The Quality of Trade: Exports, Export Destinations, and Wages*

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Abstract

This paper explores the links between exporting firms and wages in Argentina. We claim that exporting per se may not be conducive to higher wages but that the destination of exports, especially exporting to higher income countries, is. We postulate a quality theory of export destination and wages, whereby exporting to high-income countries requires quality upgrades that are skill intensive and that lead firms to offer higher wages (especially for skilled workers). We test our theory using a panel of manufacturing Argentine firms. The data spans the period 1998-2000 and thus includes the Brazilian devaluation of 1999. We use the exogenous changes in exports and exports destinations brought about by this devaluation to identify the causal effect of exports and export destinations on wages. We find that only Argentine firms exporting to high-income countries paid higher average wages than domestic firms or firm focused on neighbor countries. We also find that this link between exporting to high-income countries and wages is present in sectors with a large scope for product differentiation. This lends strong support to the quality upgrading mechanism.

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Key Words: **exports to high-income countries, wage inequality**

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1 Introduction

In this paper, we explore, in detail, the link between exporters and wages. Bernard and Jensen (1995, 1999), and the large literature that blossomed afterwards, provides substantial evidence that exporters pay higher wages than non-exporters.[1] We offer three contributions to this literature: we establish causality from exporting to wages; we introduce a theory of export-driven wage inequality based on the destination of exports and the demand for quality; and we test the theory using Argentine data.

Our first contribution is to produce estimates of the causal effect of exporting on wages. The existence of a wage-premia for exporters is very well-documented—see, in addition to Bernard and Jensen (1995, 1999), Bernard and Wagner (1997), Isgut (2001), Bernard and Jensen (2004), Alvarez and Lopez (2005), Bernard, Jensen, Redding and Schott (2007), De Loecker (2007), Schank, Schnabel, and Wagner (2007). Noticeably, however, the issue of causality of exporting to wages is seldom directly addressed, with the exception of Verhoogen (2008).[2] By establishing mostly correlations rather than causality, this literature does not fully elucidate whether exports allow firms to pay higher wages or whether high-wage firms become exporters. We fill this gap by providing a set of instrumental variable estimates of the causal link of exporting to wages.

In our second contribution, we claim that export destination matters. We argue that while exporting by itself may not be enough to allow firms to pay higher wages, exporting to higher income destinations is. Our hypothesis implies that, for middle-income countries like Argentina—the target country in the empirical work— exporting to neighbor countries (Brazil) is not conducive to higher wages, but exporting to high-income countries (the US or the EU) is. Ours is a claim that "where you export" matters and it is related to the argument in Hausmann, Hwang and Rodrik (2005), who claim that "what you export" matters. If goods are differentiated by export destination, then "what you export" and

[1] They also perform better in various other outcomes: exporters are more productive, are larger (in sales and employment) and have higher labor productivity (value added per worker).

[2] There is, however, a much more developed literature on the causal effect of exports on productivity. See, for instance, Clerides, Lach, and Tybouts (1998); Pavcnik (2002); De Loecker (2007); Park, Yang, Shi, and Jiang (2008), among others.

"where you export" are clearly interrelated. But while Hausmann et al. look at growth impacts at the country level, we focus instead on wages at the firm level. This idea remains largely unexplored in the literature (see Milner and Tandrayan, 2007).

In our view, the leading theory of why exports matter for wages is provided by the work of Verhoogen (2008), who develops a trade theory to explain the increase in wage inequality observed in Mexico during the liberalization episode of the 1990s.[3] His argument is that exports require quality upgrading, which needs skilled labor. In consequence, trade liberalization increases exports, which increases product quality, which in turn increases the relative demand for skills. Verhoogen tests his theory by comparing changes in wages after a devaluation episode for firms with varying initial productivity. He finds that the changes in wages and in the skill composition of employment are higher for high-productivity firms, which are more likely to be exporters.

Our third contribution is to extend Verhoogen theory to accommodate for the role of export destinations in the quality upgrading story and to construct a better, more general test of his extended theory. Verhoogen theory has a demand component (exporting countries value quality more) and a technology component (more productive firms are more likely to produce higher quality goods). His empirical test, however, explicitly exploits only the technological component of the theory by linking changes in wages for firms with different initial levels of productivity. Further, Verhoogen test relies implicitly on "productivity" being the only driving factor behind exporting and omits other factors such as variation in the relative costs of exporting for different firms (as in the theory of Chaney, 2008). Our test is instead based on changes in wages and exogenous changes in the destinations of exports. It thus exploits both the demand and technology features of the model and offers a more general and robust test of the theory.

We work with 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, type of ownership, plant age, and other general characteristics of the firms (like industry affiliation). Using confidential

[3]Other explanations include profit sharing and unionization, labor turnover, and scale economies. See Section 2 for more details.

information, we matched the firms in the ENI with administrative customs data available for 1998, 1999 and 2000. This allows us to combine typical information from industrial surveys with export volumes *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 to where it exported.

Furthermore, our 1998-2000 data span the Brazilian devaluation of 1999, which provides a nice setting for identification. Brazil is a major trade partner with Argentina, and the 1999 devaluation had a large impact on Argentine exporters. Also, the devaluation produced an exogenous change in export destinations, out of Brazil and into high-income countries (and also into the domestic market). In our empirical model, we use this exogenous variability to identify the role of exports and export composition on wages and on the skill composition of employment in Argentina. More concretely, we set up an instrumental variable estimator of the changes in firm wages on both the export status and the export composition of each firm, using the changes induced by the Brazilian devaluation as instruments.

We find that, for Argentine firms, while exporting to high-income countries matters, exporting per se does not. Firms that tend to export more to high-income countries pay higher wages and hire a higher ratio of non-production to production workers 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 firm's outcomes for firms specializing in exporting to high-income countries. We also set up additional tests that provide strong support to the quality-upgrading mechanism of Verhoogen (2008). First, we find that the link between exporting to high-income countries and wages is present only in industries with a large scope for production differentiation and quality upgrades (based on Khandelwal, 2008 and Rauch, 1999). Second, the links tend to be stronger is smaller firms, rather than large firms, ruling out scale economies. Third, we cannot establish profit sharing in a context of a negative shock like the Brazilian devaluation.

The remainder of the paper is organized as follows. In Section 2, we provide some motivation and prima-facie evidence that exporting to high-income countries is correlated

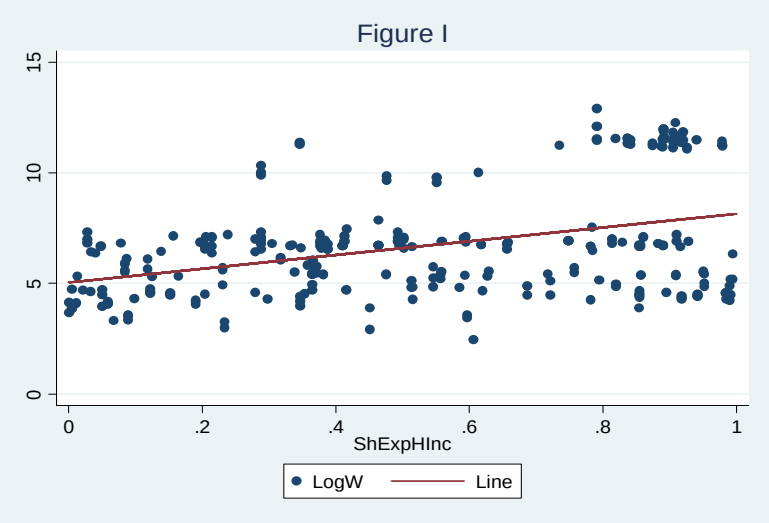
with wages across countries and we discuss models of export destinations and wages, emphasizing the quality upgrading mechanism. In Section 3 we lay out our empirical model, we discuss the identification strategy, and we present the main results. In Section 4, we assess the various mechanisms that can explain our findings. We include a sensitivity analysis in Section 5 and we conclud in Section 6.

2 Quality, Wages, and Export Destinations

Our claim is that exporting per se may not lead to higher wages but that the composition of exports, that is the destination of exports, matters more instead. In particular, we claim that exporting to *higher* income countries allows firms to pay higher wages. The argument that export destinations matters is quite novel in the literature, especially on wages.[4] Our intuition bears support from the cross country data that we present in Figure 1, which plots the relationship between the log of the average monthly wage and the share of exports destined to high-income countries. Data on wages come from the Occupational Wages Around the World (OWW) Database (Freeman and Oostendorp, 2000). It contains occupational wage data for 161 occupations and 49 industries in over 150 countries from 1983 to 2003. For the purpose of the graph, we use data for 2000, the year with the most complete sample. Because the original data is available in local currency units, we use the exchange rate data from the Penn World Tables to convert them to US dollars. Data on exports come from the COMTRADE database. As in the rest of this paper, we classify countries using the World Bank definition and include in our "High-Income" countries category those in the "Upper-Middle Income," "High-Income OECD," and "High-Income non-OECD" groups. Figure 1 reveals a positive link between the share of exports to high-income countries and average wages thus lending prima-facie support to our claim.

