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Exporting Firms and Wage Premia in Developing Counties*

Irene[†] Brambilla	Nicolas[‡] Depetris Chauvin	Marcelo[§] Olarreaga	Guido[¶] Porto
UNLP	HEG-Geneva	UNIGE	UNLP

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Abstract

There are arguably potential wage gains from exports in developing countries. Export markets bring about opportunities for firms and successful exporting firms translate some of the benefits of exports to workers via employment and wage premia. Using comparable data for 61 developing and low-income countries, we document the prevalence of the export wage premia worldwide. With an extensive literature review, we identify four major drivers of the wage premia: exporting firms hire more skilled workers, utilize more sophisticated machines, buy higher quality material inputs, and are more productive than non-exporting firms. Our empirical analysis confirms the worldwide prevalence of these mechanisms and, furthermore, establishes a strong link to the estimated wage premia.

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†Universidad Nacional de La Plata, Departamento de Economia, Calle 6 e 47 y 48, La Plata 1900, Argentina; email: irene.brambilla@gmail.com

‡Haute Ecole de Gestion de Geneva; email:

§Depatment of Economics, University of Geneva; email:

¶Universidad Nacional de La Plata, Departamento de Economia, Calle 6 e 47 y 48, La Plata 1900, Argentina; email: guido.porto@depeco.econo.unlp.edu.ar

1 Introduction

Export markets bring gains to the domestic economy and can become an engine for development in low income countries. In particular, the evidence shows that exporting firms pay higher wages and hire more workers than non-exporters. This is due to the combination of special requirements of the act of exporting, such as quality upgrades or exporting services, and some inherent attributes of firms, such as productivity, technology, and efficiency (Matsuyama, 2007; Verhoogen, 2008). In this scenario, exporting brings up enhanced opportunities for firms in world markets, and these opportunities can be successfully exploited if firms have, or develop, the needed attributes to become efficient world producers. In turn, this process has implications for employment and wages and, in consequence, the whole mechanism allows those world export opportunities to be transmitted to the local economy. In the end, the benefits from globalization can be realized not only at the firm level (e.g., in terms of profits) but also at the worker level (e.g., in terms of wages and employment).

Our goal in this paper is to assess these arguments. We want to study whether firms do pay higher wages, focusing in particular on lower income countries, and to investigate some of the operating mechanisms. To this end, we build on a literature review that identifies major theories and hypothesis related to exports and wages. In this review, we find that export markets demand high quality products and that the production of high quality products requires high-quality, skilled labor, high-quality, imported inputs, high-quality, sophisticated machine, and high-quality, productive firms. Then, we use comparable micro-data from the Enterprise Surveys to quantitatively document the wage premia paid by exporting firm in 61 developing and low-income countries and we document the role of product quality, labor quality, input quality, technology and productivity. We find strong evidence of a wage premium among exporting firms and we provide strong support for the operating mechanisms advocated by the literature. In our sample of 61 countries, these mechanisms explain most of the wage premia.

The paper is organized as follows. In section 2, we use the firm-level micro data to estimate the wage exporter premia. In section 3, we do a comprehensive literature review several dozen papers from the related literature and we provide evidence of some of the mechanisms at play behind those premia. In section 4, we assess the role of these mechanisms in explaining the wage premia. Section 5 concludes.

2 Exporting Firms and the Wage Premium

The aim of this section is to establish empirically the main premise of this study, namely that exporting leads to gains in wages. We are particularly interested in determining whether this observation holds for developing countries and also for low-income countries. The basic set of stylized facts concerning exporting firms and wages is derived here using comparable data from the Enterprise Surveys. An Enterprise Survey is a firm-level survey of a representative sample of an economy's private sector. The surveys cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, competition, and performance measures. The Enterprise Surveys provide the world's most comprehensive firm-level data for low income countries. The Enterprise Surveys project is jointly led by the World Bank and various partners, such as the European Bank for Reconstruction and Development, the Inter-American Development Bank (IDB), COMPETE Caribbean, and the UK's Department for International Development (DFID). Table 1 lists the countries covered in the analysis as well as some basic information on export exposure. The data covers most developing countries, and many low-income countries, especially in Africa.

The Enterprise Survey data uncover a significant exposure to exports. On average, worldwide, 34 percent of firms participate in exports. The fraction of exporting firms is 36 percent in Latin America and Asia, 32 percent in Europe and only 28 percent in Africa. There is a lot of dispersion, even within continents. For instance, the fraction of exporters is 71 percent in Macedonia, and 17 percent in Russia; 55 percent in Argentina, and 26 percent in Nicaragua; 62 percent in Thailand, and 14 percent in Kazakhstan. In Africa, the fraction of exporters ranges from as high as 61 percent in South Africa and 60 percent in Morocco, to 3 percent in Nigeria, 5 percent in Burundi, or 7 percent in Ethiopia.

It is noteworthy that the intensity of exports also varies a lot across countries, and not necessarily as export participation does. We define export intensity as the share of exports in total sales for exporting firms. Worldwide, the average exporter ships 53 percent of its sales abroad. The highest export intensity is computed in Asia, 69 percent. In Africa, the average exporting firm exports 53 percent of its sales, the worldwide average, but the share of exporting firms is the lowest. Latin American exporters ship on average 34 percent of their sales abroad, and the corresponding figure for Europe is 46 percent.

The starting point of our quantitative analysis is the exploration of the correlation between exports, exporting firms, and wages. Since the firm-level Enterprise Survey is a cross-section, the regression model is

$$(1) \quad \ln w_{ij} = \delta E_{ij} + \phi_j + u_{ij},$$

where $\ln w_{ij}$ is log of the average wage in firm i in industry j, E_{ij} is a measure of exporting status, ϕ_j is an industry fixed effect and u_{ij} is an error term. In (1), the exporting status of firm i is measured with a dummy (equal to 1 for exporting firms) so that the coefficient of interest, δ, is interpreted as the wage exporter-premium. It should be noted that the regression model in equation (1) can only uncover (unconditional or conditional) correlations, and that no causality can be inferred.

We explore the wage premium in Table 1. On average, exporting firms pay 31 percent higher wages than non-exporters. These premia are: 20 percent in Europe, 22 percent in Africa, 38 percent in Latin America, and 30 percent in Asia. As always, these averages mask lots of cross-country heterogeneity. For instance, the highest wage premia are estimated in Moldova (67 percent), Côte d'Ivoire (77 percent), Peru (52 percent), Brazil and Uruguay (51 percent), and the Philippines (62 percent). The lowest premia (which often are not statistically significant) are estimated in Hungary (9 percent), Ghana (6 percent), Kenya and Zimbabwe (7 percent), Paraguay (6 percent), and India (5 percent). To some extent, these cross-country differences are due to differences in industry coverage. In fact, the surveys may target different industries in different countries and in different time periods. To assess this, we identify a group of "selected" industries that are covered in all Enterprise Surveys.

These are Textiles, Garment, Food, Beverages, and Metals and Machinery. As we report in the last column of Table 1, the estimated premia as in general robust.

The finding of an export wage premium is actually not surprising. It is in fact a very well-documented fact since the seminal work of Bernard and Jensen (1995), Bernard and Jensen (1999) and Bernard and Wagner (1997). A large literature follows Bernard and Jensen's methodology (to different degrees) and establishes the existence of export premium in wage regressions. Examples include Bernard (1995), Meller (1995), Aw and Batra (1999), Liu et al. (1999), Isgut (2001), Tsou et al. (2002), Zhou (2003), Bernard and Jensen (2004), Greenway and Yu (2004), Hahn (2004), Hansson and Lundin (2004), Alvarez and Lopez (2005), Arnold and Hussinger (2005), Van Biesebroeck (2005), De Loecker (2007), Farinas and Martin-Marcos (2007), Schank, Schnabel, and Wagner (2007), Sinani and Hobdari (2010), and Baumgarten (2013). Our contribution in Table 1 is to further confirm this finding and to extend coverage to 61 developing and low-income countries.

The literature has postulated several hypotheses to explain the link between exporting and the wage (and employment) premium. Originally, two theories stood out (Roberts and Tybout, 1997; Clerides, Lach, and Tybout, 1998). One theory argues that firms self-select into exporting. Consequently, "better" firms becomes exporters and, jointly, perform better. This better performance implies the payment of a wage premium, the hiring of more workers, among other features (such as productivity, input use, technology adoption; more on this below). An elaboration of this idea is the conscious self-selection theory, whereby self-selection is a conscious decision of firms that become "better" (e.g., become more productive) with the intended purpose of becoming exporters. The other theory postulates a learning-by-exporting process. Firms become exporters and later become "better," paying higher wages, employing more workers, and so on. Both theories imply a correlation between exports and firm productivity. As in the case of wages and employment, this correlation has been extensively documented in the literature. All the papers mentioned above also document a positive correlation between exporting and productivity at the firm level.

The evidence, however, tends to support a theory of self-selection more than a theory of learning-by-exporting. A widespread (but not universal) interesting finding of this literature is that, while it is clear that good firms become exporters, it is less clear that exporters remain significantly better than non-exporters. For the U.S., Bernard and Jensen (1995) and Bernard and Jensen (1999) argue that while, at a point in time, exporters outperform non-exporters, the evidence on the benefits of export experience to the plant is mixed. Exporters perform significantly better in the short run than non-exporters in terms of employment growth. However, short-run wage growth and long-run performance in all areas are negatively correlated with export status in the initial year. Similarly, for Germany, Bernard and Wagner (1997) show that exporters are better than non-exporters *before* becoming exporters. In fact, they find no positive effects on employment, wage or productivity growth after entry into exports. Using linked employer-employee data and focusing on wages, Schank, Schnabel and Wagner (2010) show that the exporter wage premium already exists a few years before firms start to export, and that it does not increase in the following years. Higher wages in exporting firms are thus due to self-selection of more productive, better paying rms into export markets; they are not caused by export activities.

To better document this evidence, we now review some of this literature in more detail.[1] Alvarez and Lopez (2005) test the hypotheses using plant-level data from Chile. They find that plants that enter international markets show superior initial performance compared with non-exporters, consistent with self-selection; they also observe increases in productivity after plants begin to export, which is consistent with learning-by-exporting. In Sweden, support for both theories is reported by Hansson and Lundin (2004). In the U.K. chemical industry, Greenaway and Yu (2004) find that exporters are more productive than non-exporters, both because of self-selection and learning-by-exporting effects. Similar results are reported for Italy in Serti and Tomassi (2008).

Mixed evidence is reported by Isgut (2001) in Colombia. Exporters are clearly better than non-exporters, as the self-selection theory predicts. After entry, sales and employment keep growing significantly faster for exporters, but the growth of labor productivity and capital intensity is indistinguishable for exporters and non-exporters. This is partly consistent with

[1] See also the review in Wagner (2007).

the learning-by-exporting hypothesis. For Spanish firms, Delgado, Farinas and Ruano (2002) use non-parametric techniques to provide strong evidence supporting the self-selection of more productive firms in the export market. The evidence in favor of learning-by-exporting is rather weak, and limited to younger exporters only. Similarly, Fryges and Wagner (2008) find a causal effect of firms' export activities on labor productivity growth. However, exporting improves labor productivity growth only within a sub-interval of the range of firms' export-sales ratios.

A leading paper that presents evidence against the learning hypothesis (and thus in full support of the self-selection theory) is Clerides, Lach and Tybout (1998). In Colombia, Mexico, and Morocco, they find that relatively efficient firms become exporters but that the costs of a given firms are not affected by previous exporting activities. In Germany, Arnold and Hussinger (2005) also find that higher firm productivity leads to exporting, but exporting per se does not enable firms to achieve further productivity improvements.

It is important to note at this point that the evidence supports the idea that self-selection is a conscious process by which plants increase productivity with the purpose of becoming exporters. Alvarez and Lopez (2005) and Lopez (2009) find early support for this contention in Chile. They find that productivity and investment increase before plants begin to export. Moreover, productivity of entrants to exporting, but not that of non-exporters and exporters, increases in response to increases in foreign income, before entry but not after that. These results suggest that the productivity advantage of future exporters may be the result of firms increasing their productivity in order to export. Using plant data for Mexico, Iacovone and Javorcik (2012) report that quality upgrades take place in preparation for entry into export markets, but they find no evidence of upgrading after entering export markets.

All the evidence reviewed so far refers to developing or developed countries, but there is only scant evidence on these links for low-income countries. Brambilla, Dix-Carneiro, Lederman and Porto (2011) establish a positive link between the skill premium at the industry level and sectoral exports in a set of Latin American countries. For Sub-Saharan Africa, Milner and Tandrayen (2004) use employer-employee matched data for manufacturing firms in six countries and find a positive association between individual earnings and the export status of the firm. As in Brambilla et al. (2011), the skill wage premium in exporting firms is significantly higher. In terms of productivity in Africa, Mengistae and Pattillo (2004) show that export manufacturers have an average total factor productivity premium of 17 percent. African exporters also enjoy productivity growth that is 10 percent faster than among non-exporters. Using firm-level data for the manufacturing sector in Cameroon, Ghana, Kenya and Zimbabwe, Bigsten, Collier, Dercon, Fafchamps, Gauthier, Gunning, Oduro, Pattillo, Oostendorp, Söderbom, Teal and Zeufack (2004) estimate significant efficiency gains from exporting, which can be interpreted as learning by exporting. Van Biesebroeck (2005) reports similar results for a panel of manufacturing firms in nine African countries. The results indicate that exporters in these countries are more productive and, more importantly, that exporters increase their productivity advantage after entry into the export market (which is consistent with both self-selection and with learning-by-exporting).

