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## **ESTIMATION OF GENDER WAGE DIFFERENTIALS IN EGYPT USING OAXACA DECOMPOSITION TECHNIQUE**

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### **ABSTRACT**

This paper focuses on estimating wage differences between males and females in Egypt to understand the determinants of the gender wage gap and control of this variation. The methodology of this paper is based on studying and analyzing the topic of wage differentials between males and females by using the Oaxaca decomposition technique. The data used in the analysis is obtained from the Egypt Labor Market Panel Survey 2006 (ELMPS 2006), which was presented by Central Agency for Public Mobilization and Statistics (CAPMAS) in cooperation with Economic Research Forum (ERF). The findings of this paper help deepen the understanding of the wage gap between males and females in Egypt by determining differences in wages due to real variations in characteristics between both genders, for example, education and experience and differences due to discrimination against women in addition to determining differences due to selectivity bias. It is estimated that, the wage gap between males and females is 25% and the results ascertain that the overall gap is attributed to discrimination against women.

**KEYWORDS:** Income Inequalities- Gender wage inequality- Wage differentials- Oaxaca decomposition technique- Egypt.

**JEL CLASSIFICATION:** J31, J38, J71

## 1. INTRODUCTION

Wage inequality between males and females is a topic that has received a great deal of attention in the economic literature. The issue of difference in income between males and females is of great importance because it affects a very large number of people. This implies that, the gender wage gap affects women and their children and future generations as well. If the determinants of the gender wage gap can be found, policy could be implemented to reduce the income disparities.

In recent decades, male-female earnings differentials have been studied in many developed and developing countries around the world, including Egypt. The existence of such differentials is usually associated with discrimination against women in the labor market. It has been asserted that discrimination has important economic, political and social consequences that call for corrective actions. Females' jobs do pay less than males' jobs, even after accounting for observable differences in worker and job characteristics; a considerable fraction of the gender wage gap remains unexplained. An unexplained gender wage gap has often been explained as evidence of labor market discrimination. However, it could reflect additional unobserved or unmeasured differences in worker and job characteristics between males and females (Wood et al., 1993; Blau and Kahn, 2000).

The fact that females are more likely to choose occupations that offer more flexibility and that do not require continual investments in skills unique to a firm, or occupations where skills do not depreciate significantly because of career interruptions helps explain the selection hypothesis. The higher concentration of females in these jobs would then explain why female-dominated occupations pay lower wages than male-dominated ones (Görlich and de Grip, 2008; ILO, 2010).

This paper focuses on estimating wage differences between males and females in Egypt to understand the determinants of the gender wage gap and control of this variation. This study helps deepen the understanding of wage gap between males and females in Egypt by determining differences in wages due to real variations in characteristics between both genders and other differences due to discrimination against women. The study attempts to answer one important question, i.e. what are the main determinants of gender wage differentials in Egypt? The methodology of this paper is based on studying and analyzing the topic of wage differentials between males and females by using the Oaxaca-Blinder decomposition technique and examining the selection bias effect using the Neuman-Oaxaca decomposition technique.

This paper consists of five main sections, including the introduction and conclusion. The second section surveys the wage system in Egypt and its structure, the trends and profile of the Egyptian labor market. The third section presents the data description and the characteristics of males' and females' samples. The fourth part proposes the empirical model, its estimation and the results of the regression analysis of males' and females' samples.

## **2. BACKGROUND**

### **2.1 THE WAGES SYSTEM IN EGYPT: MAJOR CHARACTERISTICS**

A wage can be defined as a monetary reward that is paid to an employee for the services provided by him. There are a number of principles of a comprehensive wage policy. For example, the wage policy should achieve the national objective of economic growth with social justice; reduce the relative poverty of the working class; promote employment, productivity and capital formation; remove imbalances among sectors and wage differentials and ensure rising real wages that are consistent with the capacity of the industry and the national economy. The wage structure depends on many factors, such as, wage settlements, the labor market situation, and the nature and size of different institutions. In addition, the wage structure consists of certain grades and scales; each scale has a minimum and a maximum limit and the actual pay in a grade depends on the length of service and the performance of the employee. The wage structure in Egypt generally consists of basic wage, bonus and other incentives.

A rational wage policy must effectively fix a minimum and maximum wage strategy. This means that, there is a need to provide a wage which would be suitable to fulfill basic needs. On the other hand, the need for a wage ceiling is essential in order to check the upward inflationary trend of the wages. This implies that, the wage structure must contribute to price stability.

The wages system in Egypt has many problems and has been criticized because of its complexity and inequality. For example, the basic salary on which the bonus and the pension payments after retirement are calculated represents approximately 20% of the total wage. Furthermore, the system of wages suffers from inequities between the public and private sector. It has been asserted that, the minimum wage for workers is different in both public and private sectors. Employees who doing similar jobs whether in the public sector or private one often earn very different wages depending on the ministry (Abdelhamid and El Baradei, 2010). Many employees have demanded a minimum wage policy to be settled by the government, and this request increased heavily especially after the 25<sup>th</sup> of January Egyptian revolution in 2011. According to the International Labor Convention (1970), minimum wages policies should be established and regularly updated within the rule of law. The National Council for Wages was established by Law 12 of 2003 as the entity which is responsible for drawing up the wages policy in Egypt and ensuring that wages are suitable to the cost of living and are adequate to cover rising prices. There are many different laws and regulations controlling the wages system in Egypt. A revision of all laws and legislations that affect the wages system in Egypt is an important issue that should be taken into consideration.

