EVOLUTION OF THE GENDER WAGE GAP IN PERU, 1997-2000

A Thesis

by

JOSÉ L. MONTES

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2007

Major Subject: Statistics

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Approved by:

Co-Chairs of Committee,	Michael Longnecker
	Michael Speed
Committee Member,	James Richardson
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ABSTRACT

Evolution of the Gender Wage Gap in Peru,
1997-2000. (August 2007)
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Co-Chairs of Advisory Committee: Dr. Michael Longnecker
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Wage differentials result from different years of education or experience or size of the firms, and also from other factors that do not have anything to do with the labor characteristics of the individuals. One of these factors is usually gender. The wage differential due to gender, and not to differences in labor characteristics, is called discrimination. The goal of this project is to estimate the evolution of the wages differentials and wage discrimination between males and females in Peru within and between 1997 and 2000, a time of economic recession in Peru.

The wages differentials estimations show that all categories of males and females saw their real wages decreased; only blue-collar females saw their real wages increased; the return to the interaction between education and specific experience follow a linear trend. This means that more education and more experience will be rewarded at the same rate at any combination.

The wage discrimination estimation shows that there was a small but significant wage discrimination in favor of women in 1997 and it disappeared by 2000. This showed that employers reduced all premiums to their employees during a period of economic recession.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my wife Janet and my daughter Mariel for their patience during all my years in graduate school. I would like to express my gratitude to my committee for their assistance and patience as professors and as advisors.

I am also very grateful to all my professors and friends for their advice and assistance during these years. I would like to thank my parents. Their sacrifice, support, and love led me to graduate school.

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I. INTRODUCTION

This project tries to estimate the evolution of the wages differentials between males and females within and between 1997 and 2000. The year of 1997 marked the last year of the growing economic cycle of the nineties in the Peruvian economy and 2000 corresponds to a stabilization period (The Peruvian economy starts growing again in 2002). In 1998, the Peruvian economy decreased 0.6%. It increased in 1999 and 2000 at rates of 0.9% and 2.8% respectively. The inflation rate was around 15% for that period (Average annual inflation was less than 5%) [8].

The urban unemployment rate[1] passed from 7.2% to 8.3% in those years and the average hourly wage decreased 23.2%. This situation was not the same for males and females, while male unemployment increased almost 1.5 points the female unemployment increased only 0.7 points (Male's unemployment increased from 6.8% to 8.3% and females' increased from 7.8% to 8.5%). In hourly wages males did relatively worse than females. While the average hourly wage for females decreased 17.5%, the male hourly wage was reduced 25.9%. These results show a change in the wage gap between males and females. Apparently, males had been less successful dealing with changes in the labor markets during this period of reduced PBI growth.

The goal of this project is to analyze the evolution of the wage differentials/gap between male and female in Peru between 1997 and 2000 for urban areas only. The project will address questions such as "if during this crisis more educated people could cope better than less educated people" or "if the wage discrimination between male and female increases during crisis". A deep analysis of the determinants of labor income and wage gaps will help to understand the reason males were relatively less successful in coping with crisis that females during the recession of 1997-2000.

This thesis follows the style of the Journal of *Statistical Science*.

[1] See Appendix 4.

To make those analyzes, this project is divided in nine sections. Section II to Section V will be dedicated to describing the source of information and the methodology will be used in the estimations. Section VI is dedicated to the analysis of the differences in wages for males and females by different socioeconomic characteristics (endowments). In Section VII, determinants of labor income regressions (Mincer's regressions) will be run to estimate the determinants of wages for males and females.

Section VIII is dedicated to the Blinder and Oaxaca method of decomposition of wage. In this section it will be determine what part of the wage differences is due to differences in endowments and what part is discrimination. The last part of the project is reserved for the conclusion of the analysis.

II. THE DATA

The estimations made in this project are based on the "Encuesta Nacional de Hogares sobre Medición de Niveles de Vida" (*ENNIV*) performed in 1997 and 2000 in Peru by the Instituto Cuánto (Cuanto Institute). Both household surveys have national representation and are representative for seven geographic regions as well. Those regions are: Lima Metropolitan city, Urban Coast, Rural Coast, Urban Highland, Rural Highland, Urban Forest, and Rural Forest.

These surveys are part of the Living Standards Measurement Study (LSMS) type surveys developed by the Policy Research Division of the Development Economics Vice Presidency in the World Bank.

The LSMS surveys were "a response to a perceived need for policy relevant data that would allow policy makers to move beyond simply measuring rates of unemployment, poverty, and health care use, for example, to understanding the determinants of these observed social sector outcomes.

The LSMS was designed as a multi-faceted program to: (a) improve the quality of household survey data; (b) increase the capacity of statistical institutes to perform household surveys; (c) improve the ability of statistical institutes to analyze household survey data for policy needs; and (d) provide policy makers with data that can be used to understand the determinants of observed social and economic outcomes." [15]

After a comprehensive review of existing household surveys and the information that would be needed by policymakers and think tanks (among other institutions), the first LSMS surveys were piloted in Côte d'Ivoire and Peru in 1985. In general, the LSMS surveys ask questions about health, education, economic activities, housing, utilities, and individual and household income and expenses.

In Peru, the LSMS surveys are called "Encuesta Nacional de Hogares sobre Medición de Niveles de Vida" and have been executed by the "Instituto Nacional de Estadística e Informática del Perú" (Statistical Institute of Peru) with the technical and financial support of the World Bank and the Central Reserve Bank of

Peru in 1985; and by the Cuanto Institute in 1991, 1994, 1997, and 2000 at National level and in 1990 for Lima Metropolitan city only. [7]

The LSMS surveys in Peru follow a “probabilistic, multi-stage, and independent sample in each domain of study. In the urban area, it is stratified and three-staged. In the rural area, the sample is stratified, three-staged in the population centers containing 500 to 2,000 inhabitants and two-staged in the rest of the rural area (i.e. less than 500 inhabitants). In all the stages the selection was systematic with probability proportional to size of the unit of selection, that is, to the number of individual households.” [14]

In this project the LSMS surveys of 1997 and 2000 are used. Those surveys had interviewed more than 3000 households and almost 20000 individuals (See Table 1). They gathered information about several topics such as demographic, dwelling characteristics, education attained and education expenses, prevalence and access to health services, unemployment, labor income, other income, household expenses and access to social investment funds as the most relevant.

In 1997, 3843 households provided information for the survey, 980 of those were in Lima Metropolitan city; the rest was divided among the other regions for which the survey has statistical representation. From those 3843 households, information about 19575 individuals, of all age, was recollected (information about individuals not presented at the moment of the interviewed was obtained from the most informed member of the household).

In 2000, a similar sample distribution was used, 3977 households were sampled; In Lima Metropolitan city 977 household were sampled. The Rural Coast and Rural Forest regions had the smaller samples with 337 and 434 households in 1997, and 338 and 469 households in 2000 respectively.

The weighted sample provides a better idea of the gender and geographic distribution of the population represented by the survey. From Table 2 it can be seen that about one third of the population and households live or are located in Lima Metropolitan city (29% of household are located in Lima in 1997; while 28.7% in 2000).

Table 1. Peru: Number of households sampled and distribution of the sample by gender in the ENNIV, 1997 and 2000

		1997				2000			
		House holds	Gender			House holds	Gender		
			Male	Female	Total		Male	Female	Total
Total		3843	9,715	9,860	19,575	3,977	9,900	10,057	19,957
Lima metropolitan		980	2,419	2,475	4,894	977	2,421	2,473	4,894
Coast	Urban	509	1,269	1,355	2,624	513	1,214	1,320	2,534
	Rural	337	888	884	1,772	338	860	874	1,734
Highland	Urban	458	1,082	1,147	2,229	530	1,231	1,349	2,580
	Rural	684	1,717	1,788	3,505	553	1,361	1,334	2,695
Forest	Urban	441	1,155	1,126	2,281	597	1,516	1,523	3,039
	Rural	434	1,185	1,085	2,270	469	1,297	1,184	2,481

Another third of the population live in the rest of urban areas while the remaining third live in the rural areas. This means that in this project we will be analyzing the labor income determinants and the wage discrimination of roughly two third of the Peruvian population (recall the estimation will be performed for urban areas only).

