

IS THE GENDER WAGE DISCRIMINATION DECREASING IN CHILE? THIRTY YEARS OF “ROBUST” EVIDENCE

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ABSTRACT

This paper analyzes how discrimination by gender in Chile evolved over the period 1958-1996. The paper takes advantage of a series of household surveys that cover an unusually long time series for a developing country. This provides a valuable picture of trends in discrimination over a period that exhibited diverse economic conditions and policies. The study is based on the basic model for the decomposition of Oaxaca (1973) and Oaxaca and Ramson (1994). This methodology enables us to split the wage differential by gender in the components associated to discrimination and productivity. In addition we decompose the discrimination effect in two, a positive discrimination in one group and a negative discrimination in the other. In order to test the robustness of our conclusions, we use bootstrapping to estimate the intervals of confidence of the discrimination components. The main conclusion derived from this study is that in spite of females exhibit a higher level of human capital (endowment) than males, they have been consistently discriminated in the Chilean labor market during the last 30 years. In addition, more important than a over payments to males relative to females is the under payment of females. The evidence indicates that discrimination is statistically significant, the trend in discrimination is decreasing over time and this trend was reversed during the nineties.

Key words: Labor market discrimination, wage composition

JEL Classification: J71, C50.

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1 INTRODUCTION

The Chilean Labor Market has shown significant differences in wages received by males and females. Between 1966 and 1996, the difference in the hourly wage was 22% higher for males. Since 1966, this gap have continuously decreasing reaching its minimum in 1983, but in the nineties the wage gap increased and it has been stable since then.

In contrast with these differences, for the sample of working people, females always exhibited higher educational attainment than males. During the period examined, women show one year more education than males. The observable factors, such as education indicates that higher wages are expected for females, but this is not observed. Therefore, unobservable factors, which are not necessarily related to individual productivity, would be explaining the wage differential.

The methodology proposed by Oaxaca (1973) and continued by Oaxaca and Ramson (1994), allow us to split the wage differential in two different effects. One effect associated to differences in endowments, such as human capital. The second effect is discrimination. We use the Employment and Unemployment survey from Universidad de Chile to investigate the evolution of the wage gap by gender.

This paper contributes at least in three aspects to our knowledge on discrimination in LCD's. First, The paper takes advantage of a series of household surveys that cover an unusually long time series for a developing country. This provides a valuable picture of trends in discrimination over a period that exhibited diverse economic conditions and policies. Second, we present evidence of discrimination by identifying if such discrimination is explained by an over-payment to males or under-payment to females. Finally we use bootstrapping to estimate the intervals of confidence of the discrimination component. This last strategy permits to examine the robustness of our main results on discrimination. The main conclusions derived from this study is that in spite of females exhibit a higher level of human capital (endowment) than males, they have been consistently discriminated in the Chilean labor market during the last 30 years. In addition, more important than the over-payment to males is the under-payment to females. The evidence indicates that

discrimination is statistically significant, the trend in discrimination is decreasing over time and this trend was reversed during the nineties.

The paper is organized as follows: the second section presents the methodology and a review of the previous research. The third chapter examines the data and sampling. The fourth section presents both the results obtained and the interpretations stemming from them. Finally, the fifth section puts forth the conclusions.

2 METHODOLOGY

This paper follows Oaxaca (1973) and Oaxaca and Ramson (1994), in which a methodology is developed to identify if the observed wage differential between different groups (in this paper between males and females) are explained by differences in the endowment of each group or are due to discrimination effects. In addition, this methodology permits us to measure the percentage of each factor in explaining wage differentials. A short description of the methodology is presented below.¹

Let us assume that $G_{h/m}$ is the observed wage gap between males and females:

$$(1) \quad G_{h/m} = W_h / W_m - 1$$

Where W_h and W_m represent the average wage for males and females respectively. With no discrimination in the labor market, the wage differential would be explained by differences in endowments ($Q_{h/m}$).

$$(2) \quad Q_{h/m} = W_h^o / W_m^o - 1$$

Where the term “o” represents the lack of discrimination in the labor market. However, this statement ignores that differences in endowment may be a result of a discrimination

¹ This section follows Oaxaca y Ramson (1994).

previous the participation in the labor market.² The discrimination coefficient ($D_{h/m}$) is defined then as the proportion between $G_{hm}+1$ and $Q_{hm}+1$:

$$(3) \quad D_{h/m} = (W_h / W_m - W_h^o / W_m^o) / (W_h^o / W_m^o)$$

From equations 1,2 y 3 it is possible to obtain the following decomposition in logs

$$(4) \quad Ln(G_{h/m} + 1) = Ln(D_{h/m} + 1) + Ln(Q_{h/m} + 1)$$

If we assume that discrimination is a result of an over-payment to males and under-payment to females. The discrimination coefficient can be divided in the following terms:

$$(5) \quad \begin{aligned} Ln(D_{h/m} + 1) &= Ln(W_h / W_m) - Ln(W_h^o / W_m^o) \\ Ln(D_{h/m} + 1) &= Ln(W_h / W_h^o) - Ln(W_m / W_m^o) \\ Ln(D_{h/m} + 1) &= Ln(\delta_{h/o}) - Ln(\delta_{m/o}) \end{aligned}$$

Where $\delta_{h/o}$ represents the over-payment to males with respect to a situation with no discrimination, and $\delta_{m/o}$ is the under-payment to females with respect to a situation of no discrimination. Replacing 5 in 4, we have:

$$(6) \quad Ln(G_{h/m} + 1) = Ln(\mathbf{d}_{h/o} + 1) + Ln(\mathbf{dm} / o + 1) + Ln(Q_{h/m} + 1)$$

By estimating wage equations for males and females as function of their human capital, we obtain:

² Contreras and Caceres (1998) and Rubalcava and Contreras (2000) provide some evidence of the differences in the allocation of resources within the Chilean households in favor to sons with respect to daughters.

$$\begin{aligned}
& Ln(\overline{w_h}) = \overline{X'_h} \hat{\mathbf{b}}_h \\
(7) \quad & Ln(\overline{w_m}) = \overline{X'_m} \hat{\mathbf{b}}
\end{aligned}$$

The left-hand side shows the average of natural logarithm of wage per hour. The right-hand side is the average in endowment for males and females weighted by the estimated parameters.