Another characteristic of the complexity of the Egyptian wages system is the series of special bonuses, annual increases and incentive structures. Before the 25<sup>th</sup> of January Egyptian revolution in 2011, there was a correlation between the presidential election year and the increase in the percentage of special bonuses that should be added to the basic wage. However, there is an increased level of dissatisfaction, especially among employees in the public sector, with the wage level, which lacks the international standards of minimum wages. Egyptian Law

guarantees the minimum wage for all government and non-government employees, in addition to yearly increments to salary ranging usually between 10-15%.

In Egypt, the minimum wage policy should take into consideration the differences between sectors and geographical areas. Moreover, this policy should be modified to be compatible with the level of productivity and the increased inflation rate as well. At least one quarter of Egyptians live in harsh poverty, spending no more than LE3444 (\$500) each year. In July 2012, a minimum wage of LE700 (\$100) was set in the public sector for the first time since 1980s. From January 2014, Egyptian public sector workers will have a minimum monthly wage of LE1200 (\$171). Egypt's annual urban inflation rate rose to 10.1% in the 12 months prior to September 2013, up from 9.7% recorded in year-to-August (CAPMAS, Egypt in Figures, 2013).

The inflationary pressure resulting from a minimum wage increase can be contained if the government follows a sound policy to enhance production. Then again, Egypt's heavy reliance on imports for basic necessities makes it unlikely that raising the minimum wage would result in an increase in local production. Egypt spent around LE33 billion (\$4.8 billion) on imports in the first eight months of 2013. Moreover, Egypt's official unemployment rate reached 13.3% of the country's labor force in the second quarter of 2013, with 74% of job seekers aged between 15 and 29 years old (CAPMAS, Egypt in Figures, 2013).

In summary, it can be said that reforming the wage system in Egypt requires an overall plan and a civil service reform that would satisfy the objectives of employer and employees as well as lead to an efficient and responsive government system. It can be said that, parallel political reform allowing for greater levels of accountability and transparency in government operations and the staged implementation of reforms, are important issues to achieve the target of reforming the wage system in Egypt.

## **2.2 THE EGYPTIAN LABOR MARKET: TRENDS AND PROFILE**

The main components of the labor market in Egypt are a large public sector, a growing private sector, and an informal sector. For a long time, the government guaranteed employment associated with lifetime job security and several other benefits such as public health insurance for every secondary and postsecondary graduate. These characteristics have changed in the context of the economic reform and structural adjustment program initiated in 1991. The government has increased the waiting period for government appointments. As a result, the public sector work force growth rate declined and the private sector growth rate increased due to the privatization process. Moreover, pay and work conditions have changed, resulting in changes in the labor market structure (Assaad, 1997).

Despite significant progress in female labor force participation over past years, gender differences remain in productivity and earnings across different sectors and jobs. In spite of lower earnings and productivity, women are not worse workers than men. Instead, the gender differences in labor productivity and earnings are mainly the result of differences in the economic activities of men and women, in addition to gender differences in human capital and in the returns to worker and job characteristics. In fact, males' and females' jobs differ greatly,

across sectors, industries or types of firms. Women all over the world appear to be concentrated in low-productivity jobs. They work in small farms and run small firms. They are overrepresented among unpaid family workers and in the informal sector. Women are more likely to work in jobs that offer flexible working arrangements, so that they can combine work with care responsibilities, for instance, part-time or informal jobs. These jobs often pay lower wages than full-time and formal jobs. Sometimes, they rise to positions of power in the labor market (World Development Report, 2012).

Over the past years, women have joined the labor market in increasing numbers, partially closing the gender participation gap. Between 1980 and 2009, the global rate of female labor force participation rose from 50.2 % to 51.8 %, while the male rate fell from 82.0 % to 77.7 %. It can be said that female labor force participation is lowest in the Middle East and North Africa (26 %) and South Asia (35 %) and highest in East Asia and Pacific (64 %) and Sub-Saharan Africa (61%). The changes in female participation rates over the past 25 years can be attributed to the effects of economic development and rising levels of education among women, which increases the demand for female labor (World Bank, 2011).

In Egypt, it is a fact that marriage has usually been associated with a decline in female labor force participation. Some women rejoin the labor force several years after marriage. The exit rates for women working in informal firms or household enterprises are higher than the exit rate of government employees. Exit rates are determined mainly by marriage, but the effect of marriage on exit among informal sector employees is considerably higher than among government employees. Moreover, increases in the age of marriage and declines in the percentage of fertility are likely to have contributed to higher participation rates. To sum up, the impact of economic development and changes in the levels of education and family formation on female labor force participation varies across individuals and regions and depends on institutions and individual preferences (World Bank, 2010).