[4]There are various instances in which the importance of export destinations is implicit in the analysis as in the trade and growth literature, whereby exporting to the North could be more conducive to growth than exporting to the South.

Figure 1
The Data: Average Wages and Export Destinations



Note: The graph shows the cross-country correlation between the log of average monthly wages and the share of exports shipped to high-income countries. Data on wages come from the Occupational Wages Around the World (OWW) Database (Freeman and Oostendorp, 2000). Data on exports come from UN-COMTRADE. Countries are defined as "High-Income" using the categories "Upper-Middle Income," "High-Income OECD," and "High-Income non-OECD" from the World Bank classification.

2.1 The Theory: Quality and Export Destinations

The hypothesis that leads our empirical investigation is a quality theory of trade and wage.[5] The literature on the "quality of trade" is growing steadily. See Manasse and Turrini (2001), Hummels and Skiba (2004), Hummels and Klenow (2005), Hallak (2005), Verhoogen (2008), Hallak (2008), Hallak and Schott (2008), Hallak and Sivadasan (2008), Khandelwal (2008), and Kugler and Vergoohen (2008) among others. Our model combines elements from various papers in this literature to accommodate the role of export destinations in the theory of quality and wages.

We focus on the export behavior of Argentine firms and assume, for simplicity, that these firms face three types of markets (countries): the domestic market (Argentina), a Middle-Income neighbor (Brazil), and High-Income partners (the US and the EU). There are two major pieces in our model: a demand piece, that is, varying demand for quality for different trade partners; and a technology piece, that is, the characteristics of the technology

[5]This section needs more work. Very Preliminary

needed to produce quality.

The demand side of our model captures the notion that high income countries value high quality goods more than lower-income countries. Different utility functions generate this result. For instance, Manasse and Turrini (2001), Hallak (2005) and Hallak and Schott (2008), among others, use a modified CES function where quality enters as a utility shifter and thus consumers value quality directly and demand bundles of quantity and quality. Khandelwal (2008) and Verhoogen (2008) use instead a logit model of quality so that higher income consumers (and therefore countries) have a lower marginal utility of income and thus are willing to pay a "premium" for a good of given quality. In the end, this literature postulates an increasing relationship between income and quality demand. For now, we characterize this relationship with a parameter of the utility function, θ, that represents the valuation for quality. θ is an increasing function of income. For example, if there are three types of markets, High-Income countries (H), Middle-Income neighbor countries (M), and the domestic market (L), then $\theta_H > \theta_M > \theta_L$.

On the technology side, we need a model of quality production with explicit implications for wages and wage inequality. In Manasse and Turrini (2001), the production of quality requires "talent." Unskilled labor and raw materials determine quantities. In Verhoogen (2008), the production of higher quality requires higher quality inputs. Higher quality workers (both skilled and unskilled) and machines produce higher quality goods, and, in principle, this technology is skilled intensive so that higher quality requires a higher skill composition of the labor force.[6]

The production of quality for different destinations d is carried out in separate plants using the following production function

$$(1) \quad q_d = F\left(\lambda, L_d^s, L_d^u\right),$$

where L_d^s is skilled labor and L_d^u is unskilled labor. The parameter λ measures productivity

[6]This feature of the technology in the model of Verhoogen (2008) is a better fit for our purposes. In Manasse and Turrini (2001), for instance, one "talented" entrepreneur designs the quality of the good while the total quantity produced is determined by total employment of unskilled workers.

so that firms with higher λ can produce higher quality for given L^s and L^u. This is one source of firm heterogeneity that explains the exporting behavior of different firms. The standard formulation comes from Melitz (2003) and assumes heterogeneity in firm's productivity so that only more productive firms can pay the fixed cost of exporting.

The fact that a single attribute determines exporting behavior is problematic for our purposes because we need to be able to explain differences in export destinations, not only in exporting status. We need a second dimension of firm heterogeneity, an idea explored in Chaney (2008) and Hallak and Sivadasan (2008). Chaney works with heterogeneity in productivity as in Melitz (2003) and adds heterogeneity in bilateral fixed costs of exporting. In turn, Hallak and Sivadasan (2008) argue that firms differ both in "productivity" and in "caliber." Higher productivity allows firms to produce with lower variable costs; caliber allows firms reduce fixed costs.

To add another source of heterogeneity, we assume that firms also differ in the cost of exporting to different destinations (κ). Firms that produce for the domestic market incur a cost κ_L, those that target neighbor countries face costs κ_M and those exporting to high-income countries pay κ_H. Notice that, for simplicity, product lines are different for each destination.[7] These differences in export costs may refer to fixed costs (indicating that it is much costlier to establish operations in local markets than in Middle-Income countries, or in Middle-Income neighbor countries than in High-Income countries). They may also refer to variable costs like distribution costs and regulatory costs. For simplicity, in what follows we assume κ refers to variable per unit costs. Production of quality q then incurs a marginal costs for a firm exporting to destination d

$$(2) \quad c_d = w_d^s + w_d^u + \kappa_d,$$

where w_d^s and w_d^u are the wages paid to skilled and unskilled workers in line d.

To simplify the exposition, we assume that the market for unskilled labor is perfectly competitive and that exporting firms compete with outside sectors (non-tradable for

[7] This rules out cases where firms sell the same kind of good in Brazil as in the US. Accommodating those scenarios leads to a much less tractable model.

instance) for L^u. The prevailing wage is $\underline{w}^u$ for all d. Instead, skilled workers offer a wage quality schedule so that higher wages buy better quality skilled labor. We assume that

$$(3) \quad L_d^s = z^s(w_d^s - \underline{w}^s),$$

where w_d^s is the wage paid in the production line that satisfies destination d, $\underline{w}^s$ is outside wage paid to skilled workers, and z^s is labor supply shifter.

Profit maximization leads to the following relationship between quality q, productivity λ and export destinations θ and κ:

$$(4) \quad q_d = q_d(\lambda, \kappa_d, \theta_d ...)$$

Solving for the wage paid to skilled workers, we get:[8]

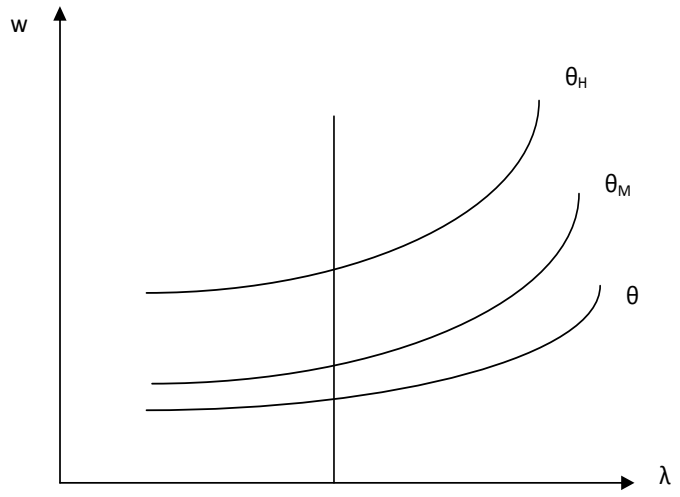
$$(5) \quad w_d^s = w_d^s(\lambda, \kappa_d, \theta_d ...)$$

Parameters λ and κ can be used to characterize firms. In Figure 2, for instance, we plot the wage paid to skilled workers employed in the different production lines destined to the home market and the two export destinations, middle income countries (θ_M) and high-income countries (θ_H). Wages are increasing in λ and, for a given λ, they are increasing in θ. Here, the distribution of κ play a role, because only firms with lower costs can afford to satisfy the high-income countries (for given productivity). The average wage is given by the weighted average of w^s, w_M^s and w_H^s. It follows that, for a firm with characteristics λ, average wages will be higher in firms that export to high-income countries. Furthermore, if the domestic economy is similar to the middle-income partners (as we claim below for Argentina and Brazil), then w^s will be close to w_M^s. In consequence, the average wage of firms exporting to Brazil may not be significantly different from the average wage paid by non-exporters, and wage differences will only be observed in firms that specialize in exporting to high-income countries.[9]

[8] The presentation of the solution of the model has to be improved. This will come soon.

[9] There are other mechanisms that could in principle explain a positive link between exporting to

Figure 2
Average Wages and Export Destinations



Note: The lines represent the relationship between wages and productivity λ for given κ.

3 Empirical Analysis

We turn now to our empirical analysis. We describe the data, we introduce the regression model and the identification strategy, and we present the main findings on the role of export destinations and wages in Argentina.