Table 2. Peru: Distribution of the weighted number of households and persons in ENNIV, 1997 and 2000
(percentage)

		1997				2000			
		House holds	Gender			House holds	Gender		
			Male	Female	Total		Male	Female	Total
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Lima metropolitan		29.0	28.6	28.5	28.6	28.7	28.9	28.9	28.9
Coast	Urban	17.5	17.4	18.1	17.8	17.9	17.2	18.3	17.8
	Rural	5.7	6.0	5.8	5.9	5.0	5.2	5.2	5.2
Highland	Urban	13.4	12.6	13.0	12.8	12.9	12.2	13.0	12.6
	Rural	21.7	21.7	22.1	21.9	22.9	22.9	21.9	22.4
Forest	Urban	5.4	5.6	5.4	5.5	5.9	6.1	6.0	6.0
	Rural	7.3	8.0	7.1	7.5	6.7	7.5	6.7	7.1

III. PERU AT THE END OF THE 90s

A. Economic indicators

The Peruvian economy at the end of the nineties has been characterized by reduction in the Gross Domestic Product (GDP) and an increase in poverty.

As mention in World Bank [15] “After years of significant growth, of an average 7 percent per year between 1993-1997, the Peruvian economy experienced a series of exogenous shocks: El Niño, which caused severe damage to infrastructure, terms of trade, which deteriorated by about 20% in 1998-99 as mineral prices dropped, and foreign capital flows, which dried up following the Asian-Russian-Brazil crisis. The lingering effects of these shocks led to an economic downturn, which turned out substantially more severe than expected: real GDP declined by 0.4 percent in 1998 and recovered by 1.4 percent in 1999”. See Figure 1.

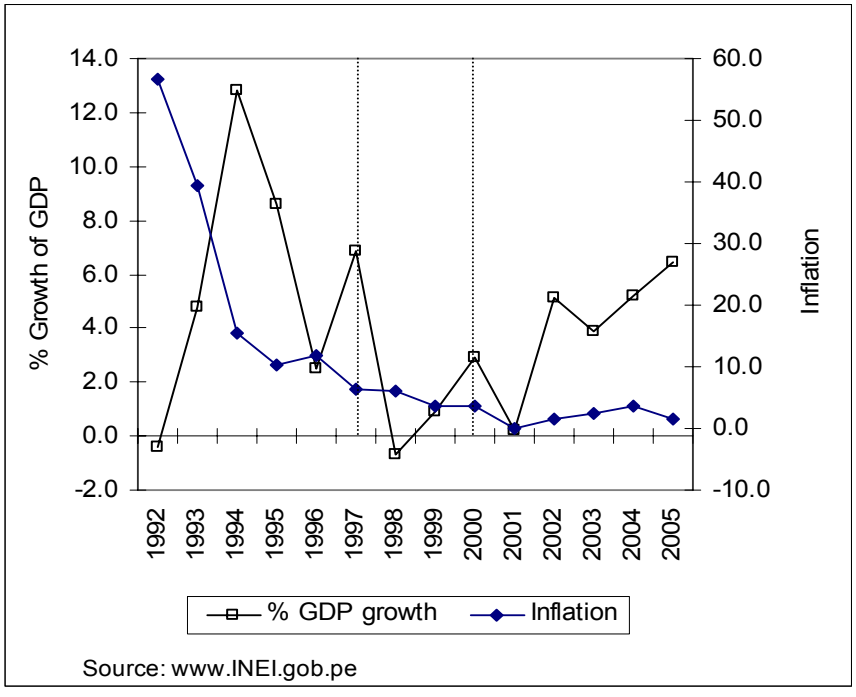

Figure 1. Peru: Growth rate of GDP and inflation, 1992-2005.

It is in this period of economic crisis, involving a reduction in the internal demand [2] that this project focused. As stated above, the goal of this project is to determine which endowments (labor characteristics) were the most able to cope with the crisis and hence are the most successful.

B. Socio-economic indicators

One of the recurrent problems in Peru at the moment of designing public policies was the lack of data to help in the justification of the policies or to prove their success or failure.

Most of the available information came from national accounts and labor surveys that only were representative of the capitol city. Since 1985, when the first LSMS was executed, data was available on different social topics at national representation. But the LSMS had a useful but short life (the last LSMS was executed in 2000). The main reason for this is that the Peruvian National Statistical Institute (Instituto Nacional de Estadistica e Informática) started in 1995 producing annually its own multi-topic and multi-stage surveys (The data for the 1995 and 1996 surveys were not made public).

Even though there was a lack of a common source of information, the methodologies applied had been made comparable. Loayza and Polastri [9], using data from “Instituto Nacional de Estadística e Informática del Perú” and Cuanto Institute [6], show that the estimated headcount poverty rate in Peru has increased from 1997 to 2001 (see Figure 2). As it was stated above, during this period the growth of the GDP was small, even negative.

The poverty rates in rural areas have always been higher than in urban areas ones; while in rural areas during 1997 and 2000 the poverty rate reached 72.5%, in urban areas the highest percentage was 42.1%. In both regions the poverty rate has increased in our period of analysis.

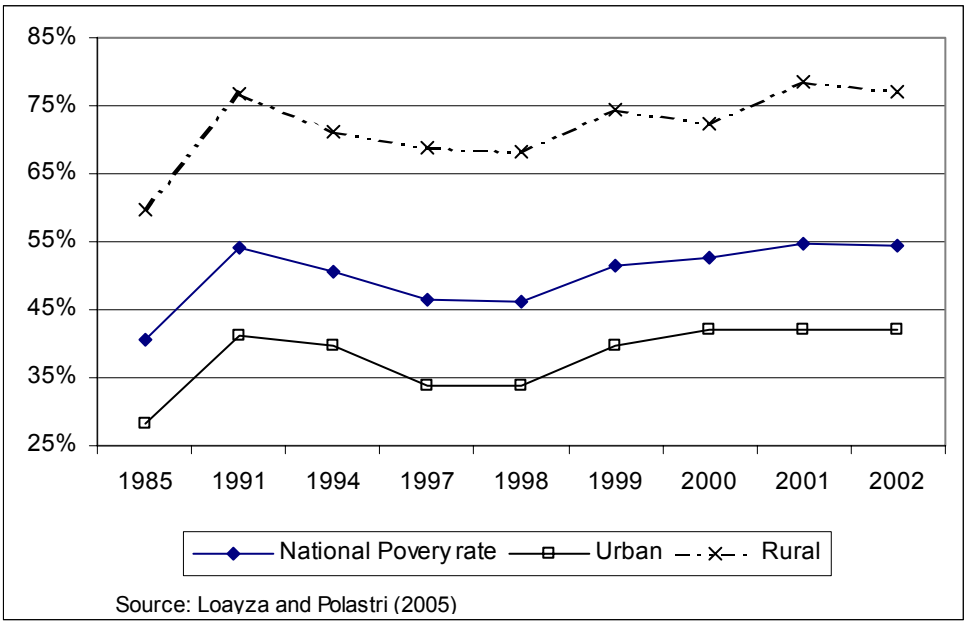

Figure 2. Peru: Poverty rate, 1985-2002.

It is in this period of increasing poverty and low productivity that this project will focus. The labor strategies to cope with the situation will be analyzed. But first let's review the unemployment and underemployment rates.

