Trends in Tariff Reforms and Trends in the Structure of Wages∗

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Abstract

This paper provides new evidence on the impacts of trade reforms on wages. Instead of achieving identification by comparing industrial wages before and after one episode of trade liberalization, our strategy exploits the recent historical record of policy changes adopted by Argentina: from significant protection in the early 1970s, to the first episode of liberalization during the late 1970s, back to a slowdown of reforms during the 1980s, to the second episode of liberalization in the 1990s. These swings in trade policy comprise broken trends in trade reforms that we can compare with observed trends in wages and wage inequality. We use unusual historical data sets of trends in tariffs, wages, and wage inequality to examine the structure of wages in Argentina and to explore how it is affected by tariff reforms. We find that i) trade liberalization, ceteris paribus, reduces wages; ii) industry tariffs reduce the industry skill premium; iii) conditional on the structure of tariffs at the industry level, the average tariff in the economy is positively associated with the average skill premium. To explain these results, we present a model that combines a non-competitive wage setting mechanism due to unions with a factor abundance hypothesis. Overall, our work suggests that the observed trends in wage inequality in Latin America can be consistent with the Stolper-Samuelson predictions in a model with unions.

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1 Introduction

The notion that trade affects wage inequality stems largely from the Stolper-Samuelson theorem and the Heckscher-Ohlin model of trade. Countries specialize in the production of those goods that use intensively the abundant factors of production. In its simplest form, the theorem states that while developed countries specialize in the production of skilled intensive goods, developing countries specialize instead in goods that use intensively unskilled labor. One key implication of this model is that trade liberalization should lead to an increase in the skilled wage premium in developed countries and a corresponding decline in developing countries.

The Stolper-Samuelson prediction is at odds with most of the empirical literature on the impacts of trade liberalization and wage inequality in Latin America, which in fact shows that tariff liberalization has increased the disparity in labor earnings between skilled and unskilled workers. Examples include Feliciano (2001), Galiani and Sanguinetti (2003), Goldberg and Pavcnik (2004), Harrison and Hanson (1999), Revenga (1997), and Robertson (2004).\(^1\) The leading argument advanced to account for the discrepancy between the model and the data is the dependency of the impacts of trade liberalization on the initial structure of tariffs. If protection is initially granted in those sectors that use unskilled labor more intensively, then trade liberalization might cause relative unskilled wages to decline and wage inequality to increase.\(^2\)

The literal Heckscher-Ohlin view of trade and wage inequality assumes the existence of competitive labor markets with perfect intersectoral factor mobility. This implies that the wages of workers with the same skills should equalize across sectors and that wages should change in the same way in all firms, independently of their internal features and reflecting only overall external market conditions. These predictions are, however, in sharp contrast with the evidence on wage differentials, even for similar individuals, documented

\(^1\)For the case of developed countries, the Stolper-Samuelson result is supported by Sachs and Shatz (1994) and Leamer (1998) but it is disputed by Lawrence and Slaughter (1993).

\(^2\)Other mechanisms behind the observed increase in wage inequality after trade liberalization are skilled biased technical change induced by openness and skill complementarity of capital goods or imported materials. See Attanasio, Goldberg and Pavcnik (2004), Goldberg and Pavcnik (2005), Feenstra and Hanson (1999), and Pavcnik (2003).
by Dickens and Katz (1986) and Krueger and Summers (1988), and more recently by Attanasio, Goldberg and Pavcnik (2004) within the trade literature. Further, Gibbons and Katz (1989) and Krueger and Summers (1988) suggest that these wage premiums cannot be fully explained by compensating differentials alone, thus acknowledging the role of other explanatory factors such as sector-specific human capital, unionization, profit sharing or bargaining between workers and owners. Moreover, there is evidence to indicate that these wage premiums can in part be affected by trade. Dickens and Lang (1988) and Gaston and Trefler (1994) find that the industry premiums are correlated with trade flows in the U.S., and Attanasio, Goldberg and Pavcnik (2004) and Goldberg and Pavcnik (2005) establish a similar link with sectoral tariffs.

In this paper, we provide a more comprehensive explanation of the links between trade reforms and wages. To do this, we set up historical data sets of trends in trade reforms, trends in wages, and trends in skill wage premiums in Argentina. The data span the period 1974-2001. We construct a time series of tariffs, for different sectors in different years, and a time series of labor force surveys with data on individual wages. This is the first instance in this literature in which such a historical record of trade reforms is put together with a historical micro data set of workers and wages. The outcome is almost 30 years of data on sectoral tariffs and individual wages.

Our data and approach have several advantages over some of the current literature. While different papers use different techniques, identification generally follows from one episode of trade liberalization: outcomes, usually the wages of skilled and unskilled workers, are compared before and after a trade reform and across different industries so that the identifying variation hinges on the differential rate of tariff reform across sectors. Arguably, however, the estimated impacts may confound unobserved effects and unaccounted simultaneous policy reforms. This is a major concern in Latin America during the 1990s, a period when most countries implemented several concurrent reforms. In this paper, we pursue a stronger identification strategy by exploring the recent historical record of trade

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3The work by Attanasio, Goldberg, and Pavcnik (2004) and Golberg and Pavcnik (2005) is similar to ours in that it exploits data from the eighties and the nineties. There is a major difference, though. Whereas their study involves one trade reform, we study two episodes of trade liberalization separated by a reversal to protection.
policy changes adopted by Argentina during the last 30 years: from high protection in the early 1970s, to a significant liberalization of trade in the late 1970s and early 1980s, to a stagnation of tariffs in the 1980s, to the full liberalization of the 1990s, and to Mercosur, a regional trade agreement among Argentina, Brazil, Paraguay, and Uruguay. These swings in trade policy generate broken trends in tariff reforms that we can compare with observed trends in wages. This encompasses a different, useful, and compelling identification strategy.

Further, we can exploit both our cross-section variability in sectoral tariffs as well as our time-series variability in the average national tariff to better uncover the presence of Stolper-Samuelson effects on the structure of wages. We propose to infer Stolper-Samuelson effects using the time series of the average national tariff once the effects of sectoral tariffs on the structure of wages are controlled for. Our data, which combine a times series of cross-sections and tariffs, provide us with a unique opportunity to establish this result.

Our econometric findings are as follows. We first confirm that tariffs protect workers and that, *ceteris paribus*, tariff cuts lead to a decrease in average wages. Further, after controlling for individual worker characteristics, period effects, industry effects, and time-varying skill premium effects, we find a strong negative association between tariffs and the skill premium at the industry level. Finally, we are able to trace Stolper-Samuelson effects in the structure of wages. After controlling for the structure of tariffs at the industry level, the average tariff in the economy is positively associated with the average skill premium over time. We conclude that, after accounting for differences in tariff changes at the industry level, and after controlling for common shocks to wages, trade liberalization can lead to a decline in the skill premium as predicted by the Heckscher-Ohlin model.

To rationalize these results, we introduce a theoretical framework that combines a factor abundance model of trade with a non-competitive wage setting mechanism. Our model works with an unskilled labor abundant country that in consequence exports unskilled intensive goods and imports skilled intensive goods. This feature of the model generates a Stolper-Samuelson type prediction: conditional of the structure of sectoral protection, the economy-wide skill premium moves in the same direction as the average tariff in the economy.

However, wages do not equalize across sectors. While this could be the consequence
of imperfect labor mobility, here we emphasize the role of non-competitive wage setting mechanisms.\textsuperscript{4} In particular, we assume that the wage setting for unskilled labor in the import competing sector is non-competitive. A union lobbies for a fraction of the tariff rent and then distributes it among unskilled workers in the import sector, who thus enjoy a wage premium over similar workers in the export sector. Even with competitive labor markets for skilled workers, this feature of the model generates differences in the skill premium at the industry level that, in turn, depend negatively on the industry tariff. Thus, the model predicts that, conditional on aggregate protection, sectoral skill premiums and sectoral tariffs move in opposite directions. Our econometric results together with this simple model of trade and unions suggest that the stolper-Samuelson predictions are perfectly consistent with the observed increase in wage inequality (particularly in Latin America).

