classification. We have access to the module of the survey that corresponds to the province of Buenos Aires for the years 1998, 1999 and 2000.[11] A key limitation of these data is sample size, with only 901 firms in a short 3-year panel.

The second source of data for our analysis is administrative customs records. From the customs records we extracted the total value of exports by country of destination at the firm level.[12] We then matched this information to the firm survey using tax identification numbers. The result is a

[11] Being the most highly industrialized and developed area of the country, the province of Buenos Aires accounts for 40 percent of the population and more than half of the manufacturing activity in terms of employment and output.

[12] We do not have access to quantities or unit values.

panel of employment, wages, exports, and export destinations by firm.

The firm survey was collected at the plant level but customs information was recorded at the firm level. Since all plants owned by a same firm share the same identification number, we aggregated information across plants owned by a given firm and created a dataset at the firm level that we then matched with the customs records. In our survey, only 14 percent of firms own more than one plant. In the online appendix, we show that regression results are very similar whether we use the full sample of firms or only one-plant firms.[13]

Table 1 presents summary statistics from the combination of firm and customs data for the full sample 1998-2000. In Panel A, we describe the export intensity and export destinations of Argentine firms; in Panel B, we focus on differences in outcomes (employment, wages, and skill utilization) across firms. Out of 901 firms and 2544 firm-year observations, 68 percent of firms exported in at least one of the three years of data, while in a given year, the average share of exporters is 59 percent (Panel A). The proportion of exporters is higher than what the literature typically finds. This can be partly explained by the fact that our firm survey corresponds to an export-oriented geographic area of Argentina.[14] The share of exports in total sales is, in contrast, small: exports account for only 8 percent of sales across all firms (column 1) and 13 percent among exporters (column 2). The average number of destinations (including the domestic market) is 3.3 in the sample of all firms and 4.9 among exporters.

In columns 3 and 4, we describe the characteristics of firms that export to at least one high income destination, the "high-income exporters." We work with two definitions of high-income destinations based on the World Bank country classification. In the first definition (Definition I), we include countries classified as high-income OECD, high-income non-OECD and upper-middle income. The countries in each group are listed in the online appendix. On average, each year 51 percent of firms export to at least one high-income destination (1307 out of 2544 firm-year observations). For high-income exporters, total exports (to all destinations) account for 15 percent of total sales and the average number of destinations, including domestic sales, is 5.4.

In the second definition (Definition II), we classify as high-income destinations only countries in the World Bank's high-income group, while upper-middle income economies are excluded. In this grouping, the number of firms that export to high-income countries drops to 27 percent (680

[13] The online appendix is available at the authors' websites.

[14] At the same time, the high share of exporting firms is not explained by biases in firm size, as the ENI covers firms of all sizes (provided they are in the formal sector), based on censuses sampling weights. While tax evasion and worker informality are prevalent among manufacturing firms in Argentina, firm informality is not.

out of 2544 firm-year observations). These firms show a higher export intensity (exports account for 22 percent of total sales) and a higher number of destinations (7.8 per firm). For our regression analysis, we chose the first classification as our main specification to show that even under a conservative definition there are significant differences between high- and low-income exporters. As we will show below, these differences are magnified when we apply the more liberal definition that excludes upper-middle income economies from the high-income destinations set.

Panel B of Table 1 explores the relationship between skill utilization, exports and export destinations by comparing exporters and non-exporters. From the ENI panel survey, we report in column 1 average employment, sales and two measures of skill utilization. Our first measure is the average wage, defined as the total wage bill divided by total employment. In the surveys, firms report the total wage bill, which includes total payments to all workers, production and non-production. Firms, however, do not report the wage paid to different types of workers. The average wage is a proxy for skill utilization inasmuch as firms with a higher skill composition pay higher wages. Firms do report separately the total number of employees in each of those two categories. Our second measure of skill utilization is thus the share of non-production workers in total employment.[15] In our sample, firms employ an average of 89.7 workers and pay average annual wages of 12,154 USD. Non-production workers account for 26 percent of total employment. In column 2, we report differences between exporters and non-exporters by running an OLS regression of each firm attribute on a dummy of whether the firm exports or not (which we build using the matched customs data), controlling for 3-digit industry and year effects. Our data confirm the stylized fact of this literature: Exporters are larger by around 122 percent (173 percent in terms of sales); they pay higher wages by about 48 percent; and they hire 5 percentage points more non-production workers than non-exporters.

In column 3, we compare high-income exporters to low-income exporters. Conditional on exporting, we run OLS regressions of the various outcomes on a dummy for high-income exporters (controlling for industry and year effects). Using Definition I, the results show that firms that export to at least one high-income destination are 39 percent larger in terms of employment and 54 percent larger in terms of sales than exporters that only export to low income countries; they pay higher wages by about 12 percent; and they hire a larger fraction of non-production workers by

[15] Firms also report hours worked by each of the two categories of employment and our results are robust to using the share of hours worked by non-production workers as a measure of skill utilization. Note that we do not have information on the educational level of the workers.

about 3 more percentage points. Thus, exporters have good attributes, and high-income exporters have even better attributes.

Column 4 compares high-income exporters in Definition I with those in Definition II. The data show that firm differences persist among high-income exporters. For instance, Definition II high-income exporters are larger (by 43 percent in terms of employment and by 54 percent in terms of sales) than Definition I high-income exporters. They also pay higher average wages (by 15 percent) and employ a higher share of non-production workers (by 1.4 percentage points).

3.2 Skills and Export Destinations: The Empirical Model

The statistics reported in Table 1 uncover the basic relationship between exports, export destinations and skills. We now study this relationship in more detail with the following regression model:

$$(7) \quad s_{ijt} = \delta_1 EXP_{ijt} + \delta_2 HI_{ijt} + \mathbf{x}'_{ijt}\beta_1 + \phi_{jt} + \phi_i + \epsilon_{ijt}.$$

The variable s_{ijt} is a measure of the utilization of skills in the labor force employed by firm i in industry j at time t (i.e., the average wage and the share of non-production workers in total employment). The right-hand side variables of interest are EXP and HI. Let E_{ijt} be total exports of firm i, let Y_{ijt} be total sales (including domestic sales and exports) and let EH_{ijt} be exports to high-income destinations.[16] We define $EXP_{ijt} = E_{ijt}/Y_{ijt}$ as the ratio of total firm exports to total firm sales. We use this variable rather than an exporter dummy because EXP captures the intensity of the exporting status and because it has much more variability within firms in a 3-year panel such as ours, but we also explore results using an export dummy indicator. $HI_{ijt} = EH_{ijt}/E_{ijt}$ is defined as the share of firm exports to high-income destinations over total firm exports. This variable is a measure of the composition of exports across destinations and captures the impact of exporting to high-income countries once export intensity has been accounted for. In our robustness tests below, we also report results where we measure HI as the ratio of exports to high-income destinations over sales.

The vector of firm characteristics, $\mathbf{x}$, includes industry dummies (when firm fixed effects are

[16] In most of this section, we use the conservative definition (Definition I) where high income destinations are countries in the high-income OECD, high-income non-OECD and upper-middle income groups of the World Bank classification. We later show robustness results dropping the group of upper-middle income countries from high-income destinations.

not included), firm size measured by the log of total sales, and differential trends across time at the firm level (which we discuss below). The error term includes a firm fixed effect ϕ_i, a year-industry (at the 3-digit level) fixed-effect ϕ_{jt}, and a random component ϵ_{ijt}.

To uncover the basic correlations that we want to study, we start by estimating (7) by OLS, pooling all years of data but including industry and year fixed effects. The results are in Table 2. In Panel A, we work with our first proxy for skill utilization, average wages. In column 1, where we include EXP but exclude HI, we confirm the cross-section result: firms with higher ratios of exports to sales pay higher wages. In column 2, where we include HI, high-income destination exports, but we exclude EXP, we find a positive and significant coefficient as well. In column 3, we include both the exports to sales ratio (EXP) and the ratio of exports to high income (HI) in the same regression. Both coefficients are positive and statistically significant. Overall, thus, we observe that skill utilization is positively correlated not only with export intensity but also with the destination of a firm's exports. This means that, conditional on the same export intensity, firms that ship a larger share of their exports to high-income markets utilize, on average, more skills.

