The impact of trade liberalization on wage inequality: Evidence from Argentina*

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Abstract: Wage inequality in Argentina largely increased during the nineties. During this period, a rapid and deep process of trade liberalization has been implemented. In this paper we study whether trade liberalization played any role in shaping the argentine wage structure during the nineties. Specifically, we test whether those sectors where import penetration deepened are also the sectors where, *ceteris paribus*, a higher increase in wage inequality is observed. We find evidence that supports this hypothesis. However, similarly to what it has been found for some developed economies, trade deepening can only explain a relative small proportion of the observed rise in wage inequality.

Keywords: Wage inequality, trade liberalization and Argentina.
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1. Introduction

Argentina has taken swiping reforms at liberalizing trade at the beginning of the 1990s, reducing average tariffs and the percentage of domestic output covered by import licenses. Trade liberalization may have stimulated economic growth, but it may also have adversely affected workers in industries that experienced an increase in competition from goods produced abroad. In particular, it may have sharpened wage inequality.

In this paper, we investigate the impact of trade liberalization on wage inequality in Argentina during the nineties. We attempt to answer the following question: has trade liberalization played any role in shaping the argentine wage structure during the nineties? Specifically, we test whether those sectors where import penetration deepened are, *ceteris paribus*, the sectors where a higher increase in wage inequality has taken place.

Galiani (1999) shows that in Argentina, contrary to what has occurred in the OECD countries, it cannot be asserted that the returns to college graduates have increased during the eighties. It is only since the beginning of the nineties that there is clear evidence that the college wage premium increased. This evidence suggest that trade openness could have played a role in shaping relative wages in Argentina.

Several OECD countries have experienced an increasing dispersion of wages during the last two decades with the biggest rise in wage dispersion taking place by considerable distance in UK and US (see Nickell and Layard, 2000). In particular, in these countries, it is observed a large increase in the wage differentials by educational level (see Bound and Johnson, 1992; Katz and Murphy, 1992; Machin, 1996 and Schmitt, 1995).

There is widespread agreement on the fact that in developed countries there has been a shift in demand away from unskilled labor in favor of skilled workers during the last two decades. Two competing explanations have been proposed to explain this shift in the relative demand for skilled labor: the impact of trade with low wage (developing) countries and skill-biased technological change (see Berman et al., 1994; Berman et al., 1998; Machin, 1995 and Wood, 1995). A large amount of research has sought to evaluate both explanations with the result that the latter is often thought to be more important in explaining the relative shift in labor demand (see Feenstra, 1998) although most of the current research arrives at this conclusion indirectly: skill-biased technological change

must be present because both the relative wages and the employment of skilled workers moved in the same direction across industries.

The claim that trade is responsible for the increase in wage inequality stems largely from the model of Hesckscher-Ohlin. According to it, countries specialize in the production of those goods that use intensively the factors of production they are abundantly endowed with. Developed countries specialize in the production of goods that are intensive in skilled labor and developing countries in goods that are intensive in unskilled labor. International competition will lead to an increase in the relative wage of high-skilled labor in developed countries if and only if there is an increase in the relative price of the goods they specialize in (Stolper-Samuelson theorem). This simple prediction has been subject to a strong empirical analysis in recent years. Wood (1994), Sachs and Shatz (1994), and Leamer (1994, 1995) provided some evidence in favor of it. Still, these results are not widely accepted (see Lawrence and Slaughter (1993)).

Our analysis departs from the traditional trade literature: we do not take as our theoretical point of reference the general equilibrium framework of Hesckscher-Ohlin. This model assumes perfect intersectoral factor mobility implying that the wages of workers with the same endowment of human capital equalize across sectors. Therefore, under the assumptions of Hesckscher-Ohlin, there is no scope to identify the effect of trade deepening on relative wages using cross-industry data. However, there is ample evidence on the existence of inter-industry wage premiums (see, e.g., Dickens and Katz, 1886 and Krueger and Summers, 1989). Wage premiums may be attributable to compensating differentials, sector-specific human capital, or it just may be that industry affiliation is systematically correlated with unobserved worker attributes. Thus, following Lovely and Richardson (2000), we use a general form of compensating differentials that allows us to think about the effect of trade shocks on industry-specific return to skilled and low-skilled labor. Our analysis combines industry-level data with micro data obtained from the ongoing household survey.

We find that trade liberalization impacted greatly on trade flows, employment and relative prices. In particular, the manufacturing sector has faced strong competition from foreign markets as reflected by the significant increase in the import penetration ratios. Additionally, we observe a negative correlation between the relative prices of the

manufacturing goods and the level of import penetration of the respective manufacturing sector.

Given that the manufacturing sector in Argentina employs intensively unskilled labor, there is a strong presumption in favor of the hypothesis that a deep increase in foreign competition like the one observed in Argentina during the nineties would affect the wages of the unskilled workers more than the wages of the skilled workers. This assertion is confirmed by our statistical analysis. In particular, we find statistical evidence that shows that there is a positive and significant association between the rise in import penetration ratios and the rise in the college wage premium, a phenomena that characterizes the evolution of wages in Argentina during the nineties. However, similarly to what have been found for some developed economies, trade deepening can only explain a relative small proportion of the observed rise in wage inequality.