A technical issue that deserves attention is causality. In many of the studies reviewed above, the analysis is based on correlations. Firm-productivity is found to be positively correlated with wages and exporting, initial export status is sometimes positively correlated with future productivity, and so on. Establishing causality requires exogenous variation in exporting or in productivity. For our literature review, a nice starting point is the paper by Frias, Kaplan and Verhoogen (2009) on exports and wages in Mexico. They use employer-employee data, so that they can account for worker heterogeneity, and an instrumental variable approach, where the instrument is varying firm-level exposure to the Mexican devaluation of 1994. The paper uses information on individual worker' wage histories to decompose plant-level average wages into a component reflecting skill composition and a component reflecting wage premia. Approximately two-thirds of the higher level of wages in larger, more productive plants is explained by higher levels of wage premia. These findings argue against the hypothesis that sorting on individual ability is solely responsible for the correlation between exporting and wages. Kandilov (2009) assesses the impact of increased export activity on plant wages exploiting the exogenous variation in exports induced by the export subsidy system implemented in Chile in 1986. While the export subsidy had only a modest positive impact on the industry-wide relative high-skilled wage, it signicantly increased the plant-level relative high-skilled wage in medium-size establishments, which are most likely to take advantage of the subsidy and enter the export market.

Looking at exports and productivity, De Loecker (2007) uses matched sampling techniques to analyze whether firms that start exporting become more productive, controlling for the self-selection into export markets. He finds that export entrants become more productive once they start exporting. The productivity gap between exporters and their domestic counterparts increases further over time. This provides causal evidence in support of learning-by-exporting. Using a large plant level panel data set from Germany and a matching approach as well, Wagner (2002) finds positive effects of starting to export on growth of employment, labor productivity, and wages. Park, Yang, Shi, and Jiang (2010) construct firm-specific exchange rate shocks based on the pre-crisis destinations of firms' exports. Because the shocks were unanticipated and large, they are a plausible instrument for identifying the impact of exporting on firm productivity and other outcomes. They find that firms whose export destinations experience greater currency depreciation have slower export growth, and that export growth leads to increases in firm productivity and other firm performance measures. Consistent with "learning-by-exporting," the productivity impact of export growth is greater when firms export to more developed countries. Using a very different approach, Marin (1992) tries to establish whether a causal link between exports and productivity exists for four developed market economies based on co-integration and Granger causality techniques. The findings suggest that an "outward-looking" regime favors the productivity performance of developed market economies as well as that of developing countries.

3 Mechanisms

For both analytical purposes and for policy purposes, it is important to understand the mechanisms via which the link between exports, wages and employment operates. To explore this issue, we proceed as follows. First, we do a comprehensive literature review to identify, both theoretically and empirically, the main mechanisms. These are skilled labor utilization, technology sophistication, imported input use, and productivity. Second, summarize the literature by introducing a simple model that captures, in a cohesive way, those four mechanisms.

3.1 Identifying Some of the Main Mechanisms

There are many reasons why exporters hire more workers and, especially, why they pay higher wages. A key reason is that the production of goods for export requires skilled labor. Skilled labor is needed because exporting requires quality upgrades, as in Verhoogen (2008) or because the act of exporting involves operational services, as in Matsuyama (2007).[2] Both the provision of quality and the production of exporting services are skilled-intensive activities. As a result, firms that choose to export need to hire proportionately more skilled labor and pay their high-skilled workers a wage premium. Exporters can afford to do that because exports markets pay, in turn, a premium for their products. Another reason why exporters pay higher wages is a complementarity between the choice of technology of production used in exporting and the skilled level needed to use those technologies. Yeaple (2005) and Acemoglu and Zilibotti (2001) are examples.[3]

There is a large empirical literature linking skill utilization and exports. Bernard and Jensen (1997) document that increases in employment at exporting plants contribute to the observed increase in relative demand for skilled labor in manufacturing in the U.S. Moreover, exporters account for almost all of the increase in the wage gap between high– and low–skilled workers. Munch and Skaksen (2008) study the link between a firm education level, its export performance and the wages of its workers. Using matched worker–firm panel

[2]Using aggregate product-level bilateral trade data, Hallak (2006) is one of the first authors to document the positive correlation between export unit values and the level of income of the country of destination. More recent studies, such as Baldwin and Harrigan (2011) and Johnson (2012), also find positive correlations between export unit values and the income of the destination country. Using firm-level data, Manova and Zhang (2012) show that Chinese exporting firms do indeed charge higher prices in richer markets. Similar evidence is reported by Bastos and Silva (2010), for the case of Portuguese exporters, and Görg, Halpern and Muraközy (2010), for the case of Hungarian exporters.

[3]Yet another reason is profit-sharing. Exporters make higher profits and, because of efficiency wages, firms share part of those higher profits with workers. See Egger and Kreickemeier (2009), Egger and Kreickemeier (2010) and Egger and Kreickemeier (2012) for a theoretical approach and Amiti and Davis (2011) for empirical evidence for Indonesia.

data, these authors find that firms with high export intensities do indeed pay higher wages and use more skilled labor. However, an interaction term between export intensity and skill intensity has a positive impact on wages and it absorbs the direct effect of the export intensity. This means that the export wage premium found in the data accrues to workers in firms with high skill intensities. Verhoogen (2008) uses the Mexican devaluation of 1994 as an exogenous change in exports. He finds that firms that were more intensively affected by this "export" shock paid higher wages and that this was in part due to an increase in the composition of skilled employment needed to upgrade product quality in Mexican exports to the U.S. Bustos (2014) studies the experience of Argentine firms in the face of enhanced export opportunities to Brazil and confirms that the reduction in Brazil's tariffs induces the most productive Argentine firms to upgrade skills. In fact, she documents that one third of the increase in the relative demand for skills can be attributed to the reduction in Brazil's tariffs. There are many other papers linking exports to skill utilization. Serti, Tomasi and Zanfei (2010) investigate the Italian manufacturing industry. Söderbom and Teal (2000), for Ghana.

A different strand of literature provides evidence in support for a quality provision mechanism in exports. Schott (2004) explores U.S. import unit values and reports higher unit values for varieties originating in capital- and skill-abundant countries. Moreover, exporting countries that become more skill- and capital-abundant with time experience increases in unit values relative to other exporters. He also finds that richer countries tend to export higher quality products. Hummels and Klenow (2005) show that quality differentiation is needed to explain differences in unit values and show that these unit values positively correlate with per capita income of the exporting country. Hallak (2010) documents that trade is more intense among countries with similar income per capita—the Linder hypothesis. Caron, Fally, and Markusen (2014) establish a positive correlation between the income elasticity of a good and its skilled-labor intensity. This implies that richer countries demand and produce higher quality goods and, as a consequence, trade between rich countries is more intense than trade between rich and poor countries (especially in higher quality goods).

Exporters may pay higher wages (on top of the skilled labor utilization mechanism) because of complementarities with technology upgrades. Bustos (2011) provides evidence on the link between exports and technology upgrading in Argentina after MERCOSUR. Her empirical analysis reveals that firms in industries facing higher reductions in Brazil's tariffs (main MERCOSUR partner for Argentine firms) increase investment in technology faster, especially for middle-upper and high-productivity firms. Lileeva and Trefler (2010) study the experience of Canadian firms and their exports to the U.S. They find that those lower-productivity Canadian plants that were induced by the tariff cuts to start exporting engaged in more product innovation and had high adoption rates of advanced manufacturing technologies. In contrast, they find no effects for higher-productivity plants. An important related paper is Aw, Roberts and Xu (2011). This paper estimates a dynamic structural model of a producer's decision to invest in R&D and export, allowing both choices to endogenously affect the future path of productivity. Using plant-level data for the Taiwanese electronics industry, both activities are found to have a positive effect on the plant's future productivity. This in turn drives more plants to self-select into both activities, contributing to further productivity gains. Simulations of an expansion of the export market are shown to increase both exporting and R&D investment and generate a gradual within-plant productivity improvement.

The literature has pointed out that the production of export goods (e.g., products of higher quality) often requires high quality inputs (besides high quality labor, as above). In general, in developing countries, higher quality inputs are imported. If there is, as suggested in the literature, a complementarity between the use of higher-quality inputs and the use of higher-quality labor, then this is another mechanism underlying the wage export premium. This mechanism can be interpreted as an extension of the idea advanced by Verhoogen (2008). Kugler and Verhoogen (2012) elaborate on this "quality-complementarity" hypothesis and show that input quality and plant productivity are complementary in generating output quality. The empirical results for Colombia indicate that higher productivity firms (which are more likely to be exporters) charge more for their outputs and pay more for their material inputs.

The empirical evidence on the link between imported inputs and wages is indirect. Bas

(2012) looks at the relationship between changes in input tariffs and within-firm changes in export status. Using detailed firm-level data from Argentina, she finds that the probability of entering the export market is higher for firms producing in industries that have experienced greater input tariff reductions. Bas and Strauss-Kahn (2011) use firm import data at the product (HS6) level in France to confirm that access to new varieties of inputs increase productivity, and thereby exports, through better complementarity of inputs and transfer of technology. Feng, Li and Swenson (2012) look at Chinese manufacturing firms following the country accession to the WTO. Their results show that firms that expanded their intermediate input imports expanded the volume of their exports and increased their export scope.

3.2 Theoretical Model

To better organize our discussion, we develop here a simple model that captures the mechanisms outlined in the review. The goal is to lay out a theoretical framework to formalize the intuitions provided by the empirical results. The model is a simple partial equilibrium model. We introduce the demand and production structure and we study optimal firm decisions. In the process, we describe how the four mechanisms work.

Firms operate in a monopolistic competition framework. Goods are differentiated in quality. A variety j has quality θ_j and price p_j. As in Verhoogen (2008) and Brambilla, Lederman, and Porto (2012), we work with logit demands. Firms can sell domestically $d = h$ (home) or abroad $d = e$ (export). Aggregate demand in market d is:

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

where α^d captures quality valuation and we assume that $\alpha^e > \alpha^h$ because export markets are willing to pay a premium for a good of a given quality.[4] In (2), M^d is the number of consumers in market d, or market size, and W^d is an index that summarizes the characteristics of all

[4] Alternatively, a quality-adjusted CES specification can also be used (Bastos, Silva, and Verhoogen, 2014; Feenstra and Romalis, 2012; Hallak, 2006; Hallak, 2010; Johnson, 2012; Kugler and Verhoogen, 2012). This demand system delivers the same results.

available products in that market (i.e. $W^d = \sum_{d \in Z^d} \exp(\alpha^d \theta_z^d - p_z^d)$, where Z^d is the set of available products).

Firm j chooses the quality θ_j of the good and its selling price p_j to maximize profits:

$$(3) \quad \pi_j = [p_j - c_j(\theta_j)]\, x(p_j, \theta_j) - F,$$

where $c_j(\theta_j)$ is the marginal cost of production, that depends on quality, with $c_j'(\theta_j) > 0$ and $c_j''(\theta_j) > 0$. F is a fixed cost of production or of entering a market, which for simplicity is assumed to be the same across firms. As in Verhoogen (2008), we assume that firms can choose prices p_j^d and quality θ_j^d for the domestic and the export market separately. The first order conditions for profit maximization are:

$$(4) \quad p_j^d = 1 + c_j(\theta_j^d),$$

$$(5) \quad \alpha^d = \frac{c_j'(\theta_j^d)}{p_j^d - c_j(\theta_j^d)}.$$

The intuition is straightforward. Firms charge a constant markup over marginal costs (equation (4) and, given the optimal markup, optimal quality in a given market requires equating the marginal costs of quality provision with the quality valuation α (equation (5). Note that since $\alpha^e > \alpha^d$, we have that $\theta_j^e > \theta_j^d$ and $p_j^e > p_j^h$. Since export markets value quality more, firms optimally sell higher quality products at higher prices abroad.

To explore the mechanisms in more detail, we need to describe the marginal cost function $c_j(\theta_j)$. We adopt a unifying framework based on Johnson (2012), Crino and Epifani (2012), Hallak and Sivadasan (2013), Flam and Helpman (1987), Hummels and Klenow (2005), Verhoogen (2008), Bastos, Silva and Verhoogen (2014), Brambilla, Lederman, and Porto (2012), Feenstra and Romalis (2012), and Kugler and Verhoogen (2012). To produce quantity and quality, a firm utilizes three production factors: labor, (imported) material inputs, and capital or technology. These factors are combined with the inherent attributes of a firm, which we call productivity. The technology to produce physical quantity differs from the technology to produce quality.