Table 3 shows the unemployment rates by gender in 1997 and 2000. The national unemployment rate was 5.0% in 1997 and 5.6% in 2000. The unemployment rate was always smaller in rural than urban areas. In 1997, the rate in Lima Metropolitan city reached 8.2% of the labor force, while it was 0.7% in the Rural Highland and Rural Forest regions. In 2000, those rates were 8.8%, 0.7%, and 1.1% respectively. (See Appendix 4 for urban unemployment rates only).

Table 3. Peru: Unemployment rate by gender, 1997 and 2000

		1997			2000		
		Male	Female	Total	Male	Female	Total
Lima metropolitan		7.3	9.4	8.2	8.9	8.8	8.8
Coast	Urban	7.3	7.9	7.6	10.1	10.2	10.1
	Rural	2.7	5.1	3.6	1.3	3.8	2.3
Highland	Urban	6.0	6.3	6.1	6.7	7.7	7.1
	Rural	1.2	0.1	0.7	1.0	0.5	0.7
Forest	Urban	3.9	2.3	3.3	3.2	3.8	3.4
	Rural	0.8	0.5	0.7	1.2	1.0	1.1
Total		4.9	5.2	5.0	5.6	5.7	5.6

Thus, the smallest unemployment rates in rural areas correspond to the highest poverty rates. The explanation is very simple. In urban areas the labor income has been higher (see Table 4). In general, wages in urban areas are about four times those in rural areas for both males and females.

Table 4. Peru: Average hourly wage, 1997-2000
(Nuevos Soles of 2000)

	1997		2000	
	Male	Female	Male	Female
Rural	1.3	0.6	1.1	0.6
Urban	4.1	2.9	3.7	2.9

In Table 5 the enrollment rates in primary and secondary school are shown. During 1997, 93.6% of persons between 6 and 16 years old attended primary or secondary education. This percentage increased in 2000 to 95.8%. The percentages of *Not Attending* reduced for males and females in those years. This is good news because, as it will be shown in section VI, *years of education* is an important determinant of labor income.

Table 5. Peru: Attendance rate by gender, 1997 and 2000
(From 6 to 16 years old)

	1997			2000		
	Male	Female	Total	Male	Female	Total
Total	100.0	100.0	100.0	100.0	100.0	100.0
Attending	93.7	93.6	93.6	96.2	95.3	95.8
Not Attending	6.3	6.4	6.4	3.8	4.7	4.2

IV. LABOR INCOME ESTIMATION (THE MINCER'S REGRESSION)

Jacob Mincer is a distinguished Labor Economist. "His contributions include pioneering studies on factors that affect the distribution of personal income, the labor force participation decisions of married women, the extent of hidden unemployment, variations in labor mobility, and the effects of work or career interruptions on wage rates and lifetime incomes." [3]

As mention by Heckman et al [7]: "Jacob Mincer's model of earnings (1974) is a cornerstone of empirical economics. It is the framework used to estimate returns to schooling, returns to schooling quality, and to measure the impact of work experience on male-female wage gaps. It is the basis for economic studies of education in developing countries and has been estimated using data from a variety of countries and time periods. Recent studies in economic growth use the Mincer model to analyze the relationship between growth and average schooling levels across countries."

The basic formulation for the Mincer's regression or model of earnings is very simple. It defines the labor income as function of schooling (*s*) and experience (*x*) in the following way [10].

$$\ln[w(s,x)] = \alpha_0 + \rho_s s + \beta_0 x + \beta_1 x^2 + \varepsilon$$

Where ρ_s correspond to the return to schooling (years of education); and β_0 and β_1 will estimate the return to experience. The last term, ε, is the residual. Since its publication this model has been adapted to incorporate other variables that will explain differentials in wages. For example Mincer and Polachek [11] define labor income as a function of years of schooling, experience, home-time, job training, etc; Ashenfelter and Krueger [1] define it as function of years of education, sibling's years of education, age, age squared, gender, and race; and Smith and Welch [13] define it as function of years of education, geographic location, public or private worker, experience, week worked, race, etc.

For this analysis several labor force characteristics, such as *firm's size*, *occupation*, *public-private sector*, etc will be included in the model. For more details see Section VII.

V. BLINDER-OAXACA DECOMPOSITION

Alan Blinder and Ronald Oaxaca published independently in 1973 a decomposition based on labor income regressions to identify wage discrimination. Blinder's paper [4] focused on analyzing wage differential (and discrimination) for white and black males and the differences in white males and white females in 1967. He found that only 40% of wage differentials between white and black males was explained by difference in endowments; while only one third of wage differential between white males and females was explained by differences in endowments.

On the other hand Oaxaca's paper [12] focused on male and female wage differential in urban labor markets. After comparing males and females wages he found that "…discrimination accounts for approximately 77.7% of the wage differential for whites and 93.6% for blacks" [12].

The estimation of wage differential or wage gaps (and discrimination) starts with the estimation of the determinants of the labor income. To do so, Mincer's regressions will be run by gender. The goal is to explain differences in wages, within each group, due to differences in labor endowments, such as, years of schooling, labor experiences, etc.

Once those regressions are run the second step is to analyze the differences in characteristics (endowments) between males and females and the differences between the return to those characteristics for each of them. Thus, it will be determined what part of the differences in wages is explained by the individual's background (endowments) and what remains is called discrimination.

To estimate the wage discrimination between males and females the Blinder-Oaxaca decomposition is used. Next, the description of the method is shown (the following description of the Blinder-Oaxaca decomposition is based on the explanation made by Berndt, Ernst [3]).

Suppose $\ln y^* = X^* b^* + e^*$ and $\ln y_* = X_* b_* + e_*$ are the regression models for males and females respectively. Where $\ln y$ is the logarithm of the hourly wage

and the X's are explicative variables such age, experience, years of education, etc. Then their expected values will be:

$$\mathrm{E}(\ln Y^{*}) = \overline{X}^{*} b^{*} \text{ and } \mathrm{E}(\ln Y_{*}) = \overline{X}_{*} b_{*}$$

Thus, the difference between those expected values is:

$$\mathrm{E}(\ln Y^{*}) - \mathrm{E}(\ln Y_{*}) = \overline{X}^{*} b^{*} - \overline{X}_{*} b_{*}$$

The difference between the male and female coefficient vectors is:

$\Delta b = b^{*} - b_{*}$ therefore $b_{*} = b^{*} - \Delta b$

Combining those equations we obtain:

$$\mathrm{E}(\ln Y^{*}) - \mathrm{E}(\ln Y_{*}) = b^{*}(\overline{X}^{*} - \overline{X}_{*}) + \overline{X}_{*}\Delta b$$

The Blinder-Oaxaca decomposition establishes that part of the differences in the expected values of the logarithm of labor income (wages) of males and females can be explained by differences in their characteristics (The first part of the right hand side of the equation above) and differences in the returns to the endowments (coefficients) what is called discrimination.

Once the wage gap is constructed the next step is to build the estimation for the evolution of the wage gap from 1997 to 2000. To do so, we will follow the methodology suggested by Wellington [14] based on Blinder-Oaxaca's work.

$$\mathrm{E}(\ln Y_{m00} - \ln Y_{m97}) - \mathrm{E}(\ln Y_{f00} - \ln Y_{f97}) = [\beta_{m00}(\overline{X}_{m00} - \overline{X}_{m97}) - \beta_{f00}(\overline{X}_{f00} - \overline{X}_{f97})]$$

$$+ [(\overline{X}_{m97}(\beta_{m00} - \beta_{m97}) - \overline{X}_{f97}(\beta_{f00} - \beta_{f97})]$$

Wellington's explains the decomposition telling us that the first term of the decomposition answers the question. If the returns to the independent variables were constant at their 2000 levels, "what portion of the wage gap can be accounted for by changes in the means? The second part of the term represents the portion of the wage gap that can be explained by changes in the coefficients over the period," [14] evaluated at the group means of 1997.

The wage gap and evolution of wage gap will be estimated for workers between 15 and 65 years old, that worked full time (at least 35 hours a week) as white or blue collar in firms with more than 10 workers (for the formal sector of the

economy) in Urban Peru. This means that the estimations will be made for the formal sector of the economy.