The majority of working urban women held government jobs, and in rural areas, the government and household enterprises reported more than 70 % of female employment. Private sector firms accounted for less than a quarter of female employment in urban Egypt in 2006. Their share in rural female employment was lower (approximately 8%). Work in the public sector is more compatible with women's needs since it offers shorter hours, more access to childcare and greater assistance for maternity leave. In 2006, the proportion of workers who reported having been at work during their last pregnancy was significantly higher in the public sector. It has been asserted that 86% of public sector workers who had a baby while working were given paid maternity leave of at least six weeks, in contrast to only 47% of those working in the formal private sector. Furthermore, the percentage of working women aged 15–29 years who complain of long working hours is significantly higher in the private sector (50%) than in the public sector (32%) (World Bank, 2010).

Table (1) demonstrates employment growth from 1988 to 2011, based on the data of ELMPS 2012. Employment has increased from 14,508 thousand in 1998 to 19,987 thousand in 2006 and to 22,487 in 2011. Over the same period, job creation has changed, and it reached 1,488 thousand in 2011. Similarly, job exit fluctuated from 1998 to 2003 and then increased gradually from 2003 to 2011. The net job growth has declined from 4.6% in 1998 to 1.1% in 2011; this

could be explained by the growing number of job exits. Additionally, working age population growth has decreased over the same period and has reached 2% in 2011.

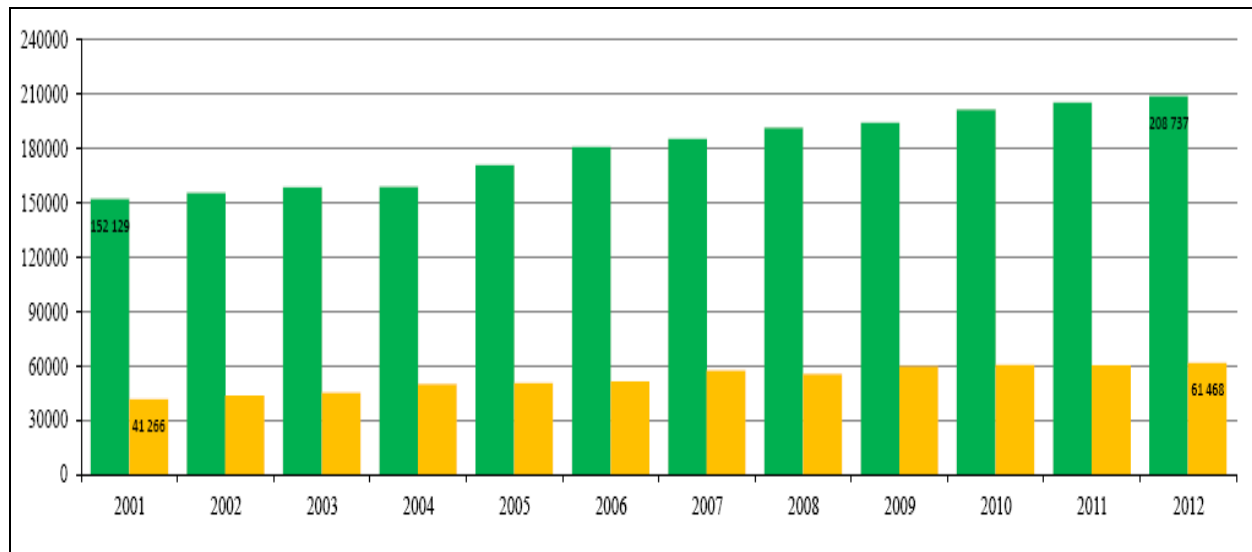
**Table (1): Employment Growth, 1998-2011**

<b>Year</b>	<b>Employment (Thousands)</b>	<b>Job Creation (Thousands)</b>	<b>Job Exit (Thousands)</b>	<b>Net Job Growth (Thousands)</b>	<b>Net Job Growth (%)</b>	<b>Working Age pop. Growth (%)</b>
<b>1998</b>	14,508	1,251	599	652	4.6	4.3
<b>1999</b>	15,125	1,216	611	605	4.1	4.4
<b>2000</b>	15,915	1,580	801	779	5.0	4.0
<b>2001</b>	16,678	1,449	709	740	4.5	3.7
<b>2002</b>	17,371	1,472	774	698	4.1	4.2
<b>2003</b>	17,910	1,270	678	592	3.3	3.7
<b>2004</b>	18,621	1,425	760	665	3.6	3.0
<b>2005</b>	19,393	1,631	901	730	3.8	3.2
<b>2006</b>	19,987	1,515	948	567	2.9	2.7
<b>2007</b>	20,484	1,386	903	483	2.4	2.5
<b>2008</b>	21,063	1,616	1,074	542	2.6	2.4
<b>2009</b>	21,695	1,754	1,137	617	2.9	2.4
<b>2010</b>	22,218	1,697	1,328	369	1.7	2.1
<b>2011</b>	22,487	1,488	1,245	243	1.1	2.0

Source: Assaad and Krafft, 2013.

The labor force in Egypt has increased from 19.3 million in 2001 to 27 million in 2012, however the female labor force has only increased from 4.1 million in 2001 to 6.1 million in 2012 (see Figure 1). In contrast, the male labor force participation rate has been increasing over this period; in fact, the male labor force has increased from 15.2 million in 2001 to 20.9 million in 2012. In terms of unemployment, females have continued to face much higher rates over the whole period. The female unemployment rate has been approximately 3 to 4 times higher than that of males.

**Figure (1): Annual Estimates of Labor Force by Sex (2001-2012)**



(1) All numbers in Y axis are in hundreds.

