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Universidad Autónoma de Ciudad Juárez
Ave Plutarco Elías Calles 1210,
Foviste Chamizal, C.P.32310
Ciudad Juárez, Chihuahua, México
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Increased trade openness, productivity, employment and wages: a difference-in-differences approach

Silvia Adriana Peluffo Geronazzo*

Resumen

En este trabajo se analiza el efecto del aumento de la competencia debido a la creación del Mercado Común del Sur (MERCOSUR) sobre la productividad, el empleo y los salarios a nivel de los establecimientos del sector manufacturero uruguayo. Se utilizan técnicas de evaluación de impacto, sin y con matching para el período 1988-1995. Uno de los resultados más robustos es que el aumento de la apertura comercial aumenta la productividad total de los factores a nivel de los establecimientos. Además se encuentra una reducción en el empleo, en particular de los trabajadores menos calificados, aumentos en los salarios y una reducción de la brecha salarial entre los trabajadores calificados y los menos calificados como resultado del incremento en la apertura comercial. Así, el aumento en la productividad y el aumento del desempleo de los trabajadores menos calificados señalarían la necesidad de políticas de capacitación, empleo y otras políticas sociales a fin de neutralizar los efectos negativos del aumento de la apertura comercial sobre los trabajadores menos calificados.

Palabras clave: *política comercial, productividad, empleo, salarios.*

Abstract

This paper analyses the effects of increased competition resulting from the creation of the Southern Common Market (MERCOSUR) on productivity, employment and wages for the Uruguayan manufacturing sector at the plant level. We use impact evaluation techniques, namely regressions and matching and difference-in-differences estimation for the period 1988-1995. One of the most robust findings is that increased trade liberalization seems to improve total factor productivity. Furthermore, we find reductions in employment driven mainly by the decrease in blue collars, increases in wages and a reduction in the wage gap between white and blue collars as a result of increased trade exposure. Thus, the increase in productivity along with the unemployment of unskilled workers would indicate a room for training, labour and social policies in order to countervail the negative impact of trade liberalization on less qualified workers.

Key words: *trade policy, productivity, employment, wages.*

JEL Classification: *F13, O12, J2, J3.*

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* Profesora asociada del Instituto de Economía de la Universidad de la República, Uruguay. Doctora en Economía Aplicada por la por la Universiteit Antwerpen, Bélgica. Correo electrónico: *apeluffo@iecon.ccee.edu.uy.*

➲ 1. Introduction.[1]

The world economy is becoming increasingly integrated through trade, affecting not only markets for products but also labour markets. Policy makers often promote trade liberalization as a way to increase living economic growth and living standards in developing countries.

Uruguay provides an interesting case to analyse the effect of trade openness in a small developing economy. In the 1970s this country initiated a trade liberalization process which was deepened during the 1990s and combined a gradual unilateral tariff reduction with the regional integration in the framework of the Southern Common Market (MERCOSUR). Between 2003 up to 2005 Mercosur's partners debated on forming new free trade areas with the European Union and the United States, but in 2005 the refusal of Argentina to pursue more open trade policies stopped the negotiations. Nowadays, Uruguay and Brazil are again discussing the pros and cons of a free trade area with Europe. Thus, to understand the possible impacts on firms and workers is quite important in order to design policies to enhance the positive effects and minimize the negative ones.

Most studies that analyse trade liberalization usually fall into two broad areas: those that examine the link between trade openness and productivity and those which focus on the effects on the labour market, namely on employment, wages and inequality. Few studies attempt to analyse both aspects in a same work, which would allow a more comprehensive picture of the impact of trade liberalization. These issues are relevant not only from an academic point of view but also for countries deciding on policies towards increasing openness.

Though the efficiency argument for trade liberalisation is usually accepted, the main argument against trade reform in developing countries is that trade liberalization could increase income inequality and worsen the conditions of the poor. In particular concerns regarding higher unemployment among workers displaced by the contraction of import competing sectors, greater uncertainty and precariousness of job conditions, and the creation of new job opportunities only for the most qualified segments of the workforce. Thus, while trade may increase efficiency, also can lead to increases in unemployment and wage inequality.

1 I am grateful to Gabriela Fachola and Carlos Casacuberta for providing the harmonized data base as well to Ken Teshima and participants at the LACEA's Trade, Integration and Growth Network meeting, participants at the Seminar at the Instituto de Economia (Facultad de Ciencias Economicas), the Jornadas de Economia del Banco Central del Uruguay, and Seminar at the Universidad Nacional de Cordoba. The usual disclaimer applies.

With respect to the impacts of trade liberalization the literature has flourished in the last decades. The economic literature has produced a large number of empirical studies analysing the effects of trade on productivity as well on labour market outcomes.[2] While several studies show that trade openness is associated with increases in productivity, no clear message emerge for labour markets.

In some cases these changes are in line with the predictions of Heckscher-Ohlin theory: widening wages or unemployment gaps between skilled and unskilled workers in the North, and symmetrically narrowing gaps in parts of the South, particularly in East Asia in the 1960s and 1970s (Wood 1994). In other cases the wage changes have diverged from these predictions. In particular in Latin America, wage inequalities rose in many countries in the 1980s and 1990s, most notably in middle-income countries (Robbins 1996; Wood 1998), but also in some low-income countries. Several explanations have been put forth to explain these findings, some of them emphasise other forces than globalization (reforms of labour markets, institutions or exogenous technical change), others suggesting alternative channels through which the effects of globalization might flow.

In this work we analyse the effect of increased trade openness on firms' productivity, employment, wages and the wage gap between skilled and unskilled workers using difference-in-difference regressions (DID) as well as matching and difference-in-difference techniques (MDID). Matching should improve the selection of the control group allowing a better insight on the effects of trade exposure on plants' behaviour.

Thus, we compare the effect of the increase in trade exposure on Uruguayan manufacturing plants' productivity and labour market outcomes before and after the creation of the Southern Common Market (MERCOSUR). The difference-in-difference approach has the advantage of removing the effects of common shocks providing so a more accurate analysis of the impact of trade openness, and allows causal identification of the impact of trade reform.

The use of the difference-in-difference approach allows analysing the impact of trade liberalization at the micro level for a small developing country -in particular the impact of MERCOSUR's creation-. To the best of our knowledge this is the first work to use this methodology for a South-South regional integration agreement –the MERCOSUR- and in particular for a small partner –Uruguay- using micro level data to analyse the impact of increased openness on plants' productivity, employment and wages.

2 Some examples are Hanson and Revenga (1995); Rama (2003); López (2004); Attanasio et al. (2004); Galiani and Porto (2006), among others.

Data at the plant level was provided by the National Institute of Statistics (Instituto Nacional de Estadísticas del Uruguay, INE) for the period 1988-1995. Data on tariffs was provided by the Mercosur Secretariat.

One of the most robust results that emerge from this work is increases in total factor productivity, reductions in employment, and wages and a reduction in the wage gap between white and blue collars as a result of increased trade exposure. Furthermore, we observe that the reduction in employment is driven mainly by the decrease in the number of blue collars per firm.

This work structures as follows: after this introduction, we present briefly some studies on the links between trade liberalization, productivity, employment and wages. In the third section we present the empirical implementation and in the fourth the results and finally some concluding remarks.

➲ 2. Literature Review.

Regarding to the impact of trade liberalisation on productivity it is argued that trade liberalization can increase productivity by inducing a better reallocation of production factors (static effects) as well as the adoption of more advance technologies (dynamic effects). Some authors (Pavcnik 2002, Melitz 2003, Bernard et al. 2003, Tybout 2003) have emphasized the first channel, i.e. trade reallocates market shares towards exporters, the most productive firms, increasing aggregate productivity. But also, as shown in Bustos (2011) the resulting increase in revenues can induce exporters to invest in new technologies, which in turn translate into increases in productivity.

The new-new models[3] of trade which incorporate firm heterogeneity (e.g. Melitz 2003; Bernard et al. 2003; Bernard, Redding and Schott 2007; Melitz and Ottaviano 2008) predict that trade liberalization could generate significant across and within-industry reallocation effects. In these models opening to trade and consequently increased trade exposure may not only generate the traditional resource reallocation effects from comparative disadvantage industries to comparative advantage ones, but also from less to more productive firms within industries. In these models trade reform will trigger job creation and job destruction in all sectors, as both net-exporting and net-importing sectors will be characterized by expanding high productivity firms while low-productivity

3 Recently, the examination of the new microeconomic evidence points out that exporting firms are more productive than non-exporting ones, and that increased exposure to international markets may increase productivity. This stylized fact gives raise to new models that incorporates firms' heterogeneity.

firms shrink or close down. This implies that an important reshuffling of jobs takes place within sectors. Moreover, these new models predict an increase in real wages driven by the expansion of more productive firms. Recently, Helpman et al. (2010) develop a model introducing heterogeneous workers and firms and unemployment.