The remainder of the paper is organized as follows. In Section 2, we describe the data used in this paper and we motivate our work by describing the trends in trade liberalization and the trends in wage inequality in Argentina. In Section 3, we present our regression analysis, and in Section 4, we lay out one theoretical framework that is consistent with the basic trends found in the data. Section 5 concludes.

\section{Tariff Reforms and the Structure of Wages}

A major input into our analysis is the historical data on Argentine trade policy and wages, spanning the 1974-2001 period. These data come from two different sources: customs data on imports and tariffs at the sectoral level, and household survey data on wages and workers.

We begin by describing the customs data. We measure trade policies with sectoral tariffs. Data on ad-valorem import tariffs come from official Tariff Schedules, which specify the tariff rate levied on each item of the Harmonized System (HS). In order to make our trade data comparable with the wage data, we need to build tariff measures at the 3-digit level of the ISIC classification. To do this, we first match each heading in the Harmonized System with its closest equivalent in the ISIC classification. We then aggregate the HS data to

\textsuperscript{4}This type of mechanisms is quite prevalent in the case study for Argentina that we investigate below. See Galiani and Nickell (1999).
build measures of tariffs at the 3-digit level. To perform the aggregate, we start from the next-to-lowest subheading, calculate the median of the item belonging to it, and iterate on this procedure. We end up with a panel data set of import tariffs for the manufacturing sector across time. Figure 1 provides some insights into the nature of trade policy and trade reform in different years. It depicts key percentiles of the distribution of import tariffs.

![Figure 1](image)

**Figure 1**
Distribution of Median Tariffs per 3 digit sector

Note: Distribution of median tariff within each 3-digit ISIC manufacturing sector for selected years. The ends of the boxes are the 1st and 3rd quartiles, while the line within the boxes corresponds to the median. The ends of the bars show the points which are furthest away from the ends of the box, but at a distance not larger than 3/2 the interquartile range. We do not show outside values (points which are even further away). The quantiles are calculated weighting each sector by its employment level.

The recent historical Argentine trade policy is characterized by at least three different periods. Our starting point in 1974 was one of high protection, with average tariffs in excess of 100 percent, and sectors with median rates in excess of 200 percent. Starting in 1976, tariffs were abruptly reduced. The average tariff was cut by two thirds in three years, dropping from slightly above 100 percent in 1976, to 47 percent in 1978 and to 32 percent in 1979. In addition, the whole distribution shifted downwards with respect to 1974.

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5See the Data Appendix for further details on sources of information, the matching of Harmonized System and ISIC classification, and the aggregation procedure.
The trend in trade reforms is broken in 1982 when there was a slight increase in average tariffs that continued all throughout the eighties. Notice, however, that trade policy is not limited to tariffs but includes non-tariff barriers like quotas, or quantitative restrictions. Although we were unable to construct adequate measures of non-tariff barriers for the period under analysis, the historical accounts on the use of quantitative restrictions in Argentina (Berlinski, 1994; Berlinski, 2003) reveal a heavy use of quotas up until 1959, when they were eliminated. Quotas were reinstated in 1982 and maintained all through the 1980s until they were again fully eliminated in 1989-1990 as a pre-requisite to Mercosur negotiations. The reversal of trade policy during this period is thus more evident in quotas than in tariffs.

In contrast, tariff rates were reduced in 1990 and 1991, remaining below 20 percent throughout all the 1990 decade. In 1994, Mercosur was adopted and tariffs were further reduced. However, in an attempt to prevent a fiscal crisis, there was a slight increase in protection in 2001.

We turn now to the labor force data. The standard source of individual data on labor earnings and worker characteristics in Argentina is the Permanent Household Survey (EPH, Encuesta Permanent de Hogares). This is a household survey with information on wages, employment status, and individual and family characteristics. The data are usually collected twice a year, in May and October. The EPHs of the 1990s have been already used in the literature but, for our purposes, we needed to track the surveys back into the 1970s and 1980s. We were able to compile 40 EPH surveys. Table A3 in the appendix provides a brief description of the different data sets used here and their sample sizes. We have data for all years, except for 1979, 1983, and 1984. For years 1974, 1976, 1977, 1978, 1981, 1985, 1986, and 1992, we only have information for October (and thus not for May). In contrast, in 1980 and 1982, we use data on May but not on October.

Before launching our formal econometric investigation, we provide next snapshots of the main features of the data. To do that, we casually inspect our data to report prima facie evidence on the relationship between the trends in wage inequality and the trends in the structure of wages in Argentina.

We begin with the “tradable premium.” If firms in the import competing sectors take
the outside opportunity of workers as given but pay a wage premium, which may be due to the protection granted by sectoral tariffs, we should see in the data that firms in the tradable sector cannot pay less than the competitive wage paid by firms in unprotected sectors. Figure 2 reveals evidence in favor of the “tradable premium” in our data. The figure depicts the coefficient of a tradable dummy, for different years from 1974 to 2001, in a standard earnings equation (after controlling, in each year, for age, age squared, gender, marital status and a set of education dummy variables). With a few exceptions, the estimated tradable premiums are always positive in our data.

Figure 2
The Tradable Premium

Note: own calculations based on historical trade data and labor surveys (EPH). The graph shows estimates of the “trade” premium. For each year in the sample, an earnings regression of log wages on age, age squared, gender, marital status, educational dummies and a tradable sector dummy is run. The coefficient of the tradable dummy is defined as the “trade premium”; it accounts for the premium, over the non-tradable sector, paid in sectors exposed to international trade.

Further, Figure 2 reveals that the tradable premium is likely to depend inversely on the level of aggregate protection. In fact, the average tradable sector wage premium is decreasing during the 1970 (the first episode of trade liberalization in Argentina), increasing during the 1980 (the reversal episode of quota use and stagnation of tariff cuts), and decreasing again
during the 1990s. This is the first trend uncovered by our data.

The second major trend of interest involves the aggregate skill premium at the national level. To document this, we restrict our sample to tradable manufacturing sectors only. We compute the skilled wage premium by defining three educational categories: skilled labor, which comprises workers who have finished college, semiskilled labor, which comprises workers who have finished secondary school (and may have incomplete college education), and unskilled labor, which comprises workers with no schooling, complete and incomplete primary education, and incomplete secondary education. The skill premium is calculated as the coefficient on the skilled dummy in a standard earnings regression. Concretely, we ran separate regressions of wages on the skill dummy for one survey in each year, controlling for age, age squared, gender and marital status. Notice that we do not include trade related variables at this point.\(^6\)

Figure 3 reveals the breaks in trade liberalization trends and the breaks in the wage inequality trends. The broken line corresponds to the evolution of the average tariff during the period 1974-2001. The figure clearly shows the initial high protection on the early 1970s, the liberalization of the late 1970s, the stagnation of tariffs during the 1980s, and the last episode of liberalization of the 1990s.

The solid line in Figure 3 depicts the skill premium.\(^7\) There is a sharp increase in the wage differential between skilled and unskilled workers between 1974 and 1982, coinciding with the first wave of trade policy reforms. While individuals with college education earned roughly 60 percent more than their unskilled counterparts in 1974, the difference grew to about 120 percent in 1982. Between 1982 and 1989, when trade liberalization lost momentum, the skill premium decreased markedly. In contrast, the skill premium resumed its upward course during the 1990s, coinciding with the second episode of trade liberalization. Thus, prima facie, there is evidence of a correlation between the skilled premiums and the tariffs.

\(^6\)One concern is the relevance of college degrees in the 1970s when a lower fraction of the population attained those degrees. To account for this, in the regression analysis of Section 3, we also work with an alternative definition of skills that merges workers with both secondary and college education. Our key findings are robust.