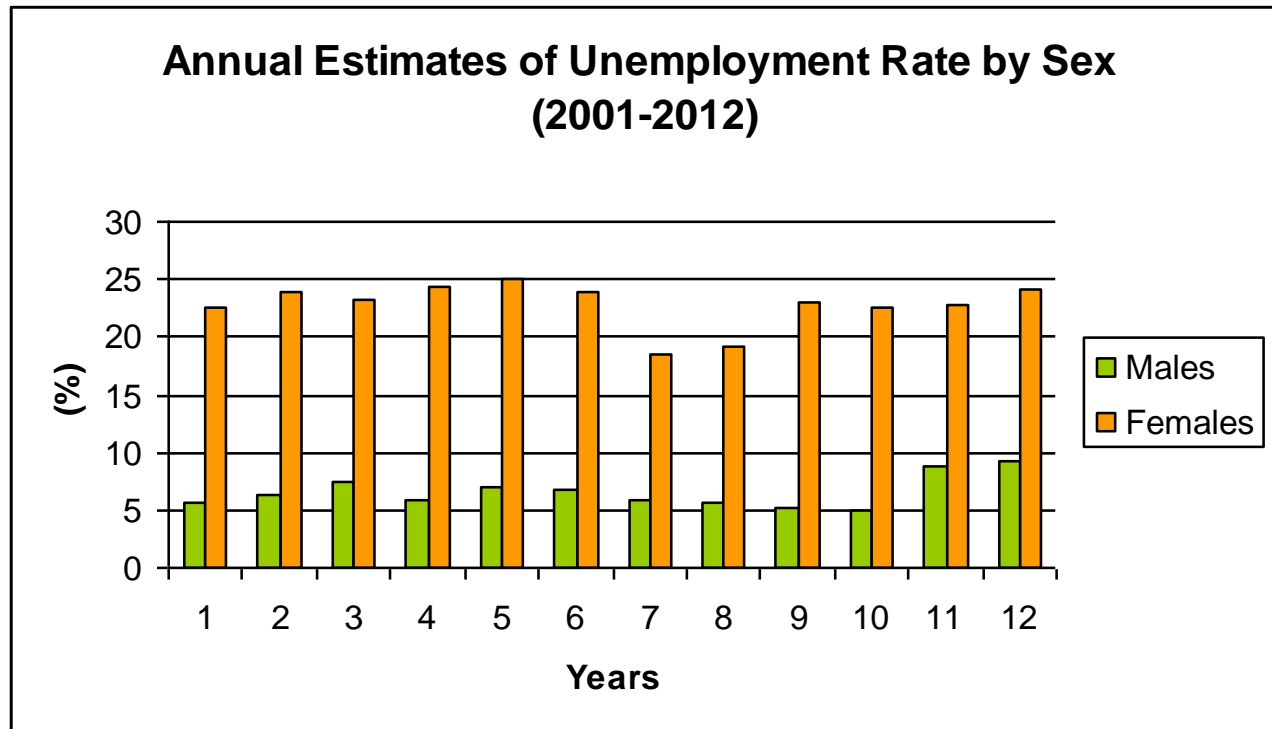
(2) ■ Males ■ Females

Source: CAPMAS, Annual Statistical Book, 2013.

Figure (2) illustrates that, the male unemployment rate as reported by the Labor Force Sample Surveys (LFSSs) conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS) nearly doubled from 2010 to 2011 (i.e. from 4.9% to 8.9%). This could be attributed to the economic slowdown caused by the 25<sup>th</sup> of January Egyptian revolution. The male unemployment rate then increased further in 2012 to 9.3%. On the contrary, the female unemployment rate was not affected heavily by the revolution; it increased from 22.57% in 2010 to 22.73% in 2011 and reached 24.1% in 2012. The overall unemployment rate increased from 9% in 2010 to 12.7% in 2012.



**Figure (2): Annual Estimates of Unemployment Rate by Sex (2001-2012)**



Source: CAPMAS, Annual Statistical Book, 2013.

There have been substantial changes in the composition of employment over time in Egypt. The public sector employed 25% of the workforce in 2006 and 26% in 2012. Employment in public enterprises continued to decrease, from 7% of employment in 1998 to 5% in 2006 and 4% in 2012. Moreover, formal private regular wage employment has increased from 8% in 1998 to 9% in 2006 and 11% in 2012, while informal private regular wage employment has decreased from 17% in 2006 to 15% in 2012. Comparing between the Egypt Labor Market Panel Survey 2006 (ELMPS 2006) and the Egypt Labor Market Panel Survey 2012 (ELMPS 2012), it has been asserted that, the largest change was the substantial increase in irregular wage work. While 8% of the employed were irregular wage workers in 2006, this had increased to 17% of the employed in 2012. Regarding males and females, there has been very little decrease in the public sector's share of male and female employment over the 1998 to 2012 period. A small increase in formal private regular work has occurred over time among males and females. The informal private regular wage work decreased among males over the 2006 to 2012 period. Similarly, the informal private regular wage work declined among females, from 9% in 2006 to 7% in 2012. Furthermore, males experienced a significant increase in irregular wage work, from 9% in 2006 to 20% in 2012, while a small number of females are engaged in irregular wage work over the 2006 to 2012 period (Assaad and Krafft, 2013).