3.1 The Data

We use two main sources of data in our analysis: a firm survey and administrative customs information. The data at the firm level comes from the National Industrial Survey (Encuesta Nacional Industrial, ENI). The ENI collects information on employment, wages, production, value added, investment, input use, sales, foreign capital participation and ownership. The

high-income countries and wages in a country like Argentina. One explanation is "profit sharing." Firms that export to high income countries are likely to make extra-profits, which are shared with workers as in Abowd and Lemieux (1993), Blanchflower, Oswald and Sanfey (1996) and Budd and Slaughter (2004). It is also possible that exporting to developed countries is associated with higher wages to reduce labor labor turnover. This is an efficiency wages story, but it could also be interpreted as a dimension of quality because the firm needs to reduce labor turnover to guarantee timely delivery of goods and maintain product standards. Another theory due to Yeaple (2005) argues for higher wages due to scale economies attached to exporting (to different destinations). In this model, the size of the market and the scale of the firm determine the choice of technology and larger firms choose more skill intensive technologies that pay higher average wages.

ENI is a panel of manufacturing firms. Notice that, even though the ENI is a national survey, we only have the information for firms with plants in the Greater Buenos Aires (the major metropolitan area of the country).

The analysis spans the period 1998-2000.[10] Table 1 reports summary statistics from our ENI panel survey for each of the years in the period of analysis. In the surveys, firms report the total wage bill, which includes the total payment to workers of all types, production and non-production. Instead, firms separately report the total number of employees in each category. Our measure of average wages is just the total wage bill divided by total employment.

A first look at average wages confirms the stylized fact of this literature: Wages are higher in exporting firms. In fact, unconditionally, average wages are 72.7 percent higher at exporters in 1998, 67.1 percent higher in 1999 and 70.9 percent higher in 2000. The average wage remains relatively constant throughout the period (in real terms since the inflation rate was close to zero during 1998-2000).

Measured by total employment, exporters are almost three times as large as non-exporters over the whole period. There is a steady decline in average employment from 1998 to 2000, from 96 employees in 1998 to 89 in 1999 and to 83.1 in 2000. Employment is declining at both exporters and non-exporters. Comparing 2000 with 1998, employment at non-exporters declines proportionally more than at exporters (16 percent vs. 12 percent).

The skill composition of the labor force (the ratio of non-production to production workers) is higher at exporters in all three years. There are virtually no differences between the ratio of the number of skilled to unskilled workers (Sk/Unsk (total)) and the ratio of the amount of total hours worked by each group (Sk/Unsk (hours)). The skill composition is slightly increasing, both for exporters and for non-exporters.

As expected, exporters have a much larger share of foreign participation. Also as expected, plants tend to be a slightly older at exporters.

Table 2 reports the number of firms by industry in 1998 (using the ISIC Revision 2 classification at 2 digits). This information gives a sense of the type of industries involved

[10]This is because the customs data is only available for this period, see below.

in our analysis, an important part of the quality discussion of Section **??**. The survey only covers manufacturing plants so that we do not have any information on firms that produce primary products like agricultural commodities. Among manufacturing, the largest number of plants are in Food & Beverages (139), followed by Chemical Products (83), Textiles (68), Rubber & Plastic (67) and Metal Products (66). In contrast, there are very few firms in Coke & Refined Petroleum Products, Office, Accounting & Computing Machinery, or Radio, TV & Communication Equipment. As it will become clear below, there is a fair amount of exporters in the sample: almost 60 percent of the manufacturing firms of the Greater Buenos Aires are exporters.[11]

The second major source of data for our analysis comes from administrative customs records. In fact, we have confidential information that allows us to match the firms in the ENI with detailed customs data on export volumes by country of destination. The combination of these two sources of data makes up a rare panel of wages, exports, and export destinations by firm. In Panel B) of Table 1, we present two summary statistics from the combination of firm and customs data.[12] The proportion of exporters is very high across the whole period. From 60.3 percent in 1998, it declines slightly in 1999 (57.0 percent) and it recovers in 2000 (59.6 percent). However, the shares of exports in total sales are relatively small. Unconditionally, exports account for only 7-8 percent of the sales of a typical Argentine firm. Instead, for those actually exporting, exports account for about 13-14 percent of total sales. Although the structure of exporters/non-exporters for a given country depends on features like general openness, trade policies, etc., these figures are roughly in line with the observation that exports account for a small fraction of the action typically found in firm surveys like the ENI (see Bernard, Jensen, Redding and Schott, 2007).

[11] This is not surprising since the area concentrates a large fraction of the industrial activity of the country. Notice, however, that the Greater Buenos Aires manufacturing belt is presumably not comparable to other industrial belts in the country.

[12] See below for details on the destination of exports.

3.2 Exports, Export Destinations and Wages: The Model

To estimate the causal effect of exports and export destinations on wages, we set up the following model:

$$(6) \quad \ln w_{it} = \alpha_1 EXP_{it} + \alpha_2 ED_{it} + \mathbf{x}'_{it}\beta_1 + \phi_t + \phi_i + \epsilon_{it},$$

where w_{it} is the average wage paid by firm i at time t, EXP measures the export status of the firm, and ED measures the destination of exports. The vector $\mathbf{x}$ contains firm characteristics such as industry dummies, location dummies, indicators of whether the firm is foreign, the percentage of foreign ownership, firm size measured by the log of total sales, materials consumption as a proxy for productivity shocks, age of the plant. Controls for differential trends across time at the firm level are also included in $\mathbf{x}$ (by interacting initial sales with a time trend and year effects; see below for details). The error term includes a firm fixed effect ϕ_i, a year fixed-effect ϕ_t, and a random component ϵ_{it}.

We are interested in EXP and ED. Export status, EXP, is measured as the ratio of total firm exports in total sales. There are two reasons why we prefer the ratio of exports to sales to an exporter dummy to measure EXP. First, since the panel is short (from 1998 to 2000), there is limited variability in exporting status while there is more variability in export density. In consequence, the export dummy may be insignificant because of a lack of switching from exports to domestic market rather than because of the economic mechanisms that we explore in this paper. Second, the ratio of exports to sales is a better measure of export density. It captures the intensity of the exporting activities of a firms, vis-a-vis the domestic market, and thus can capture more details than the dummy. In addition, this measure of exposure responds less abruptly and with more flexibly to changes in the economic environment.

We turn now to the definition of ED, the destination of exports. Our claim is that, for countries like Argentina, the destination of exports matters and, in particular, that what exporting to High-Income countries matters the most. To capture this, we define ED as the share of a firm exports to high income destinations on total firm exports. ED is a measure

of the composition of exports that captures the impact of exporting to developed countries, *once the role of export status is accounted for.* As a result, in our regression model, the coefficient on ED indicates differences in wages for two firms, with similar sales and exports (the regression includes sales as a control), but one exporter specializing in low or middle income countries (including the domestic markets) and another exporting mostly to high income countries.[13]

In principle, equation (6) can be estimated with OLS and fixed-effects, and we will show these estimates shortly. But there are various reasons why the FE estimates can be biased. While the model accounts for time-invariant firm characteristics, there are many sources of unobserved time-varying heterogeneity. One such source is imports. If firms that export a lot are also firms that import a lot, then the role of exports may be confounded.[14] Another source of heterogeneity are productivity and costs shocks that could allow firms to enter or expand their export operations and pay higher wages at the same time. Finally, there are unobserved policy variables, such as changes in labor regulations, labor contracts, and union policies. If labor regulations change for different industries during this time interval, forcing firms to pay higher wages, failure to control for this may lead to biases in the impacts of export, especially if these changes in the regulatory environment affect exporters disproportionately. This could be a potentially serious problem because Argentina introduced significant labor regulations at the end of the nineties, the period under analysis. More generally, this applies to a whole set of policies and reforms and the impossibility to account for the impacts of simultaneous reforms (see Galiani and Porto, 2008).

Another reason for biases in OLS and FE is measurement error in EXP and ED. While it is possible to argue for the presence of measurement error in these variable because we are merging data from customs with a firm survey, there is an economically more serious version

[13]The same information could potentially be extracted by measuring ED as the share of exports to high income countries on total sales. However, this variable is very collinear with EXP, which we use to measure export status. In consequence, if we include both, the regression becomes unstable. Including only ED is not possible because then the model would confound the role of exports per se with the destinations of exports, the forces that we are trying to disentangle here.

[14]See Bernard, Jensen, Redding, and Schott (2007) for evidence that importers tend to pay higher wages than domestic firms. Furthermore, firms that are exporters and importers at the same time (possibly because of fragmentation of production) also tend to pay higher wages. We do not have information on imports per firm to control for this directly.

of the problem. Concretely, ED can be a noisy measure of the *role* of export destinations, especially in the short panel. In this case, identification comes from the comparison of changes in ED and changes in outcomes (wages). In principle, it is possible for ED to change due to non-behavioral reasons (for example due to liquidation of stocks) without thus a corresponding change in outcomes. In these cases, the changes in ED are a noisy measure of the changes in export destination due to behavioral responses, which are the changes that we care about. In the regression results below, we show that this is likely to be the case in our data.