In Panel B, we work with our second proxy for s, the share of non-production workers in total firm employment. When we only include EXP (column 1), we find a positive correlation, albeit not statistically significant, between export intensity and skills. When we only include HI, we find a strong positive correlation between exporting to high-income countries and skill composition. Finally, when both EXP and HI are included (column 3), exporting to high-income countries is positively correlated with a higher utilization of skills, but export intensity is not.

Both the simple correlations in Table 1 and the OLS estimates in Table 2 are consistent with the claim that exporters utilize relatively more skilled labor and that exporters to high-income markets even more than exporters. In the light of our model in Section 2, there are two ways to interpret these findings with different implications about the behavior of exporting firms (to different destinations).

Our model combines differences in the fixed costs of exporting to different destinations, multi-dimensional firm heterogeneity (the parameters a and b), and differences in both the marginal utility of income (α) and in the costs of exporting (τ) across destinations. Consider first a scenario where there are no differences in α and τ, so that we "shut down" both the quality (Verhoogen 2008) and exporting technology (Matsuyama 2007) mechanisms. We retain the differences in a and b and we assume higher fixed costs in the high-income market, lower in the low-income market, and even lower domestically, $F^H > F^L > F^D$. In this scenario, since α and τ are the same across destinations, a *given* firm will choose the same level of skills for each export destination ($S_{it}^H = S_{it}^L = S_{it}^D$). However, this level of skill will vary *across* firms according to their efficiency in the utilization of skilled and unskilled labor (parameters a and b). This is because more efficient firms will choose a higher level of vertical differentiation for their products, which provides higher profits. At the same time, the differences in fixed costs generate a sorting of firms, where firms with lower a and b will be more likely to find it profitable to export to high income destinations.

This scenario generates a positive association between the skill (s) and the export destination variables and it is thus consistent with the OLS results of Table 2. There is no causality, however. The correlation arises because of the selection of firms into the different export markets. In other words, there are productivity and cost shocks that allow firms to simultaneously enter or expand their export operations and hire different skill levels.

Let us now add the quality and export technology channels. We showed that in a scenario with lower marginal utility of income in high-income destinations ($\alpha^H < \alpha^L = \alpha^D$) and with more costly technology to export to high-income markets ($\tau^H > \tau^L > \tau^D = 0$), firms will use a higher share of skilled workers in their exports to high-income markets ($S_{it}^H > S_{it}^L > S_{it}^D$). This result is not directly testable with our data, since we do not observe skill use by country of destination. Instead, we observe the total skill intensity, which is a weighted average of the skill use in each destination as given by equation (6). However, since $S_{it}^H > S_{it}^L > S_{it}^D$, we should observe that for a *given* firm, the average skill use increases with the share of high-income exports. This scenario is also consistent with the OLS results of Table 2 but the implications are different. The correlation between skill use and high-income exports is not merely due to selection across firms but also because of differences in firm behavior (i.e., the utilization of different skills in serving different markets) in response to differences in α and τ.

For our analysis, we want to be able to discern between the two scenarios, because they have implications regarding the relevance of the theoretical mechanisms. Clearly, it matters if the correlations between the variables are only due to selection of more productive firms or also to behavioral responses. OLS cannot distinguish between the two scenarios.[17] To tell them apart, we develop an empirical strategy to look at changes within firms and use instruments that explain

[17] There are other sources of unobserved heterogeneity which are beyond the scope of the model but that could be affecting the correlation in skill utilization and high income exports in the data. We discuss those below, when we compare the OLS and IV results.

exogenous shifts in the export share of high-income destinations. This strategy provides an answer to the following question: for a given firm, with given a and b (possibly changing over time), and thus given S_{it}^H, S_{it}^L and S_{it}^D, does the average skill use go up if there is an exogenous increase in the share of high income destinations?

3.3 Identification Strategy

There are two endogenous variables in our model: exporting to high-income destinations HI (the share of exports to high income countries on total firm exports), and export intensity EXP (the share of exports in sales). To achieve identification, we exploit the panel nature of our data and we use instrumental variables. The panel allows us to track firms over time. The instruments exploit the exogenous variation in HI and EXP caused by the Brazilian devaluation of 1999, which induced Argentine firms to cut sales in Brazil and to expand sales both domestically and in high-income countries.[18] Ultimately, our strategy boils down to tracking changes in skill utilization for a given firm, due to responses in exports and export destinations following the exogenous Brazilian devaluation.

Argentina and Brazil are major trade partners and thus the Brazilian devaluation had an impact on Argentine exports that is large enough to achieve identification. Argentine export statistics by country of destination, shown in Table 3, provide prima-facie evidence in support of our strategy. In the pre-devaluation year of 1998, Argentine exports were destined mostly to Brazil (36 percent), Europe (13 percent), the United States (10 percent) and neighbors like Chile (6 percent), Uruguay (4 percent) and Paraguay (3 percent). In 1999, when Brazil devalued, the share of exports to Brazil dropped to 28 percent. These shares partially recovered in 2000, reaching 31 percent. Consistent with our argument above, alternative markets for Argentine exports were found in the U.S. (with shares increasing to 13 percent in 1999 and 15 percent in 2000) and Europe (with shares increasing to 15 percent in 1999 and 14 percent in 2000). At the bottom of Table 3, we observe that the share of exports destined to high-income countries increased from 43 percent in 1998 to 50 percent in 1999 and 51 percent in 2000 (using Definition I) and from 28 percent to 34 percent (using Definition II).

In Table 3, we also report changes in export values. As expected, exports to Brazil declined,

[18] There is a growing literature that looks at changes in major trade partners as a source of identification. Exchange rates of trade partners were used for instance by Revenga (1992) and Park et al. (2010). Changes in Brazilian tariffs due to Mercosur were used to identify impacts on Argentine firms in Bustos (2011). Verhoogen (2008) uses the own devaluation of Mexico to link exports to wage inequality.

because Brazilian domestic products became relatively more inexpensive. At the bottom of the table, we show that exports to high-income destinations increased significantly, from 6.5 billion dollars in 1998 to 7.2 billion dollars in 2000. This expansion is largely accounted for by an increase in exports to the U.S., from 1.6 to 2.2 billion dollars. While it is interesting to confirm that exports to high-income countries increased, this result is not necessary for identification. Clearly, however, the fact that exports to high-income countries actually increased in the data only reinforces the mechanisms that we exploit in our empirical analysis.

Our empirical test is related to Verhoogen's approach in that both use devaluation episodes. However, while Verhoogen exploits Mexico's own Peso devaluation of 1994, we focus here on the devaluation of a major trading partner and exploit exogenous changes in exports to various destinations. This provides a cleaner environment for identification, allows us to test the importance of export destinations vis-à-vis exports, and to disentangle the effects of factors such as technology and willingness to pay.

3.4 IV Results

We build separate instruments for HI and EXP. Our instrument for HI is defined as $I_{it}^{HI} = Post_t * \lambda_{i98}^{BRA}$, that is, it is the interaction of a $Post$ devaluation variable with the pre-devaluation share of the firm's exports that were destined to Brazil, λ_{i98}^{BRA}. Since the 1998 shares λ_{i98}^{BRA} precede the devaluation, they measure exogenous exposure to it. The rationale for this instrument is that, as documented in Table 3, firms that were most exposed to the Brazilian devaluation adjusted by moving away from this market and by exploring new markets in high-income countries. We expect a positive correlation between the "scope to divert exports" and exports to high-income markets.