\(^7\)Note that we report the estimated coefficient directly –i.e., without the standard exponential transformation \((e^{\text{coefficient}} - 1)\).
Figure 3
Trends in Tariffs and in Wage Premium

Note: own calculations based on historical trade data and labor surveys (EPH). Tariff: average tariff across all 3-digit ISIC sectors, weighted by employment in each sector. Skilled wage premium: coefficients on the skilled dummy in different earnings regressions per year. See text for more details.
Our last observation relates to the skill premium at the industry level. In the Argentine data, the inter-industry wage differentials of Dickens and Katz (1986), Krueger and Summers (1988), and Attanasio, Goldberg and Pavcnik (2004) vary with the skill level so that there are skilled premiums at the industry level. For our purposes, the main features of these premiums is that they correlate negatively with the sectoral tariffs. To see this, we estimate a sectoral skill premium for each manufacturing industry after pooling the data for all years. This regression includes a full set of industry dummies, skill dummies, individual characteristics, and survey effects. The output of interest is a set of interactions between the skilled dummies (for college education) and the industry dummies that measure the average skilled industry premium in the sample. In Figure 4, we plot these premiums against the average tariff in each sector in the sample. The graph gives a clear hint of a negative relationship between the sectoral tariff and the skilled industry premium.
3 The Impacts of Tariffs on wages

In this section, we investigate econometrically the main features of our data revealed by the snapshots of the previous section. These snapshots first show that, ceteris paribus, sectors protected by tariffs should pay higher wages. In addition, in the Argentine data, there seems to be a skill premium at the industry level that is partly explained by the level of tariff protection. This suggests the existence of (short-run) departures from the standard Heckscher-Ohlin model, such as unions, labor specificity, profit sharing, or skill complementarities of capital (and in Section 4 below, we explore a plausible model with unions). In turn, it follows that any attempt to infer Stolper-Samuelson effects with only a few cross-sections of industry wages will be clouded by those same departures from the standard model. Instead, it would be possible to identify those effects once the sectoral structure of protection is accounted for. That is, conditional on the structure of tariffs at the industry level, we should find that the average national tariff affects relative wages according to the Stolper-Samuelson theorem and the Heckscher-Ohlin model of trade.

3.1 Trade Protection: Tariffs and Industry Wages

We begin our formal econometric analysis by establishing the tradable premium. To investigate this, we set up a simple econometric model in which sectoral tariffs affect industry wages (without distinguishing between skilled and unskilled industry premiums at this moment).

We regress the log of the wage of individual $i$, in industry $j$, at time $t$, ($\ln w_{ijt}$), on the log of the tariff in industry $j$ at time $t$, $\ln \tau_{jt}$, an indicator of skill level $dS_{igjt}$ (where $g$ indicates whether the worker is skilled, semiskilled, or unskilled), and a number of other individual characteristics ($x_{ijt}$) including age, gender, and marital status. Thus, the model that we estimate is

$$
\ln w_{ijt} = x_{ijt}' \beta_t + \sum_g \delta_{gt} dS_{igjt} + \alpha \ln \tau_{jt} + I_j + Y_t + \mu_{ijt},
$$

(1)
where $I_j$ is an industry fixed effect, $Y_t$ is a survey-period fixed effect, and $\mu_{ijt}$ is the error term. As explained in section 2, we use data on sectoral tariffs at the 3-digit level.

We report findings from four different econometric models. In Model 1, the returns to schooling ($\delta_g$) and tenure are constant across time; in Model 2, the returns to schooling are allowed to vary from survey to survey ($\delta_{gt}$), but the returns to age are not time-varying; in Model 3, both the returns to schooling and the returns to age vary across surveys. In Model (4), we further allow for a sectoral linear trend in the model to control for possible trends in the change in wages that might be a confounding factor for the impact of tariffs. A nice feature of our study is that the two episodes of trade liberalization that we exploit to identify the effect of tariffs on wages are separated in time by approximately a whole decade. This gives us enough variability to disentangle, by exploiting the within sector variability in tariffs, the effect of trade liberalization on wages from other concurrent secular trends in wages at the industry level.

In all our specifications, we include period-fixed effects and industry dummies. This controls for changes in exchange rates (devaluations and appreciations) and industry-specific characteristics so that the impacts of tariffs are not confounded by industry characteristics or by aggregate shocks (related to policy or business cycle). These fixed effects also account for unobservable variables that could induce a spurious correlation between tariffs and wages.

Since our tariff measures vary across industries, any clustering in the residuals $\mu_{ijt}$ in (1) may be exacerbated (Moulton, 1990). In all our regressions, thus, inference is made on the basis of a robust, cluster-corrected estimation of the variance of the error term. In all our results, we report two estimates of the standard errors. In one model, we allow for clustering at the industry level to account for autocorrelation in the residuals at the industry level (that is, for shocks to the industry that may perpetuate in time). In the second model, the errors are clustered at the time-industry level.\textsuperscript{8} Our results are robust to these two models of cluster effects.

The main results from model (1) are reported in Table 1. Columns (1) to (4) correspond to Models 1 to 4, respectively; the standard errors clustered at the industry level are reported

\textsuperscript{8}This is the standard clustering analyzed in Moulton (1990).
within parenthesis while those clustered by industry and time are reported within brackets. We find a positive effect of tariffs on wages, a relationship that is significant at the 10 percent level of statistical significance. These results are not affected by allowing the returns to schooling to vary from period to period (time-varying returns to schooling in column 2) and by allowing both the returns to schooling and age to be time-varying (column 3). Further, the results remain practically unaltered if we also include sector-specific linear trends in the model (columns 4).

Our findings support the view that, ceteris paribus, trade barriers protect workers’ earnings across the board.\(^9\) Although these findings are more or less expected, the previous literature is sometimes inconclusive. In Argentina, for instance, Galiani and Sanguinetti (2003) do not find a positive association between tariffs and wages (though they do find a significant association with import penetration measures). Currie and Harrison (1997) and Harrison and Hanson (1999) are other examples where tariffs show up insignificant in wage equations. In Attanasio, Goldberg, and Pavcnik (2004), on the other hand, tariffs have a significant impact on the industry premiums and overall wages, and in Revenga (1997), real wages are also found to be affected by tariffs.\(^10\)

### 3.2 Tariff Reforms and the Industry Skill Premium

We next explore whether sectoral tariffs also affect the skill premium at the industry level. Our benchmark regression is:

\[
\ln w_{ijt} = x'_{ijt} \beta_t + \sum_g \delta_g dS_{igjt} + \alpha \ln \tau_{jt} + \sum_g \phi_g dS_{igjt} \ln \tau_{jt} + I_j + Y_t + \mu_{ijt},
\]

This model differs from model (1) in that we add interaction terms between the trade policy variable (the log of tariffs, \(\ln \tau\)) and the educational attainment dummies (\(dS_{igjt}\)). The coefficients of these interactions, \(\phi_g\), can be interpreted as the differential impact of trade on

\(^9\)Since the model condition on parametric and non-parametric time trends, the correct interpretation of the negative effect of trade liberalization on wages is conditional of any growth effect of that trade reform.

\(^10\)The literature on this topic is very rich. Our review of the evidence is necessarily short, to avoid distracting attention from the main results of our paper. A recent survey on the trade-wages link is Goldberg and Pavcnik (2007).
the wage of individuals with different education, over and above the average effect of trade protection.\footnote{We also experimented with interactions of tariffs and age to explore the links between trade protection and tenure. We did not find any statistically significant association between trade policy and returns to age. See below.}

Our main findings are reported in Table 2. We estimate the four models described in the previous section (with the standard errors clustered by industry—within parenthesis—and by industry-time—within brackets). In the first row of the table, we show the direct impact of tariffs on average wages. We find evidence of a positive and significant effect of tariffs on the wages of unskilled labor (at the 10 percent level). The magnitudes of the coefficient range from 0.355 to 0.447.

The second and third rows report the coefficients of the impact of the sectoral tariffs on the skilled wage premium. Interestingly, we find no evidence of any impact of trade protection on skilled wage premiums in a model that imposes common returns to schooling and tenure across time periods (column 1). In principle, however, we should expect the skill premium to be affected across time by many factors other than trade policy (such as skill biased technical change or changes in labor regulations). In column (2), thus, we allow the returns to schooling to vary from period to period. In column (3), we further allow the returns to tenure to vary from period to period. In all these models, we find that trade protection affect negatively and significantly the returns to higher education. These results are robust (and remain practically unchanged) to the inclusion of sector specific linear trends (see column (4)).

Our findings confirm the intuition uncovered by Figures 3 and 4: after controlling for key confounding factors, reductions in average tariffs lead to increases in the skilled wage premium and to increases in wage inequality. These results appear to be very robust. They are not an artifact of the business cycle or spurious trends since we control for period effects. They are neither the result of confounding the effect of tariffs on the skill premiums with unobservable industry fixed characteristics due to the inclusion of industry dummies nor by industry specific trends. They are not the result of concurrent confounding policy factors, like labor reforms or industrial policies, since individual characteristics and time varying
returns to age and education help control for them. Overall, thus, the results do not seem to be driven by unobservables.