Yet another reason for the existence of biases is reverse causality. If a fraction of the labor cost of the firm comes from non-tradable operations (like distribution), then high local costs may cause some firms to face a high wage bill and become uncompetitive in international markets, thus not being able to export much. Further, if a country like Argentina has to compete with low-wage countries like China for markets in developed countries, then high local costs can wipe out exports to high-income destinations.

Each of these stories, unobserved time-varying heterogeneity, measurement error, and reverse causality, may lead to biases in the estimates of exports to wages even after controlling for the firm fixed effects. To address these issues and the issue of causality, we follow an instrumental variable approach.

3.3 Overview of the Identification Strategy

There are two endogenous variables in our model: the destination of exports ED (the share of exports to high income countries on total firm exports), and export density or export status EXP (the share of exports on sales). To construct instruments, we need exogenous variation in these variables. To do that, our empirical strategy exploits the Brazilian devaluation of 1999.[15] This strategy has several advantages. First, Argentina and Brazil are major trade partners and the Brazilian devaluation had a large impact on Argentine exports. Second,

[15]There is an increasing 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 (1997) and Park et al. (2008). Changes in Brazilian tariffs due to Mercosur were used to identify impacts on Argentine firms in Bustos (2008). Verhoogen (2008) uses the own devaluation of Mexico to link exports to wage inequality.

the devaluation induced exogenous shifts in export intensity and in export destinations for Argentine products. In fact, as a result of the devaluation, we argue that Argentine firms cut sales in Brazil and expanded sales both domestically and in high-income, developed countries. This generates the exogenous variation in ED and EXP needed for identification. Third, the Brazilian devaluation had a differential effect on Argentine firms according to their exposure to trade with Brazil. Firms that specialized in exports to Brazil were more severely affected the Brazilian devaluation than other firms specialized in other markets instead (abroad or domestically). We can thus exploit these differences in intensity of exposure, too.

Before turning to the implementation of our IV strategy, we provide prima-facie evidence that supports our strategy. To do that, we look at Argentine export statistics by country of destination. We report data on aggregate Argentine trade from COMTRADE and also from the Customs data confined to manufacturing plants in Buenos Aires. Buenos Aires is one of the major industrial centers of the country and thus it is likely that aggregate exports closely track exports from this region.

Table 3 reports the main destination of Argentine exports from COMTRADE data for the period 1998-2000. In the pre-crisis 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 the crisis hit and Brazil devaluated, the share of exports to Brazil dropped to 28 percent. These shares partially recovered in 2000, reaching 31 percent. Consistent with our argument above, 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) instead. Notice that exports shares to neighbor countries also increased, especially to Chile, but to a smaller extent. The reason is that the Brazilian devaluation made Brazil more competitive, especially in the region.

This evidence suggests that, following the Brazilian devaluation, Argentine exports were diverted mostly to high income developed countries. To further verify this, we report at the bottom of Table 3 the share of exports destined to High Income countries (HI), which should be interpreted as the COMTRADE equivalent to the variable ED in the regression

model. To implement this, we use the World Bank classification (Low Income, Low Middle Income, Upper Middle Income, High Income Non-OECD, High Income OECD) and define two measures of ED. In our baseline model, we let High-Income exports (High-Income 1) include exports to Upper Middle Income, High Income Non-OECD and High Income OECD countries. For robustness and sensitivity, we use a variant of this definition, High-Income 2, that includes High Income countries (both Non-OECD and OECD) but excludes Upper-Middle Income countries. Consistent with the argument in our identification strategy, the share of exports to high-income countries increases from 43 percent in 1998 to 50 percent in 1999 and 51 percent in 2000.

While the discussion so far has focused on shares, and this is certainly an important aspect of our empirical strategy, we emphasize that the changes in the volumes of exports go in the right direction, too. In fact, the strategy works if the devaluation causes exports to HI countries to actually increase. In other words, the share of exports to high-income countries may increase simply because exports to Brazil decline more than exports to high income countries. Inspection of the trends in the volumes of exports in Table 3 confirms that this is not the case. While the volume of exports to Brazil declines, as expected, because the Brazilian market became much more competitive for Argentina firms, the volume of exports to United States increased significantly, as needed (from 1550.9 million dollars to 2187.1 millions). Incidentally, notice that total exports to the EU remained relatively constant, that exports to Uruguay and Paraguay declined because of increased Brazilian participation, and that exports to Chile also increased.

Overall, thus, the COMTRADE data provide strong prima-facie evidence of changes in the pattern of Argentine exports that supports our empirical strategy for identification, which uses the dynamics generated by the Brazilian devaluation for identification of the impacts of exports on wages.

3.4 Results

We begin our exploratory analysis of wages, exports and export destinations in Table 4, which displays OLS (first three columns) and fixed-effects (last six columns) estimates from

the log wages specification in (6). In Column (1), we include EXP (but exclude ED) in the model. We find that firms with higher ratios of exports to sales pay higher wages. Based on an unconditional exports to sales average ratio of around 8 percent, exporters pay 2 percent more than non-exporters. Using the average ratio conditional of being an exporter (13 percent), wages are 3.3 percent higher at exporters. A firm fully specialized in exports pay 25 percent more than a domestically specialized counterpart.

In Column (2), where we include ED, the destination of exports, but we exclude EXP, we find a positive and significant coefficient too. Firms exporting to high income countries at the unconditional average (30 percent) pay around 1.6 percent more than firms that either export to low income countries or not export at all. Firms that export to high income countries at the conditional mean (55 percent) pay instead almost 3 percent more. Finally, firms specialized in exports to high income countries pay 5.4 percent more than fully domestic firms.

In Column (3), we include both the export to sales ratio (EXP) and the "exports to high income" ratio (ED) in the same pooled OLS regression. We find that, in this model, the positive correlation between exports to sale and wages remains, while the positive association with the share to high income countries (HIE) is lost.

We now turn to fixed effects models. The FE models allow us to control for unobserved heterogeneity at the firm level and for exit and entry into export markets. (In the FE case, we don't have industry and location dummies and we drop time invariant firm level variables, like the age of the plant, that are also absorbed into the fixed effects). Results are reported in Columns (4)-(6) of Table 4. In all these models, both the ratio of exports to sales (EXP) and the share of exports to high income countries (ED) lose explanatory power once the fixed effects are included. In other words, once unobserved heterogeneity is accounted for, exporters do not appear to pay higher wages than non-exporters.

In Columns (7)-(9), we control for varying trends for firms with different initial conditions.[16] To do this, we interact the initial level of sales in 1998 with year dummies (we also tried with an interaction of initial sales in 1998 with a time trend with similar results).

[16]While these controls are useful per se, they play an important role in our IV strategy below.

As in the previous case, we never find a significant impact of either export status (EXP) or export destinations (ED) on wages. These findings are consistent with the notion that good firms become exporters, but exporters do not necessarily pay higher wages (Bernard and Jensen, 1999) or that firms that are to become exporters are more productive and more efficient, and thus can pay higher wages, but that once the exporter status is achieved those productivity advantages tend to disappear (Clerides, Lach and Tybout, 1998).

We now turn to our instrumental variable estimates. Based on the identification strategy outlined above (which argued that the devaluation induced, first, an exogenous shift of exports from Brazil to high-income countries and, second, a retrench into domestic markets), we build the following two instruments for export destinations (ED) and export status (EXP).

Our instrument for ED is $I_{it}^{ED} = Post_t * a_{i98}$, 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, a_{i98}, which measure exogenous exposure to the devaluation (since the 1998 shares a_{i98} precede the devaluation). The rationale for the instrument for ED is that, as documented in Tables 3 and **??**, following the devaluation, firms that were mostly exposed to the Brazilian devaluation had to adjust and had to move away from this market and to explore new markets in high income countries. We expect a positive correlation between the "scope to divert exports" and exports to high-income countries.

We adopt two specifications for $Post$. In the relatively more non-parametric model, we allow the impacts of the devaluation to vary from one year to the other (as the economy adjusts, exposure in 1999 is different from exposure in 2000). We thus interact the level of exposure to Brazil before the devaluation, a_{i98}, with a 1999 year dummy variable and a 2000 year dummy (so that, in practice there are two instruments). That is,

$$(7) \quad I_{it}^{ED_1} = \phi_t * a_{i98}.$$

In the second specification, we interact a_{i98} with the exchange rate of the Brazilian currency

to the US dollar in 1999 and 2000, $erate_{it}$:

$$(8) \quad I_{it}^{ED_2} = erate_{it} * a_{i98}.$$

To deal with the endogeneity of the ratio of exports to sales (EXP), we follow a similar strategy and define

$$(9) \quad I_{it}^{EXP_1} = \phi_t * b_{i98},$$

and

$$(10) \quad I_{it}^{EXP_2} = erate_{it} * b_{i98},$$

where b_{i98} is the share of exports to Brazil on total *sales*.[17] *Post* is defined as above, with year dummies for 1999 and 2000 in equation (9) and with the trend in the Brazilian exchange rate in equation (10). The rationale for this instrument is that I^{EXP} is a measure of the "scope for retrenchment into local markets." In consequence, firms with a larger pre-shock share of exports to Brazil on total *sales* had more possibilities to divert sales into the domestic markets (compared to other firms oriented towards non-Brazil markets). We expect a negative association between EXP and I^{EXP}.

