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Gender Differences in Wages and Human Capital: Case Study of Female and Male Urban Workers in Mexico from 1984 to 1992*

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ABSTRACT

This paper investigates the wage differential between fenmale and male urban workers in Mexico from 1984 to 1992. Our objective is to determine how the wage differential between male and female workers has changed during the period of structural adjustment in Mexico and how this change has been related to differences in each groups' endowment of human capital. Using data from the incomeexpenditure surveys for 1994, 1989, and 1992, we conclude that women workers have benefited little from structural adjustment. In general, wage inequalily has increased substanlially during the period of adjustment and it has worsened the relativo wages of female workers.

RESUMEN

Este trabajo investiga el diferencial de salarios entre trabajadores urbanos masculinos y femeninos en México ele 1984 a 1992. Nuestro objetivo es determinar de que manera el diferencial de salarios entre trabajadores femeninos y masculinos ha cambiado durante un periodo de ajuste estructural en México, y cómo este cambio se ha relacionado con las diferencias en la dotación de capital humano en cada grupo. Usando información de las encuestas de ingreso-gasto de 1984, 1989 y 1992, concluimos que las mujeres trabajadoras han sido poco beneficiadas por el ajuste estructural. En general, la desigualdad de salarios ha aumentado sustancialmente durante el periodo de ajuste v ha empeorado el salario relativo de las mujeres trabajadoras.

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A substantial wage differential exists between male and female workers in Mexico. There are a number of factors which could explain such a differential. In developing countries women have traditionally had lower labor force participation rates than men, have been less likely to have access to wageemployment sectors of the economy, and have been less able to accumulate continuous onthejob experience once they have secured such employment. There is usually discrimination against women not only within labor markets but also *before* they enter labor markets inasmuch as they are unable to acquire the human capital necessary to qualify for various types of jobs. Both discrimination prior to employment and during employment could help to explain the large wage differential between male and female workers in Mexico.

In the present paper we investigate the wage differential between female and male urban workers in Mexico from 1984 to 1992. We confine our attention to urban workers because we want to focus on how formal labor markets function and on how wages are related to the human capital characteristics of workers. Our objective is to determine how the wage differential between male and female workers has changed during the period of structural adjustment in Mexico and how this change has been related to differences in each groups' endowment of human capital. Our data come from the original tapes of INEGI'S incomeexpenditure surveys for 1984, 1989, and 1992. We discuss the data further in the Appendix.

The Change in the Wage Differential between 1984 and 1989

Table I indicates that in 1984 the average wage of urban female employees was only a little over threequarters of that of urban male employees, e.g., 76.7 percent. During the remainder of the 1980s, women workers actually lost ground. In 1989 the average wage of female workers dropped to 71.6 percent of that of male workers despite the fact that women came to constitute a larger percentage of all urban workers (about 33 percent in 1989 versus 30 percent in 1984).

In Mexico the women who have succeeded in entering the urban labor force have had a higher educational level than men. In 1984, for example, the average educational level of female workers was 9 percent higher than that of male workers. The last line of Table II provides for each year the ratios of hours worked, years of experience, and years of formal education for women and men. Despite having a higher educational level, women workers lack experience and work fewer hours once they secure wage employment. In 1984 women workers were 21 percent less experienced than men and worked 17 percent fewer hours.

Decomposition of Wage Differentials

In order to clarify the role of human capital endowments in the determination of wage income and to distinguish these endowments from other factors, we estimated a relatively simple Mincerian earnings function with the natural logarithm of monthly wages as the dependent variable. We describe our model in the Appendix.

We use our regression model to decompose the wage differential between male and female urban workers into (1) the percentage explained by differences in human capital characteristics, and (2) an "unexplained" residual which is not attributable to variations in human capital characteristics but to differing wage structures for the two groups. In order to determine whether there are distinguisable wage

1 This is potential experience since it is calculated as age years of formal schooling 6. The advantage that male workers enjoy may be underestimated since women workers tend to have less continuous onthejob experience than male workers.

structures, we estimate separate regressions for male and female workers and perform a Chow F test on the equality of the two sets of regression coefficients. A statistically significant difference in the set of estimated coefficients indicates that the male and female workers face distinct wage structures. We describe the method of decomposition and the Chow F test in the Appendix.