The production of one unit of physical output requires 1 unit of labor, 1 unit of imported material inputs, and 1 unit of capital/technology. This is a fixed-coefficient production function. All these three production factors are heterogeneous in quality. Workers are heterogeneous in skills or ability, S. Imported materials differ in quality M, and capital or technology differs in their "sophistication" K.

The quality of the inputs is instead relevant in the production of the quality of the output (the "quality-complementarity" hypothesis of Kugler and Verhoogen, 2012). Thus, for example, a higher ability worker can produce, ceteris paribus, 1 unit of physical output, but of a higher quality θ. To model quality production, firms combine factors with "capability" or "caliber" λ (Kugler and Verhoogen, 2012; Hallak and Sivadasan, 2013) as follows:

$$(6) \quad \theta_j = \lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M} (S_j)^{\sigma^S},$$

where $\sigma^K > 0$, $\sigma^M > 0$, $\sigma^S > 0$. This is a standard Cobb-Douglas production function and it implies some degree of complementarity among capability, the quality or sophistication of capital, the quality of (imported) material inputs and skills. Since we are interested in wages, it is important to highlight that this production function implies that firms with higher λ, higher K, and higher M are more efficient in using skilled labor in the generation of quality. More generally, equation (6) delivers a positive relationship between the production of quality θ_j and the quality of inputs S_j, M_j and K_j.

To attract higher skilled workers (to produce higher quality), firms face an upward sloping wage scheduled as in Verhoogen (2008). We work with a simple functional form

$$(7) \quad S_j = (w_j^S)^{\xi^S},$$

where w_j^S is the wage rate offered to skills S_j and $\xi^S > 0$ governs the responsiveness of skills to the offered wage. Equation (7) can be interpreted as a reduced-form representation of an efficiency-wage model or a profit sharing model. We adopt similar factor-price schedules for technology

$$(8) \quad K_j = (w_j^K)^{\xi^K},$$

and material inputs

$$(9) \quad M_j = (w_j^M)^{\xi^M},$$

where w_j^K and w_j^M are the prices for technology and material inputs and $\xi^K, \xi^M > 0$.

For a firm, the cost of producing one unit of output of quality θ_j is the cost of hiring one worker of skill S_j at the wage w_j^S, one unit of capital with sophistication K_j at price w_j^K and one unit of material inputs with quality M_j at price w_j^M. As in Verhoogen (2008), we assume that firms run separate production lines for different qualities. Separability in production allows firms to make independent decisions of entry, quality choice, and price to each market. As in all this literature, firms are heterogeneous in capability/caliber λ.

To illustrate how the mechanisms operate in the model, it is useful to consider a firm with productivity λ_j, capital K_j and material inputs M_j.[5] Assuming capital or the sophistication of technology K is given at a moment in time can be the result of a time-to-build assumption so that capital/technology investment decisions are adopted with lags, and K is consequently predetermined. Material inputs are likely to be adjusted "instantaneously," as labor is, but for the moment we assume M is also predetermined. Using (6) and (7), the marginal cost of producing a physical unit of good j is

$$(10) \quad c_j(\theta_j) = \frac{1}{\left(\lambda_j K_j^{\sigma^K} M_j^{\sigma^M}\right)^{1/\xi^S \sigma^S}} (\theta_j)^{\frac{1}{\xi^S \sigma^S}},$$

with $c' > 0$ and $c'' > 0$ if $\xi^S \sigma^S < 1$. From (10) and (5), we can solve for optimal quality

$$(11) \quad \theta_j^* = \left(\alpha \xi^S \sigma^S\right)^{\frac{\xi^S \sigma^S}{1-\xi^S \sigma^S}} \left(\lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M}\right)^{\frac{1}{1-\xi^S \sigma^S}},$$

[5]We work out the full solution to the firm optimization problem below.

which is increasing in the quality of material inputs M_j, in the sophistication of technology K_j and in productivity λ_j.

The equilibrium is described in Figure 1. We plot the optimal choice of quality (equation (11)) as a function of firm productivity λ_j for the domestic and the foreign markets. Clearly, optimal quality is increasing in λ. Moreover, since the foreign market has a higher valuation for quality, the level of optimal quality is higher, at each productivity level. As a consequence, the quality schedule of the export market good lies above the quality schedule of the domestic market good.

As in all the literature, we assume firms face a fixed costs of entering the domestic market and an additional fixed cost of entering the foreign market. This defines two productivity cutoff λ_{min} and λ_{exp} so that firms with productivity $\lambda < \lambda_{min}$ cannot afford to enter any market, firms with productivity $\lambda_{min} < \lambda < \lambda_{exp}$ produce for the domestic market, and firms with productivity $\lambda > \lambda_{exp}$ produce for the both the domestic and the export markets. In Figure 1, we highlight the average quality produced by firms with different productivities. As it can be seen, firms that enter the export market produce higher average quality. At low productivity levels, average quality tracks the quality demanded at the domestic market. There is a discrete jump at the cutoff λ_{exp}, and then average quality is just the average of the quality demanded domestically and abroad.

Now consider a firm with higher capital sophistication or higher material input quality. (These are endogenous choices, but it is useful to explore this setting to think about the mechanisms at play). Higher K or higher M allows firms to produce higher optimal quality, both for the domestic market and for the foreign market. This means that the quality schedules in Figure 1 shift up; see Figure 2. The cutoff also change, and both λ_{min} and λ_{exp} are lower. This is because higher K or higher M allows firm to produce more and then become profitable at lower levels of productivity or capability. The effect on the quality premium of exporters is consequently ambiguous. However, overall, firms with more sophisticated machines or firms that buy higher quality inputs produce higher quality outputs.

These mechanisms affect skill utilization and wages. The solution for optimal skill utilization, conditional on all other variables, is

$$(12)\quad S_j^* = \left(\alpha\xi^S\sigma^S\right)^{\frac{\xi^S}{1-\xi^S\sigma^S}} \left(\lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M}\right)^{\frac{\xi^S}{1-\xi^S\sigma^S}} .$$

Wages are

$$(13)\quad w_j^* = \left(\alpha\xi^S\sigma^S\right)^{\frac{1}{1-\xi^S\sigma^S}} \left(\lambda_j (K_j)^{\sigma^K} (M_j)^{\sigma^M}\right)^{\frac{1}{1-\xi^S\sigma^S}} .$$

Figure 3 illustrates this solution. First, exporters utilize more skills and pay higher wages than non-exporters. Second, firms with higher K and higher M utilize even higher skills. As a result, they also pay higher wages. This shows the intuition behind this theoretical apparatus. There is a complementarity between input quality and output quality. More productive firms can afford to produce higher quality products and enter world markets. To do this, ceteris paribus, they need to hire skilled labor. Since it is expensive to do so, because to attract skilled labor firms need to pay higher wages, wages at exporting firms are on average higher than wages at non-exporting firms. There is, indeed, a wage export-premium. Moreover, given higher technology sophistication or material input quality, firms produce even higher quality, hire even higher skilled labor, and pay even higher wages.

For completeness, we work out the full solution of the model. The first order conditions for price and quality are (4) and (5), as before. Firms now jointly choose the quality of capital, labor and material inputs. Firms minimize costs $c = w^S + w^K + w^M$, subject to the quality production function (6) and the wage schedules (7), (8) and (9). The optimal choice of quality is

$$(14)\quad \theta_j^* = (alpha)^{\frac{a}{1-a}} \lambda_j^{\frac{1}{1-a}} J,$$

where $a = \xi^S\sigma^S + \xi^K\sigma^K + \xi^M\sigma^M$ and we assume that $a < 1$ (to get an interior solution for θ) and $J = [(\xi^S\sigma^S)^{\xi^S\sigma^S}(\xi^K\sigma^K)^{\xi^K\sigma^K}(\xi^M\sigma^M)^{\xi^M\sigma^M}]^{1/(1-a)}$. The solutions for optimal labor quality S, material inputs quality M and capital sophistication K are

$$(15) \quad S_j^* = (\xi^S \sigma^S)^{\xi^S} (\alpha)^{\frac{\xi^S}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^S},$$

$$(16) \quad M_j^* = (\xi^M \sigma^M)^{\xi^M} (\alpha)^{\frac{\xi^M}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^M},$$

and

$$(17) \quad K_j^* = (\xi^K \sigma^K)^{\xi^K} (\alpha)^{\frac{\xi^K}{1-a}} (\lambda_j)^{\frac{1}{1-a}} J^{\xi^K},$$

Ultimately, the choices of input quality are a function of firm features such as productivity or caliber λ. We can see that exporters hire more skilled labor, purchase more and better material inputs and adopt a higher sophistication of technology in Figure 4. In each panel, we plot the optimal choice of S (upper-left panel), M (upper-right panel) and K (lower-left panel) as a function of λ for the domestic market and for the foreign market. As with optimal quality, the average skill increases in λ as exporters hire, on average, more skilled workers. Similar statements can be made for the cases of material inputs and capital sophistication.

Next, we turn to the evidence provided by our regression analysis of the Enterprise Surveys.

3.3 Skill Utilization

To study whether exporters demand relative more skilled over unskilled workers than non-exporters, we adopt the following variant of regression model (1)

$$(18) \quad s_{ij} = \delta E_{ij} + \phi_j + u_{ij},$$

where now the dependent variable s_{ij} is some measure of the utilization of skilled labor relative to unskilled labor. All other variables are defined as above.

Our main results are reported in Table 2. In column 1, we measure the correlation between exporting and the ratio of skilled labor employment. This correlation is always positive and statistically significant across developing countries. Worldwide, for instance, an exporter has 0.91 more skilled workers per unskilled worker, on average. This result holds on average in each continent as well. In Eastern Europe, the coefficient is 1.99, in Africa, 0.74, in Latin America, 0.65, and in Asia, 1.04.

In column 2, the dependent variable is the share of the work-force with completed high-school. This information is not available for all surveys, and consequently our analysis is less detailed than before. Nevertheless, we confirm that exporting is positively correlated with this measure of skill utilization. Worldwide, on average, the proportion of the workforce of an exporting firm that has completed high-school is 4 percent higher than for non-exporters. It is interesting to note that the share of completed high-school workers is actually 5 percent higher in Europe, Latin America and Asia, while the correlation is not statistically significant in Africa.

In columns 3 and 4, we investigate whether exporters demand specific skills from high-rank employees. Concretely, we look first at the quality (i.e., education) of managers. In column 3, we find that, on the average (worldwide) exporting firm, managers are 17 percent more likely to have College Education that at a non-exporter. This correlation is strong statistically and very robust across continents. In Latin America, for instance, the coefficient is 0.25, in Asia, 0.13, and in Africa 0.19. In column 4, we explore the probability that a manager has Post-Graduate Education. We find that, on average, the probability that the manager of an exporting firm has a Post-Graduate degree is 12 percent higher compared to non-exporters. This correlation also holds in Latin America (18 percent), Asia (8 percent), and Africa (13 percent).

3.4 Sophistication of Technology

To investigate the premia in machine sophistication, the regressions are the same as before, except that we change the dependent variables. Results are also reported in Table 2. In column 5, we correlate export status with the firm' capital labor ratio. We find that this correlation is positive and statistically strong everywhere (on average, in Europe, in Latin America, in Asia, and in Africa.). In column 6, we look at the correlation with the probability of having ISO-certified product, and we find that it is much higher at exporting firms than at non-exporting firms. Worldwide, on average, exporters are 24 percent more likely to have ISO certification than non-exporters. The link appears stronger in Asia (27 percent) and Latin America (16 percent) than in Africa (20 percent) or Europe (21 percent). But the association is always statistically very significant.

For a subset of countries, we also have information of the adoption of new technologies (column 7) and R&D spending (column 8). Exporters are 11 percent more likely to incorporate new technologies than non-exporters. Similarly, R&D spending is 5 percent higher at exporting firms, on average.

3.5 Imports and Imports of Intermediate Inputs

The Enterprise Surveys allow us to explore the role of better inputs because firms are asked whether they purchase inputs from aboard. In general, for developing countries, imported inputs are of higher quality than domestic inputs (Kugler and Verhoogen, 2012; Manova and Zhang, 2012). We can thus study whether exporters tend to purchase imported inputs, and whether they tend to spend a higher fraction of resources on imported inputs. The regression model is the same as before, with changed dependent variables.