Notice also that I^{ED} should be related to EXP and I^{EXP} should be related to ED in the first stage regressions. We expect I^{EXP} to be negatively correlated with ED because a higher scope for retrenchment into local markets limit the scope to divert exports to high income. In contrast, we expect I^{ED} to be positively correlated with export intensity EXP because a higher scope for export switching to high-income countries allow firm exports to remain high relative to sales (conditional of the other controls and instruments).

Good instruments have to be exogenous, help to explain the endogenous variables, and satisfy the exclusion restrictions. Our instruments satisfy all these conditions. First, the Brazilian devaluation generates exogenous variation in export status and export destinations.

[17]Notice the difference with a_{i98} in (7) or (8), which is the share of exports to Brazil on total exports. That is, a_{i98}=exports to Brazil/total exports but b_{i98}=exports to Brazil/sales.

The devaluation originates in a trading partner, Brazil, and the induced changes in export destinations are exogenous to the pre-shock shares of exports to Brazil.[18] 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 is exogenous. It is still possible to argue that the induced responses to the shock depend on initial conditions that also affect the firm choice of shares of exports to Brazil. To address this type of concerns, we control in our IV regressions for those initial conditions by adding the interaction of sales in 1998 with year dummies and trends (as in the fixed-effects specification of columns 7-9 of Table 4). Second, as argued above, the instruments are correlated with the level of exports and its composition/destination. Finally, the exclusion restrictions require that our instruments do not have an effect on wages beyond the indirect effect via exports and export destinations. One potential violation of the exclusion restrictions is given by the macroeconomic effects of the devaluation of a major trading partner. To account for this, we control for any direct effect of the devaluation with year effects.[19].

Tables 5 and 6 report results from the first stage regressions for the variables ED, the ratio of exports to high-income countries to total exports, and EXP, the ratio of exports to total sales, respectively. We begin with the instrumentation of ED in Table 5. In Column (1), we report the results from the first stage in which the instrument is built using initial shares in 1998 interacted with year dummies (equation (7)). The instruments work very well: They have substantial explanatory power and are statistically significant. The F-statistic of joint significance is very high, thus passing the Staiger and Stock (1997) test for weak instrumentation. Economically, the results imply that, following the Brazilian devaluation, firms with higher scope for export diversion indeed switched more to high income destination countries and firms with better scope for retrenching actually did that and thus switched less to high-income destinations.

In Column (2), we include year effects to account for the macroeconomic impacts of the

[18]Our approach is closer to Revenga (1992, 1997) and Park et al. (2008), who use combinations of the exchange rates of trading partners than to Verhoogen (2008), who uses the own Mexican devaluation.

[19]In effect, we are not interested in the impacts of the devaluation nor do we claim that we can identify that. Instead, the argument is that our strategy is to rely on the exogenous change in export destinations (towards high-income countries and also towards domestic markets) caused by the devaluation for identification

devaluation (and other time effects that affected all firms in the same fashion). Results are very close to those in Column (1), and we draw exactly the same positive conclusions on the instruments. While certainly the year effects are a crucial control in our regressions, we report here both specifications as an implicit (and informal) test of the exclusion restrictions. In other words, if the devaluation is having a direct effect on the changes in export behavior of Argentine firms and this response depends on the initial shares in 1998, then the coefficients attached to the instruments in the first stage should change when we move from column (1) to column (2). The fact that this is not happening lends support our approach and estimation strategy.[20]

In Column (3), we control for additional pre-devaluation differences across firms by including interactions of initial sales in 1998 with year dummies. This is to control, in the second stage, for unobservables that could determine the pre-shock shares a_{i98} and the subsequent responses to the shock. The first stage remains largely unchanged and the instruments appear valid and strong.

In Columns (4) and (5), we report results for the specification in which the instruments are built by interacting initial shares (a_{i98}) with the Brazilian exchange rate ($erate_{it}$) as in equations (8) and (10). In both columns, the model includes year effects and in column (5) we also add the initial conditions interacted with the year effects to control for differential initial trends. These instruments work very well, are jointly very significant, and there is no risk of weak instrumentation.

As a final robustness test, we run two more specifications. First, we run the model using year dummies to build the instruments but using the exchange rate as the interaction with the initial conditions. These are reported in column (6). Finally, in column (7), we use the Brazilian exchange rate to build both the instruments and the interactions with the initial conditions. The results are very robust and the instruments work well in each one of the models.

The instruments work well also in the first stage of the model for EXP, the export

[20]Notice that we cannot rule out a direct effect of the devaluation on export behavior. This is in fact captured by the year dummies. What matters for our strategy to work is that this is not confounding the changes in exports conditional on the initial shares.

intensity or status of the firm (measured by the ratio of exports to sales). Results are reported in Table 6. As before, the instruments have explanatory power, are statistically significant, and pass the weak instrumentation tests. Notice, however, that the models that use exchange rates to build the instruments (Columns (4), (5) and (7)) are somewhat weaker because I^{ED_2} (the share of Brazilian exports on sales interacted with the exchange rate) does not perform as well as before. The signs of the coefficients conform to our previous intuition. One the one hand, firms with more scope for retrenchment into local markets (higher I^{EXP}) did that an in consequence saw a decline in the ratio of exports to sales. On the other hand, firms with more scope for export diversion to high income countries were able to reach and maintain exports and thus retain a higher exports to sales ratio.

We now turn to the main results of the paper, the IV coefficients of exports and export destinations on wages. Results are reported in Tables 7 and 8 for different specifications. There are nine columns with results in Table 7). In the first six columns, the instruments are built with interactions of the initial shares in 1998 with year dummies (equations (7) and (9)). The first three models do not include year effects, which are then introduced in the second three models. This is done to informally test for the exclusion restriction.

The main results are as follows. In the models of columns (1) and (4), we include only EXP in the regression to find that exports have no discernible impact on wages, as in the FE model. Instead, in the models where only ED is introduced (columns (2) and (5)), exporting to high-income countries does cause firms to pay higher average wages. When both export intensity (EXP) and export composition (ED) are included, we find that exporting per se is not conducive to higher wages but exporting to high income countries is. Results are robust to the inclusion of the year effects. In the model with year effect, in column (6), the coefficient of ED is 0.305, indicating that a firm with the average shares of exports to high-income countries (30 percent) pays around 9.15 percent more than firms that do not export at all to developed countries. This is a significant result.

In columns (7)-(9), we reproduce the model with year effects (as in Columns (4)-(6)), but we use the instrument built with exchange rates interacted with initial shares (equations (8) and (10)). Results are robust to these alternative instruments. The ratio of exports to

sales is never significant and the ratio of export to high income on total exports is. The magnitudes of the coefficients are slightly smaller but pretty much comparable. In the last column, for instance, the coefficient of ED is 0.293 (compared to 0.305 in column (6)).

Before discussing the intuitions for our results, we first control for the role of differences in initial conditions. It is very important that we do this to rule out the role of unobserved factors that could simultaneously determine the choice of export shares to Brazil in 1998 and the subsequent response to the shock. Pre-devaluation productivity shocks or cost shocks that persist in time are leading candidates. Those unobservable could invalidate our IV strategy because they imply that a firm's ability to change export destinations may depend on the initial share exported to Brazil (in 1998). In other words, our assumption that, even though the choice of export markets is endogenous, the *change* caused by the Brazilian devaluation is not could fail if firms more exposed to Brazil are somehow more (less) able to change destinations. While this is unlikely to be an issue in practice, we can address it directly by including controls for these unobserved pre-shock differences that may drive the potentially endogenous responses.

Our results are robust to the controls for varying initial conditions. The results for the specification where instruments are built with dummies are in the first three columns of Table 8 and those when exchange rates are used are in the last three columns. The initial conditions are captured by interactions of sales in 1998 with year dummies (upper panel) or with the Brazilian exchange rate (the lower panel). EXP is never statistically significant, either when it is introduced as the only measure of exporting activity or as a complement to ED. In turn, ED is always significant and remains relatively stable across models. For instance, when the instruments are built with dummies and dummies are also used to construct the controls for the initial conditions, the IV estimate of α_2 is 0.311 (column (3) in upper panel). When the initial conditions use dummies but the instruments use exchange rates, the IV estimate is 0.319 (column (6) in upper panel). Conversely, when dummies are used to build the instruments but exchange rate are used to build the initial conditions, the coefficient is 0.331 (column (3) in lower panel). Finally, when exchange rates are used to build both instruments and initial conditions, our estimate is 0.318 (column (6) in lower panel).