Most empirical studies that use plant or firm level data find significant productivity gains after trade liberalization (Pavcnik, 2002 for Chile, Lopez-Cordova and Mesquita, 2002 for Mexico and Brazil, Fernandes, 2007 for Colombia and Topalova 2004 for India). Furthermore, Pavcnik (2002) and Fernandes (2007) find that the reallocation of resources in favour of more productive firms is a critical determinant of productivity growth and that, consistent with Melitz's (2003) model, this effect can be largely due to trade liberalization. For Uruguay, Casacuberta et al. (2004) analysing the manufacturing sector find increases in total factor productivity especially in sectors where tariff reductions were larger and unions were not present. The limitation of these studies is that most of them focus on associations but not in causal effects, and do not disentangle the effects of trade reforms from other policies implemented simultaneously with trade liberalisation, which was usually the case for most developing countries.

Regarding to labour markets, traditional trade models assume full employment, though some workers may be better or worse off in the long run due to changes in wages. It is assumed that on average, individuals would be better off as a result of overall efficiency gains triggered by trade liberalization. However, many economies are not characterized by full employment. In this case trade liberalization would reduce demand for workers mainly in import competing sectors and unemployment would increase. Trade policies can have a significant impact on the level and structure of employment, on wages and wage differentials, and on labour market institutions and policies.

The theoretical literature provides insights into the process of job destruction and job creation following trade liberalization and illustrates how different country characteristics can affect temporary and permanent employment at the sectoral or country level (Lee and Vivarelli 2006).

As we mention above, recent trade models point out that adjustment processes may not only be observed between sectors but also within sectors. The "new-new trade models" that introduce firm heterogeneity and fixed-market entry costs predict that trade reform will trigger job creation and job destruction in all sectors, as both net-exporting and net-importing sectors will be characterized by expanding high-productivity firms and low-productivity firms that shrink or close down. This implies that an important reshuffling of jobs takes place within sectors.

As regards the impact of trade reforms on employment and wages, there are some cross-country studies that provide insights into the income effects of trade reform for subgroups in the population. The study by Rama (2003) finds temporary increases in unemployment following trade reforms in many developing countries. This author also finds that trade can have a negative impact on wages in the short run, but finds that it only takes a few years for this effect to change sign. Lopez (2004) distinguishes between the short and long run effect of trade policies. He finds that trade openness raises inequality and stimulates growth at the same time and refers to trade liberalization as a win-lose policy. Improvements in infrastructure and in education on the other hand reduce inequality and increase growth at the same time, so does inflation reduction. Further evidence on developing countries is given by Harrison and Revenga (1995). They find evidence of increases in manufacturing employment following trade liberalization periods in Costa Rica, Peru and Uruguay. Instead, in a number of transitional economies (Czechoslovakia, Poland and Romania), employment fell during the transition period. As the authors note, however, those countries were undergoing significant other reforms that went well beyond trade liberalization.

With respect to wages, the theoretical literature predicts that trade liberalization raises average income levels, and some contributions to the theoretical growth literature suggest that trade also stimulates growth. A large number of multi-country case studies and econometric studies using cross-country datasets have tested the empirical validity of the trade-growth relationship but there is no full agreement among economists concerning the precise nature of this relationship.[4]

Most empirical works for Latin America suggest that trade liberalization has led to an increase in both income and wage inequality and a skill bias of labour demand (Galiani and Porto 2006; Sanchez-Paramo and Schady 2003; Attanasio et al. 2004; Slaughter 2001; Spilimbergo et al. 1999; Wood 1998; Feenstra and Hanson 1997; Robbins 1996).[5] On the other hand, Behrman, Birdsall and Szely (2003) for a set of Latin American countries, find that trade openness affects income distribution positively whereas Edwards (1998) does not find any significant effect of trade on income distribution. More recently, Verhoogen (2008) analyse trade and wage inequality for Mexico and proposes a new mechanism linking trade and wage inequality: the quality upgrading mechanism. This researcher using panel data, and correcting for endogeneity finds that quality upgrading to serve Northern markets leads to an increase in the demand for skilled workers, rising so the wage gap between skilled and unskilled labour. The reasons for this disagreement may lay in

4 See for instance Baldwin (2003), Rodríguez and Rodrik (2001), Dollar and Kraay (2004), Loayza, Fajnzylber and Calderon (2005) and Wacziarg and Welch (2003).

5 Winters et al. (2004) and Hertel and Reimer (2005) surveyed the effects of trade on income levels.

differences in the quality of the data, the periods analysed as well as on the econometric techniques used in the studies.

For the Uruguayan case Rama (1994), in contrast, finds a negative effect of trade liberalization on employment in his analysis of trade policy reform in Uruguay in the late 1970s and early 1980s. The study by Casacuberta and Vaillant (2002) find higher reductions in employment and wages in those industries with higher tariff reductions. This literature does not appear to allow for any general conclusion on the link between trade liberalization and income distribution and the impression arises that this link is country and situation specific. Furthermore, as it is the case with the studies on the impact of trade reform on productivity gains, most studies for developing countries focus on association and not in causal effects.[6]

Hence, so far empirical research into the link between trade liberalization and market labour outcomes has produced mixed results.

As we have already mentioned we should keep in mind the difficulty of isolating the effects of trade from other policies implemented simultaneously with trade reform. In most studies, the identification of trade effects relies on the comparison before and after a policy change. As a consequence, this approach attributes changes originating from other sources to trade policy. In this regard the difference-in-difference methodology should eliminate the effects of common shocks and provides more precise description of the impact of trade policy as we explain in Section 3.

➲ 3. Empirical implementation.

This paper use a difference-in-differences methodology which allows studying the impact of increased trade exposure (the treatment) on the liberalizing group (the treated) relative to firms in industries that did not increase their exposure to foreign competition (the control group).

The effect of increased trade openness is the estimated difference-in-difference of the outcome variable (productivity, employment, wages and relative wages between white and blue collars) between the treated and the control groups. We use two approaches: difference-in-difference regression equations without matching, and matching plants with similar propensity scores and applying difference-in-differences estimation.

6 There are some exceptions of works such the work by Trefler (2004) for the CUSFTA, and Vergoohen (2008) for Mexico, Pavcnik (2002) for Chile; Bustos (2011) for Argentina.

3.1. Methodology.

3.1.1. Difference-in-Differences without Matching (DID).

In the case of regression equations - or difference-in-differences without matching- our baseline equation to estimate is the following:

$$Y_{it} = \beta_o + \beta_L TL_{it} + \beta_x X_{it} + D_j + D_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is the outcome for firm i in industry j at time t. As outcome variables we consider total factor productivity (TFP), employment and wages. TL_{it} is the trade liberalization variable. The empirical methodology follows the empirical literature measuring the effects of trade liberalization on economic outcomes through changes in tariffs.[7] Our trade liberalization variable is constructed by interacting those firms belonging to industries with tariffs cuts above the average for the period 1988-1995 (Lib_{it}, where more exposed=1 and less exposed=0) with a time dummy that takes the value of one after the creation of the MERCOSUR, i.e. after 1991.[8] The level of trade exposure is estimated by the tariff reduction over the period. The tariff cuts are calculated as: $\Delta\Psi i$= (Tariffs1995-Tariffs1988)/Tariffs1988 at the 3 digit ISIC level. Since we have data on firms classified in the main production activity the tariff change is equivalent to the change at the industry level.[9] We calculate the average change in tariffs for the 26 manufacturing industries and find that the average tariff reduction is 0.56. When the tariff change is above the average we classified this industry as more exposed to trade liberalization (more exposed=1). Thus, we have constructed one indicator variable that takes the value of one for firms belonging to industries with higher tariff cuts after Mercosur's creation and zero otherwise (TL_{it}). Also as robustness check we perform the analysis using as cut-off point industries with tariffs reductions higher than 0.46 as the more exposed group.[10]

X_{it} is a set of variables which includes firm size which is defined as a dummy variable that takes the value of 1 if the firm is big (equal or with more than 100 employees), D_j is a vector of industry specific effects and D_j is a vector of time dummies.

7 Among these studies we can mention the work by Attanasio et al. (2004) that analyses trade liberalization on inequality for Colombia, Topalova (2005) for India, and Fernandes (2007) for Colombia.

8 The Asuncion Treaty, signed on the 26th March of 1991 is a regional integration agreement to create the Southern Common Market. It was signed by Argentina, Brazil, Paraguay and Uruguay.

9 See Appendix 2 for details.

10 In a previous version we defined tradable and non-tradable industries according to the level and stability of the export import ratio, finding qualitatively similar results, which are available upon request.