We adopt two specifications for $Post$. In the relatively more non-parametric model we interact the level of exposure to Brazil before the devaluation, λ_{i98}^{BRA}, with 1999 and 2000 year dummy variables, so that the instrumental variables are

$$(8) \quad I_{it}^{HI_1} = \phi_t * \lambda_{i98}^{BRA},$$

where ϕ_t denotes the 1999 and 2000 year dummies. This specification allows the impacts of the devaluation to vary from one year to the other as firms adjust to the exchange rate shock. In the second specification, we interact λ_{i98}^{BRA} with the exchange rate between the Brazilian and the

Argentine currencies, $erate_t^{BRA}$:

$$(9) \quad I_{it}^{HI_2} = erate_t^{BRA} * \lambda_{i98}^{BRA}.$$

Since the initial shares of Brazilian exports play a predominant role in the construction of our instrument, we report summary statistics from the firm data on the share of exports to different destinations in Table 4. The export-weighted average of the share of exports to Brazil in 1998 was 37 percent, declined to 32 percent in 1999 and to 35 percent in 2000. This decline correlates with an increase in the share of exports to high-income countries from 49 percent in 1998 to 58 and 54 percent in 1999 and 2000, respectively. Unconditionally, the share of Brazilian exports declined from 19 percent in 1998 to 16 percent in 2000, while the share of high-income exports increased from 29 to 33 percent from 1998 to 2000. These trends are consistent with the story behind our identification strategy. Table 4 also reports average shares for different types of firms. For instance, with an average share of 27 percent, large firms were more exposed to Brazil in 1998 and thus increased the share of exports to high-income destination from 40 to 47 percent. Different industries reacted differently as well. For instance, the share of exports to Brazil in "Paper products," a highly-exposed industry, declined from 25 percent in 1998 to 16 percent in 2000, with an increase in the share of high-income exports from 31 to 48 percent. In contrast, the share of exports to Brazil in "Leather" was only 1 percent in 1998 (and remained roughly constant after the devaluation), while the share of exports to high-income countries in this sector in fact declined from 37 to 32 percent during the period.

To deal with the endogeneity of the ratio of exports over sales (EXP), we construct a measure of the average exchange rate faced by a given firm in international markets:

$$(10) \quad I_{it}^{EXP} = \sum_c erate_t^c * \psi_{i98}^c,$$

where ψ_{i98}^c is the share of exports of firm i to country c on total *sales* in 1998 (which is predetermined) and $erate_t^c$ is the exchange rate of country c (relative to the Argentine Peso) at time t. Instruments such as (10) have been used before by, for example, Revenga (1992) and Park et al. (2008). Given the shares of export sales to market c in 1998, a higher exchange rate would induce firm i to export more to this market, thus increasing EXP_{it}. In consequence, we expect

EXP to be positively correlated with I^{EXP} in the first stage regressions.[19]

Good instruments have to be exogenous, help to explain the endogenous variables, and satisfy the exclusion restrictions. As argued above, our instruments are prima-facie correlated with the level of exports and with its composition across destinations, and we further test these correlations below with results from the first-stage regressions. In addition, the Brazilian devaluation generated exogenous variation in export intensity (EXP) and in export destinations (HI), and these changes in exports are plausibly exogenous to the pre-devaluation shares of exports to Brazil. Likewise, our second instrument is based on arguably exogenous changes in the exchange rates of all trading partners and on each firm's exposure to those changes given their pre-shock export share over sales. In other words, while the pre-shock shares are a choice variable of the firm, once they are predetermined, the differential change in exports due to the devaluation of Brazil (or other countries) is reasonably exogenous. In our empirical analysis, we discuss various tests of potential violations of the exclusion restrictions. As a caveat, note that our strategy can fail if there is serial correlation in the errors, but we cannot do much about this with our short 3-year panel. As we show next, however, our IV results are very robust.

We begin with Table 5, which shows results from the baseline model where our measure of skills is the average wage bill, the instrument for HI is the interaction between initial shares in 1998 with year dummies (equation (8)), and the instrument for EXP is the average weighted exchange rate (equation (10)). Panel A reports the IV estimates of δ_1 and δ_2 in (7); Panels B1 and B2 document the first stage regressions for HI and EXP, respectively.

To benchmark the discussion, we begin in column 1 with a simple model including HI and EXP as regressors but omitting all controls as well as the industry-year effects: we find that exporting per se does not raise skill utilization, but exporting to high income countries does. The first stage regressions (panels B1 and B2) allow us to assess the instruments, which work very well. They have substantial explanatory power, are statistically significant, and the p-values associated with the F-statistic of joint significance of the instruments are very low.

In columns 2-5, we include various controls to test for potential violations of the exclusion restrictions that can arise if the devaluation of a major trading partner or the 1999 concurrent domestic recession had heterogeneous effects across industries. For instance, the evidence in Galiani

[19]Note that while λ_{98}^{BRA} in equations (8) and (9) is the share of exports to Brazil in *total exports*, ψ_{98}^{c} in equation (10) is the share of exports to country c on total *sales*. As a consequence, the instruments convey different useful information for identification purposes. Also, using sales in the denominator is actually preferred in the case of I^{EXP} because we are instrumenting the degree of export orientation of the firm.

and Hopenhayn (2003) suggests that unskilled workers, rather than skilled workers, are the first to be laid off during a recession, and this may lead to higher average wages and higher shares of non-production (skilled) employment. If these effects were industry-specific, we can account for them with industry-year fixed effects, which we add in column 2. With industries disaggregated at the 3-digit level, these industry-year effects are quite comprehensive. The results remain unchanged: only exporting to high-income countries matters. The first stage results (panels B1 and B2) are also robust to the addition of the industry-year effects.

Another concern with the exclusion restriction are firm-specific trends. There can be unobserved factors that simultaneously determine the choice of export shares to Brazil in 1998 and the subsequent response to the devaluation. For example, pre-devaluation productivity shocks or cost shocks that persist in time imply that a firm's ability to change export destinations might depend on the initial share exported to Brazil (in 1998). To control for these unobserved pre-shock differences in initial conditions, we interact log sales in 1998 with year dummies (column 3) and with the Brazilian exchange rate (column 4). In addition, the crisis might have affected exporters and non-exporters differently. If non-exporters are hit harder than exporters by the domestic recession, because they cannot sell to unaffected countries (such as the U.S. or the E.U.), then non-exporters may suffer larger profit losses and, eventually, may need to impose larger wage cuts. To control for this, we interact the exporter status in 1998 with year dummies (column 3) and with the Brazilian exchange rate (column 4). In the specifications in columns 3 and 4 of Table 5, EXP is never statistically significant, while HI is always positive and highly significant. In addition, the coefficients in columns 3 and 4 (0.267 and 0.284) are comparable to those in the simpler models of columns 1-2. In panels B1 and B2, we find that the addition of controls for the firm's initial conditions does not affect the statistical properties of our instruments.

In column 5, we estimate the model with the log of sales as an additional control in the regression for time-varying heterogeneity such as current productivity or cost shocks. Note that we use sales as a proxy for unobserved characteristics in order to improve the estimation of δ_1 and δ_2; we consequently do not attach any causal interpretation to the coefficient of log sales. Our main results remain unchanged: EXP does not affect skill use, but HI does. The estimated coefficient of HI is 0.260, implying that a firm with the average shares of exports to high-income countries (30 percent) pays around 7.8 percent higher wages than firms that do not export at all to these markets. Besides, the 3.4 percentage points increase in export shares to high-income destinations observed in our data between 1998 and 2000 implies, ceteris paribus, an increase in average wages of 0.9 percentage points.

Before testing the robustness of the results, we compare our IV estimates with OLS-FE estimates. In column 6, the FE coefficient is positive, not statistically significant, and, more importantly, much smaller than the IV coefficient. Note that unobserved firm attributes such as inherent productivity or cost shocks would in principle generate the opposite bias. For instance, positive productivity shocks are likely to simultaneously allow firms to expand high-income operations and utilize more skills so that OLS-FE results would be biased upwards. However, there are at least four mechanisms, some of them inherent to the Argentine case, that suggest a downward bias in the OLS-FE regressions. First, OLS-FE estimates are attenuated when firms are subject to policy or domestic regulatory shocks. For instance, firms that are more likely to be "captured" by unions could be less likely to export, especially to high-income countries, while at the same time they would be required to pay higher wages on average (see Galiani and Porto, 2010). Second, high-income exporters are likely to have ties with multinational corporations and may base a larger fraction of their managerial operations abroad. Failure to control for this type of firm outsourcing may drive the OLS-FE estimates downward. Third, a potentially important unobserved factor is imports, because Bernard, Jensen, Redding and Schott (2007) show that exporters are also importers and thus if high-income exporters are more likely to import goods to resell domestically, their labor demand and wage payments may also be lower. Finally, OLS-FE may be attenuated by stock liquidation during the 1999 domestic recession. The crisis affected all firms, but high-income exporters may be in a better position to run inventories down by liquidating stocks, originally planned for the domestic markets, in their export markets. Note that this is akin to measurement error in the export shares to high income countries in 1999 and 2000 because these shares increase due to inventory liquidation rather than to firm behavioral responses. This leads to typical attenuation bias in the pooled OLS regressions, which is actually exacerbated in the OLS-FE regressions. Our IV model is instead based on changes in exports shares caused by the exogenous Brazilian devaluation and thus only pick up the change in HI that occurs because of changes in firm behavior.[20] In column 7, we re-estimate the OLS-FE model excluding data for year 1999. This regression is in fact exploiting a 2-year (2000-1998) variation in export destinations

[20]To put the argument into a standard measurement error interpretation, the variable HI should measure production decisions (i.e., skill utilization) based on the destination of the firms exports. The claim is that HI correctly measures these decisions in normal periods, such as 1998. However, during the crisis of 1999 and 2000 firms liquidate stocks and this creates variation in HI that is spurious.

and skill utilization and is, we argue, less subject to this type of measurement error. The OLS-FE estimate is still biased down, but it is larger, positive, and statistically significant, a finding that provides some support to the presence of attenuation bias.