We end with a discussion of our results. There are two key questions to answer. The first is why export composition or destinations ED is insignificant in the FE model but becomes significant in the IV model. A leading possibility is measurement error in ED. Suppose that, prior to the devaluation, Argentine firms trade a lot with Brazil and only a bit with High-Income countries. Suppose, in addition, that after the Brazilian devaluation shock, some firms respond only by liquidating stocks originally planned for Brazil. They do not adjust employment, employment composition or wages, but rather just get rid of stocks elsewhere. These firms would show a large switch in export destinations but little change in outcomes. Suppose, finally, that, at the same time, other firms adjusted behavior according to our theory, but that these adjustments are smaller. In this scenario, the impact of export destinations can disappear in a panel setting because changes in export destinations may not correlate with changes in wages (though they could in the OLS regression). This type of measurement error would wipe out any correlation in the FE model and the coefficient on export destinations can be artificially insignificant. Our IV strategy fixes this and recovers the positive impacts indicated by our theory. The second question is why ED is significant while EXP is not. The reason why exporting to high-income countries matters for Argentine firms is in Figure 2. The domestic market in Argentina may be relative similar to export markets in Brazil, for instance. In this case, the quality upgrading required to satisfy this market may be relative small, with little impacts on wages and on the skill composition of production. In contrast, exporting to high-income countries carries more significant upgrades that translates into higher average wages. In the next section, we elaborate on this.

4 Channels: The Quality-Upgrading Mechanism

The existence of a causal positive impact of export destinations on wages is in principle compatible with the different theories outlined in Section 2.1: quality upgrading, profit-sharing, efficiency wages and labor turnover, and scale economies. However, we claim here that the main contender to explain the patterns observed in the Argentine data is the quality-upgrading mechanism and we report various sets of qualitative evidence in support

of our claim. The quality theory of trade-induced wage inequality was first advanced by Verhoogen (2008), who also produced supportive empirical results for the case of Mexico and the Peso devaluation of 1994. We discuss the links between Verhoogen test and our below.

4.1 Quality Ladder & Product Differentiation Indices

We begin with various direct tests of the quality theory. If quality is the driving factor that explains why exporters to high-income countries pay higher wages, then these mechanisms should be much stronger in sectors with higher scope for quality upgrades. We test this by running our IV regressions after splitting the sample according to three indicators of industry potential for quality upgrading: i) the variance of the unit values in exports at the industry level (a measure of the degree of product differentiation in the sector); ii) Khandelwal (2008) index of the length of the quality ladder; iii) and the Rauch (1999) index of product differentiation.

We begin with unit values. Using data from COMTRADE, we calculated the mean and the variance of the unit values in each industry and defined industries as high-variance if the variance for an industry is above the 75th percentile. Results are displayed in Table 9. We report the estimates of the IV model that uses year dummies to build the instruments and that also controls for differences in initial conditions of the firm. The results are however robust to all the other specifications presented above. Consistent with Verhoogen's quality-upgrading mechanism, we find that exporters to high-income countries pay higher wages in high-variance industries but not in low-variance sectors.

In Table 10, we split the sample using the length of the quality ladder introduced by Khandelwal (2008). He calculates an index based on the estimation of demand equations that incorporates a valuation for quality. We defined sectors with "long" quality ladder if Khandelwal (2008) index is above the mean, and with "short" ladders in the opposite case. As before, we find a strong, positive, and statistically significant relationship between exporting to high-income destinations and wages in industries with "long" ladders, but in industries with "short" ladders. This is consistent with the quality theory, too.

All these tests provide strong support for the quality story. They do so directly, because the link between export destinations and wages is observed only in sectors with high scope for quality upgrades, a prerequisite for the theory to work. But they provide support indirectly as well because, in all the other explanations, there should not be any reason why the link shouldn't be present in low-quality sectors.

4.2 Skill composition

One manifestation of the quality theory is a higher demand for skill workers. The quality upgrades required to export to high-income destinations implies a higher skill composition of the labor force of high-income exporters. In what follows, we test this in the data. Notice that we do not have information on wages by skill levels but we do have the composition of skills of the firm's employment. We can thus ask whether exporters, and in particular exporters to high income countries, hire a different skill composition. To explore this idea, we run regressions of labor force composition on the share of exports to high income countries (ED) and the ratio of exports to sales (EXP). The model is

$$(11) \quad s_{it} = \alpha_3 EXP_{it} + \alpha_4 ED_{it} + \mathbf{x}'_{it}\beta_2 + \rho_t + \rho_i + \mu_{it},$$

where s_{it} is the ratio of non-production to production workers for firm i at time t and the rest of the variables are defined as before (with ρ_t being a year-effect and ρ_i being a firm-effect). OLS and FE results are reported in Table 11. In the OLS models, we find a positive association between export destinations and skill composition but we cannot find any link between export intensity and s. In the FE models, both EXP and ED become statistically insignificant. These results pretty much track those reported for wages.

In Table 12, we explore IV estimates using the same instruments as before, I^{ED} and I^{EXP}. In the top panel, we use the ratio of the number of non-production workers to production workers as a measure of s_{it}. Our results suggest that, as in the case of wages, whereas the ratio of exports to sales does not seem to have an effect on the composition of skills at the firm level, exporting to high income countries does matter. In fact, the intensity of use of

skilled labor in firms that export to high income countries is around 12 percent higher than in other firms. In the bottom panel of Table 12, we use the ratio of hours worked by each type of worker to measure s. Our findings remain unchanged. All these results provide further support to those hypotheses that require increases of the skill composition following exports (especially to high income countries), like the quality story.[21]

For completeness, we re-estimate the wage specification adding the skill composition as one of the regressors. We include, as before, both ED and EXP as explanatory variables, and we instrument them with I^{ED} and I^{EXP}. Results are reported in Table 13. We find that, first, the skill composition of the labor force is positively associated with the average firm wage. This just confirms that firms with a higher ratio of skilled workers face a higher wage bill. Export intensity, EXP, is never significant, as before. The main finding is, however, that ED, exports to high-income countries, remain statistically significant albeit with a smaller coefficient. This means that the destination of exports still determines wages, even after accounting for export intensity and for changes in the composition of skills. If the quality story works through higher s only, then this finding suggests additional channels in place, most likely a efficiency-wage, labor turnover story. As we pointed out before, however, this could be interpreted as another aspect of the provision of quality required to access markets in developed countries.

4.3 Scale Economies

Yeaple (2005) provides another theory to explain why exporting leads to higher wages. In his model, there are two types of technologies, a low-tech one with high variable costs and low fixed costs and a high-tech, with low variable costs and larger fixed costs. The high-technology requires more skills and thus firms (countries) that choose it hire a larger proportion of skilled workers and pay higher wages, on average. In the model, the scale of the firm determines the type of technology that it can profitable choose. Exports, in turn, determine the size of the firm. In the end, exporting firms pay higher wages and have a

[21] Notice that other explanations may also be consistent with higher skill composition so that, in terms of the behavior of s, they are observationally equivalent to the quality theory.

higher skill composition of the labor force.

We present two pieces of evidence in favor of the quality model of wage inequality in our case study. The scale-economies theory does not distinguish between exporting to middle-income countries or exporting to high-income countries. Our finding of different impacts across export destinations is thus inconsistent with the model. Also, we run our IV models splitting firms according to size. This is done in Table **??**. In Columns (1)-(3), we include all plants with total employment above the mean as large; in Columns (4)-(6), the cutoff is 20 workers; and in Columns (7)-(9), we reduce the cutoff to 15 workers. In all these exercises, we find that exports remain not significant while exporting to high-income countries seems to be relevant for smaller firms rather than larger firms. These results for Argentina are also not consistent with a trade theory of wage inequality based on economies of scale.

5 Sensitivity

Our results are robust to the definition of "high income" used to build ED. In the main text, we considered as "High-Income" all the countries in the Upper-Middle Income, and High-Income OECD and High-Income non-OECD groups of the World Bank classification. In our robustness tests, we keep only those countries in the High-Income groups (both OECD and non OECD). Table 15 reports IV results for three of the models, log wages (Columns (1) and (2)), skill composition (Columns (3) and (4)), and log wages after controlling for skill composition (Columns (5) and (6)). Our main conclusion that exporting per se does not really matter but exporting to high-income countries does remains unchanged. The impacts are instead much larger. For instance, in the model of wages, the coefficient on ED is 0.836 instead of 0.305. This is consistent with the our hypothesis because we expect larger quality upgrades to meet the requirements of consumers in these markets. Overall, thus, our results are robust.

6 Conclusions

Needs to be written.