3.1.2. Matching firms with similar propensity scores and difference-in-difference estimation.

Our aim is to evaluate the impact of increased trade exposure on a set of outcome variables (Y), where Y represents productivity, employment and wages. *Y* is referred to as the "outcome" in the evaluation literature.[11]

Let $TL_{it} \in \{0,1\}$ be an indicator (dummy variable) of whether firm i was exposed to greater foreign competition after MERCOSUR's creation, i.e. after time period t=1991, and $Y^1_{i,t+s}$ the outcome of the treated at t+s, i.e. after the creation of the MERCOSUR. Also denote by $Y^0_{i,t+s}$ the outcome of firm *i* had it not experienced a greater trade exposure (control). The causal effect of trade openness for firm *i* at period (t+s) is defined as: $Y^1_{i,t+s} - Y^0_{i,t+s}$.

The fundamental problem of causal inference is that the quantity $Y^0_{i,t+s}$ is unobservable. Thus the analysis can be viewed as confronting a missing data problem. In common to most of the microeconomic evaluation literature (cf. Heckman et al. 1997) we define the average effect of trade openness as:

$$E\left\{Y^1_{i,t+s} - Y^0_{i,t+s} \middle| TL_{i,t} = 1\right\} = E\left\{Y^1_{i,t+s} \middle| TL_{i,t} = 1\right\} - E\left\{Y^0_{i,t+s} \middle| TL_{i,t} = 1\right\} \qquad (2)$$

Causal inference relies on the construction of the counterfactual for the last term in equation (2) $E\left\{Y^0_{i,t+s} \middle| TL_{i,t} = 1\right\}$ which is the outcome that firms would have experienced on average had they not been exposed to greater trade competition after the creation of the Southern Common Market. The counterfactual is estimated by the corresponding average value of firms that belong to non-tradable industries, and therefore almost unaffected due to increased trade exposure $E\left\{Y^0_{i,t+s} \middle| TL_{i,t} = 0\right\}$. An important issue in the construction of the counterfactual is the selection of a valid control group. We assume that all the difference in the outcome (Y) between firms affected by increased trade openness and the appropriately selected control group is captured by a vector of observables $\mathbf{X}_{it}$ and the level of the outcome variable $Y_{i,t-1}$, before MERCOSUR's creation.

The basic idea of matching is to select from the group of firms belonging to the non-treated or control group those firms in which the distribution of the variables affecting the outcome is as similar as possible to the distribution of the firms belonging to the treated group (those more exposed to increased trade openness). Nevertheless, some assumptions have to hold for this to be a valid comparison group. One of these assumptions is conditional independence that states that the treatment status is random, conditional on some set of attributes, $\mathbf{X}_{it}$, and independent of the poten-

11 Blundell and Costa Dias (2000) present a review of the microeconomic evaluation literature.

tial outcomes (Y_{it}^{1}, Y_{it}^{0}). This assumption implies that given a set of observable characteristics the outcome of a carefully defined group of individuals unaffected by the policy can be used as a counterfactual of the outcome levels of the treated had them not be treated. The matching procedure consists in linking each treated individual with the same values of the $\mathbf{X}_{it}$. To solve for the difficulties that arises when $\mathbf{X}_{it}$ is multidimensional, the results of Rosenbaum and Rubin (1983) show that if the conditional independence assumption holds, it will also hold conditional on a single index that captures the information from the $\mathbf{X}_{it}$ in the so called "propensity score", i.e.$Y_{it}^{1}, Y_{it}^{0}) \perp TL_{it} \left| P(X_{it}) \right.$. Thus, we adopt the "propensity score matching" method of Rosenbaum and Rubin (1983). To this end, we first identify the probability of being a firm affected by increased trade openness (the "propensity score") for all firms, irrespective if they belong to tradable or non-tradable sectors by means of a logit or probit model. For instance for the probit model:

$$P(TL_{i,t} = 1) = F(X_{it}) \tag{3}$$

where **F** is the normal cumulative distribution for the probit model, or the logistic for the logit model and **X** stands for full set of control variables.

Let P_{it} denote the predicted probability of being affected by trade openness at time *t* for firm *i* (which is actually or potentially affected by increased trade exposure). A firm *k* belonging to the non-tradable industries, which is "closest" in terms of its "propensity score" to a firm belonging to the tradable industries, is then selected as a match for the former. More formally, at each point in time and for each firm exposed to increased foreign competition *i*, a non-tradable firm *j* is selected such that:[12]

$$\left| P_{it} - P_{kt} \right| = \min_{\left\{ k \in Lib_{i,t} = 0 \right\}} \left\{ P_{it} - P_{kt} \right\} \tag{4}$$

This type of matching procedure is preferable to randomly or arbitrarily choosing the comparison group because it is less likely to suffer from selection bias by picking firms with markedly different characteristics.

There are several matching techniques, and in this work we use the "nearest-neighbour" matching method and we also try the "kernel" matching method to check the robustness of the results.[13]

12 A firm unaffected by increased trade openness can be match to more than one firm that experienced the effect of increased trade exposure.

13 The matching is performed using the command psmacht2 in Stata, version 12 as described in Sianesi (2001). Additionally, we tested the balancing properties with the command pscore.

Once selected the comparison group, we adopt a difference-in-difference methodology to isolate the role of increased trade exposure on firms' dynamics and its effects on employment and wages.

As Blundell and Costa Dias (2004) point out, a combination of matching and difference-in-difference is likely to improve the quality of non-experimental evaluation studies. The difference-in-difference approach is a two-step procedure. Firstly, the difference between the average output variable before and after MERCOSUR's creation is estimated for firms belonging to the tradable sectors, conditional on a set of covariates. However, this difference cannot be attributed only to increased trade exposure since after the creation of MERCOSUR the output variables might be affected by other macroeconomic factors, such as policies aimed to stabilization of the economy. To cater for this the difference obtained at the first stage is further differenced with respect to the before and after difference for the control group of non-tradable plants. The difference-in-difference estimator therefore removes effects of common shocks and provides a more accurate description of the impact of trade openness.

According to the literature the independent variables to include in the logit/probit regression should be correlated to the outcome variable and to participation in the policy, but they should not be potentially changed by the policy itself. Thus, the choice of variables prioritises the use of time invariant variables which poses another challenge to the analysis. To tackle the issue we construct some categorical variables such as size, high value added –defined as a dummy that takes the value of one if the plant has a value added higher than the median- high gross output, high capital intensity (capital labour ratio) and export status as we explained below.

3.2. Variables.

As outcome variables we consider total factor productivity (TFP), employment and wages at the firm level.

Since there is an ongoing debate on the estimation of total factor productivity we estimate estimate TFP using Olley and Pakes (1996) methodology, and with exports as state variable and find that the correlation between Levinshon and Petrin's estimates and Olley and Pakes have a correlation equal or higher than 0.95. We also tried Ackerberg et al. (2006) techniques which present also a high correlation with Levinshon and Petrin and Olley and Pakes estimates.[14]

14 Results are available upon request.

We use Levinshon and Petrin's methodology in our estimations. As is usual in the empirical literature the estimation of a production function uses the real value of output rather than physical units of output produced by the plant as a measure of output. A measure of productivity based on the real value of output might not reflect the ranking of plants on their productivity if plants charge different mark-ups. Discriminating between the true productivity and the specific mark-up is quite difficult in the productivity literature. In order to distinguish the true efficiency from the plant specific mark-ups we would need plant level price data which is not available for Uruguay. This caveat should be considered when interpreting the results.

We measure employment as the number of workers per plant and we also discriminate between white collar and blue collars. Wages are measured as total wages per plant, wages per employee, wages per white collar and wages per blue collar at constant prices with 1988 as the base year. We also analyse the effect of increased trade exposure on the wage gap between skilled and unskilled workers defined as the ratio of white collar wages to blue collar wages. Wages were deflated by a wage index while gross output is deflated by the wholesale price index.

As we explain above, to construct the liberalization variable (TL_{it}), we define the treated group as those establishments belonging to those industries with higher tariff cuts (Lib_{it}) after MERCOSUR's creation. Our control group is integrated by firms belonging to industries with a tariff reduction below the average tariff reduction in the period, so relatively more isolated from increased trade exposure.