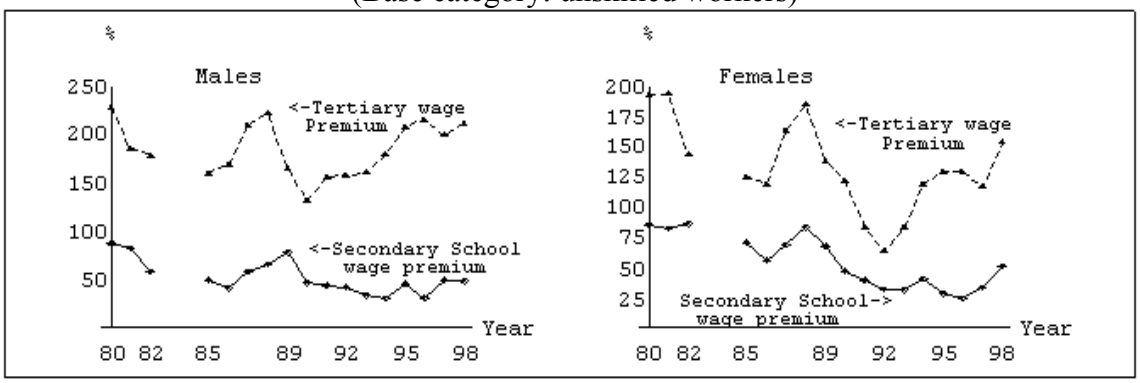
The rest of the paper is organized as follows. Next section documents the trends in wage inequality in Argentina since the eighties. Section 3 describes the main features of Argentina's trade liberalization process. In section 4, we provide a theoretical framework to motivate the empirical work we present in section 5, where we test whether trade openness had any impact on wage inequality in Argentina during the nineties. Finally, section 6 concludes the paper.

2. Trends in wage inequality

In this section, we study the recent evolution of relative wages in Argentina. Actually, the empirical evidence available is from Greater Buenos Aires, the main urban agglomerate.[1] We analyze the evolution of wages by educational attainment levels and for that, we define the ensuing three skill groups: unskilled (those individuals who at most have attended high school but have not finished it), semi-skilled (those that have finished high school) and skilled workers (those that have finished a tertiary degree). We exclude self-employees, owner-managers and unpaid workers since we are only interested in the changes in the wage structure. Figure 1 shows the evolution of the wage premiums for the period 1980-1998.

1. This market covers approximately half of the labor force of the country.

Figure 1: Wage Premiums
(Base category: unskilled workers)



Notes: The figures report the evolution of the educational wage premia by gender. These statistics are derived from the coefficients of a wage equation where the dependent variable is the logarithm of the hourly wages and among the covariates there is a set of educational dummies and a quadratic function in potential experience. The equations are estimated separately by gender. The dependent variable is the logarithm of the hourly earnings of the sampled individuals in their main occupation. For employees, this variable is equivalent to the hourly wages. The yearly data is taken from the October wave of the Household survey for Greater Buenos Aires (GBA). There are not data tapes available for the years 1983 and 1984.

The main changes in the wage structure are the following: the wages of the semi-skilled group have deteriorated relative to the wages of the unskilled group. Additionally, the unskilled group has not seen its wages deteriorate relative to the wages of the skilled workers. Nevertheless, during the nineties, we find a rather different picture. The wages of the semi-skilled group did not deteriorate relative to the wages of the unskilled group while both the unskilled and semi-skilled wages deteriorated relative to the wages of the skilled group, mainly since 1992. Indeed, the skilled-unskilled wage premium increased substantially during the nineties. In order to quantify the magnitude of these changes, we estimate the change per year in the wage premium of the skill groups plotted in Figure 1. Table 1 shows the results. We estimate that the male college wage premium raised 10 percentage points per year during the nineties. A similar trend is found for the female college wage premium during this period. We do not find that the secondary school wage premium has changed during the nineties, even though it has declined when the whole period is considered. Lastly, it is worth nothing that the trends depicted here, especially during the nineties, do not differ significantly by gender.

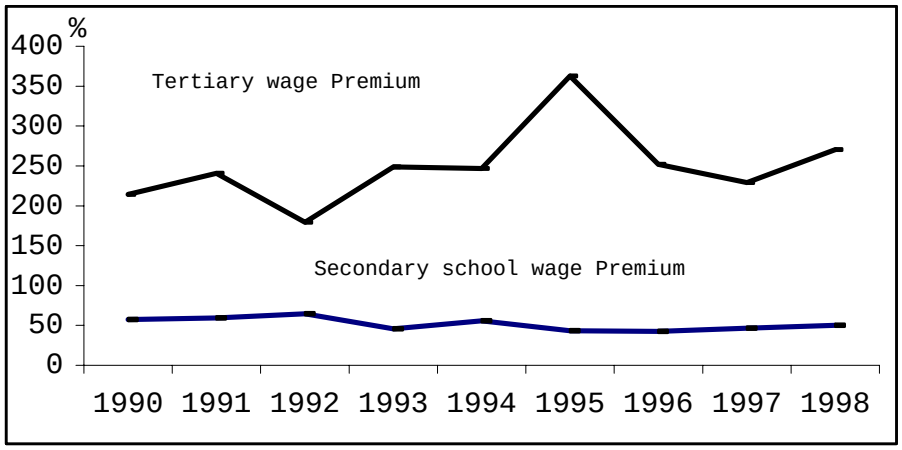
Table 1: Fitted Time Trends by Schooling Group

