Are Export Subsidies Good for Women? Micro Evidence from a Quasi-Natural Experiment*

Ricardo A. López†

October 16, 2016

Abstract

This paper uses plant-level data from Chile to show that export subsidies can have a negative effect on female employment by allowing beneficiaries to hire relatively more expensive male workers at the expense of female workers. Thus, export subsidies may help firms discriminate against women. The identification strategy exploits a quasi-natural ex-

*I would like to thank Dolores Añón, Elizabeth Brainerd, Judy Dean, Raffi Garcia, Kathleen McQueeney, Michael Munsell, Martha Denisse Pierola, Germán Pupato, Dhimitri Qirjo, Christian Volpe Martincus, and participants at seminars and conferences at the Inter-American Development Bank, Brandeis University, the 2015 Annual Meeting of the Canadian Economics Association at Ryerson University, the 2015 Annual Meeting of the Southern Economic Association in New Orleans, the 2016 Annual Meeting of the Eastern Economic Association in Washington DC, and the 14th International Industrial Organization Conference at Drexel University for helpful comments and suggestions on previous versions of this paper. My special thanks to Deniz Çivril for introducing me to this literature and for all the ideas and comments she shared with me over the last two years.

†International Business School, Brandeis University. Email: rlopez@brandeis.edu.

periment provided by a change in government policy that eliminated export subsidies in order to comply with WTO regulations. Results from a treatment effect estimation show that the policy change increased the share of unskilled female workers in total employment on firms eligible to receive the subsidy relative to firms that never received it. Thus, the export subsidy lowered employment of unskilled female workers on exporters.

F16, J70, L60

1 Introduction

What is the effect of trade reforms on gender inequality? Changes in commercial policies may affect gender outcomes through at least three channels. First, lower trade barriers may lead to a decline or growth of certain industries, which can alter the relative demand for labor by gender according to differences in factor intensities. Aguayo-Tellez et al. (2010), for example, document the link between tariff changes and industry growth in Mexico using manufacturing firm-level data. They show that there is a strong positive relationship between exports and the women's wage bill. Second, changes in trade policies may induce technology adoption and increase productivity, which may affect female employment. Juhn et al. (2013) and Juhn et al. (2014), for instance, use the decrease in tariffs brought about by NAFTA to show that more productive Mexican firms were more likely to adopt new technologies, which reduced the demand for physical skills, mostly performed by male workers. This resulted in an increase in the relative wage and employment of women in blue-collar oc-

cupations. Finally, trade reforms can make gender discrimination more costly by increasing the level of competition (see, for example, Black and Brainerd, 2004 and Ederington et al., 2012).

This paper focuses on export subsidies, a relatively unexplored tool of commercial policy in the context of gender inequality. Recent firm-level studies show that export subsidies can increase export volumes and improve market and product diversification (e.g., Álvarez and Crespi, 2000, Görg et al., 2008, Helmers and Trofimenko, 2013, Chandra and Long, 2013).[1] While this evidence suggests that export subsidies may be effective in increasing exports,[2] they may have an unintended consequence: they can decrease employment of unskilled female workers. Thus, export subsidies may allow firms to discriminate against female workers. The mechanism, based on the widely documented observation that men earn more than women,[3] is straightforward: Export subsidies provide additional financial resources that firms can use to hire relatively more expensive male workers at the expense of female workers.[4] In a perfectly competitive market, employers would need to fund the cost of discriminating. Thus, if the subsidy were eliminated, firms receiving the government support could no longer afford to pay the higher wage to some male workers and there-

[1] While export subsidies may help increase export volumes and diversification, they don't necessarily induce firms to enter international markets, as shown by Bernard and Jensen (2004) for the case of U.S. firms and Görg et al. (2008) for Irish plants.

[2] Although subsidies may be effective in increasing exports, they may be very costly for the government (see, for example, Hoffmaister 1992).

[3] While the gap between the wages of men and women has decreased in developed countries since the 1970s, this trend seemed to have stopped starting in the 1990s (Bourguignon, 2015). For a detailed survey of the evidence and the methods to measure the gender wage gap see Ponthieux and Meurs (2015).

[4] Firms may hire men instead of women because they may be afraid of the costs of maternity leaves and family-related absences, among other reasons. There is also the possibility that some employers have a taste for discrimination as in Becker (1971).

fore they would hire more women.

The identification strategy relies on exploiting a change in government policy that eliminated export subsidies in Chile to comply with WTO rules. This change in policy provides an ideal quasi-natural experiment to study the effect of export support on female employment. This paper estimates the treatment effect of the export subsidy by examining the change in the share of female and male workers on eligible plants, the treated group, relative to firms that were not eligible, the control group, using plant-level data from the manufacturing sector of Chile for the period 1995-2007.[5]

The export subsidy program was introduced in 1985 as a simplified duty drawback system to promote non-traditional exports,[6] and it was effectively a subsidy until 2002.[7] According to Agosin et al. (2010), this system was a mechanism to subsidize self-discovery (Hausmann and Rodrik, 2003) while letting the market choose the sectors to be promoted. Between 1995 and 2002, the government paid an average of US$150 million every year to all exporters who qualified for the subsidy (Agosin et al., 2010), which provided significant financial resources to beneficiaries, which they may have used to potentially hire higher-wage male workers.[8] As a comparison, the amount

[5] Other subsidies (e.g., production subsidies) are not considered here mainly because there was no change in policy during the period that would permit the use of the treatment effects analysis. In addition, other subsidies were small compared to the amounts paid under the export subsidy regime.

[6] Traditionally, Chilean exports were highly concentrated in a small group of products from the mining industry, the wood industry, as well as agriculture and fishing.

[7] For the duty drawback to be considered a subsidy it must provide a financial contribution (Ahuja, 2004). Since the Chilean government provided money in excess of the duties paid on imported inputs, it was effectively an export subsidy.

[8] According to Customs, the total number of exporters from all sectors, including those that didn't receive the subsidy, for the period 1995-2002 was about 5,600 per year, meaning that the amount of money received by individual firms was significant enough to potentially

paid to exporters using the simplified duty drawback in 2007 was less than US$3 million (General Treasury Department of the Republic of Chile).

The simplified duty drawback program (Law No. 18.480 of 1985) provided a simplified refund of 10%, 5% or 3% of the fob value of exports, depending on the value exported by the entire tariff line (at the 8-digit SITC level). No refund was given after the exports of the tariff line reached a certain threshold, which was updated by the Ministry of Economy every year.[9] Therefore, the subsidy did not depend on the amount exported by an individual firm. Given that the refunds were discontinued after exports reached the threshold set by the government, there was no incentive for rent seeking behavior (Agosin et al., 2010). Exporters could apply to this benefit by submitting a request to the General Treasury Department.[10] Since the money was given without any conditions, firms were able to use the subsidy in any way they wanted. In order to qualify for the refund, the product was required to contain at least 50% of national content. In addition, exporters were able to get a refund on the value of domestic and imported inputs used to produce an export product even if the final product did not qualify for the refund.

In December 1998, the law was first modified to make the system gradually consistent with the provisions of the WTO Agreement on Subsidies and Countervailing Duties (WTO, 2003). The change reduced the maximum refund percentage to 9% for the year 1999, and eliminated the refund for domestic and imported inputs. The maximum refund percentage was further reduced

allow paying higher salaries to male workers.

[9] A detailed description of the program and its evolution since it was first introduced is presented in Céspedes Potro (2001).

[10] The process is explained in Aduanas (2003).

to 8% in 2000, 7% in 2001, 6% in 2002, and finally to 3% from 2003. Since 2003, products qualify for the refund only if they have at least 50% of imported inputs. This change put an end to the export subsidy program.