We should note that this definition of the tradable and non-tradable groups is not free of criticism: on one hand it may be sensitive to the level of aggregation used. Moreover, usually the non-tradable industries –except for the work of Pavcnik (2002) - are defined as the service sector (construction, communication, transport, and financial services). Lack of plant level data on services for the period analysed prevented us from checking the sensitivity of the result using services as a control group. Besides, Barraud and Calfat (2008) analysing the effect of trade liberalization on wages for Argentina find evidence of significant impacts of trade liberalization on several non-tradable sectors as well as an important shift of manufacturing workers to services, which would indicate that the service sector is also likely to be affected by liberalization. Moreover, in the Uruguayan case services are liberalized and consumed mainly by not residents –namely tourism, transportation and financial services- except for the public services provided to domestic residents by public companies (electricity, fuels and telecommunications). Another possible caveat it is that our data covers only the formal sector and trade liberalisation episodes may induce an increase in

informality. Nevertheless the informality level in Uruguay is lower than for the rest of other Latin American countries. During the period 1991-2005 it remains relatively stable with a slight increase in the period 1991-1995. In 1991 there was 32 per cent of informal workers in total employment and it raises to 35 per cent in 1995 (Amarante and Espino, 2007). In Appendix 1 we present the classification of the tradable and non-tradable groups.[15]

On the other hand, the advantage of these openness measures is that they are specific to the manufacturing industries while cross-country comparisons use aggregate measures that avoid having a better insight on industry and plants' dynamics. Nevertheless, as we note previously, even though the difference-in-difference methodology should eliminate common shocks, we should be cautious in interpreting the results since under the period analyzed Uruguay did not only liberalized trade but also pursue other set of macroeconomic policies aimed to the stabilization of the economy. One of these policies was the exchange rate policy which was pegged to the dollar and domestic currency appreciated in order to control inflation. Thus, we checked that the outcome variables analysed in the treated and control group have a common trend, otherwise results will we flawed unless we use inverse probability weighting techniques. In Chart 1 to 5 we present the time trends of the variables analysed for some outcome variables, finding that they have relatively similar trends.

3.3. Data sources.

Data at the firm level comes from the National Institute of Statistics (INE) for the period 1988-1995. Estimates of TFP aggregated at the industry level were provided by Casacuberta et al. (2004).

The firm level data provided by the National Institute of Statistic, Uruguay (INE) contain information on gross product, value added, expenditures on intermediates and materials, energy, employment, wages, sales, exports, capital and age at the firm level for the period 1988-1995. In 1988, the starting year of our sample, the Second National Economic Census was conducted. The rest of the data comes from annual surveys. The surveys report information from manufacturing plants with five or more employees. All the firms with more than 100 employees are compulsorily included in the sample. A random sampling process is conducted on plants with less than 100 employees and has to satisfy the requirement that the total employment of all the selected establishments must account at least for 60 % of the total employment of the sector according to the economic Census of 1988. These selection criteria biased the database towards big firms. Each year the INE revises the sample coverage, and if necessary, due to the closure of firms, includes new ones.

15 The import penetration and export propensity for the 26 industries are available upon request.

Once a firm enters the survey, it is followed until its death. Therefore, when we have no more data for a particular establishment this is interpreted as a plant closure (exit or death).

Gross output, value added, sales and exports were deflated by the wholesale index with base year 1988. Capital was deflated by specific industry price deflators for capital, as well as employment, wages and energy. The deflators were provided by the Department of Economics, School of Social Science, and were elaborated by the Instituto Nacional de Estadisticas (INE).

In the sample there is an important reduction in the number of firms, which along with missing observations left us with and important reduction in the number of observations. Actually in the period there is exit as well entry of new firms which is quite difficult to analyse due to the sampling methodology followed by the INE. The INE periodically includes new establishments, but these do not necessarily belong to new-born firms. Thus we cannot identify new-born firms in the data. In Table 1 we present the number of firms surveyed per year.

In Table 2 we present some descriptive statistics on employment, wages, gross output, value added, labour productivity, total factor productivity, and export propensity for firms belonging to the tradable and non-tradable industries as well for the pooled data (whole sample).

Total factor productivity (TFP) and labour productivity (LP) per plant increase for the whole sample in the period. When we discriminate between more exposed and less exposed industries to trade liberalisation, we find that TFP and LP are higher for firms belonging to the less exposed group than for those belonging to the more exposed one. Both variables increase in the period with a higher increased in the more exposed group.

Total employment per firm shows a decrease in the period. In 1988 this variable is higher for firms belonging to the less exposed group in relation to those in the more exposed one. Nevertheless, employment decrease for the more exposed group in the period and in 1995 average employment per firm is higher in the less exposed group. Thus the reduction in employment in the sample is led by the decrease in employment in the more exposed group.

When we split total employment in white collars and blue collars we observe a similar behaviour to that of total employment per firm. The number of white collars per firm experienced a small reduction in the period. Moreover there is a slight increase in white collars in the less exposed group and a very slight decrease in the more exposed one.

The number of blue collars decrease in the period for the whole sample. This variable is higher for in the more exposed group in 1988 with an important decrease in 1995. In this last year the number of blue collar is higher in the less exposed group.

Regarding to wages, average wages per firm shows an increase for the whole sample in the period. We observe that it increases in the period for both groups with a higher increase for the less exposed group.

Wages per worker increase in the period for the whole sample as well as for the less exposed and the more exposed group. The increase is slightly higher in the more exposed group compared to the less exposed group.

Wages per white collar increase in the period for the whole sample. In 1988 wages per white collar are slightly higher for the less exposed group compared to the more exposed one, while in 1995 this variable is slightly higher for the more exposed one. For both groups there is an increase in wages per blue collar in the period. On the other hand wages per blue collar increases for the whole sample in the period. This variable is slightly lower for the more exposed group in relation to the less exposed in 1988 while it show a higher increase in the period for the less exposed one.

Finally, gross output per firm increases for the whole sample in the period. This variable is higher for the more exposed group than for the less exposed group in 1988, with a higher increase in 1995 for the less exposed group, i.e. gross output per plant increases more in the less exposed group than in the more exposed one.

Thus, in 1988, average values of wage per worker, value added, total factor productivity and labour productivity are higher for plants belonging to less exposed industries and lower for the more exposed ones. Total employment per firm and the number of blue collars is higher for plants belonging to more exposed industries. Except for employment that shows a decrease in the period wages, gross output, value added, labour productivity and total factor productivity increases in the period.

4. Results.

4.1 Difference-in-Differences without Matching (DID).

Results for the regressions in double differences and without matching are presented in Table 3.1 without controls for plant size and in Table 3.2 controlling for plant size.
Total factor productivity and labour productivity shows significant increases of 25 per cent and 1,788 constant pesos respectively. When we control for firm size the significance and magnitude of the coefficients are similar.

Total employment per firm shows a significant reduction (28 workers). When we discriminate between white collar and blue collar we find that the reduction in white collars is not significant (3 white collars less per plant). Nevertheless, the reduction in blue collars is negative and significant (approximately 18 blue collars less per plant). Hence, the adjustment is driven mainly by the reduction in the blue collars.

Total wages per firm shows not significant reductions. On the other hand wages per worker shows a positive and significant increase of 641 constant pesos and 654 when we control for plant size. Furthermore when we discriminate between wages per white collar and wages per blue collar (in terms of number of workers) we find significant increases for both (804 and 553 constant pesos respectively). Finally, the wage gap measured as the ratio of wages per white collar/wages per blue collar is negative and significant showing a decrease in the gap between the wages for both types of workers in the period analysed. The reduction ranges from 0.19 without controls for firm size and 0.17 controlling for size, pointing out a decrease in the wage gap for those who keep their jobs.

Thus, both, total factor productivity and labour productivity show significant increases for those firms more exposed to trade liberalisation along with significant reduction in employment. The reduction in employment along with increases in productivity may be explained by the technological modernization in the early 90s, namely a substitution of labour by capital, as me have mentioned above. This modernization process takes place due to a higher competition as well as the reduction in the real price of the capital in the period. Furthermore, as we comment above we observe that the reduction in employment is driven mainly by the decrease in blue collars, and it may be the case that those blue collars that lost employment are the less skilled among this category of workers, and may be easily substitute by subcontracting of activities.

Regarding to wages we find and increase in real wages and a reduction in the gap between wages of white collars and blue collars. The increase in wages along with the reduction in employment, once again leads us to think that it is pretty likely that those that lost employment were the less skilled ones.

4.2. Matching and difference-in-differences.

In Table 4.1 we present the results of the difference-in-difference estimation using as matching method the nearest-neighbour (with 3 and 5 neighbours with replacement), and the kernel with two weighting functions the Epanechnikov and the Gaussian).

As we mentioned before there are several matching techniques that differ on the selection and weighting of the observations in the control group. Each treated individual can be compared with a single control unit, or with the whole comparison group using nearest neighbour matching or kernel functions respectively and an appropriate weight function. The most commonly used functions include the unity (identical) weight(s) to the nearest observation(s) and zero to the rest, or kernel weights which penalize distant observations according to their propensity score. Usually increasing the neighbourhood to create the counterfactual will reduce the variance and increase the bias resulting from using more and distant matches.

According to the theoretical literature, the independent variables to include in this regression should be correlated to the outcome variables and to participation in the policy, but they should not potentially be changed by the policy itself. Thus, this is not a simple task in this study since most of the variables are continuous ones; hence we choose to construct categorical variables. We choose as covariates those that satisfied the balancing properties. After analysing the balancing tests[16], we retain as covariates the export status of the firm (dummy that takes the value of one for exporting firms and zero otherwise), a dummy equal one for those plants with a gross output higher than the median of the whole sample and a dummy for plants with value added higher than the median for the whole sample and zero otherwise..