As an additional robustness check, we run all the previous specifications using the alternative instrument for HI, equation (9) instead of (8). That is, the instrument is the interaction of the initial shares of exports to Brazil with the Brazilian exchange rate. Results are reported in Table 6. As before, panel A shows the IV estimates of δ_1 and δ_2, and panels B1 and B2 show the first-stage results for HI and EXP, respectively. All findings remain unchanged. The ratio of exports to sales (EXP) is never significant and the ratio of exports to high-income markets on total exports (HI) is always significant. The estimated coefficients are also very similar. For instance, in our preferred specification with controls for log sales (column 5), our estimate of δ_2 is 0.272 and it was 0.260 in Table 5. In the first-stage results in panels B1 and B2, the instruments show the expected signs, are jointly significant, and there is no risk of weak instrumentation.

Before discussing our interpretation of these findings, Table 7 reports the results from models where skill utilization is measured with the share of non-production workers on total employment. In panel A, we use the instrument for HI built with year dummies (equation (8)); in panel B, we replace year dummies with exchange rates (equation (9)). In both cases, the instrument for EXP is given by (10). Our results suggest that, as before, the ratio of exports to sales does not seem to have an effect on the composition of skills at the firm level, whereas exporting to high-income countries does matter. In our preferred specification, column 5, we find that a firm exporting to high-income destinations at the average share of 0.30 utilizes 2.37 percentage points more skilled workers than non-high-income exporters.

It is important to note that the changes in skill utilization that occur as firms change export destinations do not appear to be the result of a spurious shrinking of the unskilled labor force (Galiani and Hopenhayn, 2003). To verify this, we estimated separate IV regressions using the log of skilled and unskilled labor employment as dependent variables. The results (available in the online appendix) reveal positive impacts on skilled employment and negative impacts on unskilled employment (though both impacts are relatively imprecisely estimated). This means that firms that switched to high-income destinations due to the Brazilian devaluation simultaneously increased absolute employment of skilled workers and reduced employment of unskilled workers. Second, in reduced form regressions, we find that firms more exposed to Brazil in 1998 actually increased skill employment but did not modify unskilled employment, and this is consistent with the behavioral responses highlighted in this paper. Taken together, these results allow us to rule out a scenario where firms that exported more to Brazil in 1998 were the ones to downsize unskilled workers disproportionately because of the recession (thus paying higher wages and employing a higher share of non-production workers).

Turning to the interpretation of our findings, the reason why exporting to high-income countries (HI) is significant, while exporting (EXP) per se is not, is the following. If the domestic market in Argentina is similar to export markets in low- and middle-income economies (including any fixed costs), then the nature of domestic firms and of low-income exporters, in terms of their attributes a and b, will be similar and, consequently, differences in skill utilization will be small. In contrast, exporting to high-income countries does need quality upgrades and required-services, which implies a significantly higher utilization of skills. A potential concern with this conclusion is that we are exploiting the negative shock created by the Brazilian devaluation, rather than a permanent expansion in export opportunities. However, evidence from the international finance literature has consistently reported persistent exchange rate shocks, and this suggests that the Brazilian devaluation can actually be seen as a permanent or persistent shock (Rogoff, 1996).

The finding that export destinations, especially exports to high-income countries, matter has found recent support in the related literature. Using transaction-level data for Portugal, Bastos and Silva (2010) document higher unit values in shipments to richer nations. Manova and Zhang (2011) also find that Chinese firms set higher prices in richer and more distant markets (see also Martin, 2010). In turn, Görg, Halpern and Muraközy (2010) use Hungarian firm-product-destination data to establish a positive correlation between unit values and the per capita GDP of the export destination. In our data, we only have information on export volumes, not on unit values. However, the aggregate trade data for Argentina is consistent with these observations. In particular, in 2000, the unit values of exports to high-income countries were 4 percent higher than the unit values of exports to low-income countries.

3.5 A Validation Exercise

In this section, we perform a validation exercise where we explore results under the more stringent definition of "High-Income" destinations, which includes only High-Income OECD and High-Income non-OECD countries (Definition II, see section 3 and the online appendix). Table 8 reports IV results using both log average wages (Panel A) and the share of non-production workers (Panel B) as our measures of skill utilization. To simplify the exposition, we only report IV estimates from regressions models that include industry-year effects and initial conditions, and that use the more non-parametric set of instruments (I^{HI_1}, the share of Brazil in exports in 1998 times year effects, and I^{EXP}, the weighted average exchange rate, defined in equations (8) and (10), respectively). In Table 8, we confirm our conclusion that exporting per se does not really matter but that exporting to high-income countries does. In fact, we find that under the more stringent definition of high-income destinations the coefficients are close to three times larger than under Definition I. For instance, in the model of wages controlling for log sales, the coefficient on HI is 0.781 instead of 0.260. At the average share of exports to High-Income II, 8.5 percent, the results imply that high-income exporters pay 6.6 percent higher wages. This result is consistent with our hypothesis since we expect larger differences in α and τ, and thus in skill utilization, the higher the income of the high-income destination group. Our conclusions are robust to results (reported in the online appendix) using the alternative set of instruments given by (9), the share of Brazil in exports in 1998 times the Brazilian exchange rate, and (10).

3.6 Additional Robustness Tests

Table 9 reports results from various robustness tests. In all these regressions, we include industry-year effects and the two sets of controls for initial conditions. In panel A, the dependent variable is log wages; in panel B, it is the share of non-production workers. In the first test, we replace our measure of HI by the ratio of rich-countries exports to total sales (in place of the share of exports to rich countries in total exports). In column 1, HI is positive and significant for both log wages and the share of non-production workers. The coefficients are also larger, which is consistent with the fact that the share of exports to Brazil on total exports is much higher than the share of exports to Brazil on total sales (with averages of 30 and 4 percent, respectively). We still do not find any impact of the ratio of exports to total sales.

Second, although our test of relative skill utilization across destinations operates via compositional changes within firms (that is, changes in the export participation weights of the different S_j^c in equation (6)), the impact should in principle be stronger for firms that actually increased exports to high-income destinations (in absolute value) than for firms that only adjusted exports to Brazil. We explore this in columns 2 and 3 of Table 9. For firms that increased exports to high-income countries between 1998 and 2000, the estimated coefficient of HI is 0.430 (column 2), whereas the estimate is 0.319 for the rest of the sample (column 3). Both estimates are statistically significant. The point estimates are much larger for firms that expanded rich-country exports, both for log wages and for the share of non-production workers. This difference, although not significant, points in the expected direction. These results are reassuring.

Finally, we explore results on export intensity and export status to assess whether regressions based on export intensity (or status) actually confound the role of exports and exports to high-income countries. In column 4, we report estimates from an IV model that includes EXP but omits HI. In this case, a higher ratio of exports over sales is positively associated with skill utilization and the coefficient (0.208) is in fact twice as large as that in column 5 of Table 5 (0.101), with comparable standard errors. The estimates are not statistically significant, however, and this is mainly because the covariance between EXP and HI is not high enough to overturn the lack of explanatory power of EXP itself. In column 5, we replace the export intensity EXP variable with an export dummy (using the same instruments). Exporting positively affects skill utilization but, once again, the estimates are not statistically significant. Finally, in column 6 we include an exporter dummy together with a high-income exporter dummy (instrumenting both with our standard set of instruments). The results are consistent with the conclusion that while exporters to high-income countries do hire more skills, exporters to other destination do not.