Results are in Table 3. We first investigate whether exporters are more likely to be importers too (Bernard, Jensen, Redding, and Schott, 2007). They indeed are. In column 1, we find that an exporter is 27 percent more likely to be an importer as well. This is a very strong and robust correlation. It is observed in Europe (20 percent premium), Latin America (22 percent premium), Asia and Africa (31 percent premium). In column 2, we examine if this correlation operates for imports of intermediate inputs. It does, also very strongly. We look at the correlation between exporting and the share of inputs used by the firm that are imported. On average, exporters have 14 percent higher imported inputs than non-exporters. This correlation is very robust. A European exporter has 14 percent higher imported inputs, Latin American exporters, 10 percent higher imported inputs, Asian exporters, 16 percent higher imported inputs, and African exporters, 19 percent higher imported inputs. The influence of foreign factors in this mechanism is also reflected in the correlation between exporting and foreign firm ownership. In columns 3 and 4, we see that exporting firms have a much higher foreign firm participation. These links hold on average worldwide, and on average within each continent.

3.6 Productivity

We now turn to the correlation between productivity and exporting in the Enterprise Surveys. As we discussed in the literature review, firm productivity is one of the key better performance variables associated with exporting. The evidence in favor of this link is overwhelming, and it is not surprising that we find strong correlations in our data. We build three direct and indirect measures of firm productivity. First, we calculate labor productivity, which is value added per worker. Second, we measure TFP from OLS regressions of output on factor usage. Third, we use (log) sales as an indicator of productivity, as in Verhoogen (2008), Bustos (2011) and many others. We then regress these variables on the firm export status, as before. Results are in the last three columns of Table 3.

Labor productivity is much higher at exporters (column 5). On average, exporting firms worldwide are 53 percent more productive than non-exporting firms. In Europe, the labor productivity premium is 30 percent, in Latin America, 67 percent; in Asia, 54 percent, and in Africa, 32 percent. Productivity as measured by total factor productivity is also higher at exporters, but not as much as labor productivity (column 6). The TFP premium is, on average, 10 percent. This premium is 8 percent in Europe, 13 percent in Latin America, 10 percent in Asia, and 7 percent in Africa. Sales are also much larger for exporting firm (column 7). On average, the sales premium is 1.86, but it can be as large as 2.06 in Latin America or 1.89 in Asia, to as low as 1.54 in Europe or 1.49 in Africa.

For our purposes, this correlation between exporting and productivity is useful for several reasons. Productivity is a clear indicator of firm performance, and consequently these correlations confirm the notion that exporters perform better, in general, than non-exporters. Also, much of the modern literature on trade with firm heterogeneity relies on productivity differences to explain firm decisions and the observation that exporters are more productive is consistent with this view. Finally, higher factor productivity and sales at exporting firms are consistent with the observation that exporters earn more profits than non-exporters. As such, they can afford to pay higher wages. This could happen because of an inherent complementarity with the other mechanisms explored above (skill use, imported inputs, technology, R&D, investment, ownership) or because of additional mechanisms. That is, more productive firms can pay higher wages, ceteris paribus (that is, even conditional on skill utilization, imported inputs use, technology adoption and so on). This could occur under fair wages hypothesis, bargaining of profit sharing between firms and workers (Egger and Kreickemeier, 2009; Egger and Kreickemeier, 2010; Egger and Kreickemeier, 2012; Amiti and Davis, 2011).

4 Assessing the Export Wage Premium

In this section, we perform two experiments to explain the estimated export wage premia. The first experiment is the estimation of a hybrid model of the wage premia. The second experiment is based on cross-country analysis.

4.1 Explaining the Premia

In the first experiment, we run a hybrid model where we estimate the export premium for wages conditional on the variables that capture the mechanisms. Our goals are to test whether the mechanisms make sense and, in addition, to explore how much of the export premium can be accounted for by them. Concretely, our expanded regression model is

$$(19) \quad y_{ij} = \delta E_{ij} + \mathbf{m}'_{ij}\gamma + \phi_j + u_{ij},$$

where all variables are defined as above and $\mathbf{m}_{ij}$ are measures of the mechanisms, as in the discussion of the previous section. We include measures of skill utilization, technology, imported inputs, and productivity. We explore two specifications, "some controls" and "full controls." In the "some controls" specification, we include in $\mathbf{m}$ the ratio of skilled workers, the capital to labor ratio, the percentage of imports of intermediate inputs, and labor productivity. In the "full set of controls" specification, we keep the ratio of skilled workers, the capital to labor ratio, the percentage of imports of intermediate inputs, and labor productivity and we add iso certification, foreign ownership, and log sales. We add controls sequentially.

Results for the wage export premium are in Table 4. In both specifications, we observe that, as we add mechanisms **m**, the wage premium *declines*. Controlling for skill composition alone (columns 2 and 6) does not affect the wage premium by much. Adding skill composition and technology together has sizeable effects on the wage premium. For instance, on average, the wage premium drops from 31 percent to between 21 and 18 percent in the "some control" and "full controls" specifications, respectively. If we further add imported inputs, the wage premium drops to between 17 and 11 percent, respectively. Finally, and most importantly, when we add measures of firm productivity, the wage premium disappears entirely. In this case, exporters and non-exporters would pay more or less the same wage, conditional on all the mechanisms.

4.2 Cross-Country Correlations

While we work with 61 countries, the evidence so far is based on cross-firm correlations within a country. Here, we exploit the cross-country correlations in the data as well. We correlate the wage premia reported in Table 1 with the premia corresponding to each of the four mechanisms estimated in Tables 2 and 3. The scatter plots and linear fits are reported in Figure 5.

In Panel A, we find a positive correlation between the wage export premia and the skill utilization premia. A similar positive correlation is found in Panel B (the sophistication of machine premia) and in Panel C (the productivity premia). These results suggests that countries with higher skill utilization export premia, higher machine sophistication export premia, and higher productivity export premia are countries with higher wage export premia. In the case of imported inputs, the correlation is much weaker (and it is actually slightly negative). Overall, thus, these results support the argument that the mechanisms outlined by the literature (skills, machine sophistication, input quality and productivity) are major determinants of the wage premia prevalent in the data.

5 Conclusions

The motivating fact behind this paper is the potential wage gains from exports in developing countries. The argument is that export markets bring about opportunities for firms and that successful exporting firms translate some of the benefits of exports to workers via employment and wage premia. Using comparable data for 61 developing and low-income countries, we document the prevalence of the export wage premia worldwide. With an extensive literature review, we identify four major drivers of the wage premia: exporting firms hire more skilled workers, utilize more sophisticated machines, buy higher quality material inputs, and are more productive than non-exporting firms. Our empirical analysis confirms the worldwide prevalence of these mechanisms and, furthermore, establishes a strong link to the estimated wage premia.

While the existence of a wage export premia is well-known, our results provide additional evidence for a wide range of lower income countries uncovered by most of the current literature. In turn, our study of the mechanisms sheds lights on how exporting firms behave and how export opportunities abroad can be beneficial for workers at home. This should matter for our understanding of the boosters that allow for, and of the constraints that prevent, the realization of the gains from trade in general and of exports in particular.

References

Acemoglu, D. and F. Zilibotti (2001) "Productivity Differences," Quarterly Journal of Economics 116(2), 563.606.

Alvarez, R., and R. Lopez (2005). "Exporting and Performance: Evidence from Chilean Plants," Canadian Journal of Economics 38(4), pp. 1384–40.

Amiti, M. and D. D. R. Davis (2011). "Trade, Firms, and Wages: Theory and Evidence." Review of Economics Studies, vol 79, pp. 1–36.

Arnold, J., and K. Hussinger (2005). "Export Behavior and Firm Productivity in German Manufacturing: A Firm-Level Analysis," Review of World Economics 141(2), pp. 219–243.

Aw, B.Y. and G. Batra (1999). "Wages, Firm Size, and Wage Inequality: How Much Do Exports Matter?," in: Audretsch, D.B. and Thurik, A.R. (Eds.), Innovation, Industry Evolution, and Employment. Cambridge University Press, Cambridge, UK, pp. 13–56.

Aw, B.Y., M. Roberts and D.Y. Xu (2011). "R&D Investment, Exporting, and Productivity Dynamics," American Economic Review, Vol. 101(4), pp. 1312–1344.

Baldwin, R. and J. Harrigan (2011). "Zeros, Quality and Space: Trade Theory and Trade Evidence," American Economic Journal: Microeconomics, 3, pp. 60–88.

Bas, M. and V. Strauss-Kahn (2011). "Does Importing More Inputs Raise Exports? Firm Level Evidence from France," Review of World Economics, 1–35.

Bas. M. (2012). "Input-Trade Liberalization and Firm Export Decisions: Evidence from Argentina," Journal of Development Economics, Volume 97, Issue 2, pp. 481–493.

Bastos, P. and J. Silva (2010). "The Quality of a Firm's Exports: Where you Export to Matters," Journal of International Economics, vol. 82(2), pp. 99–111.

Bastos, P., J. Silva, and E. Verhoogen (2014). "Export Destinations and Input Prices: Evidence from Portugal," mimeo.

Baumgarten, D. (2013). "Exporters and the Rise in Wage Inequality: Evidence from German Linked Employer-Employee Data," Journal of International Economics, 90(1), pp. 201–217.

Bernard, A., and B. Jensen (1995). "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976–1987." In Brookings Papers on Economic Activity, Microeconomics: 1995, ed. G. L. Perry and W. C. Brainard, pp. 67–119. Washington, DC: Brookings Institution Press.

Bernard, A.B. and J.B. Jensen (1997). "Exporters, Skill Upgrading, and the Wage Gap," Journal of International Economics 42, pp. 3–31.

Bernard, A., and B. Jensen (1999). "Exceptional Exporter Performance: Cause, Effect, or Both?," Journal of International Economics 47 (1), pp. 1–25.

Bernard, A.B. and J.B. Jensen (2004). "Why Some Firms Export," Review of Economics and Statistics 86, pp. 561–569.

Bernard, A. and J. Wagner (1997). "Exports and Success in German Manufacturing," Weltwirtschaftliches Archiv, 133, pp. 134–157.

Bernard, A., B. Jensen, S. Redding, and P. Schott (2007). "Firms in International Trade," Journal of Economic Perspectives, Volume 21, Number 3, Summer 2007, pp. 105–130.

Bigsten, A., P. Collier, S. Dercon, M. Fafchamps, B. Gauthier, J.W. Gunning, A. Oduro, R., Pattillo, C. Oostendorp, M. Söderbom, F. Teal and A. Zeufack (2004). "Do African Manufacturing Firms Learn from Exporting?," Journal of Development Studies, 40(3), pp. 115–141.

Brambilla, I., R. Dix-Carneiro, D. Lederman, and G. Porto (2011). "Skills, Exports, and the Wages of Seven Million Latin American Workers," World Bank Economic Review, vol 26 (1), pp.34-60.

Brambilla, I. D. Lederman, and G. Porto (2012). "Exports, Export Destinations and Skills," American Economic Review, Vol. 102, No. 7, pp. 3406–3438.

Brambilla, I. and G. Porto (2014). "High-Income Export Destinations, Quality and Wages," mimeo University of La Plata.

Bustos, P. (2011). "Trade Liberalization, Exports and Technology Upgrading: Evidence on the impact of MERCOSUR on Argentinean Firms," American Economic Review, vol. 101(1), pp. 304–340.

Bustos, P. (2014). "The Impact of Trade Liberalization on Skill Upgrading. Evidence from Argentina," mimeo CREI.

Caron, J., T. Fally, and J. Markusen (2014). "International Trade Puzzles: A Solution Linking Production and Preferences," forthcoming in the Quarterly Journal of Economics.

Clerides, S. K., S. Lach, and J. R. Tybout (1998). "Is Learning By Exporting Important? Micro-Dynamic Evidence From Colombia, Mexico, And Morocco," The Quarterly Journal of Economics, 113(3), pp. 903–947.

Crino, R. and P. Epifani (2012). "Productivity, Quality and Export Behavior," Economic Journal, 122(565), pp. 1206–1243

Delgado, Miguel A., J.C. Farinas and S. Ruano (2002). "Firm Productivity and Export Markets: a Non-parametric Approach," Journal of International Economics 57 (2), pp. 397–422.

De Loecker, J. (2007). "Do Exports Generate Higher Productivity? Evidence from Slovenia," Journal of International Economics 73, pp. 69–98.

Egger, H. and U. Kreickemeier (2009). "Firm Heterogeneity and the Labor Market Effects of Trade Liberalization," International Economic Review, vol. 50, No. 1, pp.

Egger, H. and U. Kreickemeier (2010). "Worker-specific Effects of Globalisation," The World Economy, Wiley Blackwell, vol. 33(8), pp. 987–1005.

Egger, H. and U. Kreickemeier (2012). "Fairness, Trade, and Inequality," Journal of International Economics 86, pp. 184–196.

Farinas, J.C. and A. Martin-Marcos (2007). "Exporting and Economic Performance: Firm-level Evidence of Spanish Manufacturing," The World Economy 30 (4), pp. 618–646.

Feng, L., Z. Li and D.L. Swenson (2012). "The Connection between Imported Intermediate Inputs and Exports: Evidence from Chinese Firms," NBER Working Papers 18260, National Bureau of Economic Research, Inc.

Feenstra, R. and J. Romalis (2012). "International Prices and Endogenous Quality," NBER Working Paper No. 18314.