## **2.3 RELATED LITERATURE REVIEW**

There are a large number of previous studies of gender wage differentials. Shaban et al. (1993) and Assaad (1997) estimated joint models of sector choice and wage determination in the public and private sector using 1987 and 1988 household-level labor force sample survey data. Assaad (1997) attempted to quantify the value of non-wage benefits in the public sector. Kanellopoulos and Mavromaras (1999) presented an empirical study of the development of labor market participation and wage differentials between males and females in Greece between 1988 and 1994. This paper used recent survey data generated by the National Statistical Service. The authors used selectivity corrected earnings estimations. The results show that the adverse treatment of female labor market participation is the largest identifiable reason why the wage gap is there and why it increased between 1988 and 1994. The study found that the observed lower female relative pay can be primarily attributed to the factors which determine paid employment participation. The participation process was found to be highly discriminatory in favor of males.

Assaad (1999) compares the earnings of workers in and out of public enterprise, while taking account of differences in non-wage benefits and non-random sector selection. The author relates workers' losses to observable characteristics such as seniority, age, educational attainment, and gender, and evaluates how well alternative redundancy pay formulas typically used in severance programs match compensation payments to these estimated losses. The results of this study show that women more than men tend to face strong barriers to entry into wage jobs in the private sector and thus have poorer earning prospects.

El-Hamidi and Said (2005) studied the changes in the distribution of returns to education and gender wage in the Egypt and Morocco market using joint models of educational choice and wage determination. Their empirical analysis is based on the 1988 and 1998 Egypt Labor Force Sample Surveys and The Morocco Living Standard Measurement Studies of 1990/1991 and 1998/1999. In Egypt, the male public sector wage premium declined from 7% in 1991 to 3% in 1998; whereas the female one remained almost the same at 16-17 %. Overall, wage inequality by education and gender appears to have declined substantially in Egypt during that decade of pursuing economic liberalization policies. By contrast, all changes in public sector premiums and unexplained wage gaps in Morocco appear to be in the opposite direction. Male premiums in the public sector increased from 33% in 1991 to 58% in 1999 and so did female premiums, which dramatically jumped from 14% in 1991 to 81% in 1999. In general, the nineties appear to be a decade of increasing wage inequality by gender and education in Morocco.

Schafgans and Stelcner (2006) re-examined the gender decomposition of wages in the presence of selection bias. They derived the appropriate sample selection corrections, based on a reduced form model for the joint participation decisions of both couples. The influence that husbands' participation decision has on the female participation decision also highlights the importance of using data on both spouses for the analysis of the gender wage gap. The authors analyzed the gender earnings differential using Canadian census data. They found that adding additional controls for field of study did not significantly affect the decomposition analysis, but there was

some reduction in discrimination when additional controls for occupation and industry were added.

Haas (2006) studied the difference in income between men and women, the greatest equity is found in Switzerland, which has a male-to-female wage ratio of 1.11, meaning that men make approximately 1.11 times as much as women. The greatest inequality is seen in Egypt, with a ratio of 3.84, implying that men make almost quadruple the wages of women. This study examined the relationship between the gender wage gap and the degree of economic development of a country as measured by the gross domestic product per capita. This study used the United Nations Human Development Index as a more comprehensive measure of development. It also analyzed the relationship of educational attainment and general wage inequality to the size of the gender wage gap. The results suggested that the decrease in gender wage inequality is not expected to be seen until countries reach development levels close to 0.80 on the Human Development Index. Herrera and Badr (2011) suggested that the returns to education and experience in Egypt increase with firm size and are larger in the formal sector. Given the fact that females are overrepresented among informal workers, this would translate into female jobs paying less than male jobs.

Abdelhamid and El Baradei (2010) identified what needs to be done to reform the pay system for government employees in Egypt through proposing a set of policy solutions and strategies. The authors propose a system for pay adjustment and strategies to resolve the problem. For example, securing the needed extra funding for increasing government employees' pay, right sizing the government civil service, enhancing transparency, reducing wage discrepancies, reforming the minimum wage policy and establishing a better link between pay and performance. Moreover, the study emphasizes an urgent need for capacity building in government staff, as much as for salary and wage revision.

Yasin et al. (2010) concentrated on the gender employment positions and wage differentials in Pakistan. They analyzed the determinants of gender wage discrimination in Pakistan using descriptive and regression analysis based on the cross-sectional data of the Pakistan labor force survey. They concluded that illiteracy, poor, and low levels of education as well as low vocational, technical, and professional competence are important features of the labor market participants in Pakistan. The results of this empirical analysis showed that dissimilarity in the attainment of jobs is a remarkable phenomenon between males and females. It is also proved that, some socio-economic and cultural constraints hinder the participation of females. Moreover, the results confirmed that women were not different in their productivity from men and without discrimination women could earn more compared to men in some cases.

### **3. DATA, METHODOLOGY AND ANALYSIS**

The data used in the analysis is obtained from ELMPS 06, which was presented by CAPMAS in cooperation with Economic Research Forum (ERF). The questionnaire for the ELMPS 06 is composed of three major sections; the first section proposes the household questionnaire administered to the head of household that contains information on basic demographic

characteristics of household members. The second section presents the individual questionnaire administered to the individual containing information on parental background, detailed education histories, detailed employment characteristics, job characteristics and earnings. The third section discusses the income sources of the household. The size of the sample of males is 5107 individuals and the size of females' sample is 1465 individuals. The samples contain waged workers whose ages range from 15 to 64 years. Those individuals answer all the questions needed for the estimation of the Mincerian equation and basic earnings functions and the equation that determines the wage differentials between males and females.