TABLE I

WAGE DIFFERENTIAL AND EXPLAINED PROPORTION

Group	*1984*	*1989*	*1992*
Female	25143.0	438973.0	641763.0
Male	32787.0	613504.0	859518.0
Ratio of wages (F/M)	76.7%	71.6%	74.7%
Absolute difference*	7644.0	174531.0	217755.0
Explained proportion	27.5%	14.4%	21.1%

Source: Own calculations based on INEGI-ENIGH 1984, 1989 and 1992.
*Before conversion to new mexican pesos.

Our results for 1984 indicate that there is strong evidence of differing wage structures between male and female workers. Moreover, Table I indicates that only 27.5 percent of the wage differential between males and females is explained by differences in human capital. Male workers are more experienced and work more hours, but female workers are more educated. Yet a very high 72.5 percent of the difference in mean wages between male and female workers is not due to productivityrelated attributes. An evident factor that could explain at least part of this residual is discrimination.

A similar Chow F Test on the equality of regression coefficients for 1989 indicates that there remains strong evidence of different wage structures. From 1984 to 1989 not only did the wage gap between male and female workers widen, but also a smaller proportion of this larger gap in 1989 was explained by differences in human capital attributes. In 1989 the wages of female workers dropped to 71.6 percent of those of male workers, and the explanatory power of human capital differences between the two groups declined to 14.4 percent. Had female and male urban workers been paid *solely* according to their educational attributes, females would have had higher wages since they had more education as well as higher returns. Table II indicates that the average years of formal education for women was 9 years, whereas for men it was 8.5. While 9 percent of women had primarylevel technical education and almost 24 percent of them had secondarylevel technical education, the corresponding percentages for men were only 3.3 percent and 9.3 percent. Table III shows that the average educational rate of return for women was 22 percent higher than that for men.

As indicated by Table II, while men were less educated than women, the former retained a large advantage in experience (20 percent) — as well as in hours worked (15 percent). All three major gaps — based on education, experience, and hours worked — actually narrowed slightly from 1984 to 1989, indicating that female and male workers were becoming slightly more similar in these respects. Yet at the same time, their wage levels were becoming more dissimilar, serving to intensify inequality in the distribution of wage income. Since women increased their participation in urban wageemployment relative to men during this period, it is plausible to suspect that labor market discrimination against women increased.

The Change in the Wage Differential between 1989 and 1992

The deterioration in the ratio of mean wages between female and male workers which occurred between 1984 and 1989 was reversed somewhat between 1989 and 1992. Table I shows that the ratio of mean wages rose back up to 74.7 percent in 1992, but this ratio was still below the 76.7 percent ratio registered for 1984. A Chow F test on the equality of coefficients indicates that male and female workers continued to face distinct wage structures in 1992. This implies that, overall, female workers were not able to close the wage gap between themselves and male workers during the period of structural adjustment in Mexico.

TABLE II

RATIO OF HOURS, EXPERIENCE, AND EDUCATION

	1984	*Hours worked*	*Experience (years)*	*Schooling (years)*	*Technical Education*	
Group						
Female		144.2	16.1	7.8	12.2%	17.6%
Male		174.7	20.4	7.2	3.4%	5.4%
Ratio		83.0%	79.0%	109.0%	359.0%	326.0%
	1989					
Group						
Female		149.2	15.3	9.0	9.0%	23.4%
Male		174.9	19.1	8.5	3.3%	9.3%
Ratio		85.0%	80.0%	106.0%	273.0%	254.0%
	1992					
Group						
Female		156.1	15.8	8.9	6.5%	24.1%
Male		188.5	18.8	8.3	2.0%	9.3%
Ratio		83.0%	84.0%	108.0%	325.0%	259.0%

Source: Own calculations based on INEGI-ENIGH, 1984, 1989 and 1992.