We turn now to a sensitivity analysis. In Table 3, we reproduce the analysis of Table 2 but with a new definition of skills. Here, we classified as skill labor all workers with either a college degree or a complete secondary school degree. This alternative definition of skill could be important especially during the 1970s, when college education was much less widespread than it is today. Unskilled workers comprise all individuals with incomplete secondary or lower education. Our findings are robust to this new definition of skills. Tariffs have a direct positive impact on unskilled wages (significant only at the 10 percent level) and a negative impact of the skill premium (significant at the 1 percent level).

There are two further concerns about the results in Table 2 that we need to address. One concern is that the association of tariffs with the skill premium in the historical data may be driven by the sharp drop in tariffs during the 1970s. Indeed, as pointed out before, the tariff cuts of the 1970s are approximately 5 times larger than the cuts of the liberalization of the 1990s. To rule out this possibility, we experimented by breaking down the historical series and dropping the 1970s from the analysis.

Our main results are reported in Table 4. The first column reproduces column (3) of Table 2—i.e., the model for 1974-2001 with three educational categories and time-varying returns to schooling and age. In column (2), we exclude the 1970s from the analysis. Our main findings are unaffected by this change in the sample period. Tariffs are shown to have positive effects on average wages and negative and more significant effects on the skill premium. In fact, the impacts on the skill premium are even larger when the 1970s are excluded, strongly suggesting that our results are not driven by the tariffs cuts of this period. In column (3), we exclude all years in the 1974-1982 period, where the tariff cuts were largest (Figure 3). Once again, our findings are robust to the exclusion of these years.

The second concern is the role of non-tariff barriers like quotas or quantitative restrictions. These are usual instruments of the Argentine trade policy, and provided non-tariff barriers are correlated with tariff barriers, their omission in the regressions can cast doubts on the interpretation of our key results. The problem with non-tariff barriers is that we were
unable to construct historical series spanning the period under study. Even simple measures of coverage ratios are unavailable (or very hard to construct).\textsuperscript{12}

In principle, if non-tariff barriers were uncorrelated with tariffs, our estimates would be consistent. However, this correlation might be present, for instance if quotas are high in those industries with low tariffs. Nevertheless, using data on tariffs and non-tariff ad-valorem equivalents compiled by Kee, Nicita, and Olarreaga (2006), we found that the correlation between tariffs and non-tariff barriers in Argentina was positive but very small (around 0.03). This suggests that the omission of non-tariff barriers in the main regressions would not be problematic.

We follow two further strategies to account for the role played by non-tariff barriers. One way around the problem of lack of data on NTBs is to exploit the sequencing of trade reforms experienced by Argentina. Berlinski (1994; 2003) has documented that non-tariff barriers were exclusively used during the debt crisis of 1982-1989. Before that, non-tariff barriers were not generally used; after that, they were eliminated prior to the tariff cuts of the liberalization of the 1990s. This suggests a way to check the robustness of our results by further breaking down the historical series. In column (4) of Table 4, for instance, we exclude the 1982-1989 period from the analysis. We find that the impacts of tariffs on average wages are positive, similar in magnitude, but not statistically significant; in contrast, the impacts of tariffs on the skill premium remain negative and statistically significant.

Non-tariff barriers were fully eliminated from 1988 to 1991. Indeed, the elimination of quantitative restrictions was a pre-requisite to the negotiations of the common external tariff of Mercosur (Berlinski, 1994; 2003). Thus, an additional robustness check of the link between tariffs and the skill premium is to run the model on the 1992-2001 sample. Active trade policy during this period comprises only tariff changes. Results in column (5) confirm our previous findings. Tariffs have a positive impact on average wages; this effect is highly significant during the 1990s. Further, tariffs impact negatively, and highly significantly, on the skill premium.

\textsuperscript{12}The historical trade data that we put together in this paper does not come electronically. Instead, we had to collect hard copies of trade data for thousands of HS items for many years and to input them manually. Non-tariff barriers are usually implemented through legislative decrees specific to the different industries. Building a historical dataset of norms legislated by decrees is practically unfeasible.
A final concern with the analysis is the potential endogeneity of sectoral tariffs to wages (as in a model of political economy). In our setting, the case for the endogeneity of tariffs is relatively weak because our regressions include a number of control variables that ameliorate this problem, namely time-varying returns to schooling and tenure, individual characteristics, industry effect, time effects, and sectoral trends. The temporal variation in our data is critical to support this claim. For instance, the endogeneity of tariffs caused by political economy arguments is unavoidable in cross-section studies but can be controlled for, to a large extent, with the inclusion in the model of industry dummies, time dummies, and sectoral trends in the pooled historical data. Once we control for all these variables, the level of protection is mostly determined by two factors: the worldwide trend towards trade liberalization and the initial level of protection (so that sectors with higher tariffs would face larger tariff cuts, on average).\textsuperscript{13} We argue that these two factors can reasonably be thought of as exogenous to the level of current wages in our econometric models. Indeed, the two processes of trade liberalization in Argentina are entrenched in waves of integration of Latin America to the world. During the 1970s, all the military governments of the Southern cone in Latin America embarked in similar programs of trade and financial liberalization. These programs were the first attempt to undo a large set of regulations enacted during the period of import substitution. The second wave of trade liberalization started in 1989 is edged within an even broader movement of the whole continent towards world trade integration following the Washington Consensus and the GATT agreements.

Furthermore, we claim that pursuing an instrumental variable approach would be necessarily weak given the impossibility of finding reasonable instruments due to the nature of our empirical exercise (which spans thirty years of Argentine recent history). Instead, we exploit here the comparison of the breaks in the trends in tariff reforms and the breaks in the trends in wage inequality (which are arguably exogenous). We believe that our strategy of matching sectoral tariffs to sectoral wages through two episodes of trade liberalization and one episode of reversal to protection provides a good and valid identification strategy of the effects of trade liberalization on wages and wage inequality.

\textsuperscript{13}See also Goldberg and Pavcnik (2005)
To end, we use our data to ask whether trade liberalization has had an effect on the wages of young (versus more tenured) workers. This is an interesting question for it may indicate an additional channel by which trade can affect income inequality. Our findings reveal, however, that there is no evidence that trade protection has affected the experience premium; indeed, the coefficients of the interactions of trade with age (and age squared) are statistically insignificant. In the end, we conclude that trade has had an impact on the skill premium but not on the tenure premium.

3.3 Stolper-Samuelson: The Average Tariff and the Skill Premium

The Stolper-Samuelson theorem of the Heckscher-Ohlin model predicts that developing countries should experience an increase in the relative wage of unskilled labor after episodes of trade liberalization. However, the majority of the literature has identified increases in wage inequality and in the skill premium following trade reforms. This evidence has been traditionally reconciled with the theoretical model by noticing that the impacts on wages depend on the observed tariff changes which, in turn, depend on the initial level of protection.

However, if this last argument is true, we claim that it should be possible to extract Stolper-Samuelson effects from the data (that is, that the average tariff in developing countries is positively associated with the average wages of the skilled workers and the average skill premium), once the effects of industry tariffs are accounted for. Concretely, our claim is that trade reforms should favor unskilled labor in unskilled labor abundant countries, conditional on the structure of sectoral protection.

Notice that, in cross-section data, such a test of the Stolper-Samuelson theorem is not feasible. However, this could be done, for instance, if the cross-section variability of the data over time is used to estimate the impacts of industry tariffs on wages while the time series variability is used to identify Heckscher-Ohlin effects. Since our data fit this approach perfectly, we are in a unique position to test this hypothesis.