VI. WAGE AND ENDOWMENT DIFFERENCES BETWEEN MALES AND FEMALES

Even when in Peru most of the workers earn their wages in monthly basis (72% in 1997 and 74% of our weighted sample received their wages in monthly basis), the number of hours they had to work for those wages is not homogeneous. The average number of hours worked per week was around 51 between 1997 and 2000. This number varies by gender, level of education, etc. Thus, in 1997 males worked on average 51.1 hours per week while females worked 46.5 hours. In 2000 the pattern was the same, males worked, on average, 54.4 hours per week and females 48.2 hours (See Appendix 1 for a detailed table of hours work during a week).

The fact that people work differing number of hours per week for their wages is particular important for this estimation because we are trying to estimate the source of differences in wages. We will determine the part of the difference due to difference in endowments (labor characteristics) and the part due to discrimination, if we compare monthly salaries we will be adding an additional source of difference, the number of hours worked. Therefore, any comparison of monthly income might lead us to wrong conclusions.

In general, the wage differential between male and female reduced between 1997 and 2000. While in 1997 males made on the average 32.5% more than females, in 2000 the difference was 19.0% in favor of males (see Table 6). Even though, a deeper investigation is needed and will be given below, the evolution of the wage ratio, male/female, will provide us with a hint of the sources of changes in hourly wages. As we already pointed out, by 1997 females made or earned smaller hourly wages than males and worked fewer hours.

Between 1997 and 2000 the only group of females earning higher hourly wages than males was the *young (15-24 years old)* females. They received 8.9% and 27.2% higher wages than males in 1997 and 2000 respectively.

Additionally, some female groups managed to reduce their particular wage differentials; *young adults (from 25 to 44 years old)* and *from 2 to 5 years of specific experience* reduced their wage differentials from 21.6% to 8.4% and 40.0% to 28.1% respectively.

All this changes occurred in a period where no single category of males increased their real wages and only *blue collar* females managed to increase their real wages (22.6%).

During this time, the ratio of females to males in the labor market was still one to three (see Appendix 3). However, there was a change in the composition of females in the labor market. While younger, less educated, and fewer years of experience females left the labor market, adult females with more education and with more than 10 years of labor experience returned (see Table 7). Situations like this may explain why there was a reduction on the wage differentials for some groups of females. Would this lead to a reduction in the discrimination for females?

To answer properly this question we should consider the proportion of males and females in each category with each endowment, which will be obtained when the Mincer's regressions are run and B-O decomposition,[2] is performed. For now, we will try to identify the categories of females that managed to reduce their wage gap in this period of economic crisis.

[2] From now on, for practical reasons, the Blinder-Oaxaca's decomposition will be referred as B-O decomposition.

Table 6. Peru: Hourly wage by different characteristics, 1997 and 2000 (percentage)

	Growth rate 2000/1997			% Male/Female	
	Male	Female	Total	1997	2000
Total	**-25.9**	**-17.5**	**-23.2**	**32.5**	**19.0**
Age					
From 15 to 24 (Young)	-44.9	-30.9	-40.4	-8.9	-27.2
From 25 to 44 (Young adult)	-26.8	-17.9	-24.1	21.6	8.4
From 45 to 65 (Adult)	-20.4	-5.7	-18.5	87.8	58.4
Level of education					
None and Primary	-8.0	-16.3	-4.5	49.1	63.8
Secundary	-29.8	-15.3	-26.5	22.0	1.1
Superior	-21.4	-21.5	-21.3	51.4	51.5
Experience					
Up to 2 years	-28.5	-22.4	-25.9	19.8	10.4
From 2 to 5 years	-23.1	-15.9	-19.7	40.0	28.1
From 5 to 10 years	-43.0	-15.2	-35.1	70.3	14.4
More than 10 years	-17.3	-17.1	-17.5	15.3	15.0
Occupation					
White collar	-23.7	-22.3	-22.6	34.4	32.0
Blue collar	-27.6	22.6	-21.0	96.9	16.2

Between 1997 and 2000, workers (total males and females) saw their real wages reduced in almost all the categories considered in this project. But the reduction was not the same for all categories for males and females. As Table 6 shows *young* and middle experienced males suffered the major reduction in their real wages. On the female side, the highest reduction in real wage was faced by the youngest and less experienced.

Relatively, there are several groups for which their wage differentials have been reduced, even when their real wages fell down. We have to remember that this project is focused on the wage gaps and not on the understanding of determinants of the variations of wages. This stated, it is important to mention that even though their wages decreased, *young adult*, *adult*, and *Blue Collars* females managed to reduce their wage gaps.

Table 7. Urban Peru: Occupied population in sample by different characteristics, 1997 and 2000
(percentage)

	1997			2000		
	Male	Female	Ratio M/F	Male	Female	Ratio M/F
Total	**100.0**	**100.0**	**2.1**	**100.0**	**100.0**	**2.6**
Age						
From 15 to 24 (Young)	8.6	20.3	0.9	9.7	14.7	1.7
From 25 to 44 (Young adult)	63.6	64.6	2.1	60.4	65.9	2.4
From 45 to 65 (Adult)	27.8	15.1	3.9	29.9	19.4	4.0
Level of education						
None and Primary	8.3	6.9	2.6	7.3	3.3	5.8
Secundary	43.6	31.5	2.9	49.2	29.3	4.4
Superior	48.1	61.6	1.7	43.5	67.4	1.7
Experience						
Up to 2 years	25.5	35.9	1.5	24.4	32.6	2.0
From 2 to 5 years	23.3	27.8	1.8	23.6	25.3	2.4
From 5 to 10 years	15.0	18.9	1.7	16.6	17.9	2.4
More than 10 years	36.2	17.5	4.4	35.4	24.1	3.8
Occupation						
White collar	65.0	80.1	1.7	61.3	81.3	2.0
Blue collar	35.0	19.9	3.7	38.7	18.7	5.4

VII. ESTIMATION OF THE DETERMINANTS OF LABOR INCOME

Four Mincer's regressions will be run, one for each combination of gender and year. From these regressions, the coefficient and the mean of the explanatory variables will be used in the estimation of the B-O decomposition.

The regression equations attempt to estimate the determinants of labor income using as the dependent variable the logarithm of hourly wage and as explanatory variables: level of education, years in the occupation, occupation (white or blue collar), size of the firms, regions, and private or public sector employee.

A residual analysis demonstrated a lack of normality. Due to this lack of normality a transformation is needed. The natural logarithm correction will create a new variable of the form **ln(+/- "hourly labor income"-k)**. The procedure chooses a k and the sign to make the skewness of this new variables equal to zero (See Appendix 5). Table 8 shows that these new variables fail to reject the Shapiro-Wilk and Shapiro-Francia tests of normality.

Table 8. Test of normality after log correction
(H0: Normality)

log of labor income		Shapiro-Wilk Prob>z	Shapiro-Francia Prob>z
1997	Males	0.31	0.40
	Females	0.31	0.44
2000	Males	0.15	0.14
	Females	0.21	0.23

Once our dependent variables are transformed, the Mincer's regression will be run. The variables that will be used in the regression are shown in Table 9.