Therefore, decomposition (6) may be written as:

$$(8) \quad Ln(G_{h/m} + 1) = \overline{X'_h} (\hat{\mathbf{b}}_h - \mathbf{b}_*) + \overline{X'_M} (\mathbf{b}_* - \hat{\mathbf{b}}_m) + (\overline{X}_h - \overline{X}_m)' \mathbf{b}_*$$

Where \mathbf{b}_* are the estimated parameters for a no-discrimination structure.

The methodology proposed by Oaxaca (1973) assumes that the no-discriminatory wage structure correspond to either the wage structure of males or females. Oaxaca and Ramson (1994) assume that the total population gives the no-discriminatory wage structure. Therefore, the parameters are estimated using the complete sample.

In this paper, we compare how our results vary when assuming the no-discriminatory structure be the male and the total population. This strategy allow us to measure not only the discrimination in the Chilean labor market, but also to identify what are the type of discrimination: over-payment to males, under-payment to females or a symmetric situation.

Before to estimate the model the reader must consider some caveats. In order to obtain a reliable measure of discrimination, the parameters estimated should be unbiased. There are two potential problems of bias in the estimation process. First, in the wage equations there are several omitted variables, including intelligence, family characteristics,

etc.³ Second, the wage equations are estimated for males and females currently working in the Chilean labor market, this produces a selection bias. This problem is particularly relevant for females. Indeed, females exhibit a participation rate of 40% in average during last 30 years. Therefore, by using this sample we are obtaining relevant parameters only for working females.

In order to solve the selection bias, it would be necessary to apply some econometric techniques such as 2-stage Heckman procedure or the TOBIT method. However, it would be necessary to identify the female participation decision, as a function of a set of independent variables different from the ones used in the wage equations. There are two main limitations to this strategy. First, the data set is very rich from a long-run perspective, but it does not have enough variables to correctly identify the participation and wage equations as two separate decisions.⁴ Second, these methods impose additional assumption on the error structure, which is not necessarily compatible with our model.

Finally, the robustness of the variation in the measures of discrimination is tested using bootstrapping techniques. This methodology provides a way to estimate the standard errors with statistical accuracy when no formula is available. The bootstrap procedure estimates a statistic (discrimination) from a sample. The estimation is *replicated R times* by random drawing with replacement. In this procedure, some of the original observations will appear once, some more than one and some not at all. Thus, we construct a data set of estimated statistics. From this data we estimate the standard errors.⁵

2.1 PREVIOUS RESEARCH

³ The only way to avoid this problem is to include such variables, which in this case is not possible given they are not available in the survey. However, if we assume that the omitted variables have in average a similar effect for males and females, then this problems would be partially solve given than we are interested in the differences in parameters rather than in its absolute values.

⁴ It would be possible to use the same set of independent variables in the 2-stage but we would have a serious identification problem.

⁵ Bootstrapping often yields results that are much more accurate than those of first order asymptotic approximation. We used 200 replications for estimation purposes.

After the seminal work presented by Oaxaca 1973, Oaxaca and Ramson (1994) presented another study in which they show that discrimination factor can be divided in two different elements: a positive discrimination over one group and a negative discrimination on the other. To identify these effects, it is necessary to define a market wage structure under no-discrimination. Once this structure is identified, then the positive and negative discrimination can be estimated.

Mora (1999) proposes a non-parametric method to estimate discrimination. This work uses information of Mexican immigrants in USA and non-Hispanic workers. In this work, there are five alternative methods for wage inequality, where the non-parametric strategy fit the data more precisely. Thus, the evidence indicates that the wage differentials between Mexican and non Hispanic workers are explained by the fact that Mexican workers have higher probability to be salaried workers rather than self-employed ones, they live in segregated areas and finally for their own characteristics.

In Chile, Paredes and Riveros (1993) using the traditional Oaxaca decomposition estimate the endowment and discrimination effects for the period 1958-1990. They provide evidence on discrimination against females during the whole period examined. They also found that discrimination effect is correlated with the business cycle.

More recently Montenegro (1999) and Montenegro and Paredes (1999) analyze the wage differential for the period 1960-98 by using quantile regression and the Oaxaca decomposition. They show systematic differences in the return to schooling and experience along the wage distribution. They also present evidence of an increasing wage differential by gender during the nineties.

This paper uses the methodology proposed by Oaxaca and Ramson (1994), this strategy allow us to model the no-discriminatory wage structure as the total population structure and the male one. The previous papers in Chile assume that the no-discriminatory structure is the male. In addition, we present the results for a long period of time, which allow us to consider the evolution of discrimination in Chile. Finally, we estimate the interval of confidence of the discrimination measure for each year. This strategy permits to evaluate if such coefficient is statistically different from zero.