The empirical framework follows Mincer's estimation of the simple schooling model, which relates earnings to work experience and years of schooling. The dependent variable in the log earnings regression is the log of a respondent's total wage. The methodology of this paper is based on analyzing wage differentials between males and females by using Oaxaca and Blinder decomposition technique. The Oaxaca/Blinder decomposition technique explains whether differences in wages between males and females are due to variations in characteristics between them or alternatively due to discrimination.

Tables (2) and (3) present the variables that are used in the estimation of the empirical model:

- 1- *Age*: The age of males in the sample ranges from 15 to 64 years old, while for the female sample it varies from 15 to 62 years. In addition, the mean value of age is 35.86 years for males and 36.34 years for females.
- 2- *W*: The wage of males ranges from 90 to 20340 pounds per month, while it ranges from 85 to 15000 pounds per month for females. Moreover, the mean value of wages is 709.5 and 536.4 Egyptian pounds per month for the samples of males and females, respectively. It is clear that, the wages of males per month are greater than females and this is the wage gap, which will be decomposed.
- 3- *lnW*: The mean value of the log wages is 6.2 and 5.95 for males and females, respectively.
- 4- *S*: The number of years of schooling (*S*) ranges from 0 to 20 years for both genders. Tables (2) and (3) show that, the mean value of *S* is greater for females (13.5 years) than males (10.9 years).
- 5- *T*: There is a difference in the mean value of the number of years of experience (*T*) between the samples of males and females. While the mean value of *T* is 19.9 years for males, it is only 17.3 years for females.

**Table (2): List of the Variables used in the Model (Sample of Males)**

<b>Variable</b>	<b>No. of Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Age</i>	5107	35.86	11.28	15	64
<i>W</i>	5107	709.5	1247	90	20340
<i>lnW</i>	5107	6.2	.7015	4.5	9.9
<i>S</i>	4675	10.9	5.046	0	20
<i>SS</i>	5107	132.3	94.27	0	400
<i>experience</i>	5107	19.9	12.89	0	58
<i>expexp</i>	5107	561.1	637.7	0	3364
<i>Urban/rural</i>	5107	.6015	.4896	0	1
<i>Marital Status</i>	5107	.7235	.4473	0	1
<i>Sector of emp.</i>	4373	.5657	.4957	0	1

Source: Author's calculations based on ELMPS 2006.

**Table (3): List of the Variables used in the Analysis (Sample of Females)**

<b>Variable</b>	<b>No. of Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Age</i>	1465	36.34	10.8	15	62
<i>W</i>	1465	536.4	839.5	85	15000
<i>lnW</i>	1465	5.95	.715	4.4	9.6
<i>S</i>	1412	13.49	3.14	0	20
<i>SS</i>	1465	185.1	76.5	0	400
<i>experience</i>	1465	17.34	11.42	0	54
<i>expexp</i>	1465	431.2	461.3	0	2916
<i>Urban/rural</i>	1465	.7727	.4192	0	1
<i>Marital Status</i>	1465	.661	.4736	0	1
<i>Sector of emp.</i>	1450	.761	.4268	0	1

Source: Author's calculations based on ELMPS 2006.

### • THE CHARACTERISTICS OF THE MALE AND FEMALE SAMPLES

Tables (2) and (3) illustrate that, the average earnings are 709.5 and 536.4 pounds per month for males and females, respectively. In addition, the average age is 35.86 years for males and 36.34 years for females, the average number of years of schooling is 10.9 years for males and 13.5 years for females, the average family size is 6 individuals for both genders and the average number of years of experience is 19.9 and 17.3 years for males and females, respectively.

Moreover, the average level of schooling of an individual's parents is low for both genders; however, the females' parents are more educated. It is found that, 60% and 77% of the male and female samples, respectively, live in urban areas. In addition, the data shows that, 72.4% and 66.1% of the samples of males and females, respectively, are married.

It is concluded that, 56.6% and 76.1% of the male and female samples, respectively, are employed in government and public enterprises. The average number of working days is 6 days per week for both genders and the average number of working hours is 8.6 and 7.5 hours per day for males and females, respectively.

#### 4. EMPIRICAL MODEL, ESTIMATION AND RESULTS

This section attempts to provide an answer to the question: “What are the determinants of the wage gap between males and females in the Egyptian labor market?” In order to do that, two methods of decomposition will be used. They rely on estimating log earnings functions based on “Human Capital Theory” for each gender separately. The standard Oaxaca-Blinder procedure is used to estimate the extent to which the overall wage gap between males and females can be explained by differences in observed human capital characteristics such as education and experience (Oaxaca 1973; Blinder 1973). Then, the Neuman-Oaxaca decomposition technique is applied to correct for the selectivity bias effect.