Flam, H. and E. Helpman (1987). "Vertical Product Differentiation and North-South Trade," American Economic Review, 77 (5), pp. 810–822.

Frias, J.A, D.S. Kaplan, and E.A. Verhoogen (2009). "Exports and Wage Premia: Evidence from Mexican Employer-Employee Data," mimeo Columbia University.

Fryges, H. and J. Wagner (2008). "Exports and Productivity Growth: First Evidence from a Continuous Treatment Approach," Review of World Economics 144 (4), pp. 695–722.

Görg, H., L. Halpern and B. Muraközy (2010). "Why Do Within Firm-product Export Prices Differ Across Markets?," Kiel Working Paper No. 1596.

Greenaway, D. and Z. Yu (2004). "Firm-level Interactions Between Exporting and Productivity: Industry-specific Evidence," Review of World Economics / Weltwirtschaftliches Archiv 140, pp. 376–392.

Hahn, C.H. (2004). "Exporting and Performance of Plants: Evidence from Korean Manufacturing," National Bureau of Economic Research, NBER Working Paper Series No. 10208.

Hallak, J. C. (2006). "Product Quality and the Direction of Trade," Journal of International Economics, 62, pp. 238–265.

Hallak, J. C. (2010). "A Product-Quality View of the Linder Hypothesis," The Review of Economics and Statistics, vol. 92(3), pp. 453–466.

Hallak, J.C. and J. Sivadasan (2013). "Product and Process Productivity: Implications for Quality Choice and Conditional Exporter Premia," Journal of International Economics, 91(1), pp. 53–67.

Hansson, P. and N.N. Lundin (2004). "Exports As an Indicator On or Promoter of Successful Swedish Manufacturing Firms in the 1990s," Review of World Economics / Weltwirtschaftliches Archiv 140, pp. 415–445.

Hummels, D. and P. Klenow (2005). "The Variety and Quality of a Nation's Exports," American Economic Review, 95 (3), pp. 704–723.

Iacovone, L. and B.S. Javorcik (2012). "Getting Ready: Preparation for Exporting," CEPR Discussion Papers 8926, C.E.P.R. Discussion Papers.

Isgut, A. (2001). "What's Different about Exporters? Evidence from Colombian Manufacturing," Journal of Development Studies 37 (5), pp. 57–82.

Johnson, R. (2012). "Trade and Prices with Heterogeneous Firms," Volume 86, Issue 1, pp. 43–56.

Kandilov, I.T. (2009). "Do Exporters Pay Higher Wages? Plant-level Evidence from an Export Refund Policy in Chile," The World Bank Economic Review, Vol.23, NO. 2, pp. 269–294.

Kugler, M. and E. Verhoogen (2012). "Prices, Plant Size, and Product Quality," Review of Economic Studies, vol. 79 no. 1, pp. 307–339.

Lileeva, A. and D. Trefler (2010). "Improved Access to Foreign Markets Raises Plant-level Productivity...for Some Plants," The Quarterly Journal of Economics, 125(3), pp. 1051–1099.

Liu, J.T., M.W., Tsou and J.K. Hammitt (1999). "Export Activity and Productivity: Evidence from the Taiwan Electronics Industry," Weltwirtschaftliches Archiv / Review of World Economics 135, pp. 675–691.

Lopez, R.A. (2009). "Do Firms Increase Productivity in Order to Become Exporters?," Oxford Bulletin of Economics and Statistics, 71, 5.

Manova, K. and Z. Zhang (2012). "Export Prices Across Firms and Destinations," Quaterly Journal of Economics, 127, pp. 379–436.

Marin.D. (1992). "Is the Export-led Growth Hypothesis Valid for Industrialized Countries?," Review of Economics and Statistics 74(4), pp. 678–88.

Matsuyama, K. (2007). "Beyond Icebergs: Towards A Theory of Biased Globalization," The Review of Economic Studies, 74 , pp. 237–253.

Meller, P. (1995). "Chilean Export Growth, 19701990: An Assessment," in: Helleiner, G.K. (Ed.), Manufacturing for Export in the Developing World. Problems and Possibilities. Routledge, London, pp. 21–53.

Mengistae, T. and C. Pattillo (2004). "Export Orientation and Productivity in Sub-Saharan Africa," IMF Staff Papers, Vol. 51, pp. 327–353.

Milner, C. and V. Tandrayen (2004). "The Impact of Exporting and Export Destination on Manufacturing Wages: Evidence for Sub-Saharan Africa," Review of Development Economics, 11(1), pp. 13–30.

Munch, J.R. and J.R. Skaksen (2008). "Human Capital and Wages in Exporting Firms," Journal of International Economics 75 (2), pp. 363–372.

Park, A., D. Yang, X. Shi, and Y. Jiang (2010). "Exporting and Firm Performance: Chinese Exporters and the Asian Financial Crisis," The Review of Economics and Statistics, vol. 92, No. 4, pp. 822-842.

Roberts, M.J. and J.R. Tybout (1997). "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," American Economic Review, 87, pp. 545–564.

Schank, T., C. Schnabel, and J. Wagner (2007). "Do Exporters Really Pay Higher Wages? First Evidence from German Linked Employer-Employee Data," Journal of International Economics 72 (1), pp. 52–74.

Schank, T., C. Schnabel and J. Wagner (2010). "Higher Wages in Exporting Firms: Self-selection, Export Effect, or Both? First Evidence from Linked Employer-Employee Data," Review of World Economics 146.

Schott, P. (2004). "Across-Product versus Within-Product Specialization in International Trade." Quarterly Journal of Economics, 119 (2), pp. 647–678.

Serti, F. and C. Tomassi (2008). "Self-Selection and Post-Entry Effects of Exports: Evidence from Italian Manufacturing Firms," Review of World Economics 144 (4): pp. 660–694.

Serti, F., C. Tomasi and A. Zanfei (2010). "Who Trades with Whom? Exploring the Links between Firms' International Activities, Skills, and Wages," Review of International Economics, 18(5), pp. 951–971.

Sinani, E and B. Hobdari (2010). "Export Market Participation with Sunk Costs and Firm Heterogeneity," Applied Economics, Vol. 42, No. 25, pp. 3195–3207.

Söderbom, M. and F. Teal (2000). Skills, Investment, and Exports from Manufacturing Firms in Africa," Journal of Development Studies 37 (2), pp. 13–43.

Tsou, M.W., J.T. Liu and C.J. Huang (2006). "Export Activity, Firm Size and Wage Structure: Evidence from Taiwanese Manufacturing Firms," Asian Economic Journal, 20(4), pp. 333–354.

Van Biesebroeck, J. (2005). "Exporting Raises Productivity in Sub-Saharan African Manufacturing Plants," Journal of International Economics 67, pp. 373–391.

Verhoogen, E. (2008). "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector," Quarterly Journal of Economics, Vol 123, No. 2, pp. 489–530.

Wagner, J. (2002). "The Causal Effects of Exports on Firm Size and Labor Productivity: First Evidence from a Matching Approach," Economics Letters, 77(2), pp. 287–292.

Wagner, J. (2007). "Exports and Productivity: A survey of the Evidence from Firm-level Data," The World Economy, 30(1), pp. 60–82.

Yeaple, S. (2005). "A Simple Model of Firm Heterogeneity, International Trade and Wages," Journal of International Economics, 65, pp. 1–20.

Zhou, L. (2003). "Why Do Exporting Firms Pay Higher Wages?," Mimeo, Emory University, Atlanta.

Table 1
Wage Export Premia Across Developing Countries

Country	Year	Exporting Firms			Wage Premium	
		sample size	share exporters	average exports	all firms	selected firms
All countries			0.34	0.53	0.31***	0.28***
Europe			0.32	0.46	0.20***	0.21***
Bulgaria	2007	497	0.45	0.57	0.23***	0.18***
Hungary	2005	271	0.52	0.43	0.09**	0.10***
Macedonia	2009	103	0.71	0.64	0.46**	0.61*
Moldova	2009	107	0.4	0.67	0.67***	0.85***
Romania	2009	107	0.33	0.73	0.12	0.1
Russia	2012	858	0.17	0.19	0.26**	0.40***
Ukraine	2008	368	0.29	0.5	0.21**	0.20*
Africa			0.28	0.53	0.22***	0.19***
Angola	2010	122	0.08	0.15	0.16	0.26
Botswana	2006	112	0.21	0.37	0.1	-0.06
Burundi	2006	102	0.05	0.31	0.41*	0.83***
Congo D.Rep.	2006	149	0.08	0.38	0.21	0.70***
Egypt	2004	954	0.24	0.37	0.19**	0.1
Ethiopia	2002	417	0.07	0.53	0.63*	1.10**
Ghana	2007	292	0.22	0.31	0.06	-0.03
Guinea	2006	135	0.2	0.24	0.14	-0.05
Ivory Coast	2009	175	0.16	0.46	0.77**	1.03***
Kenya	2007	396	0.43	0.32	0.07	0.04
Madagascar	2005	210	0.34	0.83	0.2	0.21
Mali	2007	234	0.12	0.38	0.57***	0.57***
Mauritius	2009	161	0.42	0.57	0.37	0.1
Morocco	2004	838	0.6	0.82	0.1	-0.01
Mozambique	2007	207	0.04	0.53	0.55***	0.35
Namibia	2006	104	0.33	0.39	0.35*	-0.26***
Nigeria	2007	948	0.03	0.28	0.40***	0.34***
Senegal	2007	156	0.14	0.4	0.42	0.49
South Africa	2003	554	0.61	0.23	0.27***	0.40***
Tanzania	2006	272	0.15	0.25	-0.08	0.21
Uganda	2006	307	0.17	0.37	0.35***	0.39***
Zambia	2007	237	0.1	0.15	0.47***	0.47***
Zimbabwe	2011	317	0.16	0.27	0.07	-0.05

Column (1): number of plants in the survey. Column (2): share of exporting firms. Column (3) average export participation in total sales, conditional on exporting. Columns (4): Wage Premium (percentage difference in wages of exporters and non-exporters, controlling for country-industry-year interaction effects) for all firms. Column (5): Wage premium for plants in Textiles, Garments, Food, Beverages, and Metals and Machinery.

Table 1
Wage Export Premia Across Developing Countries
(cont.)

Country	Year	Exporting Firms			Wage Premium	
		sample size	share exporters	average exports	all firms	selected firms
Latin America			0.36	0.34	0.38***	0.34***
Argentina	2010	671	0.55	0.25	0.31***	0.35***
Brazil	2003	1575	0.31	0.25	0.51***	0.50***
Chile	2004	688	0.43	0.38	0.26	-0.07
Colombia	2010	633	0.46	0.23	0.42***	0.36***
Costa Rica	2005	296	0.31	0.39	0.45***	0.51
Dominican Rep.	2010	113	0.36	0.53	0.17	0.21
Ecuador	2003	329	0.29	0.31	0.21	0.14
El Salvador	2003	465	0.45	0.47	0.39***	0.39***
Guatemala	2003	435	0.37	0.44	0.19	0.11
Honduras	2003	428	0.35	0.6	0.41***	0.47***
Jamaica	2010	109	0.28	0.34	0.32***	0.26
Mexico	2010	1062	0.34	0.28	0.44***	0.52***
Nicaragua	2003	452	0.26	0.52	0.1	0.03
Panama	2006	124	0.29	0.38	0.24	-0.02
Paraguay	2006	199	0.27	0.44	0.06	0.56
Peru	2010	619	0.47	0.4	0.52***	0.61***
Uruguay	2010	234	0.44	0.47	0.51***	0.38***
Asia			0.36	0.69	0.30***	0.29***
Azerbaijan	2009	109	0.18	0.35	0.09	0.12
Bangladesh	2002	980	0.43	0.9	0.1	0.05
China	2003	1309	0.25	0.5	0.42***	0.43***
India	2000	855	0.29	0.87	0.05	-0.02
Indonesia	2003	667	0.43	0.7	0.33**	0.49***
Kazakhstan	2005	244	0.14	0.28	0.19**	0.17**
Mongolia	2009	130	0.25	0.55	0.44*	0.75***
Nepal	2009	125	0.23	0.46	0.09	0.02
Pakistan	2002	910	0.18	0.85	0.28***	0.08**
Philippines	2003	665	0.39	0.78	0.62***	0.69***
Sri Lanka	2004	404	0.7	0.88	0.36**	0.34*
Thailand	2004	1385	0.62	0.62	0.29***	0.26***
Uzbekistan	2008	120	0.28	0.37	0.19	0.2
Vietnam	2005	1145	0.48	0.66	0.16**	0.27*

Column (1): number of plants in the survey. Column (2): share of exporting firms. Column (3) average export participation in total sales, conditional on exporting. Columns (4): Wage Premium (percentage difference in wages of exporters and non-exporters, controlling for country-industry-year interaction effects) for all firms. Column (5): Wage premium for plants in Textiles, Garments, Food, Beverages, and Metals and Machinery.