3 DATA

The information used was obtained from the Employment and Unemployment Survey of Universidad de Chile for Greater Santiago. This survey is available for the period between 1958-1996⁶ and corresponds to a sample of households administered in June each year. A clear advantage of this data base is that both the questionnaire and the classifications used in the survey have been stable over time. Furthermore, the sample has been constantly reviewed to ensure that it is fully representative of Greater Santiago.⁷ We resort to a sample made up of salaried workers, i.e., both white- and blue-collar workers, who work on a full-time basis (at least 30 hours weekly). This selection precludes the possibility that the results include special cases, such as part-time workers, conceivably involving other variables.⁸

The Figure N°1 shows the participation rate for males and females for the period examined. Between 1966-69 the average male participation was 79%, during the 70s and 80s decreased to 74%, increasing again during the period 1990-96 achieving 77%. The male participation rate is significant higher than the female one, but the last one have increased during the last 15 years. During the period 1966-69 the average female participation was 36%, in the 70s achieved 36%, in the 70s this rate was 35%, during the 80s the female participation increased to 38%, finally in the period 1990-96 achieved a 42%.⁹

⁶ Information for the whole country is available only for 1980-1990.

⁷ The Metropolitan Region concentrates nearly 45% of the national labor force and a third of national GDP.

⁸ ⁸ The analysis is centered in employed and workers to have a homogeneous group.

⁹ For a complete discussion about the changes in the female participation rate and its determinants, see Contreras, Bravo and Puentes (1999).

Figure N°1
Participation rate: Males and Females

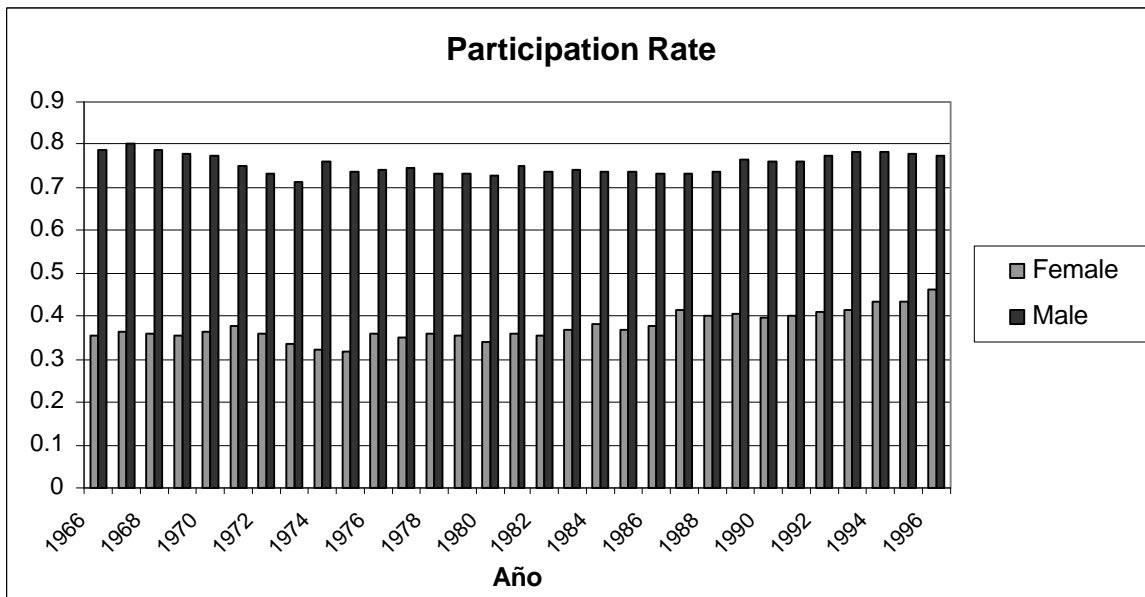


Figure N°2 shows the evolution of the hourly wage for males and females. During the period, 1966-96 the males always exhibit a higher wage than females, but during the last years a small reduction in the gap is observed. The business cycle has a similar impact on the wage behavior for males and females. In the crisis of 1975 and 1982-1983 we observe a reduction wage for both groups. On the other hand, the sustained economic growth of the nineties has been accompanied by an increase in real wages, with the sole interruption in 1992 and 1993.