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Table 1
Descriptive Statistics from Firm Survey
Argentina 1998-2000

	1998			1999			2000		
	All firms	Exporters	Non-Exporters	All firms	Exporters	Non-Exporters	All firms	Exporters	Non-Exporters
A) Firm Characteristics									
Log wage	6.91	7.10	6.55	6.92	7.11	6.60	6.93	7.11	6.57
Monthly wage	1005.8	1207.9	699.4	1014.4	1226.6	734.0	1019.2	1224.5	716.4
Employment	96.0	129.9	44.6	89.0	120.3	47.6	83.1	114.1	37.5
Sk/Unsk (total)	25.6	27.3	22.9	26.5	28.2	24.2	26.9	28.8	24.3
Sk/Unsk (hours)	25.4	27.0	23.0	26.4	28.0	24.2	27.2	29.1	24.3
Foreign share	11.8	18.3	1.9	13.0	21.3	2.2	13.5	21.7	1.4
Foreign dummy	0.14	0.23	0.02	0.15	0.25	0.02	0.16	0.26	0.02
Age	25.3	27.3	22.3	25.5	27.1	23.3	25.8	27.4	23.4
B) Exports									
proportion of exporters	60.3	–	–	57.0	–	–	59.6	–	–
share of exports on sales	7.9	13.2	–	7.3	12.9	–	8.3	13.9	–

Source: Own calculations based on firm data from the National Industrial Survey, Encuesta Nacional Industria, ENI.

Table 2
Distribution of Firms by Industry

	All firms	Exporters	Non-Exporters
Food and beverages	139	72	67
Textiles	68	38	30
Apparel	17	7	10
Leather and leather products	22	10	12
Wood, cork and straw products	20	5	15
Paper and paper products	31	20	11
Publishing, printing, media	27	10	17
Coke and refined petroleum products	4	4	
Chemicals and chemical products	83	73	10
Rubber and plastics products	67	42	25
Other non-metallic mineral products	61	29	32
Basic metals	34	20	14
Metal products	66	35	31
Machinery and equipment n.e.c.	82	62	20
Office, accounting and computing machinery	1	1	
Electrical machinery	56	37	19
Radio, TV and communication equipment	5	3	2
Medical, precision and optical instruments	13	11	2
Motor vehicles	44	30	14
Other transport equipment	14	7	7
Furniture; Other	47	27	20
Total	901	543	358

Source: Own calculations based on firm data from the National Industrial Survey, Encuesta Nacional Industria, ENI. Industries are classified according to ISIC Revision 2 (at 2 digits).

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 1	6512.3	0.43	6840.5	0.50	7265.8	0.51
High Income 2	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.

Table 4
Wage Regressions: OLS and FE

	OLS			FE					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EXP Exports/Sales	0.25***	–	0.23**	−0.07	–	−0.08	−0.08	–	−0.08
	(0.09)		(0.09)	(0.08)		(0.08)	(0.08)		(0.08)
ED High Income Exports	–	0.054*	0.038	–	0.016	0.017	–	0.015	0.016
		(0.032)	(0.032)		(0.019)	(0.019)		(0.019)	(0.019)
Log Sales	0.17***	0.17***	0.17***	0.060***	0.060***	0.060***	0.060***	0.060***	0.060***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Foreign Dummy	0.0032***	0.0033***	0.0032***	–	–	–	–	–	–
	(0.0004)	(0.0004)	(0.0004)						
Log Age	0.054***	0.057***	0.054***	–	–	–	–	–	–
	(0.018)	(0.017)	(0.017)						
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions × Year Effects	–	–	–	–	–	–	Yes	Yes	Yes
Number of firms				901	901	901	901	901	901
Observations	2502	2502	2502	2544	2544	2544	2544	2544	2544
R-squared	0.548	0.546	0.549	0.011	0.011	0.012	0.016	0.016	0.016

OLS regressions include year, industry and district effects.

Table 5
First Stage Regressions with FE. High Income Exports

	High Income Exports						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share BRA exports * 1999 ($a_{i98} * \phi_{99}$)	0.211***	0.226***	0.227***	–	–	0.225***	–
	(0.0398)	(0.0429)	(0.0445)			(0.0444)	
Share BRA exports * 2000 ($a_{i98} * \phi_{00}$)	0.244***	0.251***	0.247***	–	–	0.250***	–
	(0.0425)	(0.0464)	(0.0485)			(0.0473)	
Share BRA sales * 1999 ($b_{i98} * \phi_{99}$)	−0.284**	−0.279**	−0.278**	–	–	−0.279**	–
	(0.122)	(0.122)	(0.122)			(0.122)	
Share BRA sales * 2000 ($b_{i98} * \phi_{00}$)	−0.333***	−0.329***	−0.332***	–	–	−0.330***	–
	(0.127)	(0.127)	(0.128)			(0.128)	
Share BRA exports * erate ($a_{i98} * erate$)	–	–	–	0.397***	0.396***		0.396***
				(0.0665)	(0.0689)		(0.0689)
Share BRA sales * erate ($a_{i98} * erate$)	–	–	–	−0.503***	−0.503***		−0.504***
				(0.186)	(0.187)		(0.187)
Log Sales	0.0127	0.00925	0.00946	0.0101	0.0103	0.00928	0.0102
	(0.0178)	(0.0185)	(0.0184)	(0.0185)	(0.0184)	(0.0184)	(0.0184)
Year Effects	–	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions * Year Effects	–	–	Yes	–	Yes	–	–
Initial Conditions * Erate	–	–	–	–	–	Yes	Yes
Number of firms	901	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544	2544
R-squared	0.033	0.034	0.034	0.032	0.032	0.034	0.032
p-value	0	6.47E-09	1.72E-07	7.82E-10	1.77E-08	1.26E-07	1.79E-08

Source: ENI.

Table 6
First Stage Regressions with FE. Exports/Sales

	Exports/Sales						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share BRA sales * 1999 ($b_{i98} * \phi_{99}$)	-0.172^{**}	-0.173^{**}	-0.175^{**}	–	–	-0.175^{**}	–
	(0.0786)	(0.0788)	(0.0790)			(0.0789)	
Share BRA sales * 2000 ($b_{i98} * \phi_{00}$)	-0.234^{***}	-0.236^{***}	-0.238^{***}	–	–	-0.238^{***}	–
	(0.0890)	(0.0893)	(0.0894)			(0.0893)	
Share BRA exports * 1999 ($a_{i98} * \phi_{99}$)	0.00993	0.0102	0.00812	–	–	0.00794	–
	(0.0113)	(0.0117)	(0.0121)			(0.0121)	
Share BRA exports * 2000 ($a_{i98} * \phi_{00}$)	0.0422^{***}	0.0365^{**}	0.0343^{**}	–	–	0.0347^{**}	–
	(0.0142)	(0.0144)	(0.0148)			(0.0146)	
Share BRA sales * erate ($b_{i98} * erate$)	–	–	–	-0.331^{**}	-0.334^{**}	–	-0.334^{**}
				(0.129)	(0.130)		(0.130)
Share BRA exports * erate ($a_{i98} * erate$)	–	–	–	0.0314	0.0278	–	0.0278
				(0.0197)	(0.0204)		(0.0204)
Log Sales	0.0034	0.0055	0.0057	0.0056	0.0058	0.0057	0.0058
	(0.0083)	(0.0088)	(0.0088)	(0.0088)	(0.0088)	(0.0088)	(0.0088)
Year Effects	–	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions * Year Effects	–	–	Yes	–	Yes	–	–
Initial Conditions * Erate	–	–	–	–	–	Yes	Yes
Number of firms	901	901	0.029	901	0.024	901	901
Observations	2544	2544	2544	2544	2544	2544	2544
R-squared	0.027	0.029	901	0.023	901	0.029	0.023
p-value	0.00269	0.0178	0.0227	0.0386	0.0366	0.0158	0.0363

Source: ENI.

Table 7
Wage Regressions. IV with FE

	Log Wage								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exports/Sales	–0.008	–	–0.343	–0.013	–	–0.259	0.045	–	–0.075
	(0.506)		(0.478)	(0.534)		(0.513)	(0.545)		(0.495)
High Income Exports	–	0.341***	0.357***	–	0.295***	0.305***	–	0.291***	0.293***
		(0.105)	(0.111)		(0.102)	(0.107)		(0.110)	(0.110)
Log Sales	0.051***	0.054***	0.055***	0.06***	0.057***	0.058***	0.06***	0.057***	0.058***
	(0.019)	(0.019)	(0.018)	(0.021)	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)
Year Effects		–			Yes			Yes	
Instruments		Dummies			Dummies			Exchange rate	
Number of Firms	901	901	901	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544	2544	2544	2544

Source: ENI.