Table 9. Variables used in regressions

Variable	Description
$\ln(y^{tf})$	Transformed Natural logarithm of hourly labor income
yos	Years of education (YOS)
yos_efw	YOS * Specific experience
yos_efw2	YOS * Specific experience squared
act1	White Collar
firm_si3	Firm size: Since 101 workers
firm_si2	Firm size: From 51 to 100 workers
ram1	Industry
dom1	Lima Metropolitan city
priv	Private sector
β_0	Constant

Thus, we will try to explain hourly labor income with years of education, specific experience (number of years in the occupation), category of employment (1 for white and 0 for blue collar), firm size, sector of activity (1 for industry and 0 otherwise), location (1 for Lima Metropolitan city and 0 otherwise), and private or public sector. The regression model is the following:

$$\ln(y^{tf}) = \beta_0 + \beta_1 * yos + \beta_2 * yos\_efw + \beta_3 * yos\_efw2 + \beta_4 * act1 + \beta_5 * firm\_si3 + \beta_6 * firm\_si2 + \beta_7 * ram1 + \beta_8 * dom1 + \beta_9 * priv + \varepsilon$$

Years of education (yos) is included to measure the return to education, it is expected that higher education corresponds to higher returns; interaction between years of education and Specific experience (yos_efw and yos_efw2) is included to measure the return to the workers' experience. It is expected that this interaction has a concave shape. The interaction between years of education and specific experience will increase the return but in a smaller amount for each additional year of education and experience.

White collar (act1) is a dummy variable that has value 1 if the worker is a white collar and has value 0 if it is a blue collar. It is expected, everything else equal, that white collar workers will have a higher return than blue collar workers.

The *Firm size (firm_si3 and firm_si2)* variables are included. It is expected that bigger firms could provide higher wages to their workers, again having everything else equal. Thus, it is expected positive signs for these two variables and a bigger return in the biggest firms (*Firm size: Since 101 workers*).

Industry (ram1) is a dummy variable. It takes the value of 1 if people are working in industries and 0 if they are working in any other sector. The sign of the resulting coefficient will let us know whether there is a higher return for people working in industry or not, keeping all other variables constant.

In *Lima Metropolitan city (dom1)* lives about one third of the population. Lima is the Peruvian center of government, finance, banking, commerce, etc. It is expected that people working there, keeping all other variables constant, will receive a higher return than people working anywhere else.

Private Sector (priv) is a dummy variable that has a value of 1 if the worker is in the private sector and 0 if he/she is in the public one. A positive return will mean that workers in the private sector have a higher return, keeping all other variables constant, than those in the public sector. (For a discussion of other variables that could affect the determination of labor income, see [5]).

Before the results of the regression are analyzed the diagnostics will be shown. Table 10 shows the results for the Shapiro-Wilk test of normality. In this table it can be seen that all the residuals of the Mincer regressions failed to reject normality.

Table 10. Urban Peru: Test of normality of residuals
(H0: Normality)

		Shapiro-Wilk Prob>z
1997	Males	0.102
	Females	0.937
2000	Males	0.216
	Females	0.435

Table 11 shows the results for the equal variance test. It shows that all regressions' residual failed to reject constant variance (homoscedasticity). Thus,

so far we are doing very well. We have failed to reject both normality and equal variances.

Table 11. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance

		Prob > chi2
1997	Males	0.756
	Females	0.568
2000	Males	0.366
	Females	0.223

The next step would be checking the variance inflation factors (VIF). Table 12 shows that the only VIF greater than 10 are the ones for females in 2000. But since those are not very far from the recommended 10, we will not be very concern about it because the model works for all the other gender and year regression.

Appendix 6 contains graphs for the leverage points and relationship between residuals and fitted values. In general, what the diagnostics show in the section VII and in the appendix 6 is that we have found the right model to analyze the determinants of wages by gender during 1997 and 2000.

Table 12. Variance inflation factor for labor income regression

	1997		2000	
	Males	Females	Males	Females
yos_efw	9.97	8.97	2.91	11.94
yos_efw2	9.45	8.32	2.73	11.38
firm_si3	2.45	2.06	1.92	1.65
firm_si2	2.31	2.01	1.83	1.62
yos	1.54	1.93	1.53	1.46
act1	1.53	1.78	1.33	1.50
priv	1.25	1.58	1.33	1.50
ram1	1.25	1.56	1.25	1.48
dom1	1.07	1.21	1.09	1.13
Mean VIF	**3.43**	**3.27**	**1.77**	**3.74**

Once we have checked that we have an adequate model of labor income determinants we can analyze the results of the model. Table 13 shows a summary of the regressions output[3].

The results show positive returns to education. More years of education lead to more returns for all years and gender. The interactions between years of education and specific experience have a positive linear return. For all interactions the quadratic term is not significantly different from zero. This means that the increase in return for all combinations of education and specific experience is at the same rate.

The positive sign for all coefficients for the *White collars* dummy variables show that people, males and females, working in White collar jobs had received higher wages than blue collar workers in 1997 and 2000.

As expected the variables size of the firm have a positive coefficient and the bigger firms have the highest coefficient. This means that the bigger the firm, the higher the return for all year and gender.

The variables industry, Lima Metropolitan city, and private sector have a positive sign. This shows that people working on those categories had a higher return than those who had not.

Table 13. Urban Peru: Estimation of the determinants of labor income, 1997 and 2000

	1997				2000			
	Male		Female		Male		Female	
	Coeff.	P>|t|	Coeff.	P>|t|	Coeff.	P>|t|	Coeff.	P>|t|
Years of education (YOS)	0.104	0.00	0.075	0.00	0.089	0.00	0.080	0.00
YOS * Specific experience	0.002	0.18	0.003	0.13	0.004	0.00	0.003	0.09
YOS * Specific experience squared	0.000	1.00	0.000	0.54	0.000	0.00	0.000	0.21
White Collar	0.180	0.22	0.797	0.00	0.166	0.11	0.384	0.02
Firm size: Since 101 workers	0.451	0.01	0.127	0.48	0.155	0.20	0.411	0.01
Firm size: From 51 to 100 workers	0.272	0.12	0.075	0.67	-0.006	0.95	0.291	0.02
Industry	0.166	0.23	0.172	0.32	0.060	0.55	-0.365	0.02
Lima Metropolitan city	0.552	0.00	0.559	0.00	0.010	0.91	0.064	0.56
Private sector	0.472	0.00	0.336	0.03	0.242	0.02	0.321	0.01
Constant	-1.890	0.00	-1.566	0.00	-0.851	0.00	-1.048	0.00

[3] For the full regression output see Appendix 7.

Summarizing, the regressions are indicating that the best position in the Peruvian labor market was to have superior education, work in a white collar job, in a private firm with more than 100 employees in Lima Metropolitan city.

VIII. WAGE GAP ESTIMATIONS, 1997-2000

In this section the following wage gaps will be estimating. First, a wage gap for each year; and second, a wage gap estimating the variation of the wage gap between 1997-2000.

The B-O decomposition generates two estimations. **The first, measures the difference in endowment keeping the return (beta coefficient) constant (**$\beta^*(\overline{X}^* - \overline{X}_*)$**)**, in this case, males' return. If the result is positive, it means that men have relatively more endowment than females and the labor market rewards it accordingly. If the sign of the corresponding beta is negative and the difference between male and female respective endowment is positive, this will mean that males received more punishment for accumulating that endowment. It is important to make this clear, for a correct interpretation of the wage gaps.

The second, measures the difference in returns (males' return minus females' return) keeping the mean of the endowment constant ($\overline{X}_*(\beta^* - \beta_*)$**)** (in this case, female's endowment), if the difference is positive, it means that for males and females with the same endowment, men are getting higher wages. Thus, the difference in return to the endowment would not be based only on that endowment the worker posses, but also in this difference in returns that we call discrimination.

Table 14 shows that the total wage gap for 1997 was –0.13 and for 2000 was 0.16. Only the first (wage gap in 1997) is statistically different from zero (see Appendix 9). This does not mean that there was not wage discrimination in Peru in those years for any group. In fact, in 1997 the difference in endowments was statistically equal to zero while the difference in returns was negative, which means that there was discrimination against males and not against females.

In 1997, there were more males working than females in firms with more than 100 workers. Since those firms provide a higher return (keeping all other factors constant) males enjoyed a higher return.

There was not a statistically change in wage differential between males and females in 2000. Most of the variations in wages are statistically equal to zero for each year and gender (see Appendix 9).