Fitted variable: Wage Premiums by Schooling Group

Time period	Semi-skilled group		Skilled group	
	Males	Females	Males	Females
80-98	-2.11 ***	-3.37 ***	0.23	-3.41 ***
	(0.54)	(0.50)	(1.20)	(1.37)
90-98	0.25	-0.38	10.1 ****	6.7 **
	(1.03)	(1.21)	(1.47)	(2.2)

Notes: The time trend takes the values t = 1,2,3,6,7,…,19. Standard errors are in parenthesis. *** if the coefficient is statistically different from zero at the one percent significance level. ** if the coefficient is statistically different from zero at the five percent significance level.

Figure 2: Wage Premiums in the Manufacturing Sector
(Base category: unskilled workers)



Notes: The figure reports the evolution of the educational wage premia in the manufacturing sector. These statistics are derived from the coefficients of a wage equation where the dependent variable is the logarithm of the hourly wages and among the covariates there is a set of educational dummies, a quadratic function in potential experience and a gender dummy. The dependent variable is the logarithm of the hourly earnings of the sampled individuals in their main occupation. The yearly data is taken from the October wave of the Household survey for Greater Buenos Aires (GBA).

Finally, we study the evolution of the wage premiums for the manufacturing sector during the nineties. Due to sample size considerations, we only present the average wage premium by skill group. Figure 2 shows that the trends we observe in the manufacturing sector during the nineties are very similar to those we observe for the whole economy. We find a positive and statistically significant trend in the college wage premium. On average, it has increased approximately 7 percentage points per year during the nineties while we do not find any statistically significant trend for the secondary school wage

premium.[2] Thus, overall, we conclude that during the nineties, the trends in relative wages in the manufacturing sector are similar to those found for the whole economy.

3. Trade liberalization, trade flows and employment

During the early nineties Argentina undertook a broad program of trade liberalization through policies applied unilaterally, regionally and within the multilateral negotiations at the General Agreement on Trade and Tariffs (GATT). Trade liberalization started gradually as a unilateral policy in 1988 but took a strong impulse only since 1990. The program included both a reduction in nominal protection and a significant reduction of tariff positions that were subject to quantitative restrictions. By the end of 1991, nominal tariffs had been lowered to an average level of 10 percent and all import licenses had been eliminated. Overall, the average external tariff in Argentina was reduced from a level of 45 percent in 1988 to around 12 percent in 1991.

Unilateral tariff liberalization was complemented with regional trade liberalization through the establishment of the Mercosur treaty in 1991, which aimed at the constitution of a Custom Union among the southern cone countries (Argentina, Brazil, Paraguay and Uruguay). The treaty established free trade within the region while extra region common tariffs were set between 0 and 20 percent. Nevertheless, Argentina already had an average level of external tariffs that was close to the average tariff agreed in the Mercosur treaty. Thus, Mercosur mainly enhanced free trade within the region.

Trade liberalization significantly impacted trade flows. Total trade rose almost four times between 1990 and 1998 nearly doubling its share in GDP: from approximately 10 percent to 18 percent. Trade data disaggregated by industry shows that since 1990 most manufacturing sectors faced a significant rise in competition from abroad. Table 3 shows import penetration indicators computed as the ratio of imports to gross value added by industry. Import penetration rose from 5.7 percent in 1990 to 19 percent in 1999 for the whole manufacturing sector. Additionally, there is ample variability across sectors. For example, in those sectors where Argentina possesses comparative advantages like Food and

2. Indeed, similarly to what happened in the entire economy, the rise in the skilled workers wage premium started in 1992. It is also worth noting that the estimated value for this statistic in 1995 is extremely high. Nevertheless, it may be just the result of sampling variability.

Beverages, Petroleum Distillery, and Non Metal Mineral products, the foreign supply in 1999 was still a small proportion of domestic production (below 4 percent of value added). Contrarily, in those sectors where Argentina does not have competitive advantages, like unskilled labor-intensive activities or capital-intensive sectors (where natural resources are not complementary) we observe significant rises in import penetration ratios.