To do this, we set up an empirical model that combines these two impacts of trade: one stemming from the average national tariff and another stemming from the structure of sectoral tariffs. The model is estimated in two stages, as in Goldberg and Pavcnik (2005).
In the first stage, we estimate the earnings model in equation (2). In the second stage, we exploit the time series dimension of our data and regress the estimated skilled premium, $\delta_t$, on the log of the national average tariff $\tau_t$:

$$
(3) \quad \delta_t = a + \gamma \ln \tau_t + L_t \rho + \nu_t,
$$

where $L_t$ is the share of skilled to unskilled workers at time $t$, a control for changes in the composition of labor supply in Argentina. We estimate equation (3) by the method of weighted least squares, using the inverse of the estimates of the variance of the skilled premium from the first stage as weights.\(^{14}\)

Our results are in Table 5.\(^{15}\) Each entry corresponds to an estimate of the parameter $\gamma$ in equation (3), the coefficient of the average national tariff in the second stage regression. For robustness and consistency with our previous specifications, we estimate three models in the first stage: these are models 2 to 4 from Tables 2-4. In addition, we estimate two models for the second stage regression. The first row in Table 5 corresponds to a model of the skill premium on the average tariff only (without including $L_t$); in the second row, the model also includes the composition of skilled to unskilled labor supply between the regressors.

Our estimates reveal that the average tariff has indeed a positive effect on the average skill premium, so that a reduction in tariffs causes the average skill premium to decline. The estimates range from 0.127 to 0.187 so that a 10 percentage points increase in the average tariff would increase the skilled premium by between 0.0127 to 0.0187 percentage points. This result is consistent with the simple predictions of the Stolper-Samuelson theorem for a developing country: if Argentina is abundant in unskilled labor, then trade liberalization should cause unskilled wages to increase and thus the skill premium to decline.\(^{16}\)

\(^{14}\) Notice that the omission of the aggregate tariff in the first stage does not generate biases because the impacts of the national tariff is embedded in the overall skill premium, which varies by year in our models. Our two-stage estimation is an attempt to make clearer the need to account for the cross-sectional structure of protection in order to identify Stolper-Samuelson effects.

\(^{15}\) The first stage is the same as in Table 2.

\(^{16}\) Compared to major trade partners like the U.S. or the E.U., Argentina is abundant in unskilled labor (Galiani and Sanguinetti, 2003). On the other hand, Argentina is well-endowed in skills relative to other countries in Latin America and in the rest of the developing world. However, Berlinski (1994) has shown a specialization in natural resources and unskilled labor when Argentina is compared with Brazil, the major partner within the region. All this is evidence that Argentina tends to be, if anything, relatively endowed in
These results confirm our claim: conditional of the structure of sectoral tariffs, our evidence using historical data for Argentina provides some support to the standard Stolper-Samuelson prediction regarding trade liberalization and wages in Latin America.

4 A Simple Theoretical Framework

Our aim in this section is to introduce a theoretical model to interpret the empirical results of previous sections. We need a framework to reconcile the Stolper-Samuelson effects with the existence of skilled premiums at the industry level and to account for the correlations observed in Argentina (and in several Latin American countries) between trade liberalization and wage inequality. Thus, we want to develop an analytical framework that merges two key mechanisms: the economic logic of neoclassical models of trade (like Heckscher-Ohlin) and the existence of (skilled) wage premiums at the industry level. Based on our empirical findings, we claim that a useful model of trade protection and wage inequality should embed both typical explanations of the pattern of trade and inter-industry wage differentials. We propose to do this by combining a factor abundance hypothesis with a non-competitive wage setting mechanism in import competing sectors. In particular, we allow wages in import sectors to be determined by the bargaining power of unions. Although similar predictions can be derived with models of imperfect factor mobility or profit sharing, a model with unions seems more relevant for our empirical analysis on Argentina, where the presence of unions in the manufacturing sector is widespread (Galiani and Nickell, 1999).

The role of unions in our model is to protect unskilled workers. There is strong evidence that unions actually compress the wage distribution, particularly from below (Freeman, 1982). That is, unions raise the wages of workers who, on spot labor markets, would earn relatively low wages. This is because unions raise wages above market clearing levels whenever market clearing wages are close to the reservation wage (Vogel, 2007). Card et al. (2003a) present evidence on union wage compression for the U.S., the U.K. and Canada; Stephan and Gerlach (2005) present evidence for continental Europe (see, also, Card et al. unskilled labor rather than skill labor.

For simplicity, we work with two tradable sectors, \( i = 1, 2 \). At this point, the best way to think about these sectors is as aggregate exportable and importable sectors. (We indicate how to expand the model to various importable sectors below). There is also a non-tradable sector, denoted with 0. There are two factors of production with fixed supply, skilled \( S \) and unskilled \( U \) labor. The country is small and takes international prices \( p_i^\ast \) as given. The price of the non-traded good is determined endogenously.

Sector 2 is skilled intensive:

\[
\frac{a_{2s}}{a_{2u}} > \frac{a_{1s}}{a_{1u}},
\]

where \( a_{iu} \) and \( a_{is} \) are the technological requirements of unskilled and skilled labor, respectively, in sector \( i \). Since the country is relatively abundant in unskilled labor, the unskilled intensive good 1 is exported and the skilled intensive good 2 is imported. This is the standard factor abundance, Heckscher-Ohlin prediction.

Labor is perfectly mobile across sectors. The market for skilled labor is competitive in all sectors with equilibrium wage \( w_s \). The market for unskilled labor in the non-tradable and exportable sector 1 is also competitive, with equilibrium wage \( w_u \). The zero-profit condition in sector 0 is

\[
p_0 = w_s a_{0s} + w_u a_{0u},
\]

where \( p_0 \) is the price in domestic currency. The corresponding zero-profit condition in the export sector is

\[
p_1 = w_s a_{1s} + w_u a_{1u},
\]

where \( p_1 \) is expressed in domestic currency. The aggregate import competing sector behaves differently. First, the sector can be protected by tariffs, denoted by \( t \). This is best interpreted
as the average national tariff across several import sectors. Second, in sector 2 there is a union that represents unskilled labor. To model the role of unions, but at the same time to depart as little as possible from the standard model, we adopt a simple rule for the behavior of unions and the wage setting mechanism.\footnote{An explicit model of the bargaining mechanism of firms and unions requires profits in equilibrium. This, in turn, would require either adding one (fixed) factor to collect those profits or departing from competition (as in a model with monopolistic competition). For example, Gaston and Trefler (1995) build a model where unions bargain wages above market clearing conditions in order to share rents generated in non-competitive product markets. While we could have followed a similar approach here, we opted for the model presented here to prioritize simplicity. All our qualitative results hold in these more complicated models as well.} This rule works as follows. In the absence of a tariff in sector 2, free entry and zero profits imply that \( p^*_2 = w_s a_{2s} + w_u a_{2u} \). With a tariff \( t \), firms face a price \( p_2 = p^*_2 (1 + t) \) and, keeping factor prices constant, would enjoy instantaneous profits equal to \( p^*_2 t \). We call this the “tariff rent.”

Unions negotiate with incumbent firms and successfully appropriate a fraction \( \alpha \in [0, 1] \) of these rents.\footnote{In Argentina, unions negotiate with different Manufacturing Chambers that essentially represent incumbent producers.} This income is then transferred to unskilled workers in sector 2 via a premium over the competitive wage in both the non-tradable and export sectors \( w_u \). Formally,

\[
(7) \quad w_{2u} = w_u + \alpha \frac{p^*_2 t}{a_{2u}}.
\]

The second term on the right hand side of (7) is thus the tariff rent appropriated by the union per unit of unskilled labor. For simplicity, we assume that \( a_{2u} \) is given at its equilibrium level when unions compute the tariff rent.

Once unions secure this fraction of the “tariff rent,” competitive forces begin to work as in the standard Heckscher-Ohlin model. This means that the extra-profits generated by the tariffs (the part not appropriated by the unions) will attract entrants into the import competing sector, which will expand and thus demand more skilled and unskilled labor (the export sector will instead contract and release those factors). In the end, competitive wages \( w_s \) and \( w_u \) will adjust until those profits dissipate completely. In equilibrium, thus, this free entry condition translates into an ex-post zero-profit condition in sector 2

\[
(8) \quad p_2 = w_s a_{2s} + w_u a_{2u}.
\]
This is a simple 2 × 2 model of trade with a non-tradable sector. Given the prices of the tradable goods, the system determines the competitive wages for skilled and unskilled labor \( w_s \) and \( w_u \). The zero profit condition in the non-traded sector determines \( p_0 \). Lastly, the wage-setting rule determines the unskilled wage in the import competing sectors.