Results are presented in Table 4.1. We found that total factor productivity increases significantly for all the matching procedures tried[17]. The magnitude of the estimated effect is of 25 per

16 We analysed the balancing test with two Stata's programs: the psmatch2 and the pscore option.
17 A t-stat equal or higher than 1.67 is significant at the 10 % level.

cent in most of the estimations and similar to the regressions without matching. Further, labour productivity also shows significant increases ranging from 909 up to 1810 constant pesos.

Regarding to employment we find a significant decrease in the number of total workers per plant ranging from 27 up to 45 less workers per firm. When we discriminate between white collar and blue collar we find that the reduction in white collars is not significant for kernel matching but it is significant for 3 and 5 nearest neighbours (which ranges from 3 up to 7 white collars less per plant) while the reduction in blue collars is always negative and significant and higher (18-29 blue collars less per plant). Hence, the reduction in total workers is driven mainly by the reduction in blue collars.

Total wages per plant shows an increase but this is not statistically significant. On the other hand wages per employee shows a positive and significant increase of 600 up to 653 constant pesos. Furthermore when we discriminate between wages per white collar and wages per blue collar (in terms of number of workers in each category) we find significant increases for both. Finally, the ratio of wages per white collar/wages per blue collar is negative and significant showing a decrease in the gap between the wages for both types of workers in the period analysed. The reduction in the gap ranges from 0.15 to 0.19, fairly consistent with the regression equations without matching. Nevertheless, we should note that this analysis is including only the formal sector of the economy.

Summing up, the results show an increase in productivity, decrease in employment –namely driven by blue collars- and increases in real wages, with a reduction in the gap between white and blue collars. The reduction in employment along with increases in productivity may be explained by the technological modernization in the early 90s, namely a substitution of unskilled labour by capital (Casacuberta et al. 2004). This modernization process takes place due to a higher competition as well as the reduction in the real price of the capital in the period. On the other hand, the reduction in the relative wage of white to blue collar may be explained due to the decrease in employment, which was mainly driven by blue collars. It could be argued that the blue collars that lost employment are likely to be the less skilled ones in this category of workers. Furthermore, the period is characterized by an important subcontracting of work by the firms, and particularly of less skill intensive activities such as cleaning services and maintenance. We would need more accurate information on the skill levels of workers –which is not available in the Industrial Surveys such as years of schooling - in order to have a sound explanation for this result.

In Table 4.2 we present the results of the logit used for the estimation of the propensity

score. In Table 4.3 we report the balancing tests for the kernel matching procedure.

In Table 4.4 we present the results of a sensitivity tests when we use as cut off point for the tradable group reductions in tariffs greater than 0.46. The results are in line with the ones obtained previously with some change in the magnitude of the coefficients.

Finally, we perform some falsification tests to analyse that results were actually driven by Mercosur's creation. We choose as placebo years 1988 and 1989 and perform the difference-in-difference regressions. In all the cases the outcome variables are not significant. Results are presented in Table 5.

5. Concluding remarks.

Since the return to the democratic regime in 1985, the Uruguayan economy underwent considerable policy reforms. Among them, one of the most salient and stable of these reforms was trade liberalisation and the increasing integration of the country with the region and the world economy. This increased trade liberalisation raised voices of concern regarding to the likelihood of a negative impact on the manufacturing Uruguayan industry, which has been developed in a framework of high protection. In this regard our work contributes to the debate to improve our understanding of the effects of increased liberalization on manufacturing productivity and labour market outcomes at the micro level for a small developing country.

In order to analyse the impact of increased trade exposure on plants' productivity and labour market outcomes we use difference-in-difference techniques which is not very common for evaluating trade reform. One of the most robust findings is that trade liberalization seems to increase total factor productivity, decreases employment namely for unskilled workers, increases wages and reduces the gap between white and blue collar wages.

The reduction in employment along with increases in productivity may be explained by the technological modernization in the early 90s, namely a substitution of labour by capital,[18] as me mention above. This modernization process takes place due to a higher competition as well as the reduction in the real price of the capital in the period (Casacuberta et al. 2004). On the other hand, the reduction in the relative wage of white to blue collar may be explained due to the decrease in employment, which was mainly driven by blue collars. It could be argued that the blue collars that lost employment are likely to be the less skilled ones in this category of workers. Furthermore, the

period is characterised by an important subcontracting of work by the firms, and particularly of less skilled activities. We would need more accurate information on the skill levels of workers in order to test this possible explanation for this result.

Thus, one of the most robust results that emerge from this work is increases in total factor productivity, reductions in employment, and increases in wages and a reduction in the wage gap between white and blue collars as a result of increased trade exposure. Furthermore, as we have already mentioned we observe that the reduction in employment is driven mainly by the decrease in blue collars, and may be the case that those blue collars that lost employment are the less skilled among this category of workers, and be easily substitute by subcontracting of activities. A deeper insight on this possible explanation would require more detailed data on qualification levels such as years of schooling.

Nevertheless, the increase in productivity along with the unemployment of unskilled workers would indicate a room for training, labour and social policies in order to countervail the negative impact on less qualified workers.

18 We observe increases in capital per worker in the period. This statistics are available upon request.

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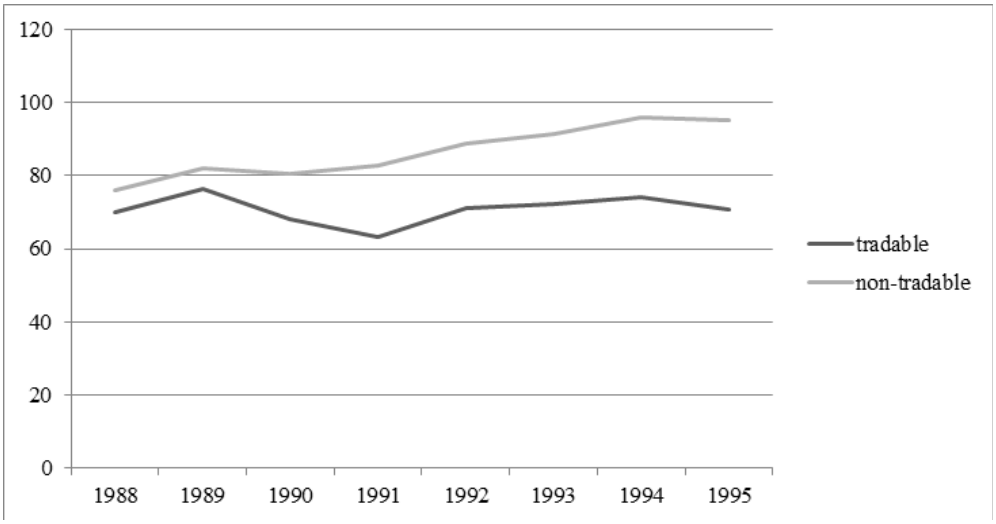
Chart 1

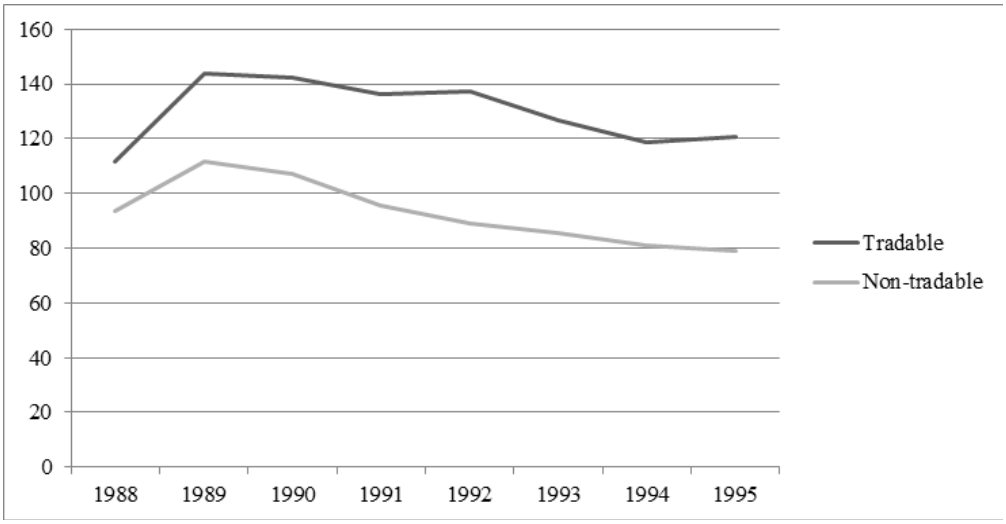
Total Factor Productivity (TFP)



Source: Own elaboration.