4 Channels

In this section, we set out to uncover some of the channels behind our "export destinations matter" result. We want to illustrate the mechanisms by which Argentine firms that became more oriented towards high-income destinations utilized more skills.

4.1 Skill Upgrading Within Labor Categories

We begin with a simple extension of our baseline regression model. We re-estimate the wage specification with the addition of the share of non-production workers as a regressor to test whether HI remains statistically significant. We include, as before, both HI and EXP as explanatory variables, and we instrument them with I^{HI_1} and I^{EXP}. Results are reported in Table 10 (similar results are obtained when we use I^{HI_2}, in place of I^{HI_1}, and I^{EXP} as instruments). We find that export intensity, EXP, is never significant, while HI, exports to high-income countries, always is. As expected, the share of non-production workers is positively associated with the average firm wage because on average non-production workers are more skilled than production workers. In addition, the coefficient of HI is smaller than in all previous regressions. Taken together, these results indicate that part of the impact of HI on average wages effectively works through increases in the share of non-production workers but that there are also other channels playing a role.

One plausible mechanism is skill upgrading within labor categories. The average wage paid by the firm is a weighted average of the wages paid to production and non-production workers. Our findings so far revealed that firms exporting to high-income countries pay higher average wages, hire a higher share of non-production workers, and pay higher average wages conditional on the non-production workers shares. This last result is consistent with a scenario where firms engage in skill upgrading within skill categories and possibly utilize better (that is, more skilled) non-production and production workers (in at least one of the two categories). To further clarify this idea, assume that, within the non-production worker category, there are semiskilled and skilled workers and that skilled wages are higher than semiskilled wages. Our finding of higher shares of non-production workers associated with high-income exports can be the result of both more skilled or semiskilled workers, but if the mechanism operates via more skilled workers, then average wages will be even higher. This channel is consistent with the within-category skill upgrading uncovered by Verhoogen (2008).[21]

4.2 Quality Valuation and Required Services

In our theory, we discussed a quality upgrading and a required services mechanism. In what follows, we attempt to tell them apart. First, note that the quality mechanism should be stronger in sectors with higher scope for quality/services upgrades. To test this, we estimate our IV regressions after splitting the sample according to the variance of the unit values in exports at the industry level (a measure of the degree of product vertical differentiation in the sector). Unit values were calculated using industry-level bilateral trade data from COMTRADE. First, we matched the COMTRADE trade data to the industrial classification system from the firm survey, the ISIC Revision 2 at the 3 digit level. Second, for each 3-digit industry, we computed the variance in export unit values from all pairwise combinations of countries of origin and destination that report to COMTRADE, after

[21] Note that, as discussed in the theoretical model, we cannot rule out other possible mechanisms like profit-sharing (fair wages), labor turnover, or scale economies.

trimming outliers. Finally, we classified industries as “High Variance,” if the variance of their unit values is above the 75th percentile, or as “Low Variance” otherwise.

Results are displayed in columns 1 and 2 of Table 11. We report the estimates of the IV models that use the more non-parametric instruments (year dummies times initial shares (equation 8) and the average exchange rate (equation 10)) and that control for industry-year effects and firm initial conditions. The results are however robust to all other specifications presented above (see online appendix). In panel A, we use log average wages as measures of skill utilization. We find that exporters to high-income countries pay higher wages in industries with both high and low scope for vertical differentiation. Furthermore, ceteris paribus, industries with a higher scope for differentiation pay higher wages than industries with lower differentiation scope (the coefficient of HI is 0.344 and highly significant in column 1, while it is 0.188 and marginally significant in column 2). In panel B, we use instead the share of non-production workers. In this case, the impact of HI is positive in both high- and low-variance sectors, but the estimates are imprecise. Similar results are obtained when using Khandelwal's (2010) quality ladder length.[22] The fact that high-income exporters pay higher wages in sectors with high scope for quality differentiation is consistent with Verhoogen's quality valuation mechanism.

A potentially important confounding factor for the quality valuation theory is that, for Argentina, high-income destinations such as the U.S. and the E.U. are also farther away. In consequence, exporting to those markets incurs higher transport costs, and this increases the scope for a shipping-the-good-apples-out argument, as in Hummels and Skiba (2004) and Görg, Halpern and Muraközy (2010). As argued in section 2, higher (non-proportional) transport costs can make high-priced exported goods (due to, for example, quality) relatively cheaper in high-income markets than in neighboring markets. If so, Argentine firms will disproportionately ship higher quality products to higher-income destinations. Furthermore, if the production of quality requires skills, our finding of a positive impact of high-income exports on skill utilization can be due to the shipping-the-good-apples-out argument rather than to the quality valuation argument. Note that this interpretation still requires a quality dimension (the good apples are higher quality goods), but the key difference is that export destinations do not differ in terms of how they value quality. Rather, the mechanism works via transport costs.

[22]Khandelwal (2010) calculates an index based on the estimation of demand equations that incorporate a valuation for quality. We defined sectors with “long” quality ladders if his index is above the mean, and with “short” ladders in the opposite case. A full set of results can be found in our online Appendix.

We explore this distinction as follows. We use U.S. customs data (from the USITC website) to construct measures of transport costs at the 3-digit ISIC codes. We use trade with Canada only in order to keep the export destination constant. Then, we split the sample into those industries with relatively high unitary transport costs and those with relatively low transport costs. For the cutoff, we use the 75th percentile of the 3-digit average U.S. transport costs (though results are robust to other cutoffs, such as the median or the 60th percentile). We expect the "good apples" argument to be stronger in the high transport costs industries. Results are reported in columns 3 (high transport costs) and 4 (low transport costs) of Table 11. For the case of log wages (Panel A), we find that exporting to high-income destinations raises skill utilization in both high and low transport costs industries. We also find that the estimated coefficient is larger in high transport costs industries (0.339) than in low transport cost industries (0.200), but they are not statistically different. In the case of the share of non-production workers (Panel B), we find instead a stronger effect of HI on skill utilization in low transport cost industries. Taken together, these results suggest that our results do not appear to be driven by a transport-cost mechanism and thus reinforce the support for the quality valuation argument.

In columns 5 and 6 of Table 11, we further elaborate on this test with regressions only for industries with larger scope for quality differentiation (as previously defined). Within these industries, we find strong impacts of HI for both high and low transport costs industries for the case of log wages. The estimated coefficients are larger than in our previous regressions and statistically significant. While we cannot reject the hypothesis that they are equal, it is noteworthy that the estimated coefficient is larger in low than in high transport costs industries (0.476 in column 7 and 0.571 in column 8). This result goes against the transport cost mechanism, thus providing additional support to the quality valuation hypothesis. Note, however, that sample sizes are reduced significantly and thus the results become less robust. For instance, in panel B, we find positive impacts of HI on the share of non-production workers, but these estimates are never statistically significant.

Another experiment that can shed light on the mechanisms is to exploit language differences across destinations. A major rich-country destination for Argentina is the U.S., which has greater linguistic distance than most of its neighbors in Latin America. In consequence, exporting to high-income destinations may matter just because of the skills associated with language requirements rather than because of the quality valuation—an argument close to our modified

Matsuyama "required services" hypothesis. To explore this, we split the high-income countries into those countries with low "language distance" (that is, countries where the main language is Spanish, Portuguese or Italian) and those countries with high language distance (all others). The low language distance countries are thus Spain, Portugal and Italy, while the high language distance group includes the U.S., Great Britain, Germany, and so on. Then, we run our IV regression models on the sample of firms that specialize in low language distance destinations (defined as firms that sell more than 75 percent of their high-income exports to these destinations) and those that specialize in high language distance countries.[23] Results are in columns 1 and 2 of Table 12 (using the same general specification from Table 11). Our typical finding that HI matters, while EXP does not, survives for firms exporting to high language-distance countries (column 1). Instead, we find that neither EXP nor HI are statistically significant explanatory variables for firms that specialize in low language distance destinations (column 2). These results support the modified Matsuyama story. Arguably, however, it is plausible that the valuation of quality in the U.S. is higher than the valuation of quality in Spain or Portugal.