To investigate how the structure of wages depends on the structure of protection, totally differentiate (6), (7) and (8) to get

\[
\theta_1 s \hat{w}_s + \theta_1 u \hat{w}_u = 0,
\]

\[
-(w_u/w_{2u})\hat{w}_u + \hat{w}_{2u} = (\alpha/\theta_{2u})\tau \hat{t},
\]

\[
\theta_2 s \hat{w}_s + \theta_2 u \hat{w}_{2u} = \tau \hat{t},
\]

where \( \tau = \frac{1}{1+t}, \) \( \hat{x} = dx/x, \) and \( \theta_{is} = (a_{is}w_s)/p_i, \) \( i = 1,2; \) \( \theta_{1u} = a_{1u}w_u/p_1; \) and \( \theta_{2u} = a_{2u}w_{2u}/p_2. \) Our skilled intensity assumption of sector 2 implies that \( B = \theta_1 s \theta_2 u w_u - \theta_1 u \theta_2 s < 0. \) The solution for the changes in wages is thus

\[
\frac{\hat{w}_s}{\hat{t}} = -\frac{1}{B} \tau \theta_1 u (1-\alpha) > 0,
\]

\[
\frac{\hat{w}_u}{\hat{t}} = \frac{1}{B} \tau \theta_1 s (1-\alpha) < 0,
\]

\[
\frac{\hat{w}_{2u}}{\hat{t}} = \frac{1}{B} \tau \theta_1 s \frac{w_u}{w_{2u}} (1-\alpha) \frac{a_{1u} a_{2s}}{a_{1s} a_{2u}} \geq 0.
\]

Note that, provided \( \hat{t} > 0, \) \( \hat{w}_{2u} > \hat{w}_u \) \( (\hat{w}_{2u} < \hat{w}_u \) otherwise).

Several key results, depicted in Figure 5, emerge from our simple model. Since factor abundance plays a role in determining the pattern of trade, the model delivers a Stolper-Samuelson prediction. An increase in the (average) tariff causes sector 2 to expand and demand factors of production and this in turn affects factor prices. Since sector 2 is intensive in skilled labor, an increase in \( t \) generates an increase in the skilled wage (equation 12) and a reduction in the competitive unskilled wage (equation 13). In consequence, increases in tariffs cause the skill premium to increase so that trade liberalization should lead to a decline in wage inequality.
In Figure 5, the initial equilibrium is at $a$. An increase in $t$ shifts the curve defined by $p_2^*[1+t(1-\alpha)] = w_s a_{2s} + w_u a_{2u}$ up. As a result, $w_s$ increases and $w_u$ declines. Notice that the increase in the tariff $t$ causes the unskilled wage in sector 2 to increase above the equilibrium $w_u$. In the end, $w_{2u}$ could increase or decrease, depending on the response of the competitive wage and on the power of unions to extract tariff rents. If unions can appropriate all of the instantaneous tariff rents ($\alpha = 1$), then neither $w_s$ or $w_u$ would change and $w_{2u}$ would instead increase by the full magnitude of the tariff rent.

Figure 5
Tariffs, Unions and Wages

A number of additional results follow from comparing the structure of wages brought about by the unions. The model predicts that sectors protected by tariffs pay higher wages. To see this, notice that unskilled wages in the protected sector are actually higher than in the non-tradable and export sectors. This is consistent with the “trade premium” in Figure 2. Further, the wedge between $w_{2u}$ and $w_u$ is increasing in the average tariff $t$. This means that these “trade premiums” should themselves depend on sectoral tariffs, as suggested by
Figures 1 and 2.

For simplicity, we have worked so far with a $2 \times 2$ model. With more sectors and/or factors, the strong predictions of the Stolper-Samuelson theorem do not hold: only statements about correlations between factor intensities, product price changes and factor price changes can be established. However, it is worth making further abstractions in the model to derive some predictions regarding the structure of protection and wages across import sectors. Clearly, the model suggests that, within the import sector, those more heavily protected are likely to pay even higher unskilled wages. A corollary of this result is that since all sectors pay the same wages for skilled labor, the model predicts the existence of different skill premiums at the industry level. Moreover, this skill premium depends on the sectoral tariff $t$ (and on the sectoral power of unions as well).

This can be more formally seen as follows. Assume there are two import competing sectors, $x$ and $y$. Both sectors are protected by tariffs $t_x$ and $t_y$ (so that the average tariff is $t = \phi_x t_x + \phi_y t_y$ given weights $\phi_x$ and $\phi_y$). Both sectors are protected by unions, and the wage setting rules are$^{19}$

$$
(15) \quad w_{ju} = w_u + \alpha_j \frac{p_j^* t_j}{a_{ju}},
$$

for $j = x, y$. To inspect the implications of the model, we can, for example, change the structure of tariffs $t_x$ and $t_y$ while keeping the average tariff $t$ constant. In principle, this should not affect competitive wages in the export (and non-tradable) sector. However, the structure of unskilled wages within the import sector does change. Differentiating (15) with respect to $t_x$ and $t_y$, while holding $t$ constant (so that $\phi_x d t_x + \phi_y d t_y = 0$), we get

$$
(16) \quad \hat{w}_{xu} = (\alpha_x / \theta_{xu}) \tau_x \hat{t}_x,
$$

and

$$
(17) \quad \hat{w}_{yu} = -(\alpha_y / \theta_{yu}) \tau_y (\phi_x / \phi_y) \hat{t}_x.
$$

$^{19}$The average unskilled wage in the import sector would be $w_{2u}$ as defined above.
An increase in the protection granted to sector $x$ causes the unskilled wage in sector $x$ to increase and the skilled premium in that sector to decline. In addition, while the tariff in sector $y$ drops, the unskilled wage declines and the skilled premium instead increases. In consequence, the model predicts an inverse relationship between the sector tariff and the industry skill premium. This is consistent with the correlations revealed in Figure 4.

A model with imperfect labor mobility is the leading competing hypothesis to our model with unions. While unions have been prevalent in Argentine history, there is also evidence that labor is not fully mobile as in many other developing countries. There are some peculiar issues with factor specificity, though. The simplest possible model would allow for imperfect mobility of unskilled labor (and perfect mobility of skilled labor). In this context, it is easy to see how sectoral tariffs would raise unskilled wages in protected sectors so that, together with equalized inter-sectoral skilled wages, this model would work exactly as our union model. If, instead, unskilled labor is perfectly mobile but skilled labor is not, then factor specificity is not enough to deliver predictions that are consistent with the trends observed in our data. Some sort of non-competitive wage setting would be required. Unions can play such a role in a hybrid model of trade, unions, and factor specificity. Finally, another option is to allow both skilled and unskilled labor to be imperfectly mobile. To accommodate the Heckscher-Ohlin trends, however, such a model should contain dynamic features whereby factor specificity is gradually lost, as in Mussa (1978). In any case, our choice of developing a model with unions rather than with factor specificity was guided by plausibility. As argued, our aim is to have a framework to understand the trends of section 2 and the regression results that we discuss next.\footnote{Naturally, there could also be other forces at work. For instance, Atolia (2007) develops a dynamic model with complementarities between capital and skills that also suggests short-term departures from Stolper-Samuelson results and long-term Stolper-Samuelson trends. Bustos (2005) provides empirical results for Argentina consistent with this view.}

## 5 Conclusions

This paper has examined the links between trade liberalization and skill premiums by exploring a historical dataset of Argentine trade policy and labor force surveys for the
period 1974-2001. The period under study is one of active and fluctuating trade reforms and wage inequality in Argentina. Tariff reforms accelerated in the late 1970s and early 1980s, stagnated during the 1980s, and picked up further momentum during the 1990s. The skill premium, in contrast, increased during the 1970s, declined during the 1980s, and increased again during the 1990s.

We have produced three pieces of econometric evidence. First, we have found that, ceteris paribus, trade liberalization reduce the average wage of workers in protected industries. Second, we have documented that, in Argentina, there is a skill premium at the industry level. Furthermore, this skill premium is, in part, affected by tariff protection. Finally, we have established that, conditional on the structure of tariffs at the industry level, the average tariff in the economy is positively associated with the average skill premium. This is an important contribution of our work; the findings imply that, once the structure of sectoral protection is controlled for, trade should decrease wage inequality in Argentina. This result provides a reconciliation of the Stolper-Samuelson predictions with the observed trends in wage inequality in Latin America.