This paper documents a negative effect of export subsidies on female employment and provides evidence that gender discrimination is the most likely reason explaining this result. Analyzing the effect of trade on gender inequality is important from a policy point of view. Recently, more than 150 world leaders met at the United Nations Sustainable Development Summit and agreed to include gender equality as one of the 17 goals of the 2030 Agenda for Sustainable Development.[11]

This paper is organized as follows. Section 2 describes the data and explains the empirical strategy. Section 3 reports the basic results of the econometric analysis and a number of extensions. Section 4 shows several robustness checks, while section 5 examines competing explanations for the results. Section 6 concludes.

2 Data and Empirical Strategy

2.1 Data and Basic Patterns

This paper uses plant-level data from the manufacturing sector of Chile for the period 1995-2007 from the Annual National Industrial Survey (ENIA) carried out by the National Institute of Statistics (INE) of Chile. The annual survey covers all manufacturing plants with 10 or more employees, and includes

[11] The United Nations summit was held on September 25-27, 2015, in New York.

information on sales, value added, employment, wages, exports, imports of intermediate inputs, foreign ownership, industry affiliation (ISIC rev. 3), and other plant characteristics. Monetary variables, such as sales and wages, are expressed in constant pesos of 2003 using 4-digit price deflators. Plants do not report information on capital stock; thus, it was necessary to construct this variable using the perpetual inventory method for each plant.[12] The data set contains detailed information on employment by gender and job category.[13] This allows constructing measures of skilled and unskilled labor by gender. In this study, the skilled labor category comprises managers, specialized workers, such as technicians, and administrative personnel.[14] The unskilled labor category includes non-specialized workers directly involved in the production process, workers in production support activities, and services workers (transportation, secretary, communications).

Figure 1 shows the evolution of the female share (female employment over total employment) and export intensity (the ratio exports to sales) in the

[12]For the majority of plants, an initial value of the capital stock was available. This initial value was used to construct the capital stock data by adding investment and subtracting depreciation for each type of capital (machinery and equipment; buildings; and vehicles) according to the following formula: $K_{imt} = I_{imt} + (1 - \delta_m)K_{imt-1}$, where K_{imt} is the stock of capital in asset m of plant i at time t, I_{imt} is investment in asset m, and δ_m is the rate of depreciation for asset m. The rates of depreciation were assumed to be 5% for buildings, 10% for machinery, and 20% for vehicles (taken from Tybout, 1996). For a small group of plants it was not possible to construct the stock of capital, so they were dropped from the data set.

[13]For the purpose of this paper, an employee is an individual who has a contract with the plant, receives a salary, and is hired in a permanent basis. Thus, subcontracted workers or those working from home receiving payments for completed work are not included in the analysis.

[14]Managers include executives and other personnel in charge of planning, organizing, controlling, and directing the activities of the establishment and do not have ownership of the plant. Specialized workers include professionals, technicians and qualified workers, who work controlling and directing the production process. Administrative workers include employees in charge of accounting, statistics, data processing and other activities.

manufacturing sector during the period 1995 to 2007. While export intensity increased significantly during the period (from 23.5% in 1995 to 36% in 2007), the share of female labor remained relatively stable between 1995 (21.1%) and 2006 (21.8%) before increasing in 2007 (23.1%). Table 1 shows that within the manufacturing sector there is significant variation in terms of export shares and employment by gender across industries. As seen in the table, the most female-intensive industries are apparel, leather, textiles, and food processing, while the least female-intensive industries are basic metals, machinery and equipment, wood products, motor vehicles and other transport equipment. Although there is a small negative correlation of about 0.2 between export intensity and female employment, some export oriented industries such as basic metals, wood products and paper employ a relatively low fraction of female workers.

Table 2 reports the number of plants in the data set by export status. There are 5,394 plants, on average, during the period 1995-2007. Exporters represent around 20% of this number, a number that remained stable during most of the period except for 1999-2002 where exporters accounted for about 19% of the total number of plants. Part of this decrease was due to the effects of the Asian crisis that reduced the competitiveness of Chilean exports.

Before examining the effect of removing the subsidy, it is important to explore if there are any differences in female labor intensity between exporters and non-exporters by estimating the following equation:

$$y_{ijrt} = \lambda_t + \lambda_i + \delta X_{ijrt} + \varepsilon_{it},$$

where y_{ijrt} is the share of female employment (total, skilled and unskilled) in total employment for plant i from industry j located in region r at time t, λ_t are year fixed effects, λ_i are plant fixed effects, while X_{ijrt} is a dummy variable for exporters at time t. The omitted group corresponds to the plants that didn't export, thus the estimate for δ measures the difference in the share of female employment between exporters and non-exporters, after controlling for year fixed effects and time-invariant unobserved plant heterogeneity. Table 3 presents the estimates for three sub-periods: 1995-98 (subsidy program in full operation), 1999-2002 (gradual elimination of the program), and 2003-2007 (subsidy no longer existed). The table shows that in the period of full operation of the subsidy, there were no significant differences between exporters and non-exporters in terms of the share of female workers. Although exporters employed relatively more unskilled female workers and fewer skilled female workers than non-exporters the differences were relatively small. As the export subsidy program was gradually eliminated, the share of unskilled female workers started to increase in exporters relative to non-exporters. Finally, after the subsidy was eliminated, exporters further increase the share of unskilled female workers relative to non-exporters. These changes resulted in a higher share of female employment than non-exporters relative to non-exporters for the period 2003-2007. Thus, it appears that the elimination of the subsidy induced exporters to hire more unskilled female workers.

2.2 Empirical Strategy

The econometric approach estimates the following difference-in-difference model:[15]

$$\begin{aligned} y_{ijrt} &= \alpha + \beta X_{i,95,02} + \gamma D_{03,07} + \delta(X_{i,95,02} \times D_{03,07}) \\ &\quad + \gamma z_{ijrt-1} + \lambda_j + \lambda_r + \lambda_t + \varepsilon_{ijrt}, \end{aligned} \tag{1}$$

where y_{ijrt} is the share of female employment in total employment for plant i, operating in sector j, located in region r at time t, $X_{i,95,02}$ is a dummy variable equal to one if plant i exported during any year between 1995 and 2002, $D_{03,07}$ is a step variable equal to one from 2003 to 2007 and zero for all other years, λ_j, λ_r, λ_t are industry, region and year fixed effects, while z_{ijrt-1} is a vector of lagged control variables at the plant level,[16] that includes total factor productivity (TFP),[17] size (total value added), a dummy variable for plants with foreign ownership, a dummy for plants that import intermediate inputs, a dummy for plants that purchase foreign technologies through licensing agreements, the average wage, age, and the capital-labor ratio, while ε_{ijrt} is an error term.

The treated group in equation (1) corresponds to all plants that were poten-

[15] Recent papers use this approach to estimate the causal effect of tax reductions (Goos and Konings, 2007) and low-wage subsidies (Huttunen et al., 2013) on employment.

[16] The use of a lag of the control variables avoids potential endogeneity issues. Using the contemporaneous values of the control variables gives similar results.