An additional related test is to investigate whether the impacts of HI and EXP on skill utilization change when we directly control for language and cultural distance, or proximity, in the baseline regressions (from Table 5). We build a measure of linguistic proximity with the share of a firm's exports to countries that speak Spanish, Portuguese or Italian, but including all countries instead of only high-income countries. We measure cultural proximity with the share of a firms' exports destined to all other countries in South America (which are arguably culturally close to Argentina). Results are in columns 3 and 4 of Table 12. In both cases, we find that exporters to high-income destinations employ higher skills (while exporting per se does not lead to higher skill intensity) even after controlling for language or cultural proximity. Furthermore, the point estimates in panels A and B are similar to those from the baseline models. These results strongly support the quality upgrading mechanism. Also, note that the coefficients for language/cultural proximity, which are negative and statistically significant, indicate that exports to "low" distance countries are correlated with lower skill utilization, a result that is consistent with the required services mechanism.[24]

[23] Results are robust to the cutoff (for example, 75 or 80 percent) and to adding France as a language (and culture) close destination.

[24] We should note, however, that to fully separate both forces in this regression would require the use of a compelling instrument for the firms' decision to export to countries with language differences, an instrument that we do not have.

5 Conclusions

In this paper, we elaborated upon a theory linking export destinations and skill utilization in developing countries. We provided a unified theoretical framework to study the behavior of firms that export to high-income countries in terms of the utilization of skilled labor. In our framework, exporters to high-income destinations hire more skilled workers for two reasons. First, since valuation for quality is higher in high-income countries, high-income exporters engage in quality upgrades, which are skill-intensive. Second, there are required services associated with exporting to high-income countries, and these activities are also intensive in skills. Our model introduces multi-dimensional firm heterogeneity in order to explain both the decision to export as well as the decision to export to high-income countries. This heterogeneity is due to differences in the efficiency in the use of skilled and unskilled labor across firms.

Empirical evidence comes from a panel of Argentine manufacturing firms and matched customs information on exports and export destinations at the firm level. The available data cover the 1998-2000 period and thus span the Brazilian devaluation of 1999, which provides a useful source of identification of exogenous changes in exports and in export destinations to explore whether firms choose the skill composition of their workforce based on the destination of their exports.

The empirical models consistently suggest that exporting to high-income countries induces firms to hire more skilled workers, but exporting per se does not. The reason is that the domestic markets in Argentina are similar to export markets in middle-income countries and thus it is only possible to observe differences in firm's outcomes for firms specializing in exporting to high-income countries. We find strong support for the quality valuation channel, and we cannot rule out the required services argument.

Our contribution lies in identifying, empirically and theoretically, mechanisms that explain how the "act of exporting" to different destinations affects the behavior of firms. Our results clarify the nature of this behavior and, in turn, this may prove useful in current research efforts to understand factors driving firm choices of exporting and of exporting to different markets.

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Table 1
Descriptive Statistics from Firm Survey (ENI) and Customs Records
Argentina 1998-2000

	All Firms	Exporters	High-income exporters I	High-income exporters II
	(1)	(2)	(3)	(4)
Panel A				
Exported in a given year	0.59			
Exported during sample period	0.68			
Exports/Sales	0.08	0.13	0.15	0.22
Number of destinations	3.3	4.9	5.4	7.8
Observations	2544	1499	1307	680
Panel B				
Number of workers	89.7	1.22***	0.39***	0.43***
		(0.04)	(0.07)	(0.05)
Annual sales in 100,000 USD	8.04	1.73***	0.54***	0.54***
		(0.05)	(0.09)	(0.06)
Average annual wage in USD	12,154	0.48***	0.12***	0.15***
		(0.02)	(0.03)	(0.03)
Share of non-production workers	0.26	0.05***	0.03***	0.014
(Number of workers)		(0.01)	(0.01)	(0.01)

Source: Own calculations based on firm data from the National Industrial Survey (ENI) and customs records.
Panel A): Averages of variables for different groups of firms: all firms, exporters, high-income exporters definition I (i.e. high-income and upper-middle-income destinations), high-income exporters definition II (i.e. only high-income destinations).
Panel B):
Column (1): Average number of workers, average annual sales, average annual wage, average share of non-production workers (number of non-production workers/number of non-production + production workers).
Column (2): Difference in means in log workers, log sales, log wage and share of non-production workers between exporters and non-exporters, controlling for 3-digit industry and year.
Column (3): Difference in means between firms that export to at least one high-income destination and other exporters (conditional on exporting), controlling for 3-digit industry and year.
Column (4): Difference in means between firms that export to at least one high-income destination (definition II) and other exporters (conditional on exporting to high-income countries, definition I), controlling for 3-digit industry and year.

Table 2
Exports, Export Destinations and Skill Utilization in the Cross Section
OLS Estimates

	(1)	(2)	(3)
Panel A: Log Average Wage			
Exports/Sales (EXP)	0.692***	–	0.513***
	(0.110)		(0.113)
High Income Exports (HI)	–	0.340***	0.291***
		(0.039)	(0.038)
Observations	2544	2544	2544
R-squared	0.219	0.238	0.256
Panel B: Share of non-prod Workers			
Exports/Sales (EXP)	0.0410	–	0.010
	(0.031)		(0.033)
High Income Exports (HI)	–	0.052***	0.051***
		(0.013)	(0.013)
Observations	2544	2544	2544
R-squared	0.257	0.266	0.266

All regressions include year and 3-digit industry effects. Standard errors are clustered at the firm level. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 3
Main Countries of Destination of Argentine Manufacturing Exports

	1998		1999		2000	
	Value	Share	Value	Share	Value	Share
Brazil	5568.5	0.36	3858.3	0.28	4363.6	0.31
United States	1550.9	0.10	1822.7	0.13	2187.1	0.15
Chile	959.8	0.06	950.4	0.07	1190.0	0.08
Uruguay	654.0	0.04	638.8	0.05	608.6	0.04
Paraguay	491.5	0.03	441.3	0.03	460.1	0.03
Europe	2025.3	0.13	2037.7	0.15	2014.8	0.14
TOTAL	15259.1	1	13716.0	1	14155.9	1
High Income I	6512.3	0.43	6840.5	0.50	7265.8	0.51
High Income II	4237.3	0.28	4624.7	0.34	4872.3	0.34

Source: UN COMTRADE. Manufacturing sector only. Values in constant 1998 millions of dollars.
High Income I: countries classified by the World Bank as high income and upper middle income.
High Income II: countries classified by the World Bank as high income.

Table 4
Export Shares: Matched Firm-Customs Data

	Brazil			High Income		
	1998	1999	2000	1998	1999	2000
Weighted Average(1)	0.37	0.32	0.35	0.49	0.58	0.54
Average exporters(2)	0.31	0.26	0.26	0.49	0.54	0.55
Average all firms(3)	0.19	0.15	0.16	0.29	0.31	0.33
Small firms	0.04	0.04	0.04	0.09	0.11	0.11
Medium-sized firms	0.13	0.13	0.15	0.24	0.27	0.28
Large firms	0.27	0.21	0.23	0.40	0.43	0.47
Food and beverages	0.15	0.11	0.13	0.30	0.30	0.30
Textiles	0.19	0.09	0.17	0.27	0.40	0.33
Apparel	0.05	0.09	0.02	0.26	0.15	0.05
Leather and leather products	0.01	0.02	0.01	0.37	0.29	0.32
Wood, cork and straw products	0.05	0.01	0.06	0.16	0.15	0.13
Paper and paper products	0.25	0.14	0.16	0.31	0.39	0.48
Publishing, printing, media	0.10	0.10	0.09	0.23	0.20	0.19
Coke and refined petroleum products	0.20	0.22	0.23	0.32	0.31	0.30
Chemicals and chemical products	0.24	0.22	0.18	0.37	0.39	0.40
Rubber and plastics products	0.21	0.23	0.21	0.28	0.30	0.34
Other non-metallic mineral products	0.08	0.04	0.04	0.32	0.31	0.35
Basic metals	0.17	0.14	0.13	0.31	0.38	0.43
Metal products	0.20	0.12	0.14	0.19	0.24	0.33
Machinery and equipment n.e.c.	0.20	0.20	0.20	0.38	0.37	0.40
Electrical machinery	0.27	0.20	0.25	0.22	0.23	0.22
Radio, TV and communication equipment	0.20	0.16	0.09	0.24	0.35	0.37
Medical, precision and optical instruments	0.08	0.06	0.06	0.56	0.42	0.52
Motor vehicles	0.41	0.36	0.41	0.19	0.22	0.24
Other transport equipment	0.19	0.11	0.19	0.30	0.31	0.30
Furniture; Other	0.19	0.12	0.11	0.32	0.32	0.35

Source: customs data. Table shows the participation of Brazil (first three columns) and High Income destinations (last three columns) in total exports. High Income destinations group countries classified by the World Bank as high income and upper-middle income. (1) Average share weighted by firm participation in total exports. (2) Unweighted average share among exporters. (3) Unweighted average share among all firms.