In fact, their relative position deteriorated somewhat. However, this was not because they were becoming relatively less endowed with human capital. Although in 1992 the proportion of the wage differential between male and female workers that was explained by human capital differences rose to 21.2 percent from 14.4 percent in 1989, human capital differences had explained a significantly higher percentage in 1984, i.e., 27.5 percent. Table II indicates that in 1992 the relative ratios of hours worked per month and years of education between female employees and male employees were aproximatley the same as they had been in 1984. Men had a 17 percent advantage in years of formal education. However, women had closed the gap with men in years of experience during this period, from a 21 percent disadvantage to a 16 percent disadvantage. Yet the average wages of female workers had fallen relative to those of men.

Table III decomposes the explained proportion of the wage differential between male and female workers into the contribution of hours worked, years of experience, years of formal education, and percentages of each group with primaryor secondarylevel technical education.

The contribution of each factor includes not only the mean value of each characteristic but also the regression coefficient which multiplies this mean value. The most dramatic changes in the relative contributions of each factor are found with respect to experience and technical education. In 1984, 38 percent of the explained advantage of male workers is attributable to their longer years of experience; however, in 1992 this advantage had shrunk to 13.5 percent. Similarly, in 1984 female workers had approximately a 24 percent advantage in technical education, but by 1992 this advantage had been reduced to only about 3 percent. In the case of all four factors, one can observe that the relative advantage of either female workers or male workers was reduced; in other words, the human capital characteristics of each group were converging.

TABLE III

CONTRIBUTION OF OBSERVED FACTORS TO WAGE DIFFERENTIALS BETWEEN MALE AND FEMALE WORKERS (PERCENTAGES)

Variable	*1984*	*1989*	*1992*
Hours worked	35.72	17.29	24.66
Experience	37.95	23.39	13.50
Education	-22.26	-12.67	-14.19
Technical Education	-23.93	-13.58	-2.88
Total	27.48	14.44	21.10

Source: Own calculations based on INEGI-ENIGH, 1984, 1989 and 1992.

The disadvantaged position of female workers relative to male workers in 1992 may actually have been worse than that indicated merely by the wage differential. Relative educational rates of return, for example, had turned against female workers during this period. Table IV shows that in 1984 female employees had a 29 percent higher rate of return to formal education than male employees (14.6 percent versus 11.3 percent); yet by 1992 the rate of return for female employees had become 4 percent lower than that for men (7.3 percent versus 7.6 percent). In other words, the superiority that women workers had accumulated in educational attainment was no longer giving them a relatively higher rate of return than that enjoyed by male workers. Unless altered, these relative rates of return would tend to widen the wage differential between male and female workers after 1992.

Structural adjustment and economic restructuring in Mexico have succeeded in narrowing wage differentials among workers in a number of important economic sectors. This has been me case for the wage differential between workers in the tradablegoods sector and nontradablegoods sector, between workers in export manufacturing and nonexport manufacturing, and between workers in the northern border region and in the rest of the country. However, the opposite has been the case for male and female workers: the differential between the two has actually widened.[2] Clearly our results suggest that women workers have

2 For a more general discussion of changes in wage differentials in Mexico during this period, see Diana Alarcon and Terry McKinley, “Wage Differentials in Mexico from 1984 to 1992: A Profile of Human Capital and

benefited little from structural adjustment. While their share of total urban workers rose marginally from 30 percent in 1984 to 31.8 percent in 1992, their average wages relative to those of male workers declined.

Measures of Inequality between Male and Female Workers

In this section we decompose total inequality among urban employees into inequality *between* male and female workers and inequality *among* both male and female employees separately considered. We seek to identify the evolution of inequality between male and female workers based on the difference in their mean wages relative to the inequality found in each of the two groups. We peform this decomposition through the use of Theil's populationweighted L index. Table V reports our results.