Chart 2

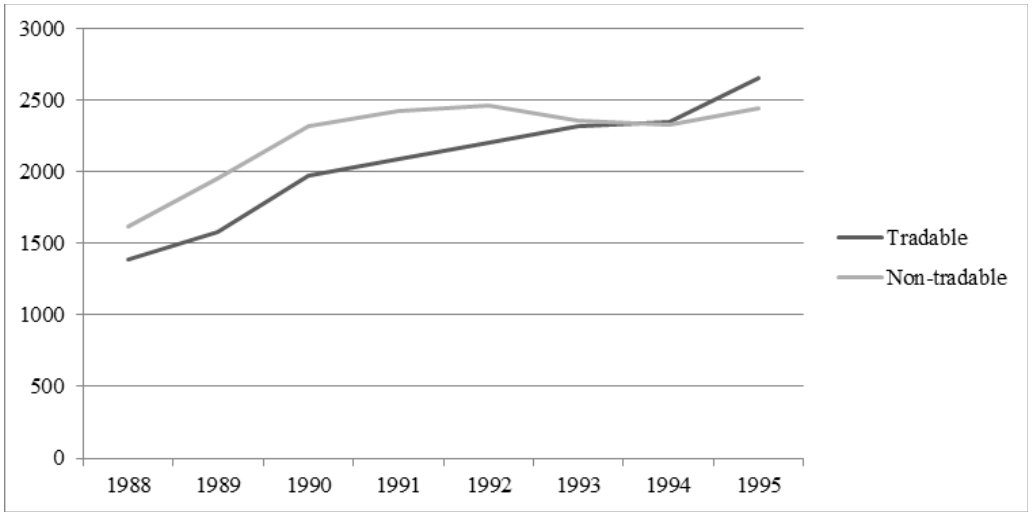
Total Employment per plant



Source: Own elaboration.

Chart 3

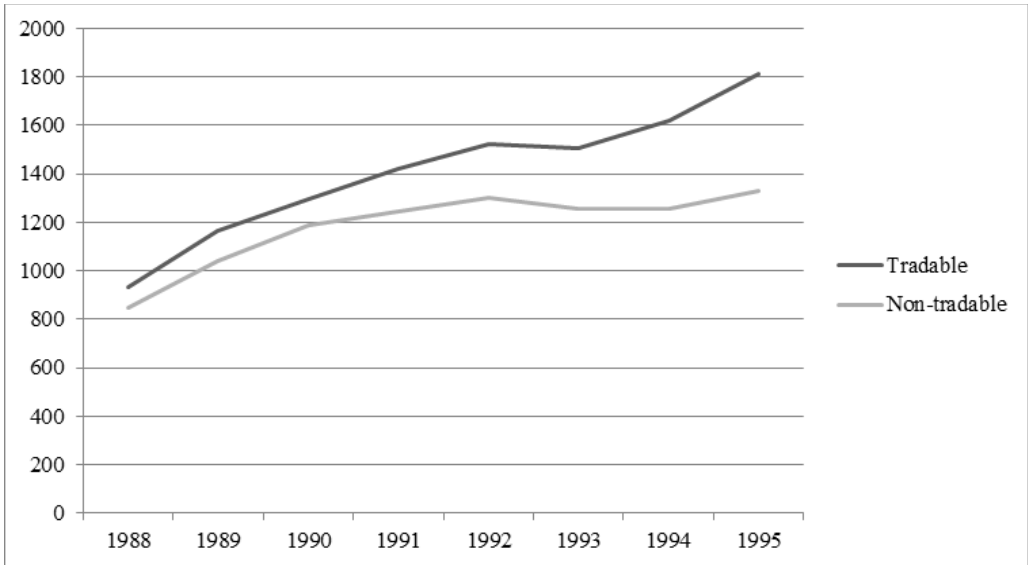
White collars wages



Source: Own elaboration.

Chart 4

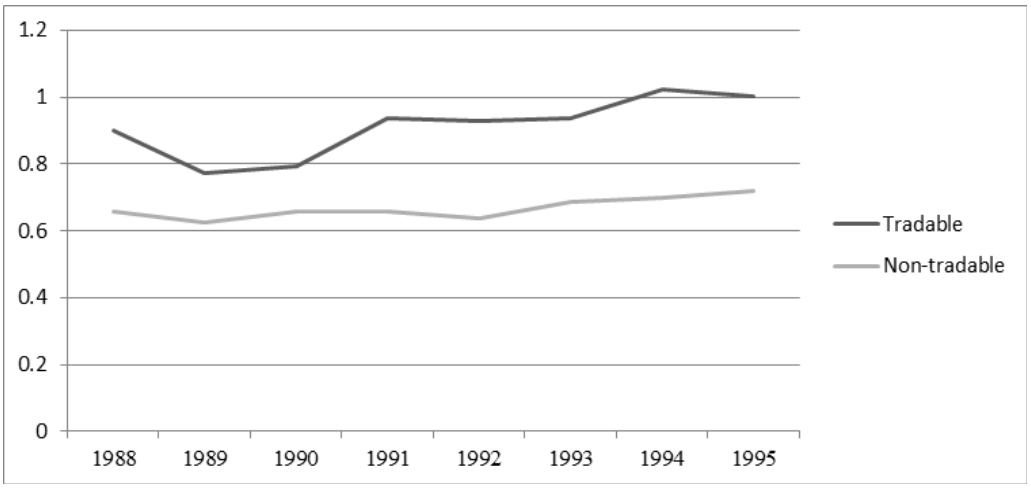
Blue collar wages



Source: Own elaboration.

Chart 5

Ratio of white collar to blue collar wages



Source: Own elaboration.

Table 1

Number of Establishments per year

Year	No. of plants
1988	1281
1989	1004
1990	965
1991	892
1992	822
1993	770
1994	720
1995	665

Source: data from the Instituto Nacional de Estadística

Table 2

Descriptive Statistic for plants belonging to tariffs reductions above the average and for the whole sample (average values per plant)

Variable	Sample	1988	1995
Employment	More Exposed	109.33	70.98
(number of employees	Less Exposed	77.96	88.86
per plant	All	95.63	82.01
White collars	More Exposed	21.69	17.59
(number per plant)	Less Exposed	18.49	21.30
	All	20.29	19.88
Blue collars	More Exposed	79.66	49.60
(number per plant)	Less Exposed	57.64	64.89
	All	70.05	59.03
Wages per plant	More Exposed	119,223.50	145,638.80
(constant pesos base	Less Exposed	98,139.79	158,217.30
year=1988)	All	110,065.90	153,395.50
Wages per employee	More Exposed	924.57	1619.92
(constant pesos base	Less Exposed	1,023.16	1,556.34
year=1988)	All	967.33	1580.34
Wages per white collar	More Exposed	1,550.43	2,477.72
(constant pesos base	Less Exposed	1,642.11	2,382.91
year=1988)	All	1,589.71	2,419.24
Wages per blue collar	More Exposed	820.92	1417.26
(constant pesos base	Less Exposed	868.89	1300.41
year=1988)	All	841.80	1344.27
Wages WC/Wages BC	More Exposed	1.89	1.73
	Less Exposed	1.84	1.80
	All	1.87	1.77
Gross output	More Exposed	1,158,350	1,111,772
(constant pesos base	Less Exposed	903,073	1,634,944
year=1988)	All	1,047,679	1,434,395
Value Added	More Exposed	466,874	516,376
(constant pesos base	Less Exposed	501,867	653,697
year=1988)	All	481,624	601,058
Capital per plant	More Exposed	694,896	797,917
(constant pesos base	Less Exposed	541,393	490,783
year=1988)	All	628,900	608,233
Labour productivity	More Exposed	3,882	5,857
(constant pesos base	Less Exposed	5,971	6,304
year=1988)	All	4,761	6,135
Total factor productivity	More Exposed	69.67	93.74
(% of manufacturing average	Less Exposed	83.35	93.49
in 1988)	All	75.47	93.59
Export propensity	More Exposed	14	16
(%)	Less Exposed	13	16
	All	14	16

ALL: the whole sample.

Source: own elaboration based on data from the Instituto Nacional de Estadísticas.

Table 3.1

Difference-in-differences regressions without matching

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	TFP	Labour productivity	Employment	White collars	Blue collars	Wages per employee	Wages per white collar	Wages per blue collar	Wage WC/Wage BC
Exposure_ri	24.58***	1,788***	-28.00**	-2.664	-17.71**	640.8***	804.4***	553.5***	-0.193**
	(4.830)	(530.1)	(11.29)	(3.105)	(8.134)	(66.57)	(113.3)	(52.31)	(0.0772)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	75.61***	4,052***	138.9***	27.23***	108.7***	1,017***	1,625***	914.1***	1.786***
	(4.238)	(231.4)	(14.21)	(4.544)	(10.44)	(35.99)	(61.64)	(27.08)	(0.0553)
Observations	999	1,789	1,920	1,920	1,920	1,843	1,691	1,801	1,652
R-squared	0.159	0.060	0.060	0.044	0.069	0.213	0.152	0.201	0.066

*Exposure_ri: trade liberalization variable defined as an indicator variable equal one for plants belonging to industries with tariff cuts above the mean in the period, interacted by a time dummy equal one after the creation of the Mercour, Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: own elaboration.