Table 5
Exports, Export Destinations, and Skills. Wage Regressions
Dummy Instruments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Second Stage							
High Income Exports (HI)	0.277***	0.343***	0.267***	0.284***	0.260***	0.009	0.053*
	(0.097)	(0.119)	(0.092)	(0.089)	(0.092)	(0.020)	(0.030)
Exports/Sales (EXP)	-0.186	-0.029	0.052	0.09	0.101	-0.040	-0.104
	(0.462)	(0.446)	(0.456)	(0.451)	(0.459)	(0.092)	(0.130)
Log Sales	—	—	—	—	0.056**	0.063**	0.076**
					(0.022)	(0.026)	(0.036)
Panel B1: First Stage (HI)							
Share BRA exports * 1999	0.213***	0.222***	0.313***	0.338***	0.313***	—	—
	(0.036)	(0.042)	(0.047)	(0.047)	(0.047)		
Share BRA exports * 2000	0.241***	0.268***	0.395***	0.356***	0.395***	—	—
	(0.039)	(0.045)	(0.051)	(0.048)	(0.051)		
Average Exchange Rate	0.986***	0.975***	0.656*	0.787**	0.670*	—	—
	(0.302)	(0.346)	(0.350)	(0.344)	(0.350)		
Log Sales	—	—	—	—	0.022	—	—
					(0.017)		
R-squared	0.034	0.106	0.158	0.147	0.159		
p-value	0	4.18e-09	0	0	0		
Panel B2: First Stage (EXP)							
Share BRA exports * 1999	0.012	0.012	0.016	0.015	0.016	—	—
	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)		
Share BRA exports * 2000	0.037***	0.032**	0.032**	0.034**	0.032**	—	—
	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)		
Average Exchange Rate	0.600***	0.808***	0.804***	0.800***	0.806***	—	—
	(0.229)	(0.227)	(0.229)	(0.228)	(0.229)		
Log Sales	—	—	—	—	0.004	—	—
					(0.009)		
R-squared	0.029	0.159	0.161	0.161	0.161	—	—
p-value	0.001	0.0003	0.0016	0.0006	0.0016		
Industry*Year	—	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions*Year	—	—	Yes	—	Yes	Yes	Yes
Initial Conditions*Erate	—	—	—	Yes	—	—	—
Number of Firms	901	901	901	901	901	901	901
Observations	2,544	2,544	2,544	2,544	2,544	2,544	1,683

Columns (1)-(5): IV-FE regressions. Columns (6)-(7): OLS-FE regressions. Dependent variable in second stage: Log Average Wage (Panel A). Dependent variables in first stage: Exports to high income destinations over total value of exports (HI) in Panel B1; and Total value of exports over Total value of sales (EXP) in Panel B2. All regressions include firm fixed effects. Industry effects are defined at the 3-digit level. Initial conditions are Log Sales in 1998 and an indicator variable for exporting status in 1998. Dummy instruments (I^{HI_1}) and the weighted average exchange rate (I^{EXP}) are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 6
Exports, Export Destinations, and Skills. Wage Regressions
Exchange Rate Instruments

	(1)	(2)	(3)	(4)	(5)
Panel A: Second Stage					
High Income Exports (HI)	0.270**	0.331***	0.278***	0.275***	0.272***
	(0.109)	(0.124)	(0.092)	(0.091)	(0.091)
Exports/Sales (EXP)	-0.258	-0.065	0.085	0.033	0.137
	(0.604)	(0.477)	(0.490)	(0.488)	(0.469)
Log Sales	—	—	—	—	0.056**
					(0.022)
Panel B1: First Stage (HI)					
Share BRA exports * erate	0.364***	0.393***	0.569***	0.576***	0.568***
	(0.0577)	(0.0665)	(0.0745)	(0.0744)	(0.0743)
Average Exchange Rate	0.814***	0.843**	0.529	0.657*	0.544
	(0.287)	(0.340)	(0.346)	(0.338)	(0.346)
Log Sales	—	—	—	—	0.0224
					(0.0171)
R-squared	0.031	0.102	0.150	0.143	0.151
p-value	0	5.77e-09	0	0	0
Panel B2: First Stage (EXP)					
Share BRA exports * erate	0.0281	0.0286	0.0352*	0.0337	0.0350*
	(0.0189)	(0.0183)	(0.0208)	(0.0207)	(0.0206)
Average Exchange Rate	0.534**	0.775***	0.787***	0.767***	0.790***
	(0.225)	(0.226)	(0.228)	(0.226)	(0.228)
Log Sales	—	—	—	—	0.00404
					(0.00892)
R-squared	0.020	0.155	0.159	0.157	0.159
p-value	0.0591	0.0028	0.0026	0.0031	0.0025
Industry*Year Effects	—	Yes	Yes	Yes	Yes
Initial Conditions*Year Effects	—	—	Yes	—	Yes
Initial Conditions*Exchange Rate	—	—	—	Yes	—
Number of Firms	901	901	901	901	901
Observations	2,544	2,544	2,544	2,544	2,544

Dependent variable in second stage: Log Average Wage (Panel A). Dependent variables in first stage: Exports to high income destinations over total value of exports (HI) in Panel B1; and Total value of exports over total value of sales (EXP) in Panel B2. All regressions include firm fixed effects. Industry effects are defined at the 3-digit level. Initial conditions are Log Sales in 1998 and an indicator variable for exporting status in 1998. Exchange rate instruments (I^{HI_2} and I^{EXP}) are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 7

Exports, Export Destinations, and Skills. Share of Non-Production Workers

	(1)	(2)	(3)	(4)	(5)
Panel A: Dummy Instruments					
High Income Exports (HI)	0.174***	0.146***	0.078**	0.088***	0.079**
	(0.042)	(0.042)	(0.031)	(0.031)	(0.031)
Exports/Sales (EXP)	-0.109	0.055	0.177	0.169	0.172
	(0.145)	(0.144)	(0.159)	(0.161)	(0.159)
Log Sales	—	—	—	—	-0.006
					(0.007)
Panel B: Exchange Rate Instruments					
High Income Exports (HI)	0.177***	0.156***	0.091***	0.090***	0.092***
	(0.043)	(0.047)	(0.033)	(0.032)	(0.033)
Exports/Sales (EXP)	-0.078	0.082	0.216	0.182	0.209
	(0.190)	(0.167)	(0.184)	(0.180)	(0.185)
Log Sales	—	—	—	—	-0.007
					(0.007)
Industry*Year Effects	—	Yes	Yes	Yes	Yes
Initial Conditions*Year Effects	—	—	Yes	—	Yes
Initial Conditions*Exchange Rate	—	—	—	Yes	—
Number of Firms	901	901	901	901	901
Observations	2544	2544	2544	2544	2544

Dependent variable: number of non-production workers over total number of workers. All regressions include firm fixed effects. Industry effects are defined at the 3-digit level. Initial conditions are Log Sales in 1998 and an indicator variable for exporting status in 1998. Dummy instruments (I^{HI_1} and I^{EXP}) are used in all regressions in Panel A. Exchange rate instruments (I^{HI_2} and I^{EXP}) are used in all regressions in Panel B. First stage regressions are the same as in Table 5 for Panel A and Table 6 for Panel B. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 8
Alternative Definition of High Income Exports