Table 8
Wage Regressions. Initial Conditions

	Dummy Instruments			Exchange Rate Instruments		
	(1)	(2)	(3)	(4)	(5)	(6)
Exports/Sales	–0.182	–	–0.396	–0.036	–	–0.141
	(0.529)		(0.523)	(0.515)		(0.491)
High Income Exports	–	0.296***	0.311***	–	0.317***	0.319***
		(0.101)	(0.103)		(0.110)	(0.109)
Log Sales	0.061***	0.057***	0.059***	0.061***	0.057***	0.058***
	(0.021)	(0.020)	(0.020)	(0.021)	(0.020)	(0.020)
Year Effects		Yes			Yes	
Initial Cond. * Year Effects		Yes			Yes	
Initial Conditions * Erate		–			–	
Instruments		Dummies			Exchange rate	
Number of Firms	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544
Exports/Sales	–0.069	–	–0.313	–0.032	–	–0.137
	0.557		0.505	0.513		0.494
High Income Exports	–	0.318***	0.331***	–	0.316***	0.318***
		0.102	0.105		0.109	0.110
Log Sales	0.06***	0.057***	0.058***	0.06***	0.057***	0.057***
	0.021	0.020	0.020	0.021	0.020	0.020
Year Effects		Yes			Yes	
Initial Cond. * Year Effects		–			–	
Initial Conditions * Erate		Yes			Yes	
Instruments		Dummies			Exchange rate	
Number of Firms	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544

Source: ENI.

Table 9
Scope for Vertical Differentiation. Variance in Unit Values

	High Variance			Low Variance		
Exports/Sales	–0.855		–1.089	0.038		–0.138
	(1.206)		(1.235)	(0.383)		(0.408)
High Income Exports		0.397**	0.422**		0.199	0.208
		(0.164)	(0.182)		(0.125	(0.132)
Log Sales	0.069**	0.054*	0.046	0.057**	0.06**	0.062**
	(0.033)	(0.032)	(0.035)	(0.028)	(0.028)	(0.029)
Year Effects		Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes	
Instruments		Dummies			Dummies	
Number of Firms	344	344	344	536	536	536
Observations	973	973	973	1506	1506	1506

Source: ENI.

Table 10
Scope for Vertical Differentiation. Length of Quality Ladder

	Long Quality Ladder			Short Quality Ladder		
Exports/Sales	0.455		0.093	–1.689		–1.564
	(0.443)		(0.43)	(1.394)		(1.49)
High Income Exports		0.342**	0.332**		0.142	0.097
		(0.147)	(0.162)		(0.122)	(0.177)
Log Sales	0.05	0.051	0.051	0.09***	0.077**	0.087***
	(0.033)	(0.032)	(0.033)	(0.032)	(0.030)	(0.034)
Year Effects		Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes	
Instruments		Dummies			Dummies	
Number of Firms	551	551	551	324	324	324
Observations	1562	1562	1562	906	906	906

Source: ENI.

Table 11: Composition of the Labor Force. OLS and FE

	OLS			FE					
Exports/Sales	–0.00851	–	-0.0207	-0.004	–	-0.00425	-0.00456	–	-0.00466
	[0.0367]		[0.0371]	[0.0282]		[0.0280]	[0.0283]		[0.0282]
High Income Exports	–	0.0288**	0.0302**	–	0.000955	0.00102	–	0.000336	0.000404
		[0.0133]	[0.0133]		[0.0110]	[0.0110]		[0.0110]	[0.0110]
Log Sales	0.0162***	0.0135***	0.0137***	-0.00192	-0.00195	-0.00193	-0.0016	-0.00162	-0.0016
	[0.00429]	[0.00440]	[0.00442]	[0.00784]	[0.00783]	[0.00784]	[0.00787]	[0.00786]	[0.00786]
Foreign Participation	0.000787***	0.000762***	0.000775***	–	–	–	–	–	–
	[0.000200]	[0.000196]	[0.000199]						
Log Age	0.00888	0.00868	0.00893	–	–	–	–	–	–
	[0.00702]	[0.00697]	[0.00702]						
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Initial Conditions * Year Effects	–	–	–	–	–	–	Yes	Yes	Yes
Number of firms				901	901	901	901	901	901
Observations	2502	2502	2502	2544	2544	2544	2544	2544	2544
R-squared	0.345	0.347	0.347	0.006	0.006	0.006	0.008	0.008	0.008

Source: ENI.

Table 12
Composition of the Labor Force. IV with FE

	Share of skilled workers					
	(1)	(2)	(3)	(4)	(5)	(6)
Exports/Sales	0.183	–	0.097	0.143	–	0.101
	(0.195)		(0.18)	(0.238)		(0.209)
High Income Exports	–	0.128***	0.124***	–	0.13***	0.129***
		(0.046)	(0.048)		(0.046)	(0.048)
Log Sales	–0.003	–0.003	–0.003	–0.002	–0.003	–0.004
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Year Effects		Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes	
Instruments		Dummies			Exchange rate	
Number of Firms	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544
	Share of hours worked by skilled workers					
Exports/Sales	0.175	–	0.106	0.136	–	0.103
	(0.185)		(0.188)	(0.233)		(0.226)
High Income Exports	–	0.100**	0.096**	–	0.106**	0.105**
		(0.043)	(0.042)		(0.045)	(0.043)
Log Sales	–0.004	–0.004	–0.005	–0.004	–0.004	–0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Year Effects		Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes	
Instruments		Dummies			Exchange rate	
Number of Firms	900	900	900	900	900	900
Observations	2540	2540	2540	2540	2540	2540

Source: ENI.

Table 13
Wage Regressions Controlling for Skill Composition

	Log Wage					
	(1)	(2)	(3)	(4)	(5)	(6)
Exports/Sales	–0.266	–	–0.442	–0.101	–	–0.188
	(0.474)		(0.476)	(0.487)		(0.469)
High Income Exports	–	0.235**	0.252**	–	0.255**	0.258**
		(0.101)	(0.103)		(0.102)	(0.102)
Log Sales	0.062***	0.059***	0.061***	0.062***	0.058***	0.059***
	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Skill Composition	0.472***	0.472***	0.471***	0.472***	0.472***	0.471***
	(0.092)	(0.091)	(0.087)	(0.096)	(0.091)	(0.088)
Year Effects		Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes	
Instruments		Dummies			Exchange rate	
Number of Firms	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544

Source: ENI.

Table 14
Drop 1999

	Log Wage			Skill Composition			Log Wage		
Exports/Sales	-0.135	–	-0.576	0.34	–	0.18	-0.31	–	-0.671
	0.712		0.684	0.249		0.237	0.63		0.632
High Income Exports	–	0.26	0.304	–	0.124	0.11	–	0.194	0.246
		0.116**	0.132**		0.048**	0.056**		0.115*	0.124**
Log Sales	0.071	0.066	0.077	-0.003	0.003	-0.001	0.072	0.064	0.077
	0.031**	0.028**	0.033**	0.011	0.008	0.011	0.029**	0.026**	0.030***
Skill Composition	–	–	–	–	–	–	0.52	0.523	0.526
							0.132***	0.121***	0.128***
Year Effects		Yes			Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes			Yes	
Instruments		Dummies			Dummies			Dummies	
Number of Firms	901	901	901	901	901	901	901	901	901
Observations	1683	1683	1683	1683	1683	1683	1683	1683	1683

Source: ENI.

Table 15
Alternative Definition of High Income Exports

	Log Wage		Skill Composition		Log Wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Exports/Sales	–	–0.338	–	0.121	–	–0.397
		(0.501)		(0.21)		(0.475)
High Income Exports (2)	0.809**	0.836**	0.341***	0.331**	0.645**	0.677**
	(0.330)	(0.353)	(0.128)	(0.137)	(0.318)	(0.329)
Log Sales	0.06***	0.062***	–0.002	–0.002	0.061***	0.063***
	(0.021)	(0.022)	(0.007)	(0.008)	(0.020)	(0.021)
Skill Composition	–	–	–	–	0.481***	0.48***
					(0.093)	(0.095)
Year Effects	Yes		Yes		Yes	
Initial Conditions * Year Effects	Yes		Yes		Yes	
Instruments	Dummies		Dummies		Dummies	
Number of Firms	901	901	901	901	901	901
Observations	2544	2544	2544	2544	2544	2544

Source: ENI.

Table 16: One Plant Firms Only

	Log Wage			Skill Composition			Log Wage		
Exports/Sales	-0.112	–	-0.448	-0.036	–	-0.139	-0.095	–	-0.396
	0.474		0.472	0.156		0.159	0.438		0.43
High Income Exports (2)	–	0.285	0.32	–	0.087	0.098	–	0.251	0.283
		0.113**	0.127**		0.045*	0.046**		0.114**	0.115**
Log Sales	0.042	0.039	0.047	-0.006	-0.007	-0.005	0.045	0.042	0.049
	0.020**	0.019**	0.022**	0.008	0.007	0.008	0.021**	0.019**	0.021**
Skill Composition	–	–	–	–	–	–	0.399	0.385	0.38
							0.089***	0.082***	0.084***
Year Effects		Yes			Yes			Yes	
Initial Conditions * Year Effects		Yes			Yes			Yes	
Instruments		Dummies			Dummies			Dummies	
Number of Firms	750	750	750	750	750	750	750	750	750
Observations	2117	2117	2117	2117	2117	2117	2117	2117	2117

Source: ENI.