Figure N°2
Real hourly wages: Males and Females 1966-1997

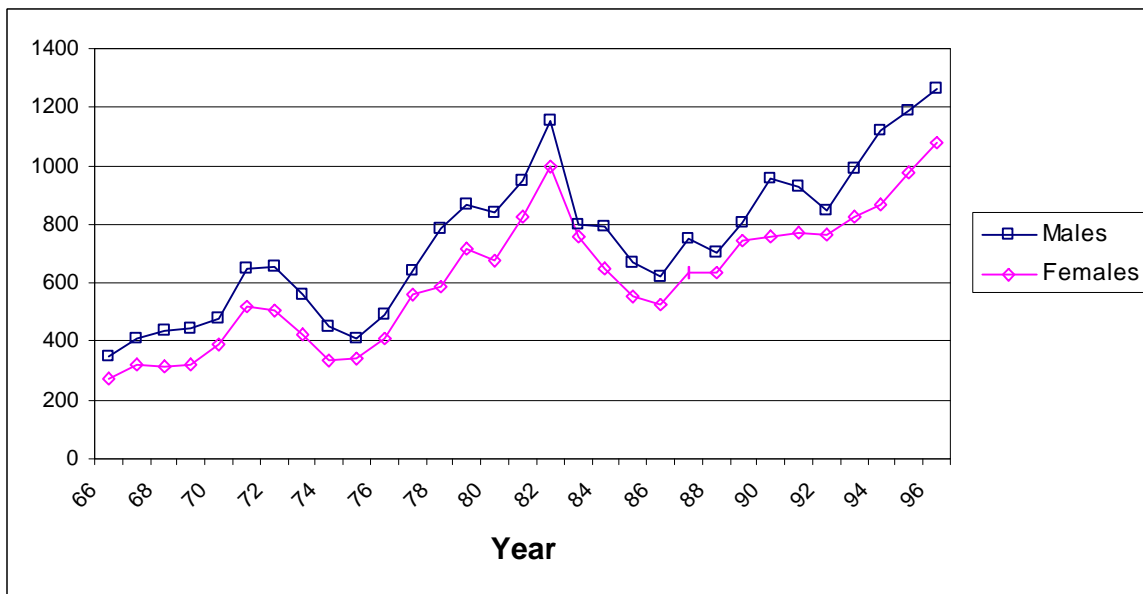
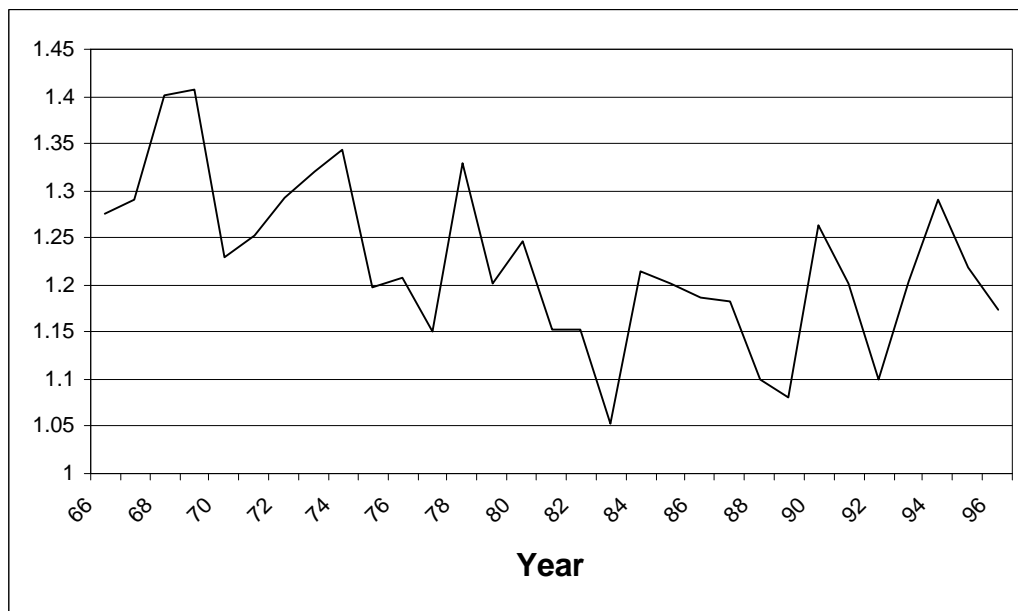


Figure N°3 exhibits the hourly wage ratio between males and females.

Figure N°3
Ratio Male/Female hourly wage



During the period 1966-69 the average ratio between males and females was 34%, in the decade of the 70s this ratio decreased to 25%, in the 80s was 16%. However, this trend was reverted during 1990-96 achieving a ratio of 20%.

Table N°1 presents the main characteristic of males and females workers and the data used. The information is available for the whole period. However, this table summarizes the information for the years 1968, 1978, 1998 y 1996.

Table N°1

	1968		1978		1988		1996	
	Males	Females	Males	Females	Males	Females	Males	Females
Year of Schooling	7.92	8.73	9.04	10.25	10.07	11.04	10.47	11.24
Age	34.34	31.71	35.26	32.83	35.07	32.84	36.49	34.63
Potential Experience	20.42	16.99	20.22	16.59	19.00	15.80	20.02	17.40
Public sector=1	21.9%	30.5%	20.9%	33.2%	12.0%	19.6%	7.4%	15.4%
Agriculture	1.6%	0.5%	1.6%	0.6%	1.1%	1.3%	0.9%	0.3%
Mining	0.4%	0.4%	0.8%	0.7%	1.1%	0.3%	0.9%	0.4%
Industry	34.6%	37.9%	34.5%	28.2%	32.7%	30.2%	28.2%	23.1%
Construction	10.6%	2.0%	10.8%	1.7%	13.5%	1.4%	14.1%	1.9%
Commerce	13.3%	14.1%	11.8%	14.6%	13.3%	17.8%	16.8%	19.7%
Financial services	13.1%	9.3%	12.1%	15.2%	12.7%	12.4%	13.5%	17.4%
Personal services	6.5%	4.1%	5.8%	3.1%	6.1%	3.2%	4.3%	1.5%
Community services	9.0%	27.8%	11.1%	32.1%	9.6%	30.2%	11.5%	31.5%
Transport	10.9%	3.9%	11.5%	3.7%	10.0%	3.2%	9.7%	4.1%

The table indicates that females exhibit in average one more year of schooling than males. This fact is consistent with a significant increase in the educational attainment of Chilean workers. In other words, the educational level of the Chilean workers has been increasing over time, but the educational gap in favor to females remains stable. Given the low female participation rate in Chile, it is not surprising that the females who currently participate in the labor market are the more qualify for such a purpose. On contrary, males exhibit a participation rate on average of 75%, which indicates that male worker participate in the

labor market independent on their level of qualification. This may explain the differences in the educational level exhibited by males and females.