TABLE IV

AVERAGE RETURNS TO EDUCATION

Group	*1984*	*1989*	*1992*
Female	14.6	11.7	7.3
Male	11.3	9.6	7.6
Ratio	129.0%	122.0%	96.0%

Source: Own calculations based on INEGI-ENIGH, 1984, 1989, 1992.

Between 1984 and 1989, the average wage of female employees fell relative to that of male employees. Correspondingly, the percentage of total inequality among urban wageearners explained by gender rose from 2.2 percent to 3.6 percent. From 1989 to 1992, when the relative wages of female workers rebounded somewhat, the percentage of total inequality explained by the difference in mean wages between male and female workers declined to only 1.4 percent. This decline was partly due to the rising differentiation of wages among female workers themselves. Inequality among female workers now exceeded that among male workers: me Theil index of inequality was 0.657 for women and 0.609 for men. This was similar to the situation it 1984: the Theil index for women was 0.311 while for men it was 0.300. It was only in 1989 mat inequality among male employees exceeded mat among female employees. Evidently the recessionary conditions of the 1980s had served to compress women's wages relative to those of men.

From 1989 to 1992, inequality increased dramatically among both male and female workers, as indicated by both the Theil indices and the standard deviations of log variance. The standard deviation measure is derived directly from our regression analysis. Table v indicates that there has been a progressive decline in the explanatory power of human capital differences for both male and female employees from 1984 to 1992 but more so for female employeees. This is shown by the R^2 for our regression results. In 1984 human capital differences explained 40 percent of the variance in wages among both men and women. By 1992 human capital difference explained only 22 percent of the variance in wages among males and 17 percent of that among females.[3] In other words, con

Earnings," paper presented for the Conference on The Impact of Structural Adjustment on Labour Market and Income Distribution in Latin America, San Jose, Costa Rica, September 79, 1994.

3 These percentages for 1992 are calculated based on a model with monthly wages, rather than the logarithm of monthly wages, as the dependent variable. We used this new model because for all urban workers the

sistent with a general trend for urban employees as a whole during structural adjustment, differences in wages among female workers themselves were not well explained by their differences in endowments of human capital. In general in 1992 wages were being paid to urban employees with little clear connection to their human capital characteristics, i.e, their productivity.

TABLE V

INEQUALITY ACCORDING TO THEIL INDICES

Group	*1984*	*1989*	*1992*
Female	0.341	0.291	0.657
Male	0.300	0.317	0.609
Between-group	2.2 %	3.6 %	1.4 %

INEQUALITY ACCORDING TO STANDARD DEVIATION OF LOG VARIANCE

	STD Deviation	R^2	*STD Deviation*	R^2	*STD Deviation*	R^2
Group	*1984*		*1989*		*1992*	
Female	1.01	40%	0.86	30%	1.39	17%
Male	0.85	40%	0.82	34%	1.29	22%

Source: Own calculations based on INEGI-ENUGH, 1984, 1989 and 1992.

The sharp rise in both the Theil index and the standard deviation of log variance indicates that inequality among urban employees increased substantially from 1989 to 1992. This rise in inequality affected female workers as well as male workers. A major effect of structural adjustment in Mexico appears to be the severing of wage payments from the productivity characteristics of workers. This was especially true for female workers. A relatively small percentage of the variation in wages among women workers was related to differences in human capital in 1992.

Conclusion

We have found that the average wages of urban female employees have fallen relative to those of urban male employees from 1984 to 1992. The percentage of the wage differential between male and female workers explained by differences in human capital has also fallen. It seems clear that these two groups of workers face distinct wage structures which cause differential payments to their labor. Structural

semilogarithmic model explained only 8.4 percent of the total variance in wages. For 1992 the standard Mincerian human capital model of wage determination became markedly less useful, in part because the relationship between years of education and the rate of increase in earnings became decidedly more convex and in part because a great deal of the increased variance in wages was not explained at all by differences in human capital among workers.