[17] The measure of TFP is the residual of a regression that estimates a Cobb-Douglas production function for each 3-digit level ISIC industry using the method proposed by Olley and Pakes (1996) and later modified by Levinsohn and Petrin (2003), which corrects for the simultaneity bias associated with the fact that productivity is not observed by the econometrician, but it may be observed by the firm. In some cases the production functions were estimated at the 2-digit level due to the small number of observations available for some industries at the 3-digit level of disaggregation.

tially affected by the policy change, while the control group includes the plants that never received export subsidies during the entire period. The estimate for δ gives the causal effect of the policy change on female employment.[18]

Given the potential role of unobserved heterogeneity at the plant level, the analysis also considers a regression with plant fixed effects:

$$y_{ijrt} = c_i + \gamma D_{03,07} + \delta(X_{i,95,02} \times D_{03,07}) + \gamma z_{ijrt-1} + \lambda_t + \varepsilon_{ijrt}, \qquad (2)$$

where c_i are the plant fixed effects. Since $X_{i,95,02}$, as well as the sector and the region dummy variables do not vary over time, these variables are dropped from the fixed effects estimation.

3 Results

3.1 Basic Results

Table 4 reports the results of estimating equation (1). The estimated coefficient for the interaction term between the dummy for plants that exported before the policy change and the step variable for the years following the policy change is positive and statistically significant for the share of female labor. The magnitude of the causal effect is also significant from an economic point of view. The share of female workers increased by 3.9 percentage points on plants that exported between 1995 and 2002 after the elimination of the subsidy

[18] The estimation of the parameters of this equation uses data for all the industries listed in Table 1. A robustness check also estimates this equation excluding the basic metals sectors, which may affect the results given its importance in Chilean exports (mainly copper products). The results do not change in any significant way when excluding this industry.

relative to plants that never exported during the period. The positive effect of the change in policy is mainly explained by an increase in the share of unskilled female labor. The estimate for skilled female labor is also positive, but only significant at the 10% level. The estimate for the share of male labor is, naturally, the same as the one for female workers but with the opposite sign, so it is omitted from the table. Thus, the policy change increased the share of female workers at the expense of male workers, suggesting that the subsidy had an unintended consequence on employment of women. The table also shows that the decrease in the male share is mostly due to a decrease in the share of skilled male labor, which falls 4.4 percentage points after the policy change in exporters relative to non-exporters. Taking all this together, Table 4 shows that the elimination of the subsidy induced plants to substitute relatively more expensive skilled male workers with relatively cheaper unskilled female workers.[19]

With respect to the estimates for the control variables, larger plants (in terms of value added) have a lower share of skilled labor, but a higher share of unskilled labor for both female and male. More productive plants use relatively more skilled workers, while plants that pay higher wages, that are more capital intensive, and those with foreign ownership employ relatively more skilled workers but relatively less unskilled labor. Most of the estimates for the other control variables are not statistically significant.

Table 5 presents the results of estimating equation (2), which includes the

[19]Using employment levels instead of labor shares as dependent variables does not alter the results: unskilled female employment increases after the policy change while skilled male employment goes down.

plant fixed effects. The estimate for the share of female labor is again positive although the magnitude is lower than the OLS estimates (3.3 percentage points instead of 3.9). The estimate for the share of skilled female labor is no longer statistically significant from zero. In addition, the share of skilled male labor decreased as a result of the elimination of the subsidy. Given that the plant fixed effects allow controlling for unobserved heterogeneity at the plant level, all the following results are based on fixed effect estimations.[20]

3.2 Heterogeneous Effects and Extensions

It is possible that the change in policy affected establishments differently according to their size. In order to investigate if there are heterogeneous effects of the change in policy, the treatment variable ($X_{i,95,02} \times D_{03,07}$) is interacted with dummy variables for medium size plants (50-149 workers) and large size plants (150 workers and more). The omitted group corresponds to small plants (less than 50 workers). Table 6 shows the results. The estimate for the treatment effect is still positive and significant for both the share of female labor and for the share of unskilled female labor, and negative and significant for the share of male and the share of skilled male workers. The estimate for the interaction term between the treatment variable and the dummy variables for size are positive for female and unskilled female workers and negative for skilled male workers, but only the ones for large plants are significant. This implies that after the subsidy was eliminated, female employment increased relatively more in large plants.

[20] OLS estimates are similar.

The export subsidy may have had a different effect on female employment in majority female-owned establishments relative to plants with a minority of female owners. The data set reports information on the number of owners, but unfortunately the information is limited to owners that worked at least 15 hours a week in the plant. Only about half of the plants reports information on owners working at the plant. The other half either had owners not working at the plant or they did not report this information, so the variable is missing for these cases. Keeping in mind this limitation, a dummy variable equal to one for plants with more than 50% of female ownership is introduced in equation (2) and interacted with the treatment variable. The results, not presented here, show that the estimate for this interaction term is never statistically significant, while the estimate for the dummy for majority female ownership is not significant in most cases.

One could argue that it is managers rather than owners the ones who mainly make the hiring decisions. Therefore, the next regressions investigate if the results are different for plants with more than half female managers. As before, a dummy variable equal to one for plants for which more than half of their managers is female is interacted with the treatment effect variable. The estimates for this interaction term, not presented here, are never statistically significant. Thus, having a majority of female managers does not affect the impact of the change in policy. Interestingly, the dummy for majority female managers is positive and significant for the share of female labor and for both skilled and unskilled labor, and negative for the share of male labor, skilled and unskilled, suggesting that plants with a majority of female managers use

relatively more female workers and less male workers than plants with majority male managers.

It is also important to understand why the share of skilled female labor remains unaffected by the policy change and why the share of skilled male workers decreases so much. This is explored by looking at the effect of the elimination of the export subsidy on the share of the three categories of skilled female labor in the data: managers, administrative personnel, and specialized workers. Table 7 presents the estimates. While the overall effect is not significant for skilled female workers, there is a small increase, and also significant at the 10%, in the share of administrative workers. The share of managers declines slightly, although the coefficient is not statistically significant. The share of specialized workers remains unchanged. Given that administrative workers are the least skilled group of the three, this result seems to confirm that the elimination of the subsidy benefited relatively less skilled female workers, while highly skilled female workers were not affected. For male workers most of the decrease in skilled workers comes from a decrease in the share of specialized workers, while the share of managers is unaffected.

As explained in the introduction, the Chilean government started to introduce the first changes to the export subsidy program in 1999. It is therefore possible that the elimination of the subsidy started to affect plants even before the official end of the program (2003). In order to see whether this was indeed the case, a variant of equation (2) is estimated, including interaction terms between the dummy for plants that exported in any year during the period

1995-2002 and year dummy variables from 1999 to 2002.[21] The basic idea is to investigate if the share of female workers changed in the years before the complete elimination of the subsidy in 2003. Table 8 reports the results. The estimates show that the share of female workers and that of unskilled female workers did in fact increase during the two years preceding the end of the subsidy (2001 and 2002). This may have been the result of the changes in the program explained before, or perhaps plants decided to adjust their gender compositions of labor in anticipation to the end of the subsidy. For male workers the results follow the same pattern, but with the opposite sign: the male labor share starts decreasing two years before the end of the program.

4 Robustness of the Results

This sections presents a number of robustness checks that investigate the validity of the results. The first robustness check refines the control group by selecting a group of plants that didn't export during the period 1995-2002, so they didn't receive the subsidy, and had similar characteristics than plants that exported and were affected by the elimination of the subsidy. The new control group is selected using matching. This technique first estimates the probability that a plant exported in any year during the period 1995-2002 as a function of plant characteristics at the initial year (1995). Then, it uses propensity score to match each treated plant to a similar control plant. Matching can be performed with and without replacement. For the case of matching without

[21] This is an application of the technique proposed by Laporte and Windmeijer (2005) to estimate models when the treatment effect is not constant over time.

replacement, 1,572 treated plants were matched to 1,572 control plants. The results of using this sample of plants are presented in Table 9.[22] As seen in the table, the policy change increased the share of female workers, and this is explained by an increase in the share of unskilled female workers. The estimates for male workers show that the decrease in the share of male workers after the policy change is explained by a decreased in the share of skilled male workers. Thus, the basic results with OLS and fixed effects are robust to using a matched control group.

The next robustness check uses a different definition for the treated and control groups. The data set has information on subsidies received, although it does not distinguish between domestic subsidies and export subsidies. This information allows creating an indicator variable, $SubX_{i,95,02}$, equal to one if the plant simultaneously received a subsidy and exported in any year during the period 1995-2002. This new variable is then interacted with the step variable $D_{03,07}$:

$$y_{ijrt} = c_i + \lambda_t + \eta(SubX_{i,95,02} \times D_{03,07}) + \gamma z_{ijrt-1} + \varepsilon_{ijrt}. \tag{3}$$

The control group in equation (3) corresponds to all plants that never received any type of subsidy and never exported during the entire period 1995-2007. The estimation results are presented in Table 10. The estimated coefficients are similar to the estimates using the basic specifications. The share of female workers increases and all the increase is explained by an increase in the share of unskilled female workers. For male workers, their share obviously

[22]Using matching without replacement gives similar results.

decreases and this is explained by a decrease in the share of skilled male workers. Thus, the basic results are robust to these alternative definitions of the treated and the control groups.

A related robustness check estimates:

$$y_{ijrt} = c_i + \lambda_t + \varphi Stop_{ijrt} + \gamma z_{ijrt-1} + \varepsilon_{it}.$$

where $Stop_{ijrt}$ is a step variable equal to one at the year in which plant i stopped exporting and receiving a subsidy, and the years after that, and zero in all other years. The results, not presented here, are similar to the fixed effects estimates in Table 5.

The paper also estimates equation (2) using a random effects model. Although the assumption that the unobserved plant effects are uncorrelated with the regressors is unlikely to hold in this particular case, it is helpful to verify the results using this alternative estimation method. The results, not presented here, are similar to the fixed effects estimates.

Finally and since the survey only includes plants with at least 10 workers, it is possible that some plants disappear from the sample because they fall below the 10-employee threshold. As a robustness check, the empirical analysis is carried out using plants with at least 20 workers, which are less likely to disappear from the data because of sampling issues. The results, not presented here, remain similar to the estimates using the entire sample.

In summary, the basic results are robust to alternative definitions of the treated group, the control group, and the estimation technique.

5 Understanding the Mechanisms

This sections examines two possible explanations for the negative effect of export subsidies on female employment: technology adoption and gender discrimination.

Technology Adoption

One possible explanation for the results is that the export subsidy encouraged firms to upgrade their technologies and enter export markets, which may have affected the relative demand for female labor. This idea is based on the empirical observation that a decrease in trade costs may induce firms to invest in new technologies and enter international markets (see evidence in López, 2009, and Bustos, 2011). According to Juhn et al. (2013) and Juhn et al. (2014), however, new technologies are likely to reduce the demand for physical skills which are mostly performed by men. Thus, the subsidy should have increased the relative demand for unskilled female workers, which is the opposite to what this paper finds. Still, it is worth investigating if this channel may potentially explain the results of this paper.

Juhn et al. (2014) study this channel by looking at the effect of foreign tariffs on new technology. While the Chilean data set does not have detailed information on technology adoption, there is information on investment on new machinery and equipment as well as on purchases of foreign technology using licenses. Using this information, equation (2) is estimated using three different dependent variables: the investment in new machinery over sales, foreign technology license fees and royalties over sales, and a dummy variable for plants that purchased foreign technologies through licenses. If technology

adoption is the main channel through which the export subsidy affects employment of unskilled labor, then the elimination of the subsidy should have had a significant effect on plants' technology adoption. Table 11 presents the results. Column (1) shows the results for the ratio new machinery and equipment to sales. Column (2) uses the spending on foreign technology licenses divided by sales as the dependent variable, while column (3) uses the dummy for plants purchasing technologies through licenses. While the estimate for the treatment effect is positive in all cases, it is never statistically significant. Thus, the elimination of the export subsidy had no significant effect on technology adoption. In addition, empirical evidence from Agosin et al. (2010) shows that the export subsidy did not even increase exports during the period 1995-2000. Thus, the argument that the export subsidy may have affected female employment through technology adoption does not seem to be supported by the data in this case.

Gender discrimination

The main argument of this paper is that the export subsidy may have allowed firms to discriminate against female workers. The mechanism is likely to be relevant for Chile, where men earn more than women. In Chile, the gender wage gap, defined as the difference between the average female monthly wage and the average male monthly wage relative to the male wage, averaged -17% during the period 2001-2007.[23] As seen in Figure 2, the gender gap fluctuated sharply during this period, reaching -21% in 2002 before declining to -12.2% in 2007. Thus, male workers earned significantly more than female

[23]Source: National Institute of Statistics, Chile. Comparable data on the gender gap for Chile is only available since 2001.

workers.[24] There was, however, significant variation across sectors. Table 12 shows average wages for female and male employees by sector of economic activity for the year 2007.[25] The sectors with the highest gaps were wholesale and retail trade (-27,4%), financing services (-21.4%), and manufacturing (-20.7), the subject of this paper. While the manufacturing data set does not have information on wages paid to female and male workers, there is a robust negative correlation between the average wage paid by the plant and the share of female workers, even after controlling for export status, foreign ownership and unobserved plant heterogeneity (see Table 13).[26] Thus, plants that use relatively more female workers pay lower wages.

If the subsidy allowed firms to hire relatively more expensive male workers at the expense of female workers, then the elimination of the subsidy should have not only increased the share of female workers, as it was shown before, but also decreased the average wage paid by the firms since they now hire female workers who received a relatively lower wage. By using equation 2 with the average wage paid by the plants as the dependent variable, it is possible to examine this idea. Column (4) of Table 11 shows the results of this exercise. The estimate for the treatment variable is negative and also statistically significant. This indicates that the elimination of the subsidy decreased the average wage paid by firms eligible for the subsidy relative to firms that never received it. In conclusion, the results of this paper are consistent with the

[24]Note that the numbers in the graph represent the monthly average wage received by male and female workers regardless of the number of hours worked.

[25]This table is reproduced from INE (2008).

[26]It is possible, however, that female workers worked fewer hours than male workers. Unfortunately, the data set does not have information to verify this.

discrimination story.

6 Conclusions

This paper used manufacturing plant-level data for Chile and an exogenous change in policy to investigate the impact of export subsidies on female employment using a difference-in-difference estimation. The results show that the policy change that eliminated the export subsidy increased the share of unskilled female labor in total employment on firms eligible for the subsidy relative to firms that never received the subsidy. The findings of this paper suggest that the export subsidy program may have allowed firms to discriminate against female workers.

If export subsidies, or any other subsidies, allow gender discrimination, then there is justification for government policy aimed at correcting this discriminatory behavior. The Chilean government has slowly taken steps in this direction. First of all, the export subsidy program was effectively eliminated in 2003. Second, in 2009 Chile introduced an equal-pay law which requires companies to pay men and women the same wage for doing the same job. The new law requires that every company with more than 10 workers must include in its internal regulations a procedure allowing female employees, who feel they are being treated unfairly, to present a formal complaint. Companies with more than 200 workers are obliged to keep a register of employee jobs and responsibilities. Employers, however, are allowed to pay different wages in cases where it is justified on the basis of objective aspects, such as abilities,

qualifications, suitability, responsibility and productivity.

Given that export subsidies may have negative consequences on female employment, governments should look for different ways to promote exports. The use of export promotion organizations providing training and information about markets and export procedures may be more efficient and effective, especially in helping firms to become exporters.

References

Aduanas. Estudio del Impacto de los Mecanismos de Fomento a las Exportaciones. Technical report, Servicio Nacional de Aduanas, Chile, February 2003.

M. R. Agosin, C. Larraín, and N. Grau. Industrial Policy in Chile. Technical report, Inter-American Development Bank, 2010.

E. Aguayo-Tellez, J. Airola, and C. Juhn. Did Trade Liberalization Help Women? The Case of Mexico in the 1990s. NBER Working Paper 16195, National Bureau of Economic Research, 2010.

R. Ahuja. Export Subsidies: Theory, Evidence and the WTO Agreement on Subsidies. In B. Guha-Khasnobis, editor, *The WTO, Developing Countries and the Doha Development Agenda: Prospects and Challenges for Trade-Led Growth*, pages 261–286. Palgrave Macmillan, New York, NY, 2004.

R. Álvarez and G. Crespi. Exporter Performance and Promotion Instruments: Chilean Empirical Evidence. *Estudios de Economia*, 27(2):225–241, 2000.

G. S. Becker. *The Economics of Discrimination*. University of Chicago Press, Chicago, Ill., 2nd edition, 1971.

A. B. Bernard and J. B. Jensen. Why Some Firms Export. *Review of Economics and Statistics*, 86(2):561–569, 2004.

S. Black and E. Brainerd. Importing Equality? The Impact of Globalization on Gender Discrimination. *Industrial and Labor Relations Review*, 57(4): 540–59, 2004.

F. Bourguignon. *The Globalization of Inequality*. Princeton University Press, 2015.

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

P. Chandra and C. Long. VAT Rebates and Export Performance in China: Firm-Level Evidence. *Journal of Public Economics*, 102:13–22, 2013.

R. Céspedes Potro. El Reintegro Simplificado de Gravamenes Aduaneros. *Revista Chilena de Derecho*, 28(1):59–86, 2001.

J. Ederington, J. Minier, and K. R. Troske. Where the Girls Are: Trade and Labor Market Segregation. Discussion Paper 4131, IZA, 2012.

M. Goos and J. Konings. The Impact of Payroll Tax Reductions on Employment and Wages: A Natural Experiment using Firm Level Data. LICOS Discussion Paper 178/2007, 2007.

H. Görg, M. Henry, and E. Strobl. Grant Support and Exporting Activity. *Review of Economics and Statistics*, 90(1):168–174, 2008.

R. Hausmann and D. Rodrik. Economic Development as Self-discovery. *Journal of Development Economics*, 72(2):603–633, 2003.

C. Helmers and N. Trofimenko. The Use and Abuse of Export Subsidies: Evidence from Colombia. *The World Economy*, 36(4):465–486, 2013.

A. Hoffmaister. The Cost of Export Subsidies: Evidence from Costa Rica. *IMF Staff Papers*, 39(1):148–174, 1992.

K. Huttunen, J. Pirttila, and R. Uusitalo. The Employment Effects of Low-wage Subsidies. *Journal of Public Economics*, 97:49–60, 2013.

INE. Ingresos de Hogares y Personas 2007. Technical report, Instituto Nacional de Estadísticas, Chile, 2008.

C. Juhn, G. Ujhelyi, and C. Villegas-Sanchez. Trade Liberalization and Gender Inequality. *American Economic Review*, 103(3):269–73, September 2013.

C. Juhn, G. Ujhelyi, and C. Villegas-Sanchez. Men, Women, and Machines: How Trade Impact Gender Inequality. *Journal of Development Economics*, 106:179–193, 2014.

A. Laporte and F. Windmeijer. Estimation of Panel Data Models with Binary Indicators when Treatment Effects are not Constant over Time. *Economics Letters*, 88(3):389–396, 2005.

J. Levinsohn and A. Petrin. Estimating Production Functions using Inputs to Control for Unobservables. *Review of Economic Studies*, 70(2):317–341, 2003.

R. A. López. Do Firms Increase Productivity in Order to Become Exporters? *Oxford Bulletin of Economics and Statistics*, 71(5):621–642, 2009.

G. S. Olley and A. Pakes. The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica*, 64(6):1263–1297, 1996.

S. Ponthieux and D. Meurs. Gender Inequality. In A. B. Atkinson and F. Bourguignon, editors, *Handbook of Income Distribution*, volume 2, chapter 12, pages 981–1146. North-Holland, 2015.

J. R. Tybout. Chile, 1979-86: Trade Liberalization and its Aftermath. In M. J. Roberts and J. R. Tybout, editors, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure*. New York: Oxford University Press, 1996.

WTO. Trade Policy Review: Chile. Technical report, World Trade Organization, 2003.

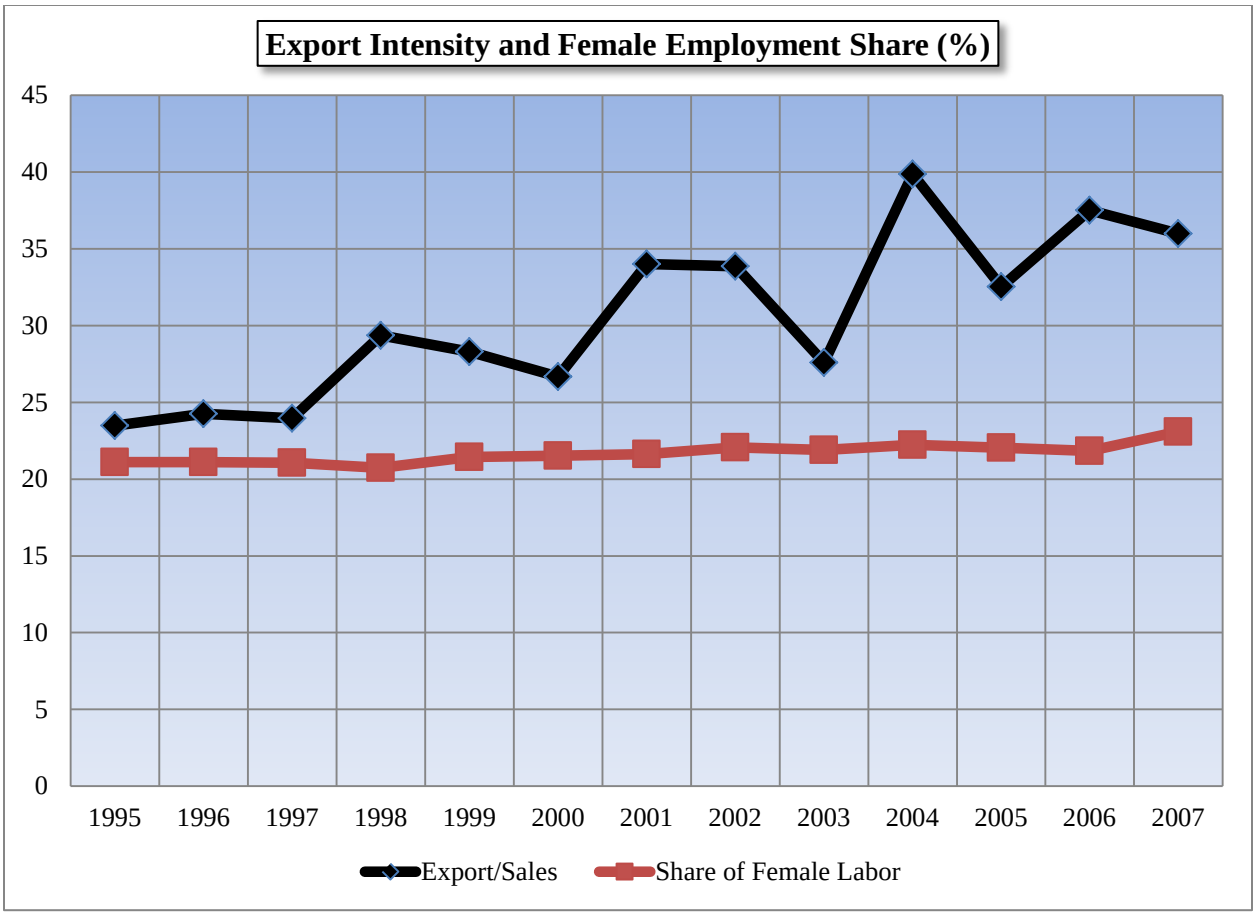
Export Intensity and Female Employment Share (%)
45
40
35
30
25
20
15
10
5
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Export/Sales
Share of Female Labor

Figure 1

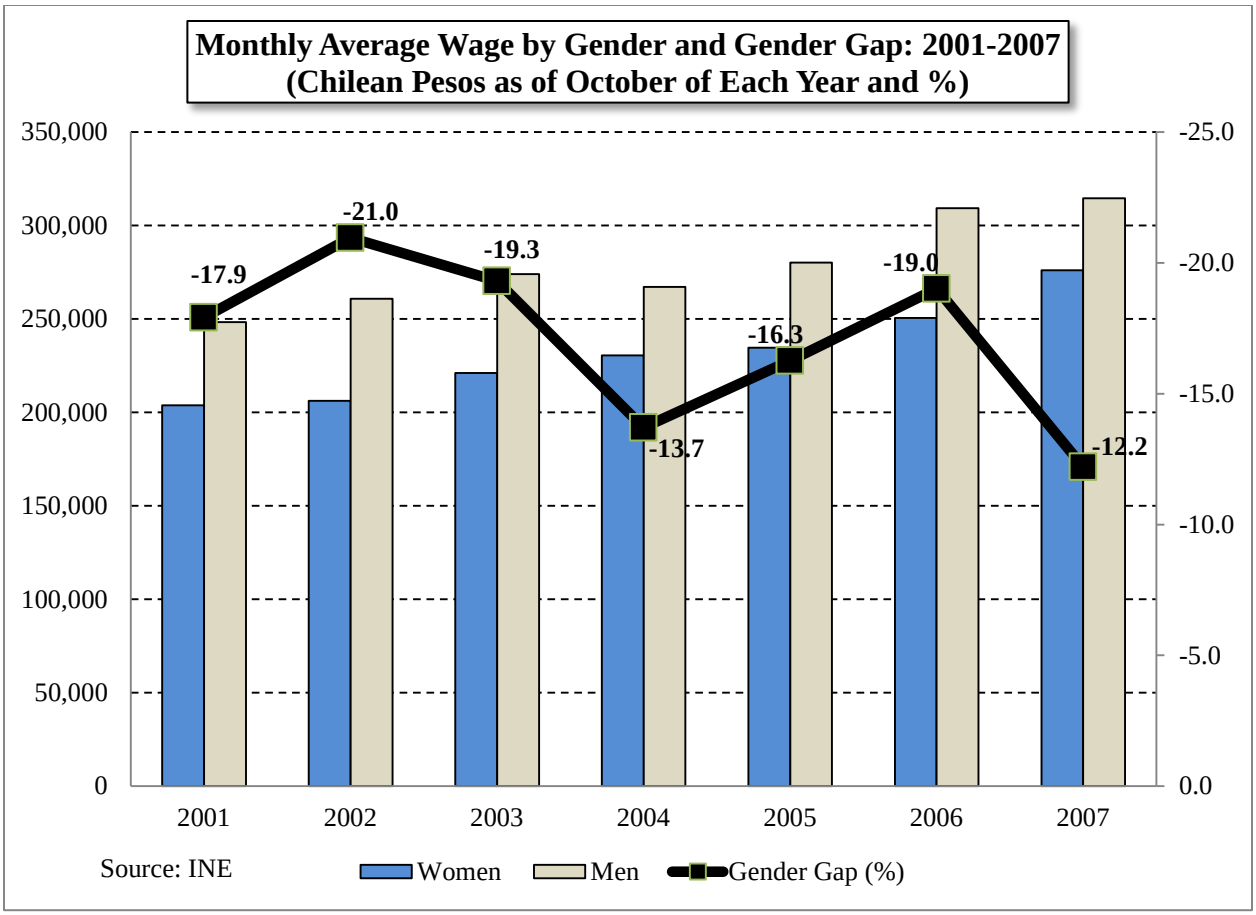
Monthly Average Wage by Gender and Gender Gap: 2001-2007
(Chilean Pesos as of October of Each Year and %)
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
-17.9
-21.0
-19.3
-13.7
-16.3
-19.0
-12.2
2001
2002
2003
2004
2005
2006
2007
Source: INE
Women
Men
Gender Gap (%)

Figure 2

Table 1: Export Intensity and Female Employment by Industry (%, Average 1995-2007)

Sector	Exports/Sales	Share of Female in Total Employment		
		Female	Skilled Female	Unskilled Female
Food products and beverages	27.4	29.8	6.9	22.9
Textiles	16.8	33.2	9.1	24.1
Apparel	6.7	65.6	21.0	44.6
Leather	11.4	30.4	8.3	22.1
Wood products	48.9	6.8	3.6	3.2
Paper	45.6	9.7	6.4	3.3
Publishing, printing	7.3	18.2	13.0	5.2
Coke, refined petroleum products and nuclear fuel (*)	3.3	9.4	9.2	0.2
Chemical products	16.7	25.7	13.6	12.1
Rubber and plastic products	14.5	13.5	6.7	6.8
Non-metallic mineral products	3.6	7.7	5.6	2.1
Basic metals	49.5	4.4	3.9	0.6
Fabricated metal products	9.7	8.0	5.3	2.8
Machinery and equipment	13.6	6.4	5.1	1.3
Office, accounting and computing machinery (*)	2.3	10.6	2.3	8.3
Electrical machinery	7.3	15.8	6.9	8.9
Radio, television and communication equip. (*)	36.3	16.3	7.9	8.4
Medical, precision and optical instruments (*)	48.0	20.8	13.3	7.5
Motor vehicles	35.7	7.1	5.6	1.5
Other transport equipment	20.0	7.1	6.2	0.9
Furniture	14.9	15.7	7.3	8.4

(*) Low number of plants

Table 2: Number of Plants by Export Status

	Total	Non-Exporters	Exporters	
			N	%
1995	5,506	4,338	1,168	21.2
1996	5,848	4,646	1,202	20.6
1997	5,629	4,454	1,175	20.9
1998	5,434	4,318	1,116	20.5
1999	5,302	4,279	1,023	19.3
2000	5,155	4,191	964	18.7
2001	5,082	4,116	966	19.0
2002	5,407	4,370	1,037	19.2
2003	5,367	4,288	1,079	20.1
2004	5,588	4,458	1,130	20.2
2005	5,507	4,367	1,140	20.7
2006	5,266	4,146	1,120	21.3
2007	5,028	3,966	1,062	21.1
Average	5,394	4,303	1,091	20.2

Table 3: Differences in Female Labor Intensity between Exporters and Non-Exporters

	1995-1998	1999-2002	2003-2007
Female Share	-0.002	0.010+	0.038**
	(0.005)	(0.006)	(0.006)
Skilled Female Share	-0.016**	-0.017**	-0.009**
	(0.003)	(0.003)	(0.003)
Unskilled Female Share	0.014**	0.027**	0.047**
	(0.005)	(0.005)	(0.005)

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. Numbers indicate the differences in favor of exporters relative to non-exporters for each of the three variables.

Table 4: OLS Results for Shares of Employment by Skill Level and Gender

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
$X_{i,95,02} \times D_{03,07}$	0.039**	0.006+	0.033**	-0.042**	0.003
	(0.004)	(0.004)	(0.004)	(0.007)	(0.008)
$X_{i,95,02}$	0.021**	-0.003	0.024**	-0.014	-0.007
	(0.007)	(0.004)	(0.006)	(0.009)	(0.010)
$D_{03,07}$	0.022**	0.024**	-0.002	0.137**	-0.159**
	(0.007)	(0.006)	(0.007)	(0.012)	(0.012)
TFP	-0.001	0.004**	-0.005**	0.021**	-0.020**
	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)
Exporter	0.025**	0.003	0.022**	-0.008	-0.017*
	(0.007)	(0.004)	(0.006)	(0.008)	(0.009)
Size (Value Added)	-0.007**	-0.015**	0.008**	-0.014**	0.021**
	(0.002)	(0.001)	(0.002)	(0.003)	(0.003)
Foreign Ownership	-0.006	0.002	-0.009	0.068**	-0.061**
	(0.008)	(0.005)	(0.007)	(0.011)	(0.011)
Importer Intermediate Inputs	0.002	0.003	-0.001	-0.021**	0.019**
	(0.005)	(0.003)	(0.005)	(0.006)	(0.007)
Foreign Technology Licenses	0.012+	0.011**	0.001	0.017+	-0.029**
	(0.006)	(0.004)	(0.006)	(0.009)	(0.009)
Average Wage	-0.036**	0.019**	-0.055**	0.071**	-0.035**
	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)
Age	-0.011**	-0.008**	-0.002	-0.029**	0.039**
	(0.003)	(0.002)	(0.003)	(0.005)	(0.005)
Capital-Labor Ratio	-0.010**	0.002+	-0.011**	0.018**	-0.008**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Observations	52,905	52,905	52,905	52,905	52,905
R-squared	0.412	0.129	0.295	0.143	0.144

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Industry, region and year dummy variables were included.

Table 5: Fixed Effects Results for Shares of Employment by Skill Level and Gender

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
$X_{i,95,02} \times D_{03,07}$	0.033**	0.002	0.031**	-0.044**	0.011
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
TFP	-0.006**	0.007**	-0.013**	0.014**	-0.008
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Exporter	0.000	-0.000	0.001	-0.000	-0.000
	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)
Size (Value Added)	0.007**	-0.008**	0.015**	-0.016**	0.008+
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Foreign Ownership	0.001	0.007**	-0.007*	0.026**	-0.026**
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
Importer Intermediate Inputs	-0.002	-0.002	-0.000	-0.005	0.007
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Foreign Technology Licenses	0.001	0.000	0.001	-0.006	0.005
	(0.002)	(0.002)	(0.002)	(0.006)	(0.006)
Average Wage	-0.007**	0.005*	-0.012**	0.018**	-0.011*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Age	0.006+	0.002	0.004	-0.025**	0.019*
	(0.003)	(0.004)	(0.004)	(0.007)	(0.008)
Capital-Labor Ratio	-0.002	0.003+	-0.004**	0.005+	-0.004
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Observations	52,905	52,905	52,905	52,905	52,905
R-squared (Within)	0.014	0.005	0.020	0.033	0.022

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 6: Fixed Effects Results by Size Category

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
$X_{i,95,02} \times D_{03,07}$	0.029**	0.002	0.026**	-0.032**	0.004
	(0.004)	(0.005)	(0.005)	(0.009)	(0.009)
$X_{i,95,02} \times D_{03,07} \times$ Medium	0.003	-0.004	0.007	-0.019+	0.016
	(0.004)	(0.005)	(0.005)	(0.011)	(0.011)
$X_{i,95,02} \times D_{03,07} \times$ Large	0.016**	-0.001	0.017**	-0.030*	0.014
	(0.005)	(0.005)	(0.005)	(0.012)	(0.012)
Medium	0.001	-0.019**	0.020**	-0.032**	0.031**
	(0.003)	(0.004)	(0.004)	(0.007)	(0.008)
Large	0.004	-0.030**	0.034**	-0.059**	0.056**
	(0.006)	(0.005)	(0.006)	(0.012)	(0.013)
TFP	-0.000	0.001	-0.001	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Exporter	0.001	-0.000	0.001	0.000	-0.001
	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)
Foreign Ownership	0.000	0.007**	-0.007*	0.026**	-0.026**
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
Importer Intermediate Inputs	-0.002	-0.002	-0.000	-0.004	0.006
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Foreign Technology Licenses	0.001	0.000	0.001	-0.005	0.004
	(0.002)	(0.002)	(0.002)	(0.006)	(0.006)
Average Wage	-0.008**	0.006**	-0.014**	0.020**	-0.012**
	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)
Age	0.007*	0.001	0.006+	-0.027**	0.020**
	(0.003)	(0.004)	(0.004)	(0.007)	(0.008)
Capital-Labor Ratio	-0.001	0.001	-0.002+	0.003	-0.002
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Observations	52,905	52,905	52,905	52,905	52,905
R-squared (Within)	0.014	0.006	0.021	0.035	0.023

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 7: Fixed Effects Results for the Share of Skilled Workers by Type of Job and Gender

	Female Workers			Male Workers		
	Managers	Administrative	Specialized	Managers	Administrative	Specialized
$X_{i,95,02} \times D_{03,07}$	-0.001	0.003+	-0.000	0.002	-0.004+	-0.042**
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.007)
TFP	0.000	0.004+	0.003*	0.003**	-0.003*	0.014**
	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)	(0.004)
Exporter	-0.000	0.001	-0.002	0.001	0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.005)
Size (Value Added)	-0.001+	-0.003	-0.003*	-0.004**	0.004**	-0.016**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.004)
Foreign Ownership	-0.000	0.004*	0.003	0.002	0.002	0.022**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.007)
Importer Intermediate Inputs	0.001	-0.002	-0.001	-0.002	-0.002	-0.001
	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)
Foreign Technology Licenses	-0.001+	0.000	0.000	-0.000	0.000	-0.006
	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)	(0.006)
Average Wage	0.001**	0.006**	-0.003+	0.006**	0.007**	0.005
	(0.000)	(0.002)	(0.001)	(0.002)	(0.002)	(0.004)
Age	-0.001+	0.003	0.000	-0.003+	0.005*	-0.026**
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.007)
Capital-Labor Ratio	-0.001+	0.004**	-0.001	0.001	0.000	0.004
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
Observations	52,905	52,905	52,905	52,905	52,905	52,905
R-squared (Within)	0.010	0.007	0.004	0.020	0.016	0.038

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 8: Anticipation Effects

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
$X_{i,95,02}$ × Year 1999	0.004	0.001	0.003	-0.006	0.002
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)
$X_{i,95,02}$ × Year 2000	0.001	-0.002	0.003	-0.006	0.004
	(0.003)	(0.004)	(0.004)	(0.008)	(0.008)
$X_{i,95,02}$ × Year 2001	0.031**	0.004	0.027**	-0.039**	0.008
	(0.004)	(0.004)	(0.005)	(0.009)	(0.009)
$X_{i,95,02}$ × Year 2002	0.036**	0.002	0.034**	-0.056**	0.019*
	(0.004)	(0.004)	(0.004)	(0.009)	(0.010)
$X_{i,95,02}$ × $D_{03,07}$	0.045**	0.003	0.042**	-0.061**	0.016+
	(0.004)	(0.004)	(0.004)	(0.009)	(0.009)
TFP	-0.006**	0.007**	-0.013**	0.014**	-0.008
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Exporter	0.001	-0.000	0.002	-0.001	-0.000
	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)
Size (Value Added)	0.007**	-0.008**	0.014**	-0.015**	0.008
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Foreign Ownership	-0.001	0.007**	-0.008**	0.028**	-0.027**
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
Importer Intermediate Inputs	-0.002	-0.002	-0.000	-0.005	0.007
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Foreign Technology Licenses	0.001	0.000	0.001	-0.006	0.005
	(0.002)	(0.002)	(0.002)	(0.006)	(0.006)
Average Wage	-0.006**	0.005*	-0.011**	0.017**	-0.011*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Age	0.006+	0.002	0.004	-0.025**	0.019*
	(0.003)	(0.004)	(0.004)	(0.007)	(0.008)
Capital-Labor Ratio	-0.002	0.003+	-0.005**	0.006+	-0.004
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Observations	52,905	52,905	52,905	52,905	52,905
R-squared (Within)	0.018	0.005	0.023	0.035	0.022

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 9: Matching

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
$X_{i,95,02} \times D_{03,07}$	0.013**	-0.007	0.020**	-0.026**	0.013
	(0.004)	(0.004)	(0.004)	(0.009)	(0.009)
TFP	-0.000	0.010*	-0.010**	0.020**	-0.019**
	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)
Exporter	0.002	0.001	0.001	0.001	-0.003
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)
Size (Value Added)	-0.000	-0.013**	0.012**	-0.018**	0.018**
	(0.003)	(0.004)	(0.004)	(0.006)	(0.006)
Foreign Ownership	-0.005	0.003	-0.008*	0.021*	-0.016+
	(0.004)	(0.003)	(0.004)	(0.010)	(0.010)
Importer Intermediate Inputs	-0.001	-0.001	-0.000	-0.010+	0.011*
	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)
Foreign Technology Licenses	-0.001	-0.002	0.001	-0.006	0.007
	(0.003)	(0.003)	(0.003)	(0.008)	(0.008)
Average Wage	-0.004	0.004	-0.008**	0.022**	-0.018**
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)
Age	0.046+	0.003	0.043+	-0.015	-0.031
	(0.026)	(0.021)	(0.023)	(0.050)	(0.051)
Capital-Labor Ratio	-0.002	0.002	-0.004*	0.006	-0.004
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
Observations	23,563	23,563	23,563	23,563	23,563
R-squared (Within)	0.007	0.013	0.009	0.031	0.035

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 10: Fixed Effects Results with Alternative Treatment Variable

	(1) Female	(2) Skilled Female	(3) Unskilled Female	(4) Skilled Male	(5) Unskilled Male
Stop	0.027**	0.003	0.023**	-0.041**	0.014
	(0.005)	(0.004)	(0.005)	(0.010)	(0.010)
TFP	-0.008**	0.007**	-0.015**	0.016**	-0.008
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Exporter	-0.001	-0.002	0.001	0.004	-0.002
	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)
Size (Value Added)	0.008**	-0.007**	0.016**	-0.017**	0.009+
	(0.002)	(0.003)	(0.003)	(0.005)	(0.005)
Foreign Ownership	0.003	0.007*	-0.004	0.019*	-0.022**
	(0.003)	(0.003)	(0.003)	(0.008)	(0.008)
Importer Intermediate Inputs	-0.002	-0.002	0.001	-0.006	0.008+
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Foreign Technology Licenses	0.000	0.000	0.000	-0.006	0.006
	(0.002)	(0.002)	(0.002)	(0.006)	(0.007)
Average Wage	-0.008**	0.004	-0.011**	0.016**	-0.008+
	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
Age	0.003	-0.000	0.003	-0.021**	0.019*
	(0.003)	(0.004)	(0.004)	(0.007)	(0.007)
Capital-Labor Ratio	-0.002	0.003*	-0.005**	0.006+	-0.004
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Observations	50,444	50,444	50,444	50,444	50,444
R-squared (Within)	0.010	0.005	0.017	0.031	0.022

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 11: Technology and Wages

	(1) New Machinery/Sales	(2) Licenses/Sales	(3) Dummy Licenses	(4) Average Wage
$X_{i,95,02} \times D_{03,07}$	0.133	0.001	0.011	-0.033*
	(0.115)	(0.000)	(0.007)	(0.013)
TFP	0.254	-0.000	-0.003	0.120**
	(0.313)	(0.000)	(0.004)	(0.010)
Exporter	0.168	-0.000	0.009	0.025*
	(0.180)	(0.000)	(0.007)	(0.011)
Size (Value Added)	-0.261	0.001+	0.011**	-0.040**
	(0.309)	(0.000)	(0.004)	(0.009)
Foreign Ownership	-0.152	0.001+	0.018+	0.077**
	(0.126)	(0.000)	(0.011)	(0.015)
Importer Intermediate Inputs	-0.018	0.000	0.011+	0.022*
	(0.019)	(0.000)	(0.006)	(0.009)
Foreign Technology Licenses	-0.008	0.002**		0.017
	(0.026)	(0.001)		(0.011)
Average Wage	0.063	0.000	0.004	
	(0.101)	(0.000)	(0.003)	
Age	0.077	0.000	-0.010+	0.003
	(0.096)	(0.000)	(0.005)	(0.012)
Capital-Labor Ratio	-0.152	-0.000	-0.001	0.084**
	(0.101)	(0.000)	(0.002)	(0.007)
Observations	50,576	50,576	52,904	52,904
R-squared (Within)	0.0004	0.003	0.004	0.198

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1. TFP, size, average wage, age, and capital-labor ratio in logs. All controls variables lagged one year. Year and plant fixed effects included.

Table 12: Average Monthly Wage by Gender and Sector, Chilean Pesos (October 2007)

	Total	Women	Men	Gap (%)
Agriculture, hunting and fishing	165,764	148,198	170,135	-12.9
Mining and quarrying	604,391	555,069	606,882	-8.5
Manufacturing	275,509	229,950	290,049	-20.7
Electricity, gas and water	393,832	334,543	404,694	-17.3
Construction	271,643	304,119	269,628	12.8
Wholesale and retail trade and restaurants and hotels	230,138	193,021	265,982	-27.4
Transport, storage and communication	322,631	291,277	330,453	-11.9
Financing, insurance, real estate and business services	372,958	322,478	410,295	-21.4
Community, social and personal services	367,465	335,952	406,726	-17.4
Total	300,851	276,082	314,453	-12.2

Source: INE (2008).

Table 13: Relationship between Average Wage and Female Labor Intensity

	(1)	(2)	(3)	(4)
Female Employment Share	-0.463**	-0.477**	-0.093*	-0.094*
	(0.030)	(0.029)	(0.046)	(0.046)
Exporter		0.389**		0.026**
		(0.013)		(0.010)
Foreign Ownership		0.388**		0.105**
		(0.021)		(0.015)
Observations	69,714	69,714	69,714	69,714
R-squared	0.250	0.323	0.206	0.207
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	No
Region FE	Yes	Yes	No	No
Plant FE	No	No	Yes	Yes

Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1