	(1)	(2)	(3)
Panel A: Log Average Wage			
High Income Exports II (HI)	0.803**	0.843***	0.781**
	(0.315)	(0.297)	(0.314)
Exports/Sales (EXP)	-0.092	-0.044	-0.035
	(0.480)	(0.478)	(0.483)
Log Sales	—	—	0.060***
			(0.023)
Panel B: Share of non-prod Workers			
High Income Exports II (HI)	0.238**	0.260***	0.240**
	(0.099)	(0.100)	(0.100)
Exports/Sales (EXP)	0.135	0.128	0.13
	(0.155)	(0.157)	(0.157)
Log Sales	—	—	-0.005
			(0.007)
Industry*Year Effects	Yes	Yes	Yes
Initial Conditions*Year Effects	Yes	—	Yes
Initial Conditions*Exchange Rate	—	Yes	—
Number of Firms	901	901	901
Observations	2544	2544	2544

High Income Exports II is defined as the share of total value of exports that is shipped to countries classified by the World Bank as high income (it excludes upper-middle income countries). Dependent variables: Log average wage in Panel A; Number of non-production workers over total number of workers in Panel B. All regressions include firm fixed effects. Dummy instruments are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 9
Additional Robustness Tests

	High Income Sales (1)	Increased Exports (2)	Did not increase Exports (3)	Export Intensity (4)	Exporter Dummy (5)	Exporter Dummies (6)
Panel A: Log Average Wage						
High Income Exports/Sales	5.394**	—	—	—	—	—
	(2.262)					
High Income Exports (HI)	—	0.430***	0.319**	—	—	—
		(0.158)	(0.129)			
Exports/Sales (EXP)	-1.007	-1.128	0.072	0.208	—	—
	(0.965)	(1.751)	(0.426)	(0.447)		
Exporter Dummy	—	—	—	—	0.153	-0.006
					(0.286)	(0.325)
High Income Exporter Dummy	—	—	—	—	—	0.602**
						(0.261)
Log Sales	0.102***	0.074**	0.058**	0.063**	0.054*	0.018
	(0.036)	(0.029)	(0.027)	(0.024)	(0.029)	(0.034)
Panel B: Share of non-prod Workers						
High Income Sales	1.559*	—	—	—	—	—
	(0.892)					
High Income Exports (HI)	—	0.159**	0.101**	—	—	—
		(0.074)	(0.046)			
Exports/Sales (EXP)	-0.147	-0.27	0.250*	0.205	—	—
	(0.367)	(0.567)	(0.145)	(0.181)		
Exporter Dummy	—	—	—	—	-0.045	-0.100
					(0.101)	(0.107)
High Income Exporter Dummy	—	—	—	—	—	0.178**
						(0.085)
Log Sales	0.007	-0.006	-0.004	-0.005	-0.001	-0.012
	(0.011)	(0.012)	(0.008)	(0.007)	(0.009)	(0.011)
Industry*Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions*Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	901	508	673	901	901	901
Observations	2544	1513	1871	2544	2544	2544

Column (1): The share of high income exports in total exports is replaced with the share of high income exports in total sales. Columns (2)-(3): Exporting firms are split into those that increased and did not increase the total real value of exports between 1998 and 2000. Column (4): Excludes the high income exports variable from the regression specification. Columns (5)-(6): export shares are replaced with export indicators. Dependent variables: Log average wage in Panel A; Number of non-production workers over total number of workers in Panel B. All regressions include firm fixed effects. Dummy instruments are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 10
Wage Regressions Controlling for Share of Non-Production Workers.

	(1)	(2)	(3)
High Income Exports (HI)	0.227**	0.240***	0.219**
	(0.091)	(0.090)	(0.086)
Exports/Sales (EXP)	-0.037	0.005	0.013
	(0.453)	(0.458)	(0.455)
Share of non-prod Workers	0.505***	0.505***	0.510***
	(0.084)	(0.086)	(0.082)
Log Sales	—	—	0.060***
			(0.021)
Industry*Year Effects	Yes	Yes	Yes
Initial Conditions*Year Effects	Yes	—	Yes
Initial Conditions*Exchange Rate	—	Yes	—
Number of Firms	901	901	901
Observations	2544	2544	2544

Dependent variable: Log average wage. All regressions include firm fixed effects. Dummy instruments are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 11
Channels: Quality Valuation

	Scope for Differentiation		Transport Costs		Transport Costs + Scope for Differentiation	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
A: Log Average Wage						
High Income Exports (HI)	0.344**	0.188*	0.339**	0.200*	0.476**	0.571**
	(0.137)	(0.104)	(0.137)	(0.111)	(0.196)	(0.269)
Exports/Sales (EXP)	0.272	0.100	0.999	-0.236	5.412	-0.434
	(0.980)	(0.310)	(1.279)	(0.499)	(3.795)	(0.978)
Log Sales	0.043	0.063*	0.087**	0.049*	0.132*	-0.004
	(0.033)	(0.033)	(0.044)	(0.029)	(0.070)	(0.039)
B: Share of non-prod Workers						
High Income Exports (HI)	0.045	0.091	0.027	0.117**	0.038	0.102
	(0.050)	(0.059)	(0.058)	(0.048)	(0.078)	(0.101)
Exports/Sales (EXP)	0.444	0.027	0.131	0.209	0.596	0.242
	(0.348)	(0.140)	(0.278)	(0.203)	(1.465)	(0.432)
Log Sales	-0.004	-0.006	0.002	-0.01	0.013	-0.018
	(0.014)	(0.008)	(0.018)	(0.007)	(0.029)	(0.013)
Industry*Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions*Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	344	536	313	611	149	195
Observations	973	1506	892	1717	430	543

Columns (1)-(2)—Scope for vertical differentiation: 3-digit ISIC industries are split according to variance in export unit values computed from all bilateral transactions in COMTRADE data (High: above the 75th percentile). Columns (3)-(4)—Transport costs: industries are split according to unitary transports costs (High: above 75th percentile). Columns (5)-(6)—Transport costs + Vertical differentiation: industries with high scope for vertical differentiation are split into High and Low transport costs. Dependent variable: Log average wage (Panel A) and Share of non-production workers (Panel B). All regressions include firm fixed effects. Dummy instruments are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis. Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.

Table 12
Channels: High-Income Exports and Linguistic and Cultural Distance

	Split Regression		Controlling for	
	High-Income Countries		Language	Cultural
	High *LD*	Low *LD*	Proximity	Proximity
	(1)	(2)	(3)	(4)
A: Log Average Wage				
High Income Exports (HI)	0.327***	0.063	0.237***	0.239***
	(0.111)	(0.207)	(0.080)	(0.080)
Exports/Sales (EXP)	0.014	0.548	-0.039	0.015
	(0.564)	(0.464)	(0.456)	(0.465)
Log Sales	0.054**	0.062**	0.060***	0.059***
	(0.023)	(0.026)	(0.022)	(0.022)
Language/Cultural			-0.079**	-0.055**
Proximity			(0.033)	(0.026)
B: Share of non-prod Workers				
High Income Exports (HI)	0.109**	0.149	0.074***	0.078***
	(0.043)	(0.133)	(0.029)	(0.029)
Exports/Sales (EXP)	0.186	0.280	0.138	0.163
	(0.207)	(0.227)	(0.155)	0.156)
Log Sales	-0.003	-0.002	-0.005	-0.006
	(0.008)	(0.010)	(0.007)	(0.007)
Language/Cultural			-0.020*	-0.006
Proximity			(0.011)	(0.011)
Industry*Year Effects	Yes	Yes	Yes	Yes
Initial Conditions*Year Effects	Yes	Yes	Yes	Yes
Number of Firms	838	585	901	901
Observations	2341	1440	2544	2544

Columns (1)-(2)—Split regression and language distance: firms are split according to the language spoken in their high-income destination markets (Low LD: above 75% of high-income exports destined for Spain, Portugal or Italy). Dependent variable: Log average wage (Panel A) and Share of non-production workers (Panel B). All regressions include firm fixed effects. Dummy instruments are used in all regressions. Bootstrapped SE clustered at the firm level in parenthesis.
Column (3): baseline regression controlling for language proximity, measured as the share of a firm's exports to low and high-income destinations where the main language is Spanish, Portuguese or Italian.
Column (4): baseline regression controlling for cultural proximity, measured as the share of a firm's exports to South American countries.
Significance at the 1 percent, 5 percent and 10 percent level is denoted by ***, ** and *.