Table 14. Urban Peru: Wage gap, 1997-2000

	1997			2000		
	(X*-X)b*	X(b*-b)	Total	(X*-X)b*	X(b*-b)	Total
Years of education (YOS)	-0.09	0.37	0.28	-0.13	0.11	-0.02
YOS * Specific experience	0.12	-0.18	-0.07	0.07	0.05	0.12
YOS * Specific experience squared	0.00	0.19	0.19	-0.04	0.28	0.24
White Collar	-0.03	-0.50	-0.53	-0.03	-0.18	-0.21
Firm size: Since 101 workers	0.02	0.12	0.14	0.01	-0.07	-0.06
Firm size: From 51 to 100 workers	0.00	0.08	0.09	0.00	-0.14	-0.14
Industry	0.01	0.00	0.00	0.01	0.07	0.08
Lima Metropolitan city	-0.03	0.00	-0.03	0.00	-0.03	-0.03
Private sector	0.03	0.08	0.11	0.03	-0.04	-0.01
Constant	0.00	-0.32	-0.32	0.00	0.20	0.20
Total	**0.03**	**-0.16**	**-0.13**	**-0.09**	**0.25**	**0.16**

b*=coefficient for males. b=coefficient for females.
X*=Mean of exogenous variables for males X=Mean of exogenous variables for females

Our next analysis will focus on the understanding of the changes in the wage gap during 1997 and 2000. We call this: *evolution of wage gap*.

To measure the **evolution of the wage gap** the decomposition will be divided in four columns. The first two measure the change in endowments keeping the return constant for males and females. And the third and fourth columns, measure the change in return keeping the endowment fixed for males and females. If the total effect is negative it will mean the gap reduced between those years.

In general, there was not a statistical change on the average endowments for males and females between 1997 and 2000 (see Appendix). Changes in the average endowments in the short run (between those years) might come from changes in the characteristics of people coming in and out of the labor market. This is only observed in the changes to the returns for males between 1997 and 2000 (column c in Table 15), when there was a higher return for males with the same endowments in 2000 than in 1997.

Furthermore, the differences in wages were not significantly different from zero in 1997 and 2000. Thus we should expect a similar result for the evolution of the wage gap. The estimation shows that the total evolution of the wage gap is equal to 0.072, which is as expected, not significantly different from zero (see Appendix 9).

But there were changes for some labor characteristics. Females working in *White Collars jobs*, *Industrial jobs*, and/or big firms (*Firms with 51 to 100 workers)* saw their returns increased; while females working in *Firms with more than 100 workers* saw their returns reduced between 1997 and 2000. On the other hand, no male category managed to increase their return.

It was expected to see different categories of males or females increasing or reducing their wage differentials, but from what the estimations are showing during this period of economic crisis there was not really any significant change in the wage differential due to discrimination. This could mean that in time of economic crisis the employers cope very fast by reducing the real wages to all their employees and not paying any premium to any category of employees.

Table 15. Urban Peru: Evolution of the wage gap, 1997-2000

	(x*00-x*97)b*00 (a)	(x00-x97)b00 (b)	x*97(b*00-b*97) (c)	X97(b00-b97) (d)	TOTAL (a)-(b)+(c)-(d)
Years of education (YOS)	-0.015	0.040	-0.188	0.064	-0.306
YOS * Specific experience	-0.028	0.082	0.308	0.009	0.188
YOS * Specific experience squared	0.008	-0.074	-0.220	-0.180	0.043
White Collar	-0.007	0.002	-0.009	-0.335	0.316
Firm size: Since 101 workers	-0.013	-0.049	-0.125	0.108	-0.197
Firm size: From 51 to 100 workers	0.000	0.017	-0.120	0.092	-0.229
Industry	-0.001	0.031	-0.031	-0.137	0.074
Lima Metropolitan city	0.000	-0.005	-0.307	-0.307	0.005
Private sector	-0.008	-0.035	-0.155	-0.009	-0.120
Constant	0.000	0.000	1.039	0.518	0.522
Total	**-0.065**	**0.009**	**0.193**	**-0.177**	**0.295**

b*=coefficient for males. b=coefficient for females.

X*=Mean of exogenous variables for males X=Mean of exogenous variables for females

IX. CONCLUSIONS

- The results of the Mincers' regressions show that the return to the interaction between education and specific experience does not have Diminishing Marginal Returns (DMR). The quadratic interaction term is essentially zero. This means that more education and more experience will be rewarded at the same rate at any combination.
- The Mincer's regression (determinants of labor income regression) show that there is a positive return to education, experience; as well as to workers in bigger firms, Lima Metropolitan city and in the private sector.
- During periods of economic crisis (between 1997 and 2000) in Peru the employees seem to have very low negotiation power. All categories of males and females saw their real wages decreased; only blue-collar females saw their real wages increased. This could mean that employers reduced all premiums to all employees during a period of crisis, but to test this hypothesis is beyond this paper.

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APPENDIX 1

NUMBER OF HOURS WORKED

Peru: Number of hours worked by different characteristics, 1997 and 2000

	1997			2000		
	Male	Female	Total	Male	Female	Total
Total	**51.1**	**46.5**	**49.6**	**54.4**	**48.2**	**52.7**
Age						
From 15 to 24 (Young)	49.3	47.9	48.6	52.8	51.1	52.2
From 25 to 44 (Young adult)	51.3	46.5	49.7	55.3	47.9	53.1
From 45 to 65 (Adult)	51.1	44.4	49.8	53.1	46.8	51.8
Level of education						
None and Primary	49.0	48.1	48.7	53.7	47.7	52.8
Secundary	51.7	47.0	50.5	55.3	48.4	54.0
Superior	50.8	46.0	49.0	53.5	48.1	51.5
Experience						
Up to 2 years	52.0	45.3	49.3	52.4	48.9	51.2
From 2 to 5 years	50.4	47.9	49.5	53.5	49.3	52.3
From 5 to 10 years	51.9	49.1	50.9	57.7	48.4	55.0
More than 10 years	50.5	43.9	49.3	54.8	45.8	52.9
Occupation						
White collar	50.8	46.3	49.1	54.5	47.6	52.2
Blue collar	51.6	47.3	50.7	54.2	50.6	53.6

APPENDIX 2

HOURLY WAGE

Peru: Hourly wage by different characteristics, 1997and 2000
(Nuevos Soles of 2000)

	1997			2000		
	Male	Female	Total	Male	Female	Total
Total	**7.49**	**5.65**	**6.90**	**5.55**	**4.66**	**5.30**
Age						
From 15 to 24 (Young)	4.29	4.71	4.51	2.37	3.25	2.69
From 25 to 44 (Young adult)	7.59	6.24	7.15	5.56	5.13	5.43
From 45 to 65 (Adult)	8.26	4.40	7.47	6.57	4.15	6.09
Level of education						
None and Primary	4.73	3.17	4.29	4.35	2.65	4.10
Secundary	5.19	4.25	4.95	3.64	3.60	3.64
Superior	10.06	6.65	8.77	7.91	5.22	6.91
Experience						
Up to 2 years	6.75	5.63	6.30	4.82	4.37	4.67
From 2 to 5 years	7.75	5.54	6.96	5.96	4.66	5.58
From 5 to 10 years	9.04	5.31	7.65	5.16	4.51	4.97
More than 10 years	7.21	6.25	7.03	5.96	5.18	5.80
Occupation						
White collar	8.55	6.36	7.74	6.52	4.94	5.99
Blue collar	5.53	2.81	4.96	4.01	3.45	3.92

APPENDIX 3

OCCUPIED POPULATION BY GENDER

Urban Peru: Occupied population by different characteristics, 1997, 2000 (percentage)