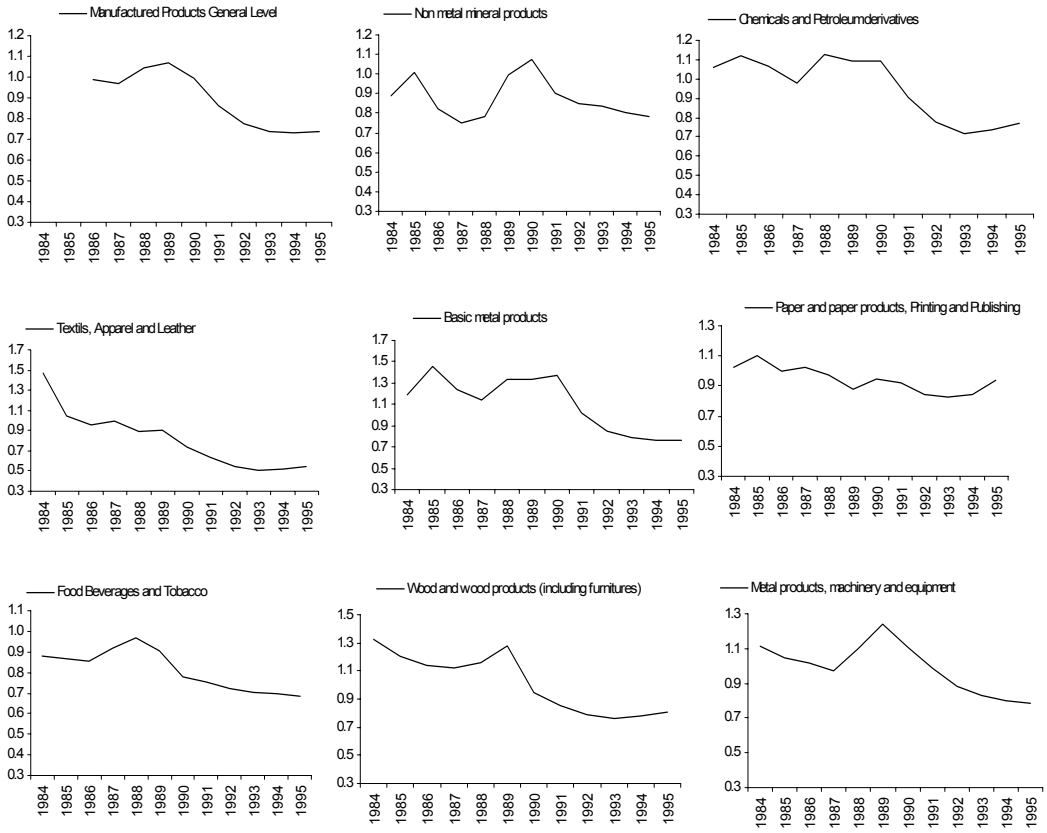
Table 3: Import Penetration Ratios: Imports to Gross Value Added by Industry (%)

Manufacturing Sector	1990	1991	1993	1995	1999
Food and Beverages	0.4	1.5	2.9	3.1	3.5
Tobacco	0.1	0.1	0.1	0.1	0.2
Textile products	1.6	6.7	13.6	12.2	19.8
Apparel	0.3	3.9	11.9	9.1	11.3
Leather, footwear	0.6	2.9	7.7	8.2	11.9
Wood production (non furniture)	3.3	5.5	11.8	16.6	21.4
Paper production and paper products	3.4	11.6	20.9	28.8	32.6
Printing and publishing	0.4	1.4	4.4	8.0	9.7
Petroleum distillery	0.3	2.0	2.9	6.1	3.9
Chemical products	14.7	21.9	25.3	36.8	44.3
Rubber and Plastic products	2.4	7.1	18.1	26.7	29.1
Non metal mineral products	2.2	4.0	7.3	9.7	11.1
Basic metals	4.3	10.3	15.0	19.5	24.0
Metal products (Non machinery and equipment)	2.7	5.5	11.5	20.4	26.0
Machinery and equipment	11.8	28.6	60.5	67.3	92.0
Computer, Accounting and Office Machinery	70.7	124.4	308.5	368.3	357.8
Engines and Electric equipment	10.9	17.1	44.2	62.8	68.4
Audio, video, TV, and communication equipment	12.7	53.9	83.7	83.8	107.1
Medical, Ophthalmic, watches and clocks, etc.	27.8	52.3	100.4	133.9	159.1
Motor vehicles and equipment	3.5	12.6	28.0	36.6	46.8
Other Transportation equipment	16.7	32.8	99.4	77.2	220.3
Furniture and manufacturing industries	4.4	18.0	29.0	30.9	39.5

Notes: Data is classified according to the Standard International Trade ISIC Classification, revision 3.
Source: Own calculation based on data provided by CEPAL.

Import penetration ratios (or import shares) are an intuitively appealing way to categorize industries facing significant competition from abroad. For this purpose, a complementary piece of evidence is given by prices. Figure 3 plots the time series of the relative prices of the manufacturing sector to the GDP deflator (8 industry aggregates and the general level of prices of the manufacturing sector) for the period 1985-1995. It is observed a significant decline in the relative prices of all manufacturing sectors after 1990. Additionally, as it is the case with the import penetration ratios, we also find substantial variability across industries. Interestingly enough, we find a negative and significant correlation between (relative) prices and import penetration ratios.