4 For a more general discussion of the unexplained nature of wage dispersion under structural adjustment in Mexico, see Terry McKinley and Diana Alarcon, “Widening Wage Dispersion under Structural Adjustment in Mexico,” paper prepared for the Conference on The Impact of Structural Adjustment on Labour Markets and Income Distribution in I.atin America, San Jose, Costa Rica, September 79, 1994.

adjustment and economic restructuring have done little to alter these structures; in fact, they appear to have worsened the relative wages of female workers.

The results for 1992, which are based on six years of continuous though modest economic growth in Mexico, indicate that wage inequality has increased substantially under structural adjustment, affecting both male and female urban employees. This is apparently one of the major legacies of adjustment policies. Even among female workers, differentiation of wage payments has sharpened considerably. No longer are such payments clearly tied to differences in human capital and worker productivity.

Appendix The Data

For all three years our data come from the original tapes of INEGI'S incomeexpenditure surveys. The three are reasonably comparable in terms of methodology.[5] In all three cases a stratified, multistage sampling method is utilized.

For each of the three years we restrict our sample to urban wage earners. INEGI does not make the distinction between urban and rural, but rather distinguishes between workers on the basis of whether they reside in "highdensity areas" or in "lowdensity areas." We use these categories as proxies for urban and rural respectively.

Our sample size is 3 490 for 1984, 9 239 for 1989, and 9,837 for 1992. Female workers are 30 percent of the total in 1984, 32.8 percent in 1989, and 31.8 percent in 1992.

INEGI also provides weights which expand the sample to be representative of census data. We have opted to analyze the original, unmodified data, rather than altering it with extraneously derived factors. For much of our analysis we have found that this makes little difference.

The Human Capital Model

Our human capital regression model takes the following form:

$$LN(W_i) = a_1S + a_2S^2 + b_1X + b_2X^2 + cHR + d_1TEC1 + d_2TEC2 + e$$

The first four variables correspond to standard usage except that we utilize years of schooling squared in order to capture increasing or decreasing rates of return to schooling as the years of school increase.[6]

Where

S	=	Years of schooling
S^2	=	Years of schooling squared
X	=	Years of potential experience (Age - years of schooling - 6)
X^2	=	Years of potential experience squared
HR	=	Hours worked per month
TEC1	=	A dummy variable for technical education after primary schooling
TEC2	=	A dummy variable for technical education after secondary schooling or above
e	=	the disturbance term
a1...d2		are the estimated coefficients of each independent variable.

5 For a discussion of issues of comparability between the 1984 and 1989 data, see Diana Alarcon, Changes in the Distribution of Income in Mexico and Trade Liberalization, El Colegio de la Frontera Norte, Mexico, forthcoming.

6 For the classic statement of a human capital model, see Jacob Mincer, Schooling, Experience and Earnings, Columbia University Press, New York, 1974. An alternative model which is often used to identify changing rates of return to schooling includes dummy variables for each level of education. For a recent example and statistical test, see Christopher R.S. Dougherty and Emmanuel Jimenez, "The Specification of Earnings Functions;

We include hours worked per month in order to control for the impact of the quantity of work on total monthly wages and to independently track the changes in hours worked. We also include two dummy variables for technical education:

(1) TECI takes the value 1 if a worker has formal technical education pursuant to completing some years of primary school, and (2) 'T'EC2 takes the value 1 if a worker has formal technical education pursuant to completing some years of secondary or tertiary education. With the exception of hours worked per month, we regard our 6 other variables as indicative of endowments of human capital. We maintain a relatively simple model because our main purpose is to facilitate focused comparisons of the returns to human capital across the three years 1984, 1989, and 1992. Such a simple model, which excludes dummy variables for factors such as geographical location, ethnicity, and economic sector, will in general lend to overestimate the returns to education.[7] For comparison with other studies, we estimate the returns to education as a1/9 + 2a2(mean S) although this in turn represents an overestimation.[8] The rates of return that we estimate for Mexico tend to be low compared to rates of return reported for other developing countries. The reader should take note that they would be lower were we to take account of the above two factors.