	1997			2000		
	Male	Female	Total	Male	Female	Total
Total	**67.9**	**32.1**	**100.0**	**72.3**	**27.7**	**100.0**
Age						
From 15 to 24 (Young)	5.8	6.5	12.4	7.0	4.1	11.1
From 25 to 44 (Young adult)	43.2	20.7	63.9	43.6	18.3	61.9
From 45 to 65 (Adult)	18.9	4.8	23.7	21.6	5.4	27.0
Level of education						
None and Primary	5.7	2.2	7.9	5.2	0.9	6.2
Secundary	29.6	10.1	39.7	35.6	8.1	43.7
Superior	32.7	19.8	52.4	31.4	18.7	50.1
Experience						
Up to 2 years	17.3	11.5	28.8	17.7	9.1	26.7
From 2 to 5 years	15.8	8.9	24.7	17.1	7.0	24.1
From 5 to 10 years	10.2	6.0	16.2	12.0	5.0	16.9
More than 10 years	24.6	5.6	30.2	25.6	6.7	32.2
Occupation						
White collar	44.1	25.7	69.8	44.3	22.5	66.9
Blue collar	23.8	6.4	30.2	28.0	5.2	33.1

APPENDIX 4

UNEMPLOYMENT RATES

Urban Peru: Unemployment Rates, 1997 and 2000.
(percentages)

	Males	Females	Total
1997	6.8	7.8	7.2
2000	8.3	8.5	8.3
Total	7.6	8.2	7.8

APPENDIX 5

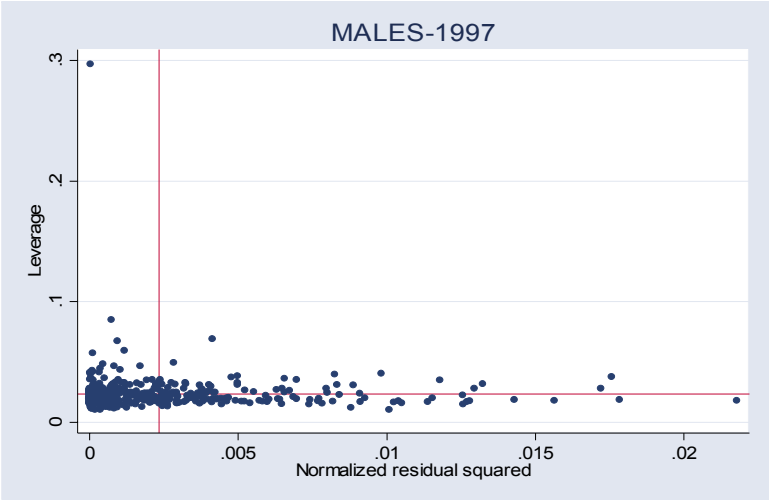
NATURAL LOGARITHM OF LABOR INCOME TRANSFORMATION

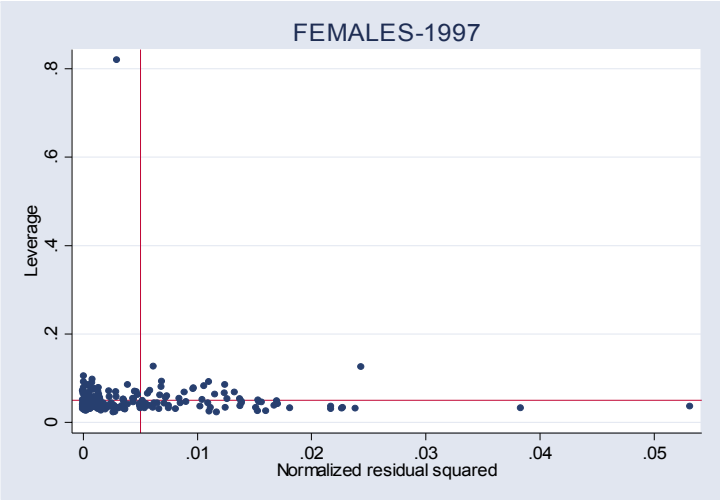
Natural logarithm transformation to normalily
(Transforming ln(Y) into ln(Y-k))

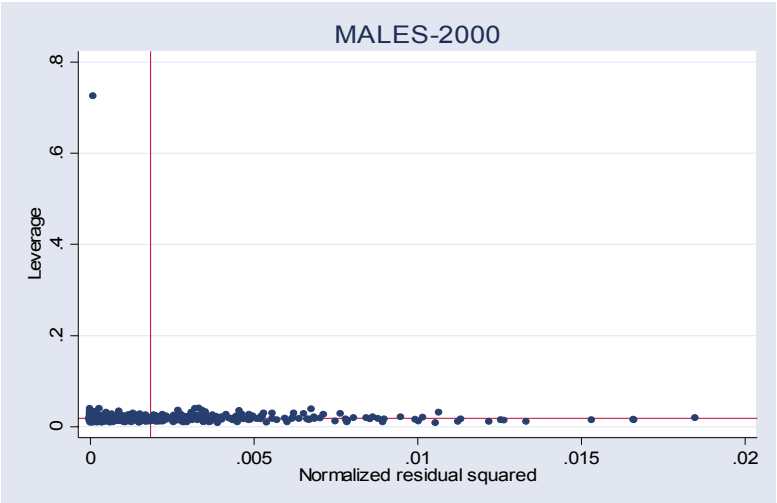
		k	Skewness
1997	Males	2.677	0.001
	Females	1.328	0.000
2000	Males	1.379	0.000
	Females	1.178	0.000

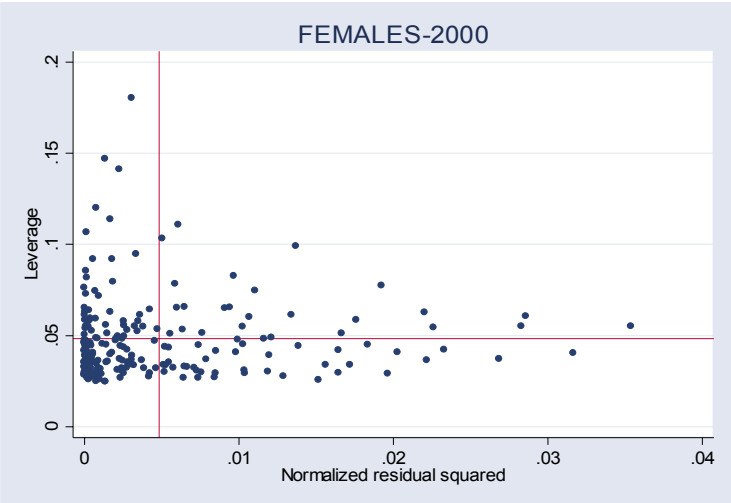
APPENDIX 6

LEVERAGE POINTS ESTIMATION









APPENDIX 7

LABOR INCOME REGRESSIONS

Urban Peru: Determinants of males' labor income, 1997
(Weighted regression)

Number of obs = 429					
F(9, 419) = 13.49					
Prob > F = 0.0000					
R-squared = 0.2247					
Adj R-squared = 0.2080					
Root MSE = 1.1637					
Log of hourly labor income	Coef.	Std. Err.	P>|t|	[95% Conf.	Interval]
Years of education (YOS)	0.104	0.020	0.000	0.064	0.144
YOS * Specific experience	0.002	0.002	0.181	-0.001	0.006
YOS * Specific experience squared	0.000	0.000	0.999	0.000	0.000
White Collar	0.180	0.146	0.218	-0.107	0.466
Firm size: Since 101 workers	0.451	0.178	0.011	0.102	0.800
Firm size: From 51 to 100 workers	0.272	0.173	0.116	-0.067	0.612
Industry	0.166	0.136	0.225	-0.103	0.434
Lima Metropolitan city	0.552	0.118	0.000	0.319	0.784
Private sector	0.472	0.136	0.001	0.204	0.739
Constant	-1.890	0.280	0.000	-2.440	-1.341

Urban Peru: Determinants of females' labor income, 1997
(Weighted regression)