##### 4.1 THE EMPIRICAL MODEL

The earnings function is,

$$\ln W_j = B_0 + B_1 S_j + B_2 T_j + B_3 T_j^2 + u_j. \quad (1)$$

Where  $W$  represents the monthly wage of an individual,  $S$  reflects his/her years of schooling. The variable  $S = 0$  for illiterates,  $S = 6$  for primary education,  $S = 9$  for preparatory education,  $S = 12$  for secondary education,  $S = 14$  for above intermediate education,  $S = 16$  for university education and  $S = 20$  for post graduate studies. Furthermore,  $T_j$  represent the number of years of experience for individual  $j$ . It is assumed that this function exhibits positive but diminishing marginal returns to experience. The number of years of experience ( $T_j$ ) is calculated by using a simple rule, that is,

$$T_j = A_j - S_j - 6, \quad (2)$$

where  $A$  is the age of an individual and  $S$  is the number of years of schooling.

The earnings functions for males and females are,

$$\ln W_{mi} = b_0 + b_1 S_{mi} + b_2 T_{mi} + b_3 T_{mi}^2 + u_{mi} \quad (3)$$

$$\ln W_{fi} = B_0 + B_1 S_{fi} + B_2 T_{fi} + B_3 T_{fi}^2 + u_{fi} \quad (4)$$

The total difference in wages for both genders can be expressed by,

$$\Delta \ln W = \ln \bar{W}_m - \ln \bar{W}_f. \quad (5)$$

The Oaxaca-Blinder decomposition equation is,

$$\begin{aligned}\ln \bar{W}_m - \ln \bar{W}_f &= \bar{X}_m \hat{B}_m - \bar{X}_f \hat{B}_f + \bar{X}_f \hat{B}_m - \bar{X}_f \hat{B}_m \\ \therefore \ln \bar{W}_m - \ln \bar{W}_f &= (\bar{X}_m - \bar{X}_f) \hat{B}_m + (\hat{B}_m - \hat{B}_f) \bar{X}_f\end{aligned}\quad (6)$$

Where the first term  $(\bar{X}_m - \bar{X}_f) \hat{B}_m$  refers to differences in characteristics between males and females and the second term  $(\hat{B}_m - \hat{B}_f) \bar{X}_f$  captures the discrimination effect.

The selectivity-corrected wage equation is,

$$\ln \bar{W}_m - \ln \bar{W}_f = (\bar{X}_m - \bar{X}_f) \hat{B}_m + (\hat{B}_m - \hat{B}_f) \bar{X}_f + (\hat{\theta}_m \hat{\lambda}_m - \hat{\theta}_f \hat{\lambda}_f). \quad (7)$$

Where the term  $(\hat{\theta}_m \hat{\lambda}_m - \hat{\theta}_f \hat{\lambda}_f)$  denotes the selectivity bias effect.

## 4.2 ESTIMATION AND RESULTS

### • RESULTS OF WAGE FUNCTIONS ESTIMATION

Tables (4) and (5) present the results of estimation of the wage functions for males and females. The results show that, the private rate of return to education is 3.9% for males and 8.3% for females. It is clear from the results that, there is a positive relationship between the number of years of experience and the earnings for both genders. In addition, the wages of males and females will increase at a decreasing rate as the number of years of experience increases, because  $b_3$  is negative in tables (4) and (5).

Moreover, the rate of return to the number of years of experience is 1.91% for males and 3.56% for females. In other words, each additional year of experience will increase the wages by 1.91% and 3.56% for the samples of males and females, respectively.

**Table (4): The Regression Results of Wage Function (Males' Sample)**

<i>lnY</i>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t</b>	<b>P&gt;  t </b>
<i>S</i>	.0380302	.0021382	17.79	0.000
<i>experience</i>	.0294937	.0027469	10.74	0.000
<i>expexp</i>	-.0002667	.0000597	-4.47	0.000
<i>cons</i>	5.382155	.0382285	140.79	0.000

Source: Author's calculations based on ELMPS 2006.



**Table (5): The Regression Results of Wage Function (Females' Sample)**

<i>lnY</i>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t</b>	<b>P&gt;  t </b>
<i>S</i>	.0801928	.0052082	15.40	0.000
<i>experience</i>	.0440133	.004959	8.88	0.000
<i>expexp</i>	-.0002621	.0001319	-1.99	0.047
<i>cons</i>	4.251109	.0833718	50.99	0.000

Source: Author's calculations based on ELMPS 2006.

### • OAXACA-BLINDER GENDER WAGE GAP DECOMPOSITION RESULTS

As mentioned above, the first method of decomposition is simple and it depends on the Oaxaca (1973) and Blinder (1973) decomposition technique. By subtracting the earnings functions by parts, it is possible to decompose the earnings gap into two different components. The first component is the part of the gap that can be attributed to the differences in mean human capital characteristics of the two groups and this component is called differences in characteristics. The second component is the part of the gap that can be attributed to differences in the estimated parameters of the earnings functions of males and females, this part is called discrimination. This method of decomposition can be illustrated by equation (6).

The results of the estimation of gender wage differentials using the Oaxaca-Blinder decomposition technique are illustrated in table (6). The mean value of real monthly wages amounted to 709.5 Egyptian pounds for males and 536.4 Egyptian pounds for females in 2006 (The wage gap is:  $709.5 - 536.4 = 173.1$  Egyptian pounds). The characteristics of the sample imply that the average number of years of schooling *S* is greater for females (13.5 years) than males (10.9 years). Given the characteristics of the females' sample, the estimation of the model implies that, without discrimination against women, their monthly wages should equal 749.8 Egyptian pounds. This means that, due to discrimination; females are receiving 213.4 Egyptian pounds less in terms of their real monthly wages. The value of discrimination represents 39.8% of the mean value of real monthly wages they are actually receiving.