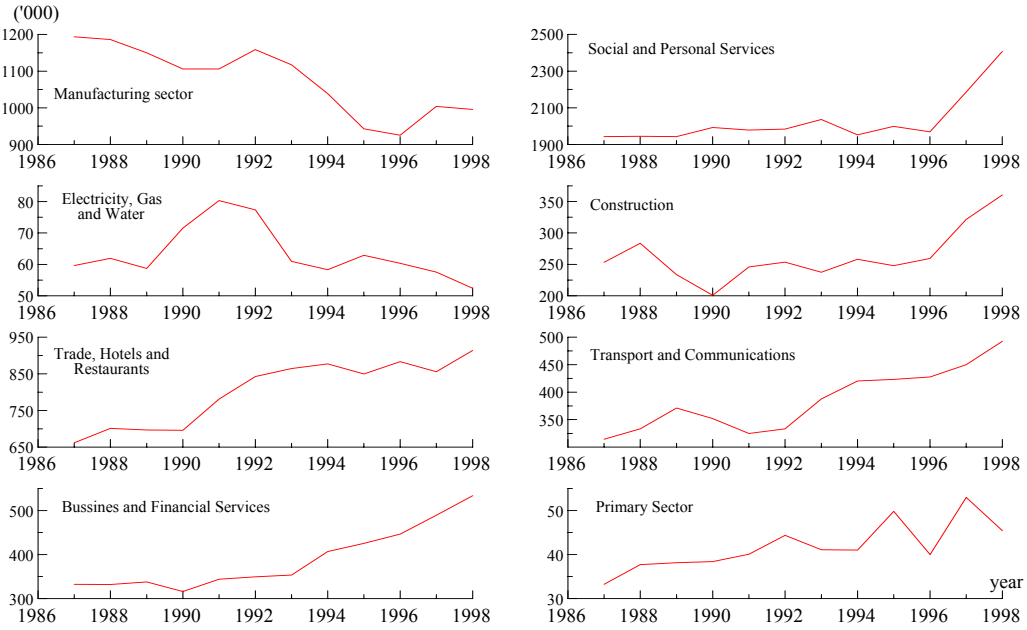
Figure 3: Manufacturing Prices Relative to GDP Deflator



During the nineties there was a significant change in the employment structure in Argentina. As shown in Figure 4, employment in the manufacturing sector was severely affected. Approximately thirty percent of the net employment in the manufacturing sector was destroyed between 1992 and 1996. It may seem natural to associate this phenomenon with trade openness.[3] Table 4 shows a considerably fall in employment in most manufacturing sectors. However, the changes in employment by industry are not statistically correlated with the respective changes in import penetration ratios.

3. The other sector that suffered a significant reduction in employment is electricity, gas and water; a sector that was heavily affected by unmanning because of privatization during the nineties.

Figure 4: Employment by Sector: Employees
Annual averages (miles)



Source: Household survey, all urban agglomerates.

Table 4: Employment Index by Industry
Base 1993 = 100

Manufacturing Sector	1993	1994	1996	1998	Variation 1993-98 (%)
Manufacturing sector	100	97.1	88.0	88.3	-11.7
Food and Beverages	100	100.0	91.1	88.0	-12.0
Tobacco	100	89.9	72.5	67.2	-32.8
Textile products	100	90.0	83.0	81.2	-18.8
Apparel	100	92.1	77.9	78.9	-21.1
Leather, footwear	100	97.0	85.2	85.2	-14.9
Wood production (non furniture)	100	98.8	86.9	92.9	-7.1
Paper production and paper products	100	100.5	93.6	83.3	-16.7
Printing and publishing	100	100.3	94.1	91.2	-8.8
Petroleum distillery	100	73.3	69.1	66.8	-33.2
Chemical products	100	97.4	94.6	93.4	-6.6
Rubber and Plastic products	100	96.0	97.9	102.5	2.5
Non metal mineral products	100	95.0	84.0	83.9	-16.1
Basic metals	100	96.3	93.0	93.0	-7.0
Metal products (Non machinery and equipment)	100	97.0	86.4	98.8	-1.2
Machinery and equipment	100	95.9	89.2	90.8	-9.2
Computer, Accounting and Office Machinery	100	97.0	92.0	76.3	-23.7
Engines and Electric equipment	100	94.9	82.2	84.6	-15.4
Audio, video, TV, and communication equipment	100	89.1	64.8	66.2	-33.8
Medical, Ophthalmic, watches and clocks, etc.	100	94.6	89.0	85.3	-14.8
Motor vehicles and equipment	100	103.5	85.8	91.0	-9.0
Other Transportation equipment	100	87.0	73.0	83.3	-16.7
Furniture and manufacturing industries	100	93.9	80.4	87.0	-13.0

Source: INDEC

Finally, table 5 presents the share of skilled labor by sector. Clearly, the service sector is intensive in skilled labor while the manufacturing sector is intensive in low-skilled labor (i.e. unskilled and semi-skilled workers). Certainly, the share of skilled labor in the manufacturing sector is the lower in the economy. Thus, since industries that experienced larger reductions in protection levels employed a greater proportion of low-skilled workers, trade liberalization may have had the effect of reducing the wages of the less-skilled workers relative to the wages of the high-skilled workers. We explore this question in section 5.