The Decomposition of the Differential and the Chow F Test

Our method of decomposition was originated by R. Oaxaca, "MaleFemale Wage Differentials in Urban Labour Markets," *International Economic Review,* #14, pp. 693709. For a recent explanation, see Tony Addison, "Employment and Earnings," in Lionel Demery, Marco Ferroni, and Christiaan Grootaert, *Understanding the Social Effects of Policy Reform,* World Bank, Washington, D.C., 1993.

From the estimation of the earnings functions for each group of workers, we can calculate the predicted wage of the representative worker in each sector (₩i). Next we can calculate the predicted wage of a representative worker of one sector if paid according to the wage structure of the other sector [say $₩_{12}$ = f1(X2)].$₩_{12}$ is the predicted wage of an average worker in sector 2 who is paid according to the wage structure of sector 1. Following this procedure, the difference in wages paid to representative workers in sectors 1 and 2 may be decomposed as:

$$D = \overline{W}_1 - \overline{W}_2 = [\overline{W}_1 - f_1(X_2)] + [f_1(X_2) - \overline{W}_2]$$
$$= \quad E \quad + \quad R$$

The first expression (E) is an estimation of the wage differential which is explained by: 0 human capital differences

Tests and Implications," Economics a/Education Review, vol. 10, #2, 1991, pp. 8598.

7 A more elaborate model of an earnings function is utilized for 1989 data in Diana Alarcon with Terry McKinley, "The Persistance of Labor Market Segmentation in Mexico in the Aftermath of Economic Restructuring," mimeo, 1994. Because of the inclusion of dummy variables tor border states, poor states, urban areas, and gender, as well as other variables, the private rates of return to education are generally lower for this more comprehensive model than those reported in the current paper. A recent illustration of the reduction in estimated rates of return when dummy variables are included for geographical area and economic sector is found in Peter Griffin and Alejandra Cox Edwards, "Rates of Return to Education in Brazil: Do Labor Market Conditions Matter?" Economics of Education Review, vol. 12, #3, 1993, pp. 245255.

8 The full expression for the rate of return to education is as follows: a1 + 2a2(mean S) + b1(l) + b2(mean X)(1). Generally this rate of return will be lower than that found for the first two terms since the third term tends to be a large negative relative to the positive fourth term.

9 See George Psacharopoulos, "Returns to Education: A Further International Update and Implications," Journal of Human Resources, vol. XX, #4, 1985, pp. 583597; and George Psacharopoulos and Ying Chu Ng, "Earnings and Education in Latin America: Assessing Priorities for Schooling Investments," World Bank Working Papers WPS »1056, Technical Department, Latin America and the Caribbean Region, December 1992.

among workers, e.g., their differing levels of education or experience. The second term (R) is a residual which indicates the effect of "unexplained factors," which could be demandside or supplyside factors or other determinants of which our model does take account. Since it is often assumed by NeoClassical theory that in smoothly functioning markets workers should be paid at the margin according to their productivity, the residual is often interpreted as "suggestive" evidence of differences in wage structures prevailing among groups of workers, including possibly the effect of discriminatory practices.

The Chow F lest involves testing the null hypothesis that the two regressions for male and female workers are identical. If Bi and a; are the coefficients in the first and second regressions respectively, such as for male and female workers, we want to test the null hypothesis that Bi = (Xi jointly, i.e., that the wage structures for males and females are the same. The F test may be expressed as:

$$F_{k,N+M-2k} = \frac{(EES_R - EES_{UR})\backslash k}{EES_{UR}\backslash (N + M - 2k)}$$

Where: k is the degrees of freedom, N and M the number of male and female workers respectively, EESR the error sum of squares in the restricted model, and EESUR the error sum of squares in the unrestricted model. The null hypothesis was rejected with 99 percent probability.

See Gregory C. Chow, "Tests of Equality between Sets of Coefficients in Two Linear Regressions," *Econometrica,* Vol. 28, July I960, pp. 591-605.