Table 3.2

Difference-in-differences regressions without matching

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TFP	Labour Productivity	Wages per employee	Wages per WC	Wages per BC	Wages WC/Wages BC
Exposure_ri	24.88***	1,816***	654.3***	847.6***	563.8***	-0.167**
	(4.792)	(531.1)	(65.23)	(107.3)	(51.39)	(0.0751)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
	(8.600)	(496.5)	(85.13)	(145.1)	(62.19)	(0.161)
Big	2.725	536.1	319.1***	840.2***	234.3***	0.511***
Constant	74.29***	3,836***	889.0***	1,278***	819.5***	1.572***
	(3.891)	(383.1)	(41.08)	(67.97)	(29.24)	(0.0564)
Observations	999	1,789	1,843	1,691	1,801	1,652
R-squared	0.159	0.061	0.238	0.223	0.229	0.111

*Exposure_ri: trade liberalization variable defined as an indicator variable equal one for plants belonging to industries with tariff cuts above the mean in the period, interacted by a time dummy equal one after the creation of the Mercosur; Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*
Source: own elaboration.

Table 4.1

Difference-in-differences using matching methods

Matching Procedure	Output Variable	Treated	Controls	Difference*	S.E.	T-stat	No. treated	No. controls	No. total
st Neighbor=3	Total Factor Productivity	93.89	68.57	25.32	4.92	5.14	162	458	620
	Labour productivity	5,929	4,750	1,179	501.90	2.35	249	856	1,105
	Total Number of Workers	70.98	116.15	-45.17	9.12	-4.95	276	892	1,168
	White collars (number)	17.59	25.25	-7.66	2.86	-2.68	276	892	1,168
	Blue collars (in number)	49.60	78.29	-28.69	6.54	-4.38	276	892	1,168
	Total wages (constant pesos)	145,639	138,237	7,402	20,252	0.37	276	888	1,164
	Wages/worker	1,619	1,016	604	66.37	9.09	249	873	1,122
	Wages/white collar	2,473	1,778	695	110.33	6.30	231	811	1,042
	Wages/blue collar	1416.35	890.77	525.58	53.04	9.91	242	853	1,095
	Wages wc/wages bc	1.73	1.97	-0.24	0.07	-3.49	226	795	1,021
Nearest Neighbor=5	Total Factor Productivity	93.89	68.68	25.21	4.96	5.08	162	458	620
	Labour productivity	5,929	5,019	909	540.73	1.68	249	856	1,105
	Total Number of Workers	70.98	112.31	-41.33	9.13	-4.53	276	892	1,168
	White collars (number)	17.59	24.57	-6.98	2.87	-2.43	276	892	1,168
	Blue collars (in number)	49.60	76.33	-26.73	6.55	-4.08	276	892	1,168
	Total wages (constant pesos)	145,639	135,508	10,131	20,316	0.50	276	888	1,164
	Wages/worker	1,619	1,017	602	66.53	9.05	249	873	1,122
	Wages/white collar	2,473	1,779	694	111.06	6.25	231	811	1,042
	Wages/blue collar	1416.35	892.30	524.05	53.19	9.85	242	853	1,095
	Wages wc/wages bc	1.73	1.97	-0.24	0.07	-3.56	226	795	1,021
Kernel	Total Factor Productivity	93.89	68.76	25.12	5.26	4.77	162	458	620
(Epanechnikov)	Labour productivity	5,929	4,477	1,452	582	2.50	249	856	1,105
	Total Number of Workers	70.98	101.99	-31.01	11.51	-2.69	276	892	1,168
	White collars (number)	17.59	20.82	-3.23	3.21	-1.01	276	892	1,168
	Blue collars (in number)	49.60	69.49	-19.89	8.29	-2.40	276	892	1,168
	Total wages (constant pesos)	145,639	116,256	29,382	22,244	1.32	276	888	1,164
	Wages/worker	1,619	997	622	71.44	8.71	249	873	1,122
	Wages/white collar	2,473	1,745	728	119.61	6.09	231	811	1,042
	Wages/blue collar	1416.35	878.07	538.28	55.16	9.76	242	853	1,095
	Wages wc/wages bc	1.73	1.97	-0.24	0.08	-2.89	226	795	1,021

Table 4.1

Difference-in-differences using datching methods (cont.)

Matching Procedure	Output Variable	Treated	Controls	Difference*	S.E.	T-stat	No. treated	No. controls	No. total
Kernel	Total Factor Productivity	93.89	69.12	24.76	6.19	4.00	162	458	620
(Gaussian)	Labour productivity	5,929	4,118	1,810	590	3.07	249	856	1,105
	Total Number of Workers	70.98	98.30	-27.32	13.06	-2.09	276	892	1,168
	White collars (number)	17.59	19.94	-2.35	3.93	-0.60	276	892	1,168
	Blue collars (in number)	49.60	67.15	-17.55	9.45	-1.86	276	892	1,168
	Total wages (constant pesos)	145,639	110,677	34,962	25,127	1.39	276	888	1,164
	Wages/worker	1,619	967	653	73.32	8.90	251	873	1,124
	Wages/white collar	2,473	1,679	794	125.07	6.35	231	811	1,042
	Wages/blue collar	1416.35	861.11	555.24	57.00	9.74	242	853	1,095
	Wages wc/wages bc	1.73	1.94	-0.21	0.08	-2.48	226	795	1,021

** Difference: average treatment effect on the treated, wc: white collars; bc: blue collars.*

Source: own elaboration.

Table 4.2

Propensity score estimation

Variable	Coef.	Std. Err.	z	P>z
Hvbp2	0.26	0.242	1.09	0.28
Hva	-0.38	0.233	-1.61	0.11
Exp	0.48	0.149	3.21	0.00
Constant	-0.66	0.113	-5.86	0.00

Hvbp2: gross output higher than the average; Hva: value added higher than the average; Exp: dummy equal one for exporting firms and zero otherwise. Number of obs=999; Log likelihood=-651.38; LR chi(3)=14.24; Prob>chi2=0.002, Pseudo R2=0.01

Results from: psmatch2 tl1 hvbp2 hva exp, kernel outcome(tfplp) common logit ties

Source: own elaboration.

Table 4.3

Balancing tests

		Mean			%	t-test	
Variable	Sample	Treated	Control	%bias	Reduction	t	p>t
Hvbp2	Unmatched	0.727	0.552	36.90		9.20	0.000
	Matched	0.651	0.620	6.50	82.20	0.87	0.383
Hva	Unmatched	0.711	0.553	33.10		8.26	0.000
	Matched	0.619	0.610	1.90	94.20	0.26	0.798
Exp	Unmatched	0.203	0.249	-11.10		-2.78	0.005
	Matched	0.470	0.399	17.10	-53.80	1.96	0.050

Hvbp2: gross output higher than the average; Hva: value added higher than the average; Exp: dummy equal one for exporting firms and zero otherwise.

Results from the balancing tests after kernel matching with pstest (Leuven and Sianesi, 2003)

Source: own elaboration.

Table 4.4

Sensitivity tests defining the more exposed industries those with tariffs cuts higher than 0.46

Matching Procedure	Output Variable	Treated	Controls	Difference*	S.E.	T-stat	No. treated	No. controls	No. total
Kernel	Total Factor Productivity	87.61	77.04	10.57	3.94	2.68	345	515	860
(Epanechnikov)	Labour productivity	5,406	4,626	781	369	2.12	544	989	1,533
	Total Number of Workers	82.27	101.85	-19.58	8.87	-2.21	590	1,045	1,635
	White collars (number)	19.42	21.69	-2.27	2.70	-0.84	590	1,045	1,635
	Blue collars (in number)	59.74	74.05	-14.31	6.49	-2.20	590	1,045	1,635
	Total wages (constant pesos)	147,142	118,508	28,634	15,857	1.81	590	1,038	1,628
	Wages/worker	1,557	1,001	557	51.52	10.80	546	1,028	1,574
	Wages/white collar	2,348	1,656	693	81.74	8.47	500	949	1,449
	Wages/blue collar	1320.47	862.04	458.42	34.66	13.23	531	1,004	1,535
	Wages wc/wages bc*	1.76	1.89	-0.13	0.06	-2.14	489	927	1,416

**wc:white collars; bc:blue collars*

Source: own elaboration.