Table 5: Factor Intensity

	1993	1994	1995	Average 1993-95
	Share of skilled workers (%)			
Total Economy	21.6	22.0	24.6	22.7
Total economy but the manufacturing sector	23.9	23.8	26.6	24.8
Manufacturing sector	13.8	15.1	16.9	15.3
Services sector	30.3	31.1	33.9	31.8

Source: household survey, Greater Buenos Aires (GBA).

4. Wage inequality and trade: Analytical framework

The aim of this section is to provide an analytical framework for our empirical analysis in the next section. Most applied work analyzes the relationship between trade liberalization and wage inequality by relying on the Heckscher-Ohlin (HO) model. In particular, this literature is based on the simplest version of this model: it is assumed that there are two factors of production (skilled and low-skilled labor) and two traded manufactured goods, one that uses intensively skilled labor and other employing intensively low-skilled labor. Under the assumption of full employment and product diversification, the HO model lead to the Stolper-Samuelson (SS) hypothesis, which implies that, if trade liberalization causes a decline in the relative price of the good produced intensively with low-skilled workers, the wages of these workers decline relatively to the wages of the skilled workers. This prediction has guided most of the empirical work conducted in developed countries (see, for example, Wood 1995, Sachs and Shatz, 1994 and Leamer, 1994).

The HO model assumes perfect intersectoral factor mobility implying that the wages of workers with the same endowment of human capital equalize across sectors. However, there is ample evidence of the existence of interindustry wage premiums (see, e.g., Dickens and Katz, 1886 and Krueger and Summers, 1989). Wage premiums may be attributable to compensating differentials, specific human capital, or more general, it may be that industry affiliation is systematically correlated with unobserved worker attributes.

Consider, following Lovely and Richardson (2000), an economy in which each firm takes the outside wage as given, but pays a premium to compensate workers for firm-specific skill acquisition or from the disutility from higher effort associated with employment in the industry. Firms are assumed to face distinct labor markets, one for each type of labor (unskilled, semi-skilled and skilled labor). A firm in a particular industry faces an upward-sloping curve for labor of each type. The elasticity of these labor supply curves is decreasing in the degree of firm or in the industry specific content of the human capital.

In addition, lets assume that the demand curve for each type of labor for a given industry is downward sloping. Lovely and Richardson (2000) conceive changes in the volume of trade as shocks to the demand for labor. Changes in the volume of trade arise outside the industry from fundamental shocks like trade liberalization and are uncorrelated with shocks to industry labor-supply curves. Thus, shocks to the demand for final manufactures can be treated in the model as an exogenous increase in the share of income spent on finished manufactures. In particular, it may be the case that an increase in the import penetration ratio in an industry affects relatively more unskilled than skilled workers. It may also occur that skilled workers possess less (relative) industry specific human capital, or more generally, their supply curve to an industry is more elastic than the supply curves of low-skilled workers. In both cases, which may hold true together, a shift in labor demand as a result of the increase foreign competition would likely increase the premium paid to skilled workers.

Trade liberalization induces an exogenous change in labor demand by industry. In the next section, we exploit this variability across industries and time to identify the impact of import penetration ratios on wage premiums. However, others, more standard channels through which import penetration may affect wage premiums are not identified. Since the

manufacturing sector is more intensive in low-skilled labor, the aggregate demand of these workers is more affected by trade liberalization than the aggregate demand of skilled labor. Thus, in a world with perfect factor mobility, the wages of the unskilled workers decline the same in all sectors of the economy and hence, the correlation between the degree of import penetration and wage differentials by sector vanishes. Therefore, our empirical analysis may not estimate the whole effect of import penetration on wage inequality, that is, it is not an estimate of its general equilibrium effect, which may not be identified. Thus, the general form of compensating differentials presented in this section provides us with a frame to analyze the effect of trade shocks on industry-specific return to skilled and low-skilled labor. In the next section, we use this model to develop a method for estimating the correlation between premiums for skilled and low-skilled workers and trade flows.