Table 2
Skill Utilization and Machine Sophistication
Exporting Firms' Premium

Country	Skill Utilization				Machine Sophistication			
	share skilled workers	share high school	manager with college	manager with pos-grad	capital labor ratio	ISO Certf.	New Tech.	R&D Spenging
All countries	0.91***	0.04***	0.17***	0.12***	0.44***	0.24***	0.11***	0.05***
Europe	1.99***	0.05***			0.45***	0.21***	0.04	0.16***
Bulgaria	0.95				0.26	0.17***		
Hungary	1.08	0.05***				0.13***	0.04	0.16***
Macedonia	1.72***				1.21***	0.37**		
Moldova	1.29*				0.95***	0.37***		
Romania	4.37*				0.54	0.09		
Russia	2.71***				0.39***	0.22***		
Ukraine	3.20***				0.94***	0.26***		
Africa	0.74***	0.01	0.19***	0.13***	0.17***	0.20***	0.15***	0.04***
Angola	1.76	-0.01			0.25	0.50***		
Botswana	1.63***				0.34	0.1		
Burundi	1.56				0.68	0.41		
Congo D.Rep.	-0.01				0.05	0.20**		
Egypt	0.67	0.04***	0.08***	0.03***	0.28	0.26***	0.17***	0.12***
Ethiopia	-0.05		0.22***		0.88**	-0.03*		0.14*
Ghana	2.46***				0.09	0.11		
Guinea	-0.17				0.21	0.16**		
Ivory Coast	0.75					0.16		
Kenya	-0.06				0.26***	0.24***		
Madagascar	-0.05	-0.06	0.37	0.14	-0.86	0.16*	0.27**	
Mali	-0.77***				0.59***	0.31***		
Mauritius	0.25				-0.56	0.18**		
Morocco	1.25**	0.01	0.24***	0.17***	0.07	0.11**	0.19***	0.04***
Mozambique	-0.59***				0.08	0.76***		
Namibia	0.61				0.23*	0.3		
Nigeria	1.01*				0.80***	0.31**		
Senegal	-0.15				-0.23**	0.19		
South Africa	1.28**	0.02	0.24***	0.19***	0.29	0.22***	0.04	0.16***
Tanzania	0.53				1.01***	0.04		
Uganda	0.21				0.70***	0.26***		
Zambia	1.61***				0.27	0.35***		
Zimbabwe	-0.08	-0.03			-0.39*	0.27***		

Export premium controlling for country-industry-year interaction effects. Variables: Share of skilled workers (Column 1); Share of workers with high school education or more (Column 2); Manager has a college degree (Column 3); Manager has post-graduate education (Column 4); log capital to labor ratio (Column 5); Indicator variable for ISO-certified products (Column 6); Indicator variable for whether new production technology was introduced in the past 3 years (Column 7); Indicator variable for positive R&D spending (Column 8).

Table 2
Skill Utilization and Machine Sophistication
Exporting Firms' Premium
(cont.)

Country	Skill Utilization					Machine Sophistication			
	share skilled workers	share high school	manager with college	manager with pos-grad		capital labor ratio	ISO Certf.	New Tech.	R&D Spenging
Latin America	0.65***	0.05***	0.25***	0.18***		0.52***	0.26***	0.09***	0.05***
Argentina	0.63***	0.10***				0.66***	0.36***		
Brazil	0.72***	0.04***	0.22***	0.19***		0.61***	0.22***	0.04	0.21***
Chile	0.60*	0.04	0.20***	0.17***		0.73***	0.35***	0.14***	0.13***
Brazil	1.34***					0.67***	0.24***		
Colombia	0.43***	0.04***				0.42***	0.41***		
Costa Rica	0.89*	0.08***	0.43***	0.30***		0.53***	0.26***	0.14**	0.10**
Dominican Rep	0.52	-0.20***		0.14	0.22**				
Ecuador	2.41*	-0.05***	0.08*	0.15***		0.77***	0.24***	0.11*	0.12***
El Salvador	0.51***	0.21***	0.35***	0.20***		0.62***	0.09***	0.17**	0.12***
Guatemala	0.11	-0.10***	0.29***	0.16***		0.08	0.01	0.18***	0.15*
Honduras	-0.04	0.15*	0.37***	0.15***		0.30**	0.06***	0.03	0.14***
Jamaica	-0.11	0.03				0.59*	0.13**		
Mexico	0.39***	0.09***				0.36***	0.34***		
Nicaragua	0.02	0.08	0.19***	0.14***		0.11	0.02	-0.04	0.08*
Panama	0.93					0.07	-0.01		
Paraguay	0.02					0.74***	0.14**		
Peru	0.22	0.02*				0.60***	0.31***		
Uruguay	0.52	0.08				1.11***	0.27***		
Asia	1.04***	0.05***	0.13***	0.08***		0.50***	0.27***	0.11***	0.07***
Azerbaijan	1.98					-1.03**	0.28***		
Bangladesh	2.62		0.06	0.01		0.08			0.04
China	0.02*		0.11***	0.09***		0.61***	0.18**	0.08	0.18**
India	1.38**		0.08*			0.11			
Indonesia	1.11	0.09**	0.28***	0.09***		0.76***	0.19***	0.08**	
Kazakhstan	3.47***	0.06					0.07***	0.02	0.04*
Mongolia	0.74					0.95**	0.45***		
Nepal	0.6					0.88**	0.08		
Pakistan	1.72**	0.05*	0.27***	0.25***		-0.14	0.45***		-0.0018
Philippines	2.25**		0.16***	0.12***		0.66***	0.21*	0.16***	0.15***
Sri Lanka	2.57	0.04*	0.06	0.01		0.05			0.02
Thailand	-0.07	0.04**	0.16***			1.22***	0.28***	0.14***	0.14***
Uzbekistan	1.3					-0.31	0.44***		
Vietnam	2.08***	0.0027	0.14***	0.02		0.04	0.25***	0.11**	0.07***

Export premium controlling for country-industry-year interaction effects. Variables: Indicator variable for imported inputs (Column 1); Percentage of inputs that are imported (Column 2); Indicator variable for some percentage of foreign ownership (Column 3); Indicator variable for more than 50 percent of foreign ownership (Column 4); Labor productivity defined as value added per worker (Column 5); Total factor productivity estimated by OLS (Column 6); Log sales (Column 7).

Table 3
Imported Inputs and Productivity
Exporting Firms' Premium

Country	Imported Inputs				Productivity		
	importer	share imported inputs	foreign	majority foreign	output per worker	TFP	log sales
All countries	0.27***	0.14***	0.17***	0.13***	0.53***	0.10***	1.86***
Europe	0.20***	0.14***	0.15***	0.11***	0.30***	0.08***	1.54***
Bulgaria	0.18***	0.17**	0.15***	0.11***	0.31***	0.10***	1.18***
Hungary	0.35***	0.23***	0.25***	0.22***	0.18***		1.58***
Macedonia	0.31***	0.15	0.20**	0.16**	0.53**	0.15	2.09***
Moldova	-0.01	0.03	0.32***	0.28***	0.17	0.01	1.98***
Romania	0.31***	0.35***	0.35**	0.27*	0.11	0.04	1.54***
Russia	0.17***	0.05	0.06***	0.03*	0.48***	0.11	1.52***
Ukraine	0.33***	0.24***	0.14***	0.14***	0.46**	0.15*	2.16***
Africa	0.31***	0.19***	0.16***	0.12***	0.32***	0.07***	1.49***
Angola	0.43***	0.23***	0.30*	0.11	-1.55**	-0.96	-0.49
Botswana	0.20***	0.35***	0.19*	0.20**	0.39*	0.15	1.57**
Burundi	0.25***	0.36**	0.14	0.18	0.99***	-0.08	2.74***
Congo D.Rep.	0.13	0.03	0.30*	0.31*	0.26	0.04	1.1
Egypt	0.44***	0.22***	0.07***	0.04***	0.63***	0.20***	1.91***
Ethiopia	-0.02	-0.15***	0.10**	0.10*	0.66**	0.12	1.76***
Ghana	0.30***	0.23***	0.09	0.05	0.08	0.07	0.89
Guinea	0.33***	0.13	0.10**	0.10**	0.2	0.03	0.75
Ivory Coast	0.19**	0.09	0.27***	0.22***			
Kenya	0.29***	0.22***	0.11***	0.07***	0.26	0.04	1.93***
Madagascar	0.19*	0.14	0.28***	0.27**	0.21	0.17**	1.45***
Mali	0.20**	0.1	0.06*	0.06*	0.34**	-0.05***	0.42
Mauritius	0.25***	0.15	0.25***	0.21***	0.52**	0.40***	1.85***
Morocco	0.32***	0.30**	0.19***	0.14***	0.06	-0.0008	1.13***
Mozambique	0.73***	0.54***	0.34	0.14	1.14***	0.06***	2.91***
Namibia	0.17**	0.27***	0.34***	0.25***	0.52***	0.02	1.54***
Nigeria	0.45***	0.17***	0.03	0.03	0.75***	0.11***	1.49***
Senegal	0.33***	0.18***	0.29***	0.18	0.48***	0.06	2.39**
South Africa	0.31***	0.06*	0.12***	0.10**	0.36***	0.06	1.45***
Tanzania	0.33***	0.17*	0.22**	0.14**	0.83***	0.31***	2.06***
Uganda	0.31***	0.13***	0.33***	0.30***	0.76***	0.02	2.26***
Zambia	0.45***	0.18	0.06	0.09	0.27***	0.01	1.48***
Zimbabwe	0.27***	0.15***	0.21***	0.03	-0.12	0.10**	1.64***

Export premium controlling for country-industry-year interaction effects. Variables: Indicator variable for imported inputs (Column 1); Percentage of inputs that are imported (Column 2); Indicator variable for some percentage of foreign ownership (Column 3); Indicator variable for more than 50 percent of foreign ownership (Column 4); Labor productivity defined as value added per worker (Column 5); Total factor productivity estimated by OLS (Column 6); Log sales (Column 7).

Table 3
Imported Inputs and Productivity
Exporting Firms' Premium
(cont.)

Country	Imported Inputs				Productivity		
	importer	share imported inputs	foreign	majority foreign	output per worker	TFP	log sales
Latin America	0.22***	0.10***	0.16***	0.12***	0.67***	0.13***	2.06***
Argentina	0.18***	0.06***	0.20***	0.17***	0.39***	0.05	1.74***
Brazil	0.23***	0.03**	0.09***	0.07**	0.92***	0.16***	2.05***
Chile	0.41***	0.14***	0.15***	0.11***	0.52	0.15	2.05***
Colombia	0.17***	0.06***	0.21***	0.13**	0.71***	0.11	2.17***
Costa Rica	0.40***	0.25***	0.20***	0.17***	0.85***	0.2	2.52***
Dominican Rep.	0.28***	0.15**	0.18**	0.18**	0.07	0.02	1.30***
Ecuador	0.11**	0.13***	0.15***	0.10**	0.68	0.20**	1.83***
El Salvador	0.35***	0.27***	0.12***	0.09***	0.68***	0.12	1.98***
Guatemala	0.41***	0.31***	0.16***	0.14***	0.42**	0.18***	1.94***
Honduras	0.27***	0.22***	0.20***	0.12	0.68***	0.18***	2.36***
Jamaica	-0.08	-0.02	0.22***	0.02	0.68**	0.01	1.93***
Mexico	0.31***	0.14***	0.18***	0.16***	0.66***	0.08	2.33***
Nicaragua	0.10*	0.05	0.14***	0.12***	0.28**	0.1	1.31***
Panama	0.23***	0.16***	0.13***	0.05	0.19	0.09	2.00***
Paraguay	0.05*	-0.06	0.14**	0.09**	0.96***	0.14	2.13***
Peru	0.10***	0.03	0.19***	0.14***	0.63***	0.05	1.98***
Uruguay	0.03	0.07	0.14**	0.09**	0.59**	0.03	1.62***
Asia	0.31***	0.16***	0.19***	0.14***	0.54***	0.10***	1.89***
Azerbaijan	0.32***	0.20*	0.03	-0.0023	-0.2	-0.13	1.40***
Bangladesh	0.15***	0.1	0.03	0.03	0.06	0.01	0.47
China	0.38***	0.13***	0.29***	0.20***			2.03***
India	0.13***	0.06***	0.03***	0.0017	0.15	0.18***	0.88***
Indonesia	0.53***	0.27***	0.27***	0.26***	1.35***	0.17***	4.02***
Kazakhstan	0.51***	0.30***	0.16***	0.04	0.47		1.83***
Mongolia	0.04	-0.14*	0.27***	0.19**	1.03***	0.2	1.54***
Nepal	0.29*	0.27***	0.06	0.03	0.09	0.06	1.93***
Pakistan	0.15***	0.04*	0.02	0.02	0.66***	0.40***	1.55***
Philippines	0.48***	0.40***	0.38***	0.30***	0.89***	0.07	2.60***
Sri Lanka	0.15	0.12	0.16**	0.12**	0.6	0.13*	1.28*
Thailand	0.32***	0.16***	0.28***	0.15**	0.68***	0.07**	1.77***
Uzbekistan	0.23	0.05	0.34***	-0.04	0.36	0.07	2.23***
Vietnam	0.25***	0.14***	0.15***	0.12***	0.26***	0.11	1.36***

Export premium controlling for country-industry-year interaction effects. Variables: Share of skilled workers (Column 1); Share of workers with high school education or more (Column 2); Manager has a college degree (Column 3); Manager has post-graduate education (Column 4); log capital to labor ratio (Column 5); Indicator variable for ISO-certified products (Column 6); Indicator variable for whether new production technology was introduced in the past 3 years (Column 7); Indicator variable for positive R&D spending (Column 8).