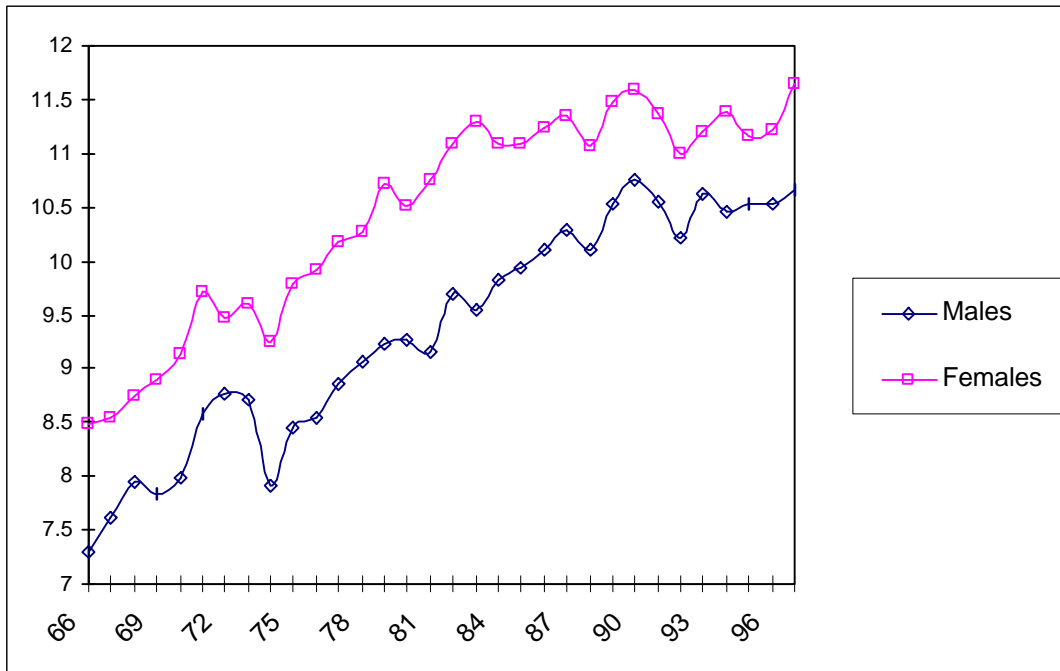
In addition, the Chilean workers are aging over time in approximately 2 years.¹⁰ Males exhibit in average two years more than females and higher potential experience, which eventually imply higher wages.

There are also differences in the allocation of males and females in productive sectors. In 1968, males are mainly concentrated in industry, commerce and financial services with a 35%, 13.3% and 13% respectively. In 1996, the industry concentrated male workers in 27% followed by construction (17%) and commerce and financial services (13%). On the other hand, in 1968 females were mainly working in industry (35%) and community services (28%). In 1996, females were more concentrated in community services (33%) and commerce (21%). This table also shows how the economic structure has change over time. Industry has exhibited a significant relative reduction, a similar trend is observed in the public sector. In 1968, 30% of females and 22% of males worked in the public sector, in 1995 this figures have reduced to 15% and 7% respectively.

Figure 4 shows the years of schooling for males and females for the whole period. This figure confirms the evidence presented in the previous table. Working females systematically show higher level of education than males. Following the human capital hypothesis, it is expected that female earn higher wages than males considering the impact of education on productivity. But, as it was mentioned before, the hourly wage ratio between males and female show the opposite trend. This may be explained by several factors including, differences in productive sectors, omitted variables, and discrimination. The next section investigated this hypothesis.

¹⁰ This is consistent with the demographic transition.

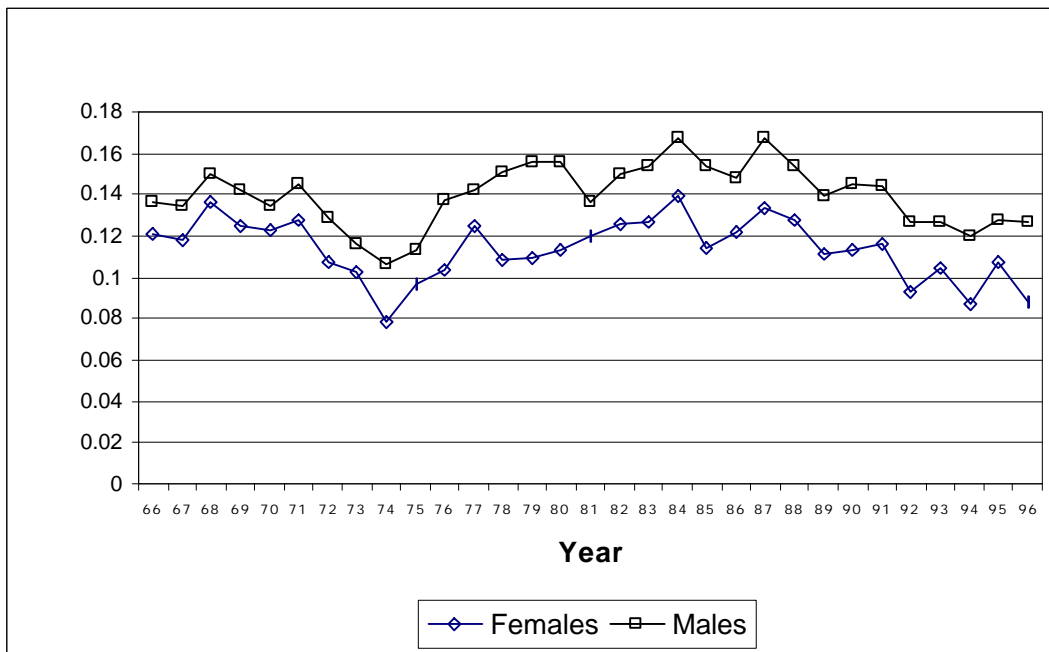
Figure N°4
Average years of schooling: Males and Females