Our core results suggest that a useful modern model of trade reform and wage inequality should combine traditional explanations of the pattern of trade with non-competitive wage setting mechanisms. To support this claim, we have developed a simple factor abundance model (as in Heckscher-Ohlin) where unions set wages of unskilled labor in import competing sectors. While such a model rationalizes our findings, other modeling frameworks with factor specificity are likely to play a role as well. The ultimate lesson is that the Stolper-Samuelson effects predicted for Latin America are found to play a role in shaping the wage distribution.

Data Appendix

In this Appendix we document the construction of the tariff measures used in the paper and we briefly describe the household surveys.
Import Tariffs

Our goal was to construct a measure of ad-valorem import tariffs in place in Argentina in each year during the 1974–2001 period. The source for the raw data is the Guía Práctica del Exportador e Importador, a monthly publication that provides current tariffs at the most disaggregated level of the National Import Tariff Classification (NADI). Table A1 describes the tariff definition used for different periods. Notice that these different periods are characterized by different institutional arrangements (like the adoption of Mercosur in the 1990s) and different trade related policies. For each year, we use the tariffs in place in the middle of the year.

Table A1
Tariff Definition

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Tariff Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974-1991</td>
<td>Tariff + Statistics rate (1)</td>
</tr>
<tr>
<td></td>
<td>Extra-MERCOSUR tariff +</td>
</tr>
<tr>
<td></td>
<td>Statistics rate +</td>
</tr>
<tr>
<td></td>
<td>ad-valorem equivalent of DIEM (2) +</td>
</tr>
</tbody>
</table>

Notes: (1) The Statistics rate is an additional ad-valorem levy which the government adds to certain goods. Its purpose is to finance the collection of statistical data. It was originally instituted by Executive Decree 6123/61.
(2) DIEM (Derechos de Importación Mínimos Específicos, minimum specific import taxes) originated as anti-dumping measures for certain import categories (including textiles). An “average import price” was calculated for each category, and the corresponding tariff was applied to each price. The actual tariff paid was the higher of this “minimum import levy” and the ad-valorem tariff applied to the actual price.
(3) The convergence factor was established by law in June 2001. It was calculated as $cf = 1 - \frac{1}{e}$, where $e$ is the dollar price of 1 Euro.

We needed to match the tariff information from the customs sources (the Guía Práctica) with the industry data from the household survey, which is based on the ISIC industry classification. From 1974 to 1991, the Argentine Statistical Institute used the ISIC Revision 2, and moved to the Revision 3 afterwards. Hence, we matched each category in the NADI with its closest equivalent in the ISIC classification used in different period. Since the ISIC classification is coarser, we constructed an aggregate indicator for NADI categories corresponding to a single ISIC code. This resulted in two series - one for 1974-1991, another
for 1992-2001. At a second stage, we produced a uniform classification for the whole period. Each stage is described in detail below.

Official conversion tables between 8–10 digit NADI classification and 5-digit ISIC (Revision 2) are available starting from 1980 (when 1000 new categories were added to the NADI classification). Backward compatibility with data from 1974-1979 is also possible, but at the 5-digit level of aggregation of the NADI classification. Starting in 1991, we used official conversion tables between NADI and ISIC Revision 3. Table A2 describes the sources used in this process.

Table A2
NADI-ISIC Conversion

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Internal Classification</th>
<th>Source for match with ISIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974 − 1979</td>
<td>Matched with new 1980 classification, based on 5-digit NADI</td>
<td>Matched with Revision 2 Categories with nonzero imports: Conversion Table published by the National Statistics Agency (INDEC) Categories with no imports: Conversion table produced by Secretaría de Planeamiento (Secretary of Planning, Economic Ministry)</td>
</tr>
<tr>
<td>1980 − 1991</td>
<td>Data were kept at original level of disaggregation. (8- or 10-digit, depending on the year) (1)</td>
<td>same as 1974 − 1979</td>
</tr>
<tr>
<td>1992 − 2001</td>
<td>Harmonized System. Original level of aggregation (8 digits)</td>
<td>Matched with Revision 3 All categories: Conversion Table provided by Secretaría de Industria (Secretary of Industry)</td>
</tr>
</tbody>
</table>

Notes: (1) In 1980 and 1981, some tariffs are disaggregated at 8 digits, and other at 10. In these cases, the conversion was done in two stages, starting with the 10 digit categories, and then continuing with the rest.

Given that 5-digit ISIC is a coarser category than the NADI, we created two versions of each tariff measure. In one, we treated each NADI category as a unique observation (this is version 1, or $v_1$ below). In the other one, version 2 $v_2$, we kept one instance of each unique 5-digit ISIC/tariff combination, eliminating duplicate entries.
Once we had the 5-digit ISIC code for each NADI category, we aggregated them into 3-digit measures. Starting from the 5-digit classification, we computed the median tariff level corresponding to each 4-digit category. To go one step further and obtain the three-digit tariff measure, we repeated this procedure. The final result is therefore the median of the medians of each subcategory.

The analysis in the main text uses $v_2$ as the starting point for the aggregation procedure. However, our results do not change much if we use $v_1$ instead. In fact their correlation coefficient between our tariff measures $v_1$ and $v_2$ is 0.954 at the three digit level. In Figure A1, we plot the time series of tariffs for nine 2-digit categories. It is clear that the series are quite similar (the correlation is 0.682 at this stage).

We used an intermediate nomenclature built by the World Bank to match the Revision 2 and Revision 3 classifications. Once again, several categories overlap and we used the median to take a representative tariff.

As a final step, we adjusted the import tariffs to take into account the differential tariff levied on imports originating in Mercosur countries (Brazil, Paraguay, and Uruguay). Our source for this exercise is the Commercial Liberalization Program included in the Asunción Pact (1991). This program established a progressive, automatic and linear reduction in the tariffs assigned to imports from the Mercosur countries.

First, we computed the share of the imports from the Mercosur in the year 1990, prior to the signing of the agreement. Next, we adjusted the original import tariffs considering the estimated ratio and the scales of tariff reduction established by the Asunción pact:

$$\text{Import Tariff}_{it} = \text{Intrazone Tariff}_{it} \ast \text{Ratio} + \text{Original Import Tariff}_{it} \ast (1-\text{Ratio}),$$

where $i$ is a 3-digit ISIC code and $t$ is a year.

In order to provide some external consistency check on our tariff series, we compared our data with some of the indicators provided by Berlinski (1994) and Berlinski (2003). These are some of the most comprehensive accounts of the history of trade policies in Argentina. Overall, the numbers on tariff protection reported by Berlinski are quite similar to our numbers. For example, he reports that the average tariff before the liberalization of the 1970s
was 99 percent (our estimate is around 100 percent). For the 1990s, Berlinski’s estimates of the average tariff fluctuate around 16-19 percent, and our averages are around 18 percent. During the 1980s, he reports estimates for 1988, before the reform of the late 1980s and early 1990s, of 48 percent. We instead find that the average tariff is close to 30 percent. Even though there are differences in methodologies, mostly in aggregating the average tariffs, it is clear that our estimates are pretty consistent with those in Berlinski. It is important to remark that while Berlinski built tariff measures for selected years, in this paper we need a full time series of historical trade data. The series produced here are, we believe, an important contribution of our work.