Table 4
Explaining the Wage Premium

Country	No Controls	Some Controls				Full Set of Controls			
		Labor	Technology	Imports	Productivity	Labor	Technology	Imports	Productivity
All countries	0.31***	0.31***	0.21***	0.17***	0.04***	0.31***	0.18***	0.11***	-0.02*
Europe	0.20***	0.20***	0.11**	0.07	0.01	0.20***	0.05	-0.01	-0.09*
Bulgaria	0.23***	0.22***	0.18**	0.17**	0.08	0.22***	0.16**	0.1	0.01
Macedonia	0.46**	0.48**	0.28*	0.06	0.06	0.48**	0.18	-0.02	-0.19
Moldova	0.67***	0.65***	0.43	0.45*	0.46*	0.65***	0.37	0.45	0.39
Romania	0.12	0.11	0.16	0.21	0.03	0.11	0.15	0.36	0.25
Russia	0.26**	0.24**	0.16**	0.14*	0.02	0.24**	0.14*	0.11	-0.06
Ukraine	0.21**	0.27**	-0.04	-0.17	-0.13	0.27**	-0.28	-0.42	-0.35
Africa	0.22***	0.22***	0.17***	0.14***	0.05*	0.22***	0.11***	0.07**	-0.01
Angola	0.16	0.34*	0.93**	0.64*	0.80***	0.34*	1.10***	0.91***	1.21***
Botswana	0.1	0.14	0.09	0.05	-0.07	0.14	0.06	0.0017	-0.07
Burundi	0.41*	0.3	-0.16	-0.23	-0.68*	0.3	-0.59***	-0.62***	-0.82**
Congo D.Rep.	0.21	0.21	0.21	0.19	0.09	0.21	0.14	0.1	0.05
Egypt	0.19**	0.19**	0.12	0.03	-0.13	0.19**	0.02	-0.06	-0.20**
Ethiopia	0.63*	0.63*	0.55	0.55	0.33	0.63*	0.56	0.55	0.31
Ghana	0.06	0.04	0.01	0.08	0.0035	0.04	-0.03	0.05	-0.03
Guinea	0.14	0.16	0.12	0.03	0.06	0.16	0.17	0.06	0.19
Kenya	0.07	0.07	-0.02	-0.07	-0.13	0.07	-0.11	-0.16	-0.15***
Madagascar	0.2	0.2	0.31	0.31	0.25	0.2	0.14	0.03	0.05
Mali	0.57***	0.56***	0.52***	0.47***	0.37***	0.56***	0.50***	0.45***	0.30**
Mauritius	0.37	0.35	0.32	0.4	0.21	0.35	0.48*	0.44**	0.31
Morocco	0.1	0.1	0.09	0.03	0.03	0.1	0.04	-0.07	-0.13***
Mozambique	0.55***	0.56***	0.41***	0.32***	-0.04	0.56***	0.45**	0.35	-0.06
Namibia	0.35*	0.33	0.2	0.11	0.03	0.33	-0.03	-0.03	-0.1
Nigeria	0.40***	0.40***	0.25***	0.34***	0.06	0.40***	0.22***	0.30***	0.05
Senegal	0.42	0.42	0.54	0.49	0.11	0.42	0.47	0.41	-0.16
South Africa	0.27***	0.27***	0.13***	0.09**	0.05	0.27***	0.08*	0.05	-0.01
Tanzania	-0.08	-0.1	-0.19	-0.25	-0.44***	-0.1	-0.2	-0.26*	-0.45***
Uganda	0.35***	0.35***	0.21***	0.16**	-0.04	0.35***	0.17**	0.08	0.0046
Zambia	0.47***	0.50***	0.35***	0.29	0.21*	0.50***	0.29	0.26	0.17
Zimbabwe	0.07	0.07	0.18	0.14	0.17*	0.07	0.15	0.1	0.15

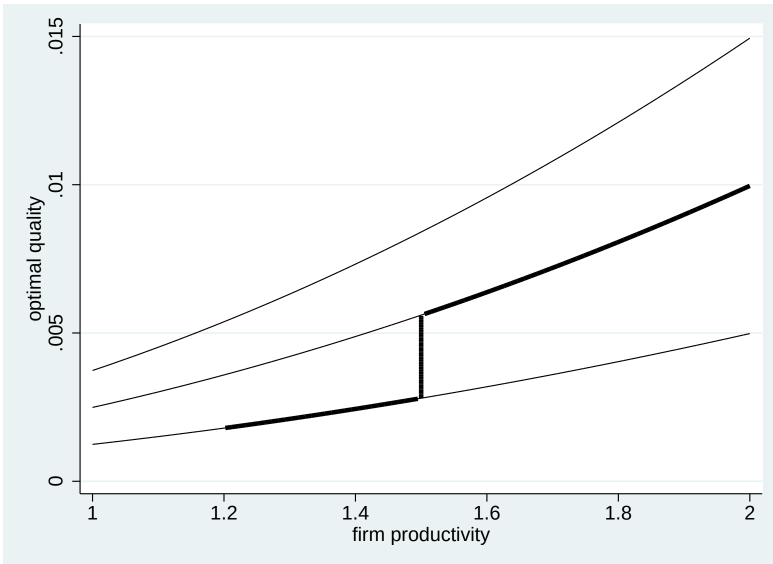
Wage export premium controlling for plant characteristics. Some controls: ratio of skilled workers, capital to labor ratio, imports of intermediate inputs, labor productivity. Full set of controls: ratio of skilled workers, capital to labor ratio, iso certification, imports of intermediate inputs, foreign ownership, labor productivity, log sales..

Table 4
Explaining the Wage Premium
(cont.)

Country	No Controls	Some Controls				Full Set of Controls			
		Labor	Technology	Imports	Productivity	Labor	Technology	Imports	Productivity
Latin America	0.38***	0.38***	0.26***	0.22***	0.03	0.38***	0.22***	0.17***	-0.03
Argentina	0.31***	0.30***	0.23***	0.22***	0.16***	0.30***	0.13**	0.09	-0.03
Brazil	0.51***	0.51***	0.38***	0.34***	0.07*	0.51***	0.28***	0.24***	-0.05*
Chile	0.26	0.26	-0.13	-0.16	-0.11***	0.26	-0.06	-0.12	-0.06
Colombia	0.42***	0.42***	0.35***	0.32***	0.11*	0.42***	0.23*	0.15	0.02
Costa Rica	0.45***	0.43***	0.37**	0.30**	0.02	0.43***	0.27	0.23	0.11
Dominican Rep.	0.17	0.20*	0.32**	0.22	0.21	0.20*	0.37**	0.25**	0.09
Ecuador	0.21	0.21	0.1	0.07	1.24***	0.21	0.06	0.04	1.18
El Salvador	0.39***	0.38***	0.29***	0.23**	0.09	0.38***	0.29***	0.20**	0.07
Guatemala	0.19	0.19	0.18*	0.11	0.02	0.19	0.18	0.12	0.01
Honduras	0.41***	0.41***	0.35***	0.29***	0.11	0.41***	0.37***	0.25***	0.07
Jamaica	0.32***	0.32***	0.17*	0.17*	0.07	0.32***	0.20**	0.14	0.01
Mexico	0.44***	0.43***	0.35***	0.28***	0.06	0.43***	0.27***	0.20***	0.01
Nicaragua	0.1	0.1	0.08	0.06	-0.03	0.1	0.08	0.0009	-0.09
Panama	0.24	0.34	0.04	0.03	-0.005	0.34	0.04	0.04	-0.21
Paraguay	0.06	0.06	0.12	0.12	0.11	0.06	0.05	0.06	0.01
Peru	0.52***	0.52***	0.36***	0.32***	0.15**	0.52***	0.30***	0.25***	0.06
Uruguay	0.51***	0.50***	0.20*	0.21	0.12*	0.50***	0.09	0.08	0.04
Asia	0.30***	0.30***	0.18***	0.12***	0.03	0.30***	0.16***	0.05	-0.04
Azerbaijan	0.09	0.08	0.12	0.05	0.08	0.08	-0.01	-0.01	-0.06
Bangladesh	0.1	0.12	0.11	0.1	0.1				
China	0.42***	0.35***	0.10*	-0.02	-0.03	0.35***	0.1	-0.09**	0.07
India	0.05	0.06	0.01	-0.0037	-0.05				
Indonesia	0.33***	0.31***	0.21	0.1	0.01	0.31***	0.1	-0.06	-0.22**
Kazakhstan	0.19*	0.19	0.41*	0.36*	0.17***	0.27	0.47	0.46	0.12
Mongolia	0.44*	0.42	0.2	0.2	-0.01	0.42	0.22	0.18	0.03
Nepal	0.09	0.06	-0.19	-0.27	-0.15	0.06	-0.19	-0.3	-0.27
Pakistan	0.28*	0.26*	0.30**	0.30**	0.16	0.26*	0.30**	0.30**	0.16
Philippines	0.62***	0.62***	0.42**	0.30**	0.14**	0.62***	0.42**	0.18*	0.04
Sri Lanka	0.36**	0.34**	0.30***	0.24***	0.15***				
Thailand	0.29***	0.29***	0.14***	0.09*	-0.06	0.29***	0.12**	0.03	-0.10**
Uzbekistan	0.19	0.14	0.15	0.07	0.23**	0.14	0.32	0.23	0.46
Vietnam	0.16**	0.15*	0.15**	0.11**	0.06	0.15*	0.13**	0.07	-0.02

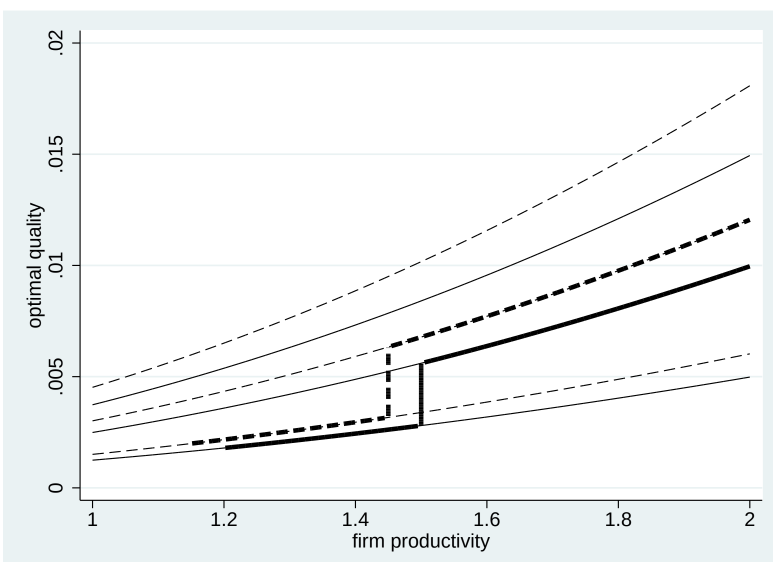
Wage export premium controlling for plant characteristics. Some controls: ratio of skilled workers, capital to labor ratio, imports of intermediate inputs, labor productivity. Full set of controls: ratio of skilled workers, capital to labor ratio, iso certification, imports of intermediate inputs, foreign ownership, labor productivity, log sales.

Figure 1
Optimal Quality and Productivity
(Given Capital K and Material Inputs M)



Note: Optimal quality as a function of productivity λ. Numerical solution of the model under the following parameter configuration: $\alpha = 1$, $\sigma^S = 0.5$, $\sigma^K = 0.3$, $\sigma^M = 0.1$, $\xi^S = 1$, $\xi^K = 1$, $\xi^M = 1$.