Number of obs = 200					
F(9, 190) = 12.09					
Prob > F = 0.0000					
R-squared = 0.3642					
Adj R-squared = 0.3341					
Root MSE = .85501					
Log of hourly labor income	Coef.	Std. Err.	P>|t|	[95% Conf.	Interval]
Years of education (YOS)	0.075	0.024	0.002	0.027	0.123
YOS * Specific experience	0.003	0.002	0.128	-0.001	0.008
YOS * Specific experience squared	0.000	0.000	0.538	0.000	0.000
White Collar	0.797	0.210	0.000	0.382	1.212
Firm size: Since 101 workers	0.127	0.179	0.479	-0.226	0.479
Firm size: From 51 to 100 workers	0.075	0.174	0.667	-0.268	0.418
Industry	0.172	0.172	0.320	-0.168	0.511
Lima Metropolitan city	0.559	0.137	0.000	0.289	0.830
Private sector	0.336	0.157	0.034	0.026	0.645
Constant	-1.566	0.325	0.000	-2.207	-0.924

Urban Peru: Determinants of males' labor income, 2000
(Weighted regression)

Number of obs = 544					
F(9, 534) = 13.69					
Prob > F = 0.0000					
R-squared = 0.1875					
Adj R-squared = 0.1738					
Root MSE = .9598					
Log of hourly labor income	Coef.	Std. Err.	P>|t|	[95% Conf.	Interval]
Years of education (YOS)	0.089	0.015	0.000	0.060	0.117
YOS * Specific experience	0.004	0.001	0.000	0.002	0.005
YOS * Specific experience squared	0.000	0.000	0.001	0.000	0.000
White Collar	0.166	0.105	0.113	-0.039	0.371
Firm size: Since 101 workers	0.155	0.119	0.195	-0.080	0.389
Firm size: From 51 to 100 workers	-0.006	0.112	0.954	-0.226	0.213
Industry	0.060	0.100	0.548	-0.137	0.257
Lima Metropolitan city	0.010	0.088	0.907	-0.162	0.182
Private sector	0.242	0.102	0.018	0.042	0.443
Constant	-0.851	0.201	0.000	-1.246	-0.456

Urban Peru: Determinants of females' labor income, 2000
(Weighted regression with robust standard errors)

Number of obs = 207					
F(9, 197) = 7.97					
Prob > F = 0.0000					
R-squared = 0.2670					
Adj R-squared = 0.2335					
Root MSE = .72349					
Log of hourly labor income	Coef.	Std. Err.	P>|t|	[95% Conf.	Interval]
Years of education (YOS)	0.080	0.022	0.000	0.037	0.124
YOS * Specific experience	0.003	0.002	0.087	0.000	0.007
YOS * Specific experience squared	0.000	0.000	0.205	0.000	0.000
White Collar	0.384	0.158	0.016	0.072	0.695
Firm size: Since 101 workers	0.411	0.145	0.005	0.126	0.696
Firm size: From 51 to 100 workers	0.291	0.128	0.024	0.038	0.544
Industry	-0.365	0.156	0.021	-0.674	-0.057
Lima Metropolitan city	0.064	0.109	0.557	-0.151	0.280
Private sector	0.321	0.124	0.011	0.076	0.566
Constant	-1.048	0.310	0.001	-1.659	-0.437

APPENDIX 8

INPUTS FOR OAXACA'S DECOMPOSITION

Urban Peru: Variable Means for B-O Decomposition

	Explicatives Variables (Mean)			
	1997		2000	
	Male	Female	Male	Female
Years of education (YOS)	12.0	12.8	11.9	13.3
YOS * Specific experience	227.8	176.7	220.0	201.0
YOS * Specific experience squared	5653.7	3590.7	5460.5	4304.5
White Collar	0.7	0.8	0.6	0.8
Firm size: Since 101 workers	0.4	0.4	0.3	0.3
Firm size: From 51 to 100 workers	0.4	0.4	0.5	0.5
Industry	0.3	0.3	0.3	0.2
Lima Metropolitan city	0.6	0.6	0.5	0.5
Private sector	0.7	0.6	0.6	0.5
Constant	1.0	1.0	1.0	1.0

APPENDIX 9

CONFIDENCE INTERVALS B-O DECOMPOSITION

Urban Peru. 95% Confidence Intervals for Intra-temporal B-O decomposition

	1997						2000					
	(X*-X)b*		X(b*-b)		Total		(X*-X)b*		X(b*-b)		Total	
	L	U	L	U	L	U	L	U	L	U	L	U
Years of education (YOS)	-0.12	-0.05	-0.63	1.37	-0.69	1.26	-0.19	-0.07	-0.77	0.99	-0.87	-0.02
YOS * Specific experience	-0.06	0.29	-1.05	0.68	-1.06	0.92	0.02	0.12	-0.74	0.84	-0.70	0.12
YOS * Specific experience squared	-0.15	0.15	-0.24	0.63	-0.35	0.74	-0.11	0.02	-0.15	0.71	-0.24	0.24
White Collar	-0.07	0.02	-0.91	-0.09	-0.92	-0.14	-0.08	0.01	-0.53	0.18	-0.55	-0.21
Firm size: Since 101 workers	0.00	0.03	-0.08	0.33	-0.07	0.36	-0.01	0.03	-0.17	0.04	-0.17	-0.06
Firm size: From 51 to 100 workers	0.00	0.00	-0.13	0.30	-0.13	0.30	-0.01	0.01	-0.32	0.03	-0.31	-0.14
Industry	0.00	0.02	-0.12	0.12	-0.12	0.13	-0.02	0.03	0.01	0.14	0.00	0.08
Lima Metropolitan city	-0.04	-0.02	-0.24	0.23	-0.26	0.19	0.00	0.00	-0.18	0.13	-0.18	-0.03
Private sector	0.01	0.05	-0.19	0.36	-0.18	0.40	0.01	0.06	-0.21	0.13	-0.20	-0.01
Constant	0.00	0.00	-1.33	0.68	-1.33	0.68	0.00	0.00	-0.60	1.00	-0.60	0.20
Total	-0.04	0.11	-0.44	-0.07	-0.38	-0.05	-0.14	-0.01	-0.14	0.15	-0.20	0.06

Urban Peru. 95% Confidence Intervals for Inter-temporal B-O decomposition

	(x*00-x*97)b*00 (a)		(x00-x97)b00 (b)		x*97(b*00-b*97) (c)		X97(b00-b97) (d)		TOTAL (a)-(b)+(c)-(d)	
	L	U	L	U	L	U	L	U	L	U
Years of education (YOS)	-0.02	-0.01	0.01	0.06	-0.95	0.58	-0.97	1.09	-1.60	0.99
YOS * Specific experience	-0.05	-0.01	0.01	0.15	-0.67	1.28	-0.80	0.82	-1.10	1.48
YOS * Specific experience squared	0.00	0.02	-0.13	-0.02	-0.75	0.31	-0.63	0.27	-0.68	0.76
White Collar	-0.02	0.00	0.00	0.00	-0.24	0.22	-0.80	0.13	-0.20	0.83
Firm size: Since 101 workers	-0.03	0.01	-0.09	-0.01	-0.31	0.06	-0.08	0.30	-0.44	0.05
Firm size: From 51 to 100 workers	0.00	0.00	0.00	0.03	-0.31	0.07	-0.10	0.28	-0.50	0.05
Industry	0.00	0.00	0.00	0.06	-0.13	0.07	-0.26	-0.01	-0.07	0.22
Lima Metropolitan city	-0.01	0.01	-0.02	0.01	-0.47	-0.14	-0.53	-0.08	-0.27	0.28
Private sector	-0.01	0.00	-0.06	-0.01	-0.40	0.08	-0.28	0.26	-0.47	0.23
Constant	0.00	0.00	0.00	0.00	0.29	1.79	-0.52	1.56	-0.76	1.80
Total	-0.09	-0.04	-0.01	0.08	0.04	0.33	-0.22	0.11	-0.07	0.36

VITA

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