4 DECOMPOSITION

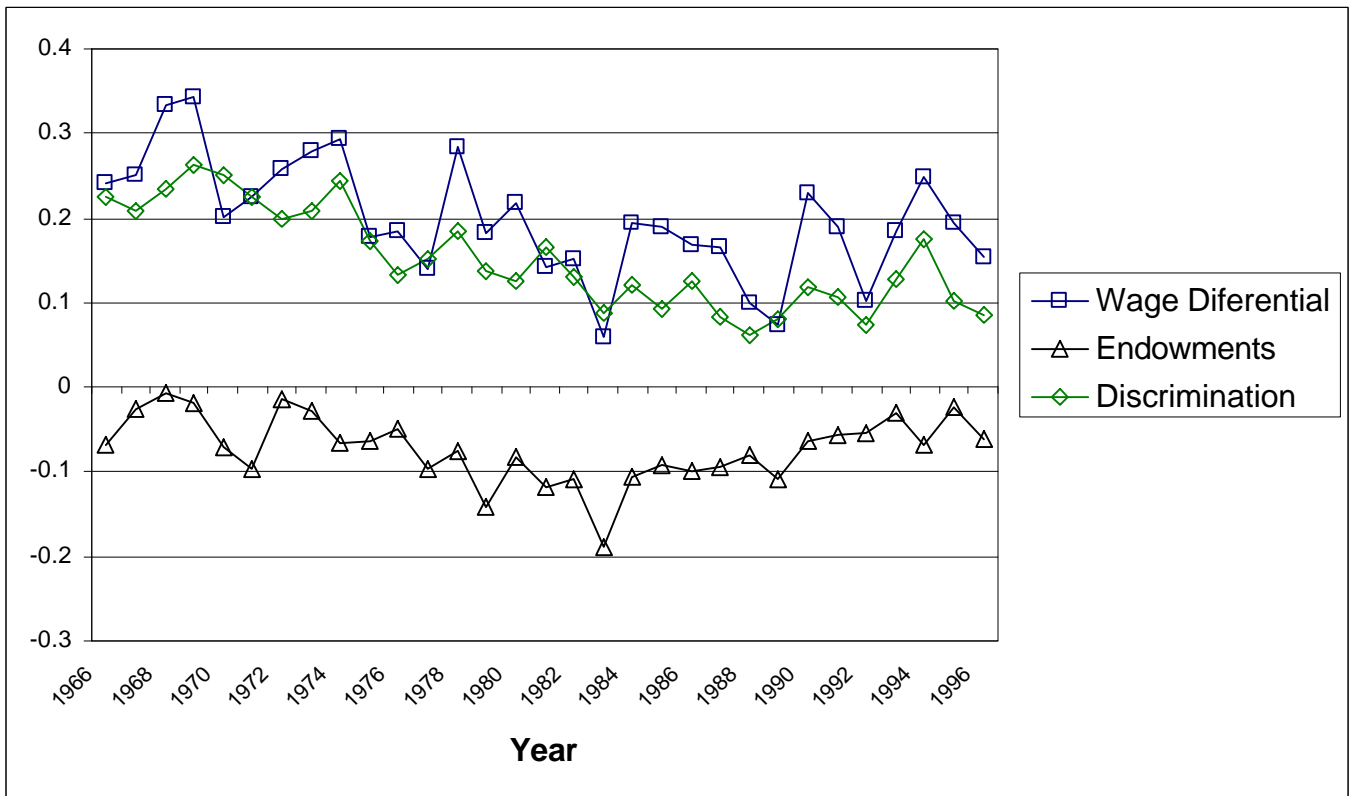
In order to estimate the Oaxaca decomposition we first estimate wage equations for males and females for the period 1966-96. The dependent variable is defined as the natural log of the hourly wage. The explanatory variables include year of schooling, potential experience and its square and a set of dummy variables, which indicates whether the worker works in the economic sectors and public sector. In each estimation, the model was corrected for heterocedasticity. From the wage equation we estimate the return to schooling for males and females. This rate of return is presented in Figure N°5.

Figure N°5
Return to Schooling: Males-Females



The figure indicates that the return to schooling is systematically higher for males than females. In other words, for each additional year of education, the males receive a higher premium in term of wages than females. In the decomposition such kind of results are associated to discrimination: for a same educational level males have higher wages than females. As it was discussed before, this result may be contaminated for potential bias in the estimation of the parameters in the wage equations. With the results we are able to estimate the endowment and discrimination effects. Our first set of results assumes that the no-discriminatory wage structure is the male wage structure. Figure 6 show the results of such decomposition.

Figure N°6
Wage Differential Decomposition



The evidence indicates that the wage differential has always favored males. The endowment effect is negative which means that in a labor Market with no discrimination females should expect to have higher wages than males. This is explained for the fact than females exhibit higher education than males. However, the discrimination effect in the labor market more than compensate the endowment effect, and consequently induces that males receive higher wages than females.

Next, the bootstrap method permits to construct intervals of confidence to statistically examine the significance of the discrimination effect previously estimated. This result is presented in Figure N°7.