5. An empirical test of the impact of trade on wage inequality using micro data

In this section we study whether trade liberalization had any identifiable impact on the distribution of wages in the manufacturing sector in Argentina during the nineties. Specifically, we test, using micro data, whether those sectors where import penetration deepened are also the sectors where, *ceteris paribus*, a higher increase in wage inequality is observed. Thus, we investigate whether, after we control for other factors including worker individual characteristics, relative wages widened comparatively more in those sectors that faced strongest competition from foreign markets. In order to test this hypothesis, we estimate the following regression function:[4]

$$Log(w_{ijt}) = \sum_{g\_1} ds_{ijgt}\ \alpha_{gt} + \sum_{g} ds_{ijgt}\ m_{jt}\ \alpha_{gm} + \sum_{c\_1} dt_{ijct}\phi_{ct} + f_t(age_{ijt}) + dsex_{ijt}\ \varphi_t + c_t + \mu_j + u_{ijt} \quad (1)$$

where ds_{ijgt} is a dummy variable that indicates schooling group g in period t, and α_{gt} is a schooling effect in period t; m_{jt} is the logarithm of the ratio of imports to gross value added in the manufacturing sector j in period t. dt_{ijct} is a dummy variable that indicates

4. We also test the validity of this specification by augmenting it with other trade variables at the industry level.

tenure group and ϕ_{ct} is the tenure effect in period *t*. The tenure groups are: (0,1), [1,5), [5,10), [10,20) and [20,20+). $f_t(age_{it})$ is a non-linear function of the age of individual *i* in period *t*, which is linear in the coefficients to be estimated. $dsex_{ijt}$ is a dummy variable indicating the gender of individual *i* and φ_t is the gender impact on wages in period t; c_t is the intercept in period *t* (the period effect); μ_j is the sector fixed-effect, and u_{ijt} is the error term for individual *i* working in sector *j* during period *t*. The dependent variable is the logarithm of the hourly earnings of the sampled individuals in their main occupations. The schooling groups are the unskilled group, the semi-skilled group and the skilled group defined in section 2. The micro data is gathered from the household survey for the period 1992-1999. The survey is conducted twice per year. Thus, the period effect refers to the wave-year effect. Finally, the data on imports, exports, value added and prices by sector at the two digit levels is taken from the Argentine International Trade Commission.

We estimate equation (1) by sampling workers in the manufacturing sector only. This is the only group of workers for which the measure of import penetration adopted here presents variability. Thus, it is worth reemphasizing that our objective is to test whether there is an identifiable impact of import penetration on wage inequality, even though this is not necessarily an estimate of the general equilibrium effect of trade liberalization on wage inequality.[5]

Thus, under the specification adopted in equation (1), the schooling group *g* wage premium in sector *j* in year t is given by $WP_{jgt} = 100$ [Exponential $(\alpha_{gt} + (\alpha_{gm} - \alpha_{bm})\, m_{jt}) - 1$], where α_{bm} is the estimated coefficient in the regression function (1) for the educational base category. Consequently, the set of α_{gm} are our parameters of interest. Given our hypothesis, that is, that the relative wages widened comparatively more in those activities that faced strongest competition from foreign markets and the evidence gathered in section 2, we expect the difference among the coefficients for the skilled group and the other two skill groups to be positive. Additionally, given the factor content of the manufacturing sector, we may also expect these two estimated differences to be statistically similar.

5 As we discuses in section 4, an increase in import penetration may widen income inequality relatively to the rest of the economy in the sectors affected. Our test evaluates the existence of these differential effects in the manufacturing industries. However, if we do not find any effect, it is still plausibly, that trade liberalization is shaping wage inequality.

It is worth noting that equation (1) controls both for period fixed-effect and sector-fixed effect. Thus, our model does not provide information about the level of wages by industry because we are conditioning our estimates on the sample means by sector. Also, this means that we are controlling for any aggregate shock that affect wages homogeneously. Thus, for example, if inflation affects all wages homogenously, its effect on wages is controlled by the period effects in our specification (for instance, the same would be true for technological change). Instead, if inflation, or any other aggregate variable, affects wages differently by skill group, its effect on wages is captured by the time varying wage premiums. This is an important feature of the specification adopted that makes justice to the alternative hypothesis of our test (i.e. other things widened relative wages). Thus, the set of parameters α_{gm} only captures the impact on wages of the sector import penetration.

Table 7 presents a pair of typical estimated coefficients for the variables that control for individual characteristics in the regression function (1). The estimated coefficients are as expected. Wages increase with education, age and tenure. Both age and tenure profiles look familiar and to some extent they appear to be stable during the period studied. There is also a male wage premium that has risen considerably during the period studied. The skilled wage premium also increased on average during the period studied.

Table 7: Individual Control Variables: Estimates for Selected Years

Variable	1992		1997	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
Semi-skilled dummy	0.39	0.05 ***	0.29	0.06 ***
Skilled dummy	1.00	0.15 ***	1.46	0.14 ***
Age	0.04	0.01 ***	0.06	0.01 ***
Age^2	- 0.0004	0.0001 ***	- 0.0005	0.001 ***
Tenure [1,5)	0.08	0.06	0.09	0.08
Tenure [5,10)	0.16	0.06 ***	0.20	0.10 **
Tenure [10,20)	0.21	0.06 ***	0.19	0.08 **
Tenure [20,20+)	0.36	0.08 ***	0.16	0.12
Gender	0.13	0.05 ***	0.26	0.05 ***

Notes: The coefficients correspond to the October wave of the survey for each year. *** if the coefficient is statistically different from zero at the one percent significance level. ** if the coefficient is statistically different from zero at the five percent significance level.