Table 5

Falsification tests

	(1)	(2)	(3)	(4)	(5)		(6)	(7)
VARIABLES	TFPLP	Employment	White Collars	Blue Collars	Wwc		Wbc	Wwc/Wbc
Tradable*RI	0.862	-2.376	1.254	1.646	-165.8		52.02	-0.151
	(12.15)	(39.89)	(15.80)	(29.17)	(171.8)		(90.99)	(0.157)
T	5.628**	2.943	-0.207	1.692	271.3***		180.9***	-0.0850*
	(2.650)	(6.800)	(1.878)	(5.161)	(49.94)		(21.72)	(0.0455)
Medium	3.552	53.10***	14.09***	38.73***	742.5***		173.3***	0.578***
	(4.295)	(1.594)	(0.827)	(1.390)	(64.66)		(26.47)	(0.0551)
Big	1.500	260.1***	52.05***	190.0***	985.4***		212.5***	0.810***
	(2.600)	(11.62)	(3.368)	(8.761)	(53.66)		(22.72)	(0.0533)
Industry dummies	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Constant	74.25***	19.87***	4.772***	13.51***	1,254***		787.7***	1.546***
	(2.466)	(2.949)	(0.883)	(2.239)	(36.48)		(15.82)	(0.0354)
Observations	1,186	2,100	2,100	2,100	1,884		2,013	1,845
R-squared	0.058	0.371	0.224	0.357	0.221		0.131	0.149

*Robust standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1. Tradable*RI=tradable group interacted by a time dummy equal to 1989; T: dummy for 1989, Medium: firms with 50 up to 99 workers; Big: firms with more than 100 workers; TFPLP: Total Factor Productivity; Employment: total employment per firm; WC: number of white collars per firm; BC: number of blue collars per firm;*

Source: own elaboration.

Appendix 1

Table A 1

Classification of plants/industries according to the level of exposure to increased trade liberalisation

Trade Orientation	ISIC code	Industry
Less exposed	311	Meat products
Less exposed	313	Beverages
Less exposed	314	Tobacco
More exposed	321	Textiles
Less exposed	322	Wearing apparel
Less exposed	323	Leather and fur products
Less exposed	324	Footwear products
More exposed	331	Wood and cork products
Less exposed	332	Furniture (except primary of metal)
More exposed	341	Paper and paper products
More exposed	342	Printing and publishing
More exposed	351	Industrial chemicals
Less exposed	352	Other chemical products
More exposed	355	Rubber products
Less exposed	356	Plastic products nec
More exposed	361	Pottery, china and earthenware products
More exposed	362	Manufacture of glass and glass products
More exposed	369	Non-metallic mineral products
Less exposed	371	Iron and steel basic industries
Less exposed	372	Non-ferrous metal basic industries
More exposed	381	Fabricated metal products(except machinery and equipment)
Less exposed	382	Machinery except electrical
Less exposed	383	Electrical machinery
Less exposed	384	Transport equipment
Less exposed	385	Professional and scientific equipment
Less exposed	390	Other industries nec

Source: own elaboration.

Appendix 1

Table A 1

Changes in nominal tariffs

ISIC	1988	1989	1990	1991	1992	1993	1994	1995	T95-T88/T88
321	37.768	37.003	35.238	26.846	22.691	18.782	18.782	16.445	-0.565
322	43.125	40.881	38.636	29.318	23.730	19.800	19.800	19.956	-0.537
323	22.314	22.263	22.212	16.832	15.026	11.270	11.270	13.533	-0.394
324	39.091	36.591	34.091	26.364	23.520	19.660	19.660	19.640	-0.498
331	39.653	37.996	36.338	28.311	23.017	19.254	19.254	9.121	-0.770
332	37.692	36.923	36.154	28.462	24.000	20.000	20.000	18.000	-0.522
341	32.615	32.056	31.497	24.631	21.532	17.856	17.859	13.871	-0.575
342	32.885	31.535	30.185	25.200	20.600	17.460	17.460	9.086	-0.724
351	22.626	23.563	24.499	18.933	16.409	12.824	12.786	8.366	-0.630
352	25.277	26.053	26.829	20.754	18.717	15.377	15.372	11.199	-0.557
354	30.484	29.839	29.194	22.903	17.910	14.430	14.430	3.444	-0.887
355	33.597	33.148	32.698	25.905	20.950	17.600	17.600	13.688	-0.593
356	31.977	32.167	32.356	25.341	21.650	18.250	18.250	16.444	-0.486
361	35.889	35.010	34.130	26.957	21.050	17.890	17.890	14.690	-0.591
362	32.526	32.279	32.031	25.313	20.120	16.810	16.810	11.896	-0.634
369	31.629	31.466	31.302	24.763	20.759	17.520	17.520	8.458	-0.733
371	23.370	24.443	25.515	20.221	17.340	14.330	14.290	11.793	-0.495
372	18.704	20.783	22.863	16.838	15.610	12.390	12.690	8.339	-0.554
381	34.403	33.835	33.267	25.630	20.044	16.592	16.592	14.904	-0.567
382	24.574	26.250	27.925	20.257	16.564	13.146	13.086	12.267	-0.501
383	29.787	30.111	30.436	24.312	19.164	16.144	16.085	14.265	-0.521
384	28.336	28.314	28.291	22.253	18.286	14.766	14.766	16.713	-0.410
385	20.865	22.731	24.598	19.395	15.512	12.654	12.626	12.468	-0.402
390	32.280	31.763	31.245	25.018	20.871	17.633	17.835	17.639	-0.454
311	33.146	32.400	31.653	25.173	20.814	17.370	17.544	12.821	-0.613
312	25.883	26.963	28.043	21.467	19.405	16.495	16.495	11.324	-0.563
313	37.381	35.774	34.167	26.190	22.875	18.795	18.880	19.554	-0.477
3140	35.625	34.688	33.750	26.250	21.900	18.500	18.500	18.000	-0.495
Average	32.663	32.088	31.513	24.581	20.589	17.049	17.059	13.968	-0.572

T95:nominal tariff in 1995; T88: nominal tariff in 1988.

Source: own elaboration based on data provided by the Secretaría del Mercosur.

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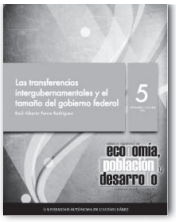

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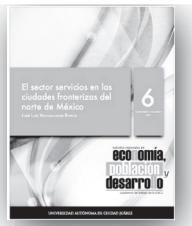

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Noviembre-Diciembre 2011
El sector servicios en las ciudades fronterizas del norte de México
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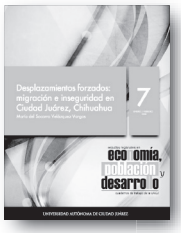

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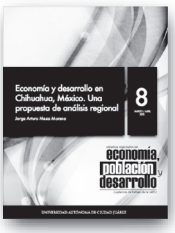

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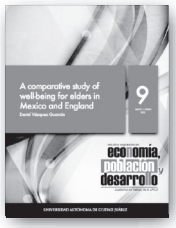

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Análisis y determinantes de la productividad legislativa en México (2009-2012)
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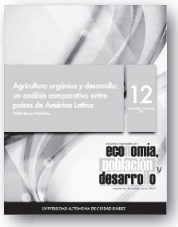

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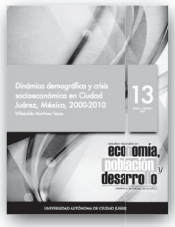

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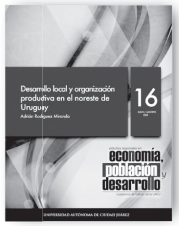

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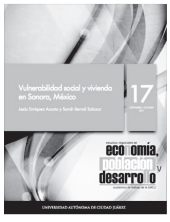

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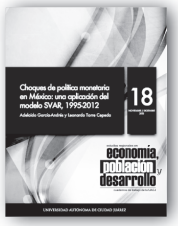

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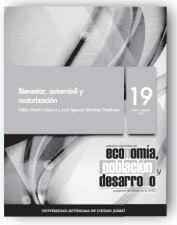

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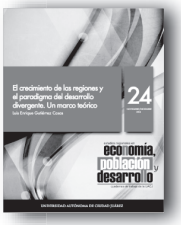

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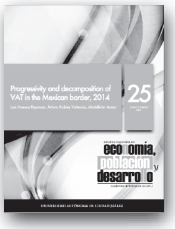

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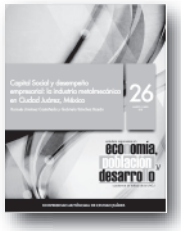

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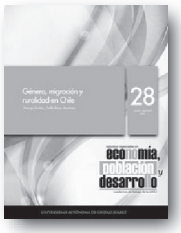

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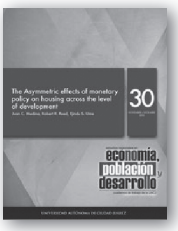

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