**Table (6): Oaxaca-Blinder Wage Decomposition Results**

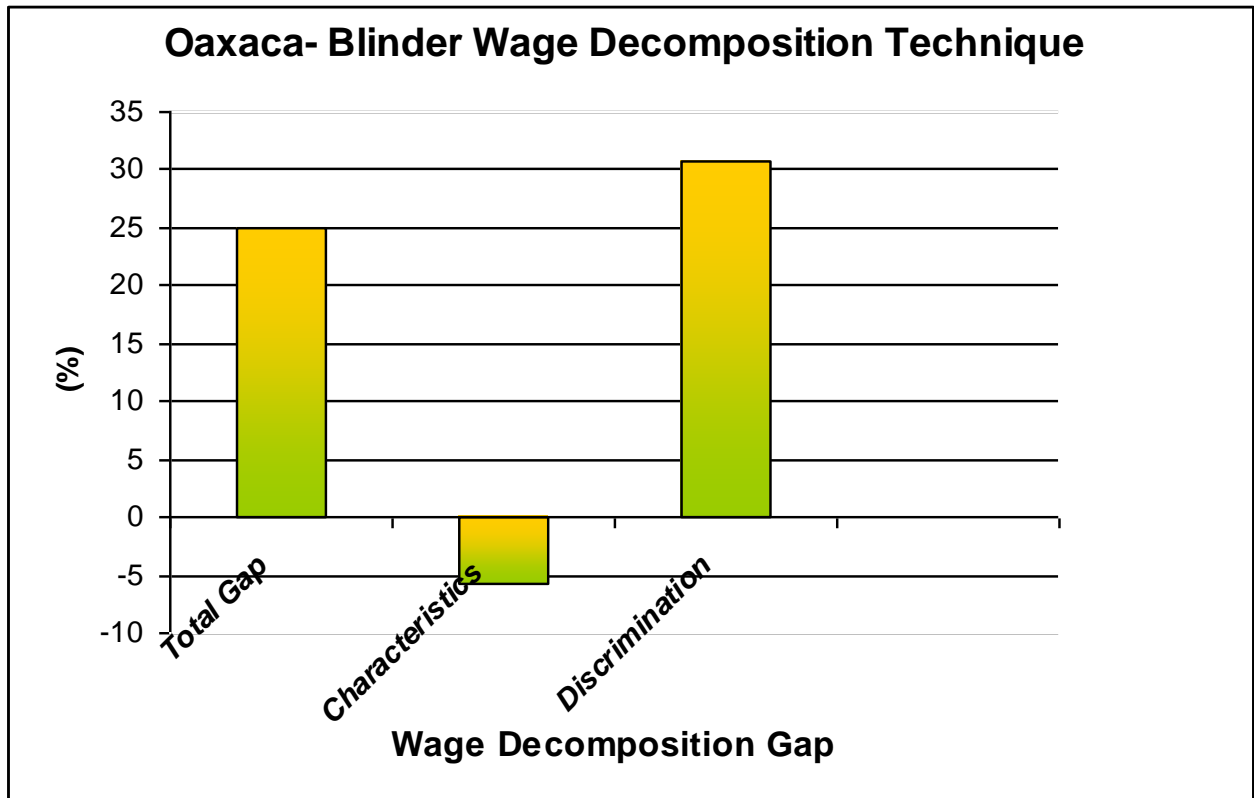
<b>Wage Decomposition components</b>	<b>Males</b>	<b>Females</b>
<b>Mean value of real monthly wages</b>	709.5	536.4
<b>Overall wage gap</b>	<b>173.1</b>	
<b>Endowments effect</b>		-40.3
<b>Discrimination effect</b>		213.4
<b>Wage without discrimination effect</b>		749.8

(1) All values in the table are in Egyptian pounds.

Source: Author's calculations based on ELMPS 2006.

Figure (3) reports the results of the Oaxaca-Blinder wage decomposition. The overall gap is attributed to discrimination. The data ascertains that males have higher potential years of experience and females have more years of education that made them better endowed in terms of overall human capital characteristics. It is estimated that, the wage gap is 25%, where  $\ln \bar{W}_m - \ln \bar{W}_f = 0.25$ , the endowments or characteristics effect is -5.8, where  $(\bar{X}_m - \bar{X}_f)\hat{B}_m = -0.058$  and the discrimination effect is 30.8%, where  $(\hat{B}_m - \hat{B}_f)\bar{X}_f = 0.308$ . The discrimination effect includes differences in coefficients in addition to differences in the constant term.

**Figure (3): Oaxaca- Blinder Wage Decomposition Technique**



Source: Author's calculations based on ELMPS 2006.

#### • NEUMAN-OAXACA GENDER WAGE GAP DECOMPOSITION RESULTS

The second method of decomposition is more complicated and it depends on wage decomposition with selectivity-corrected wage equation adopted by Neuman and Oaxaca (2004). The estimates of males and females wage