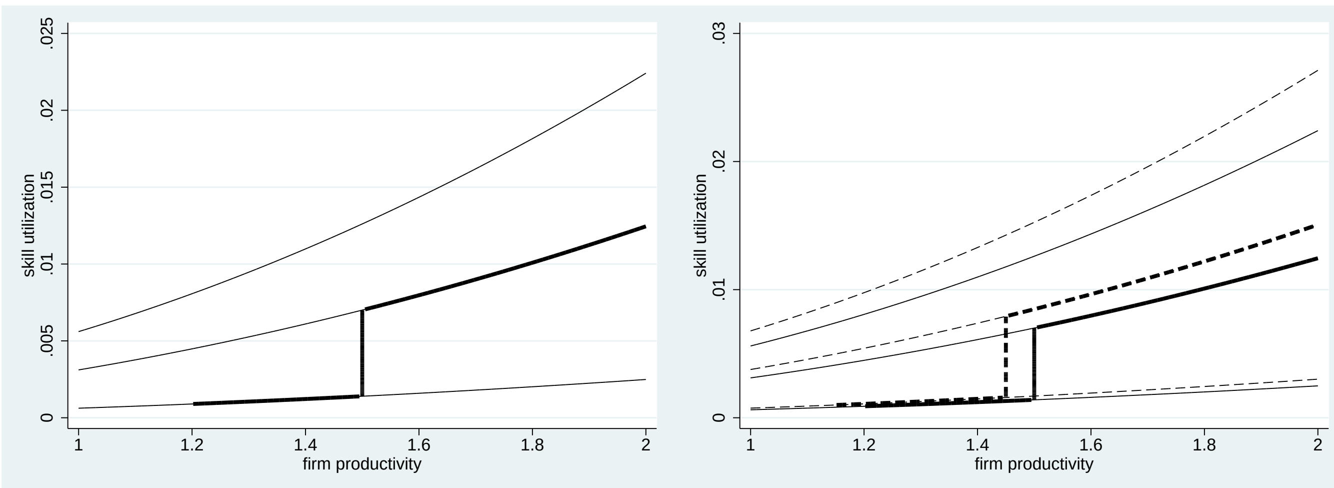
Figure 2
Optimal Quality and Productivity with Higher Capital
(Given Material Inputs M)



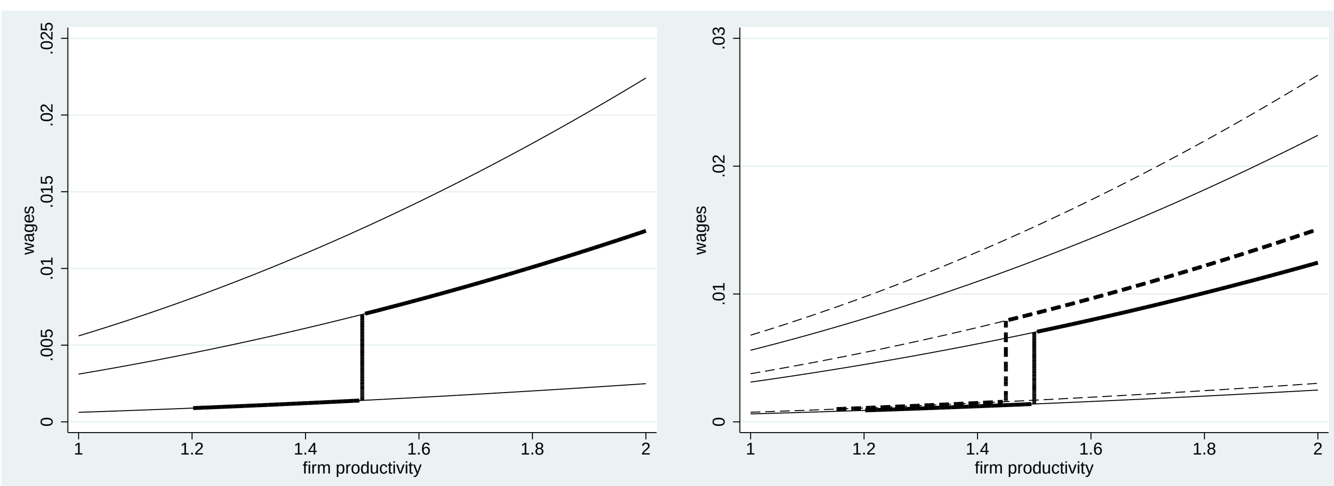
Note: Optimal quality and the impact of higher capital sophistication. Example from a numerical solution of the model under the following parameter configuration: $\alpha = 1$, $\sigma^S = 0.5$, $\sigma^K = 0.3$, $\sigma^M = 0.1$, $\xi^S = 1$, $\xi^K = 1$, $\xi^M = 1$.

Figure 3
Skill Utilization, Wages and Productivity
Effects of Higher Capital Sophistication

A) Skill Utilization

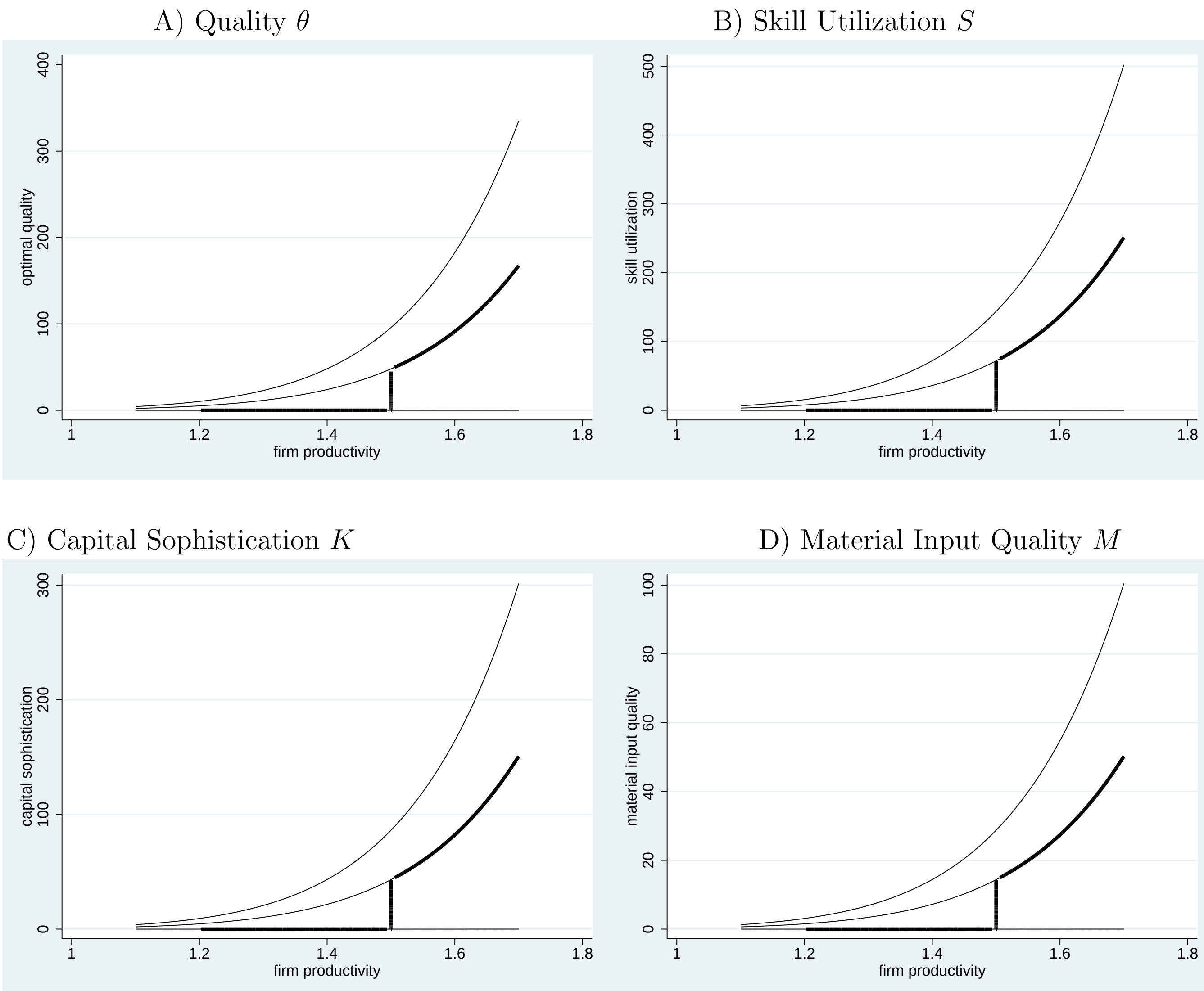


B) Wages



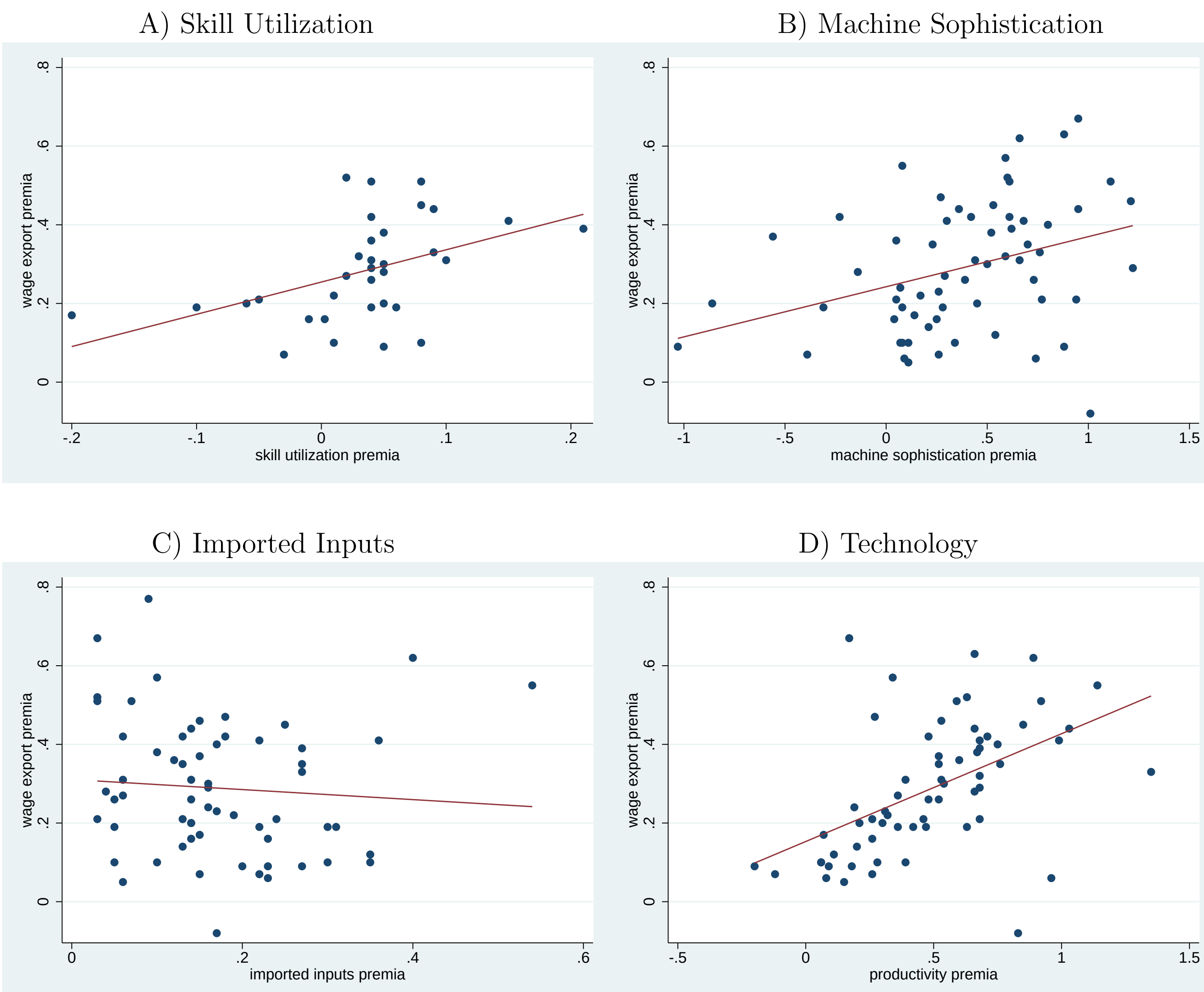
Note: Optimal skill utilization and equilibrium wages. Effects of higher capital sophistication on the right panels. Example from a numerical solution of the model under the following parameter configuration: $\alpha = 1$, $\sigma^S = 0.5$, $\sigma^K = 0.3$, $\sigma^M = 0.1$, $\xi^S = 1$, $\xi^K = 1$, $\xi^M = 1$.

Figure 4
Optimal Firm Choices
Quality, Skills, Capital Sophistication, Material Input Quality



Note: Optimal quality, skill utilization, capital sophistication and input quality as a function of productivity. The solid curve represents the average for the domestic and foreign markets. Examples from a numerical solution of the model under the following parameter configuration: $\alpha = 1$, $\sigma^S = 0.5$, $\sigma^K = 0.3$, $\sigma^M = 0.1$, $\xi^S = 1$, $\xi^K = 1$, $\xi^M = 1$.model.

Figure 5
Wage Export Premia
Cross-Country Analysis



Note: cross-country scatter plots and linear fits of the export wage premia and the skill utilization premia (panel A), the machine sophistication premia (panel B), the imported inputs premia (panel C) and the productivity premia (panel D). Based on coefficients estimated in Tables 1-3.