Figure N°7

Interval of Confidence for the Discrimination Effect

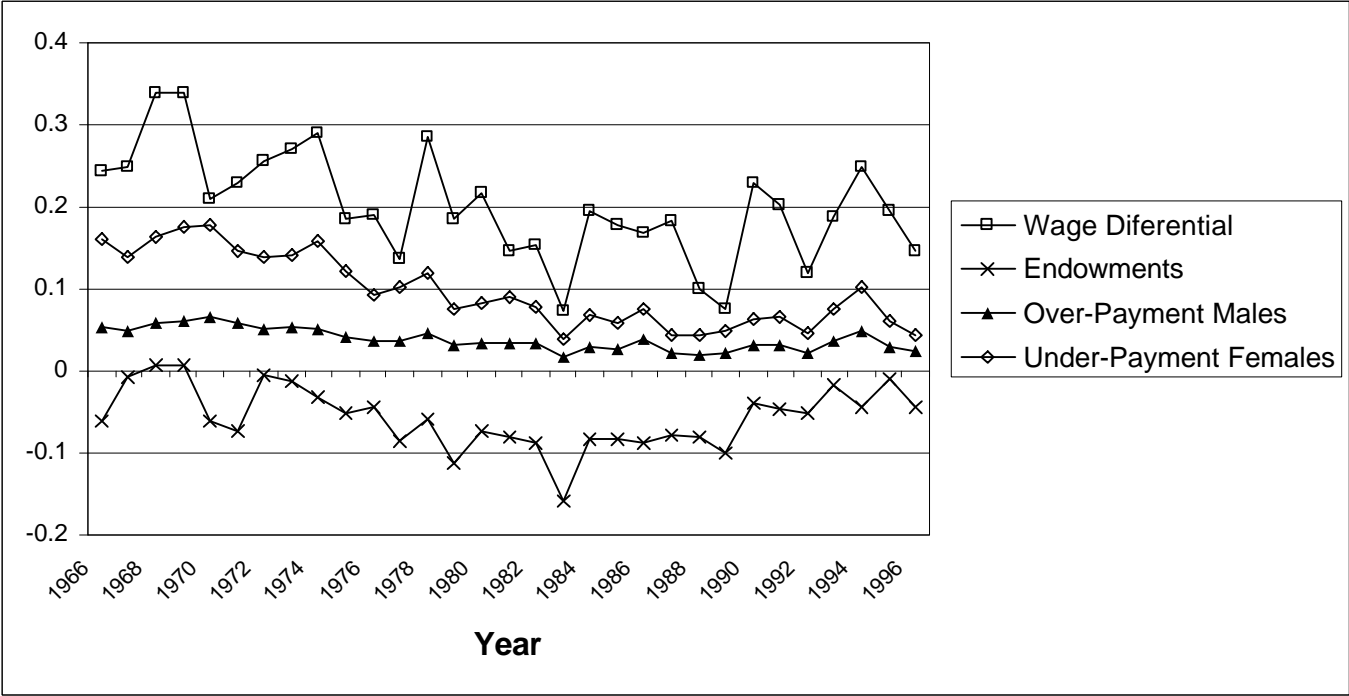


Thus, the evidence indicates that the discrimination effect is statistically different from zero. Only in 1988, the discrimination is not different from zero. In that year the interval of confidence includes zero. The discrimination shows a decreasing trend until 1988. After that year, the discrimination increased remained relatively stable during the nineties.

The second exercise uses the total population as the no-discriminatory wage structure. This is done by estimating a single wage equation for the whole population (males and females) and assuming that these results are representative of a no-discrimination situation.

This decomposition provides as a result with one effect associated to endowment and two effects associated to discrimination. One of them represents an over-payment received by males with respect to the no-discriminatory wage structure (positive discrimination), while females receive an under-payment with respect to the no-discriminatory wage structure (negative discrimination). For each discrimination effect we estimate the statistical significance of such estimation by bootstrapping techniques. The results are presented in Figure N°8.

Figure N°8
Discrimination Effect: over –payment to males and under-payment to females



These results are similar to the ones presented before in several aspects. First, the endowment effect indicates that females should have higher wages than males under a situation of no discrimination. Second, the discrimination effect indicates the most important effect is the under-payment of females. Finally, the trend in discrimination is decreasing, both the positive and negative discrimination show such a tendency. However, the under-payment in wages for females exhibits a most significant decrease, which explain the general reduction in discrimination.

The drop in discrimination over time may be explained by better labor condition to females such as labor legislation, socio-cultural changes, etc, which has been translated in a lower wage gap with respect to males.

The previous results also indicates there are no significant differences in decomposing endowment and discrimination by using as a reference group males or the total population. However, the second approach to measure discrimination, the one which uses the total population as a comparison group, it allow us to appreciate what kind of discrimination is happening in the labor market and facilitate the design of policies oriented to reduce it.

Finally, the Figures 9 and 10 show the positive and negative effects of discrimination with their correspondent interval of confidence. Thus, the evidence indicates that such effects are statistically different from zero.