Table 8 presents the estimates of the parameters of interest. Additionally, it presents the results of successively enlarging the model by adding the interaction of the school dummy variables with the logarithm of the ratio of exports to gross value added by industry and the logarithm of the relative prices, that is, the logarithm of the ratio of the price of each industry to the aggregate price level. The standard errors reported are consistent even though the errors in the regression function (1) are not independent within industries. That is, the standard errors reported are robust to the problem of random group or cluster effects in the data (cf. e.g. Huber, 1967 and Moulton, 1986).

Table 8: The impact of trade variables on wages by skill group

Variable	Coefficient	Robust standard error	Coefficient	Robust standard error	Coefficient	Robust standard error
Unskilled dummy * import penetration	0.067	0.035 **	0.067	0.035 **	0.068	0.037 *
Semi-skilled dummy * import penetration	0.060	0.035 *	0.062	0.035 *	0.061	0.038 *
Skilled dummy * import penetration	0.125	0.048 ***	0.121	0.047 ***	0.139	0.050 ***
Unskilled dummy * export ratio			0.000	0.026	-0.019	0.024
Semi-skilled dummy * export ratio			0.007	0.026	-0.004	0.027
Skilled dummy * export ratio			0.071	0.047	0.035	0.051
Unskilled dummy * relative prices					0.000	0.001
Semi-skilled dummy * relative prices					0.000	0.002
Skilled dummy * relative prices					0.003	0.002

Notes: *** if the coefficient is statistically different from zero at the one percent significance level. ** if the coefficient is statistically different from zero at the five percent significance level. * if the coefficient is statistically different from zero at the ten percent significance level.

Table 9: Test F for Equality of Coefficients

Unskilled dummy * import penetration = Skilled dummy * import penetration		
F(1, 174) = 3.33 Prob > F = 0.0698	F(1, 174) = 3.03 Prob > F = 0.0834	F(1, 146) = 4.80 Prob > F = 0.0300
Semi-skilled dummy * import penetration = Skilled dummy * import penetration		
F(1, 174) = 4.15 Prob > F = 0.0431	F(1, 174) = 3.56 Prob > F = 0.0609	F(1, 146) = 6.07 Prob > F = 0.0149
Unskilled dummy * import penetration = Semi-skilled dummy * import penetration		
F(1, 174) = 0.28 Prob > F = 0.5969	F(1, 174) = 0.18 Prob > F = 0.6720	F(1, 146) = 0.21 Prob > F = 0.6506

We find that import penetration affects wage premiums. This result holds unaltered when we also control for the impact on wage premiums of both export penetration ratios and relative prices. Most important, the estimated impact of import penetration on the wages of the skilled workers is positive and statistically larger than the coefficient of this variable on the other two skill groups, which themselves are not statistically different (see Table 9). Thus, our evidence shows that in the wage premiums of the skilled workers in any sector is increasing on the level of import penetration faced by that industry. During the 90s, in those industries where the import penetration increased the most, wage inequality also widened relatively more in favor of the most skilled workers.

Consequently, we find that there is scope for trade liberalization to explain the increase of the wage premium of skilled workers during the 90s. Thus, at least partially, the aggregate trends on wage differentials we presented in section 2 may be explained by the impact of trade liberalization on wages. However, the identified effect of trade liberalization on wage inequality does not explain a large portion of the rise of the skilled wage premium during the nineties even though the average (weighted by employment) import penetration ratio increased approximately 80 percent during the same period. Hence, for example, the average identifiable increase in the skilled wage premium due to trade liberalization in the manufacturing sector is 8 percentage points between 1992 and 1998 which is only 16 percent of the increase in the skilled wage premium during the same period.

6. Concluding remarks

Argentina has taken swiping reforms at liberalizing trade at the beginning of the 1990s. The evidence presented in section 2 shows that during the 90s the college wage premium increased substantially. Contrarily, during the 80s it decreased. This evidence suggest that trade openness could have played a role in shaping relative wages in Argentina. In this paper we investigate whether this was the case. Specifically, we test whether those sectors where import penetration deepened are, *ceteris paribus*, the sectors where a higher increase in wage inequality has taken place.

We use a general form of compensating wage differentials to build a framework to analyze the effect of trade shocks on industry-specific return to skilled and low-skilled labor. To study this relationship we combine aggregate data compiled at the industry level with micro-data gathered from household surveys.

When we perform the micro-data analysis we find evidence that trade liberalization has raised the college wage premium. In particular, once we control by individual and industry specific characteristics, we find a positive and significant correlation between import penetration and wage premium. Still, similarly with what have been found for some developed economies, trade deepening can explain a relative small proportion of the observed rise in wage inequality. In particular, the direct increase in the male skilled wage premium due to trade liberalization in the manufacturing sector is approximately 8 percentage points which is only 16 percent of the increase in the male skilled wage premium during the same period.

Thus, we conclude that there is evidence that supports that the view that trade liberalization increased wage inequality. Nevertheless the identified effect does not seem to be among the main causes of the growth in wage inequality in Argentina during the 90s.

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