The Permanent Household Surveys

Data on wages and worker characteristics come from the Encuesta Permanente de Hogares (EPH, Permanent Household Survey). These surveys collect information on household characteristics (size, composition, housing) as well as on individual characteristics like labor earning, sector of employment, hours worked, education, age, gender, marital status, etc. The EPH is a repeated cross-section and is usually collected in May and October in each year. In this paper, we pool individual data from 1974 to 2001. In Table A3, we report the different historical EPH surveys that we use and the sample sizes. For the evolution of the skill premium, see Figure 2 in the text.
Figure A1: Comparison of Tariff Measures

Note: The dark line corresponds to version 1, \( v_1 \) (multiple observations per opening/tariff). The lighter line corresponds to version 2, \( v_2 \) (one observation per unique opening/tariff combination).
<table>
<thead>
<tr>
<th>Year</th>
<th>May</th>
<th>October</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>–</td>
<td>1299</td>
</tr>
<tr>
<td>1975</td>
<td>1039</td>
<td>923</td>
</tr>
<tr>
<td>1976</td>
<td>–</td>
<td>886</td>
</tr>
<tr>
<td>1977</td>
<td>–</td>
<td>834</td>
</tr>
<tr>
<td>1978</td>
<td>–</td>
<td>811</td>
</tr>
<tr>
<td>1979</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1980</td>
<td>721</td>
<td>–</td>
</tr>
<tr>
<td>1981</td>
<td>–</td>
<td>757</td>
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<tr>
<td>1982</td>
<td>162</td>
<td>–</td>
</tr>
<tr>
<td>1983</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1984</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1985</td>
<td>–</td>
<td>891</td>
</tr>
<tr>
<td>1986</td>
<td>–</td>
<td>978</td>
</tr>
<tr>
<td>1987</td>
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<td>947</td>
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<tr>
<td>1988</td>
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<td>1008</td>
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<tr>
<td>1991</td>
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<td>–</td>
<td>640</td>
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<tr>
<td>1993</td>
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<td>680</td>
</tr>
<tr>
<td>1994</td>
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<td>617</td>
</tr>
<tr>
<td>1995</td>
<td>585</td>
<td>613</td>
</tr>
<tr>
<td>1996</td>
<td>576</td>
<td>522</td>
</tr>
<tr>
<td>1997</td>
<td>644</td>
<td>599</td>
</tr>
<tr>
<td>1998</td>
<td>614</td>
<td>634</td>
</tr>
<tr>
<td>1999</td>
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<td>533</td>
</tr>
<tr>
<td>2000</td>
<td>519</td>
<td>522</td>
</tr>
<tr>
<td>2001</td>
<td>461</td>
<td>453</td>
</tr>
<tr>
<td>Total</td>
<td>11786</td>
<td>17267</td>
</tr>
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</table>

Note: Description of Permanent Household Surveys used in the analysis and effective sample sizes in each data set.
References


Table 1
The Impacts of Tariffs on log Wages

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
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<td>0.357*</td>
<td>0.353*</td>
<td>0.355*</td>
<td>0.412*</td>
</tr>
<tr>
<td></td>
<td>(0.203)</td>
<td>(0.206)</td>
<td>(0.205)</td>
<td>(0.226)</td>
</tr>
<tr>
<td></td>
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<td>[0.216]</td>
<td>[0.216]</td>
<td>[0.247]</td>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sectoral Trends</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
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<td>0.89</td>
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</table>

Notes. Standard errors: in parentheses (clustered by 3-digit industry); in brackets (clustered by industry and time period).
The regression includes three educational categories. Skilled labor includes college graduates, semiskilled labor includes workers with secondary school and incomplete college; unskilled labor includes incomplete secondary or less.
*: Significant at 10
Other controls: age, age squared, gender dummy, head dummy, marital status.
<table>
<thead>
<tr>
<th></th>
<th>Model 1 (1)</th>
<th>Model 2 (2)</th>
<th>Model 3 (3)</th>
<th>Model 4 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log Tariff</td>
<td>0.355*</td>
<td>0.388*</td>
<td>0.389*</td>
<td>0.447*</td>
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<tr>
<td></td>
<td>(0.200)</td>
<td>(0.211)</td>
<td>(0.210)</td>
<td>(0.231)</td>
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<tr>
<td></td>
<td>[0.213]</td>
<td>[0.224]</td>
<td>[0.224]</td>
<td>[0.254]</td>
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<td>0.033</td>
<td>-0.077</td>
<td>-0.076</td>
<td>-0.082</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
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<td>(0.056)</td>
<td>(0.058)</td>
</tr>
<tr>
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<td>[0.053]</td>
<td>[0.054]</td>
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<tr>
<td>log Tariff*Skilled</td>
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<td>-0.339***</td>
<td>-0.345***</td>
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<tr>
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<td>[0.127]</td>
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<td>Yes</td>
<td>Yes</td>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
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<tr>
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<td>0.89</td>
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</table>

Notes. Standard errors: in parentheses (clustered by 3-digit industry); in brackets (clustered by industry and time period).
The regression includes three educational categories. Skilled labor includes college graduates, semiskilled labor includes workers with secondary school and incomplete college; unskilled labor includes incomplete secondary or less.
*: Significant at 10%
**: Significant at 5%
***: Significant at 1%
Other controls: age, age squared, gender dummy, head dummy, marital status.
Table 3  
Tariff Reform and the Industry Skill Premium  
Sensitivity to The Definition of Skilled Labor

<table>
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<tr>
<th></th>
<th>Model 1 (1)</th>
<th>Model 2 (2)</th>
<th>Model 3 (3)</th>
<th>Model 4 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log Tariff</td>
<td>0.359*</td>
<td>0.401*</td>
<td>0.402*</td>
<td>0.455*</td>
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<tr>
<td></td>
<td>(0.199)</td>
<td>(0.208)</td>
<td>(0.207)</td>
<td>(0.229)</td>
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<td>-0.002</td>
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<td>-0.154**</td>
<td>-0.154***</td>
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<td>(0.064)</td>
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<tr>
<td>returns to schooling</td>
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<tr>
<td>returns to age</td>
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</tbody>
</table>

Notes. Standard errors: in parentheses (clustered by 3-digit industry); in brackets (clustered by industry and time period).  
The regression includes two educational categories. Skilled labor includes college and secondary school graduates, and unskilled labor includes workers with less than complete secondary school.  
*: Significant at 10%  
**: Significant at 5%  
***: Significant at 1%  
Other controls: age, age squared, gender dummy, head dummy, marital status.
Table 4
Robustness Check

<table>
<thead>
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<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>log tariff</strong></td>
<td>0.389*</td>
<td>0.456*</td>
<td>0.595*</td>
<td>0.335</td>
<td>0.128***</td>
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<td>[0.257]</td>
<td>[0.043]</td>
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<tr>
<td><strong>log tariff*semiskilled</strong></td>
<td>-0.076</td>
<td>-0.088</td>
<td>-0.134</td>
<td>-0.127**</td>
<td>-0.128***</td>
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</tr>
<tr>
<td></td>
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<td>(0.094)</td>
<td>(0.078)</td>
<td>(0.071)</td>
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<td>[0.083]</td>
<td>[0.056]</td>
<td>[0.049]</td>
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<td>-0.461***</td>
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<td></td>
</tr>
<tr>
<td>returns to schooling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>returns to age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time effects</strong></td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<td><strong>Industry effects</strong></td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
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<td>0.85</td>
<td>0.89</td>
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<td>21126</td>
<td>11131</td>
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</tr>
</tbody>
</table>

Notes. Standard errors: in parentheses (clustered by 3-digit industry); in brackets (clustered by industry and time period).

The regression includes two educational categories. Skilled labor includes college and secondary school graduates, and unskilled labor includes workers with less than complete secondary school.

*: Significant at 10%
**: Significant at 5%
***: Significant at 1%

Other controls: age, age squared, gender dummy, head dummy, marital status.
Table 5  
The Average Tariff and the Skill Premium

<table>
<thead>
<tr>
<th></th>
<th>Model 2 (1)</th>
<th>Model 3 (2)</th>
<th>Model 4 (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average national tariff</td>
<td>0.139* (0.076)</td>
<td>0.128* (0.075)</td>
<td>0.127* (0.070)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Average national tariff (with supply composition)</td>
<td>0.182** (0.082)</td>
<td>0.172** (0.081)</td>
<td>0.187** (0.076)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.21</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Observations</td>
<td>39</td>
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<td>39</td>
</tr>
</tbody>
</table>

Notes. Standard errors in parentheses. The results correspond to the coefficient of the average national tariff on the average skill premium from a two-stages regression model. In the first stage, we run the model in equation (2) and recover the skill premium. In the second stage, we regress the skill premium on the average national tariff (using the time series dimension of the data only).

We estimate three models in the first stage, Models 2 to 4 in Table 2. The first row in the table corresponds to a model of the skill premium on the average tariff only. In the second row, the model also includes the composition of skill to unskill labor supply.

*: Significant at 10%
**: Significant at 5%
***: Significant at 1%