Figure 9

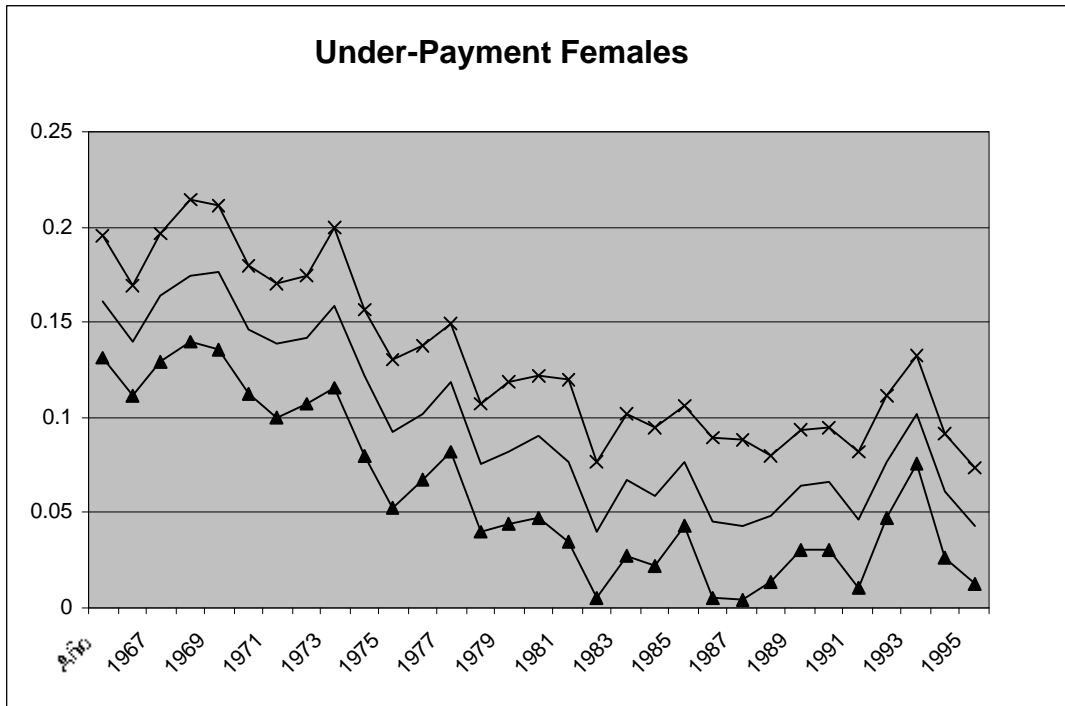
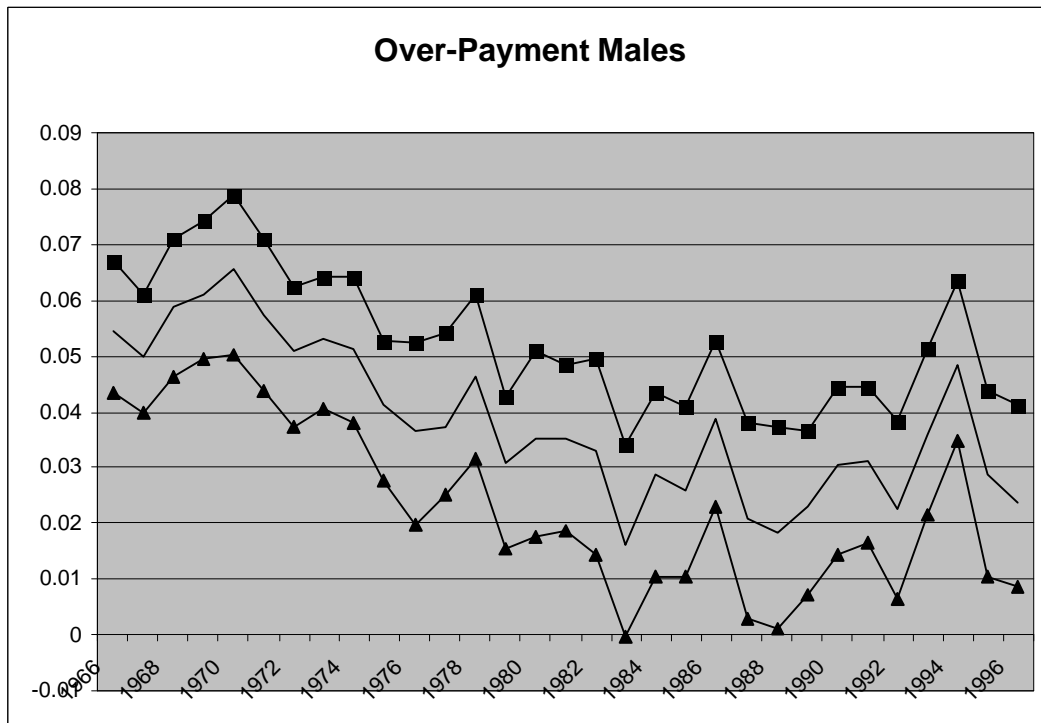


Figure 10



5 CONCLUSIONS

This paper present evidence on the behavior of discrimination in the Chilean labor market during the last 30 years. The evidence suggests that discrimination by gender decreased since de 60s until the 80s, but this trend was reverted in the 90s.

The decomposition proposed by Oaxaca (1973) and Oaxaca and Ramson (1994) permit divide the wage differential in two effects: endowment and discrimination. The endowment effect in Chile suggests that in average females should receive a higher wage than males. This is explained by the higher educational attainment exhibited by Chilean females workers. However, the discrimination effect is significantly high, more than compensating the endowment effect. As a result, males in each year of the period examined receive higher wage. One of the reasons is that males enjoy higher return to schooling than females.

By using the second strategy to decompose the wage differential, the evidence indicates that discrimination is mainly the result of the under-payment of females rather than the over-payment of males. This negative discrimination is also decreasing over time reducing the wage differential. Finally, we empirically test the robustness of the previous result using bootstrapping to obtain the interval of confidence of each one of the discrimination effects. The evidence shows that all these effects are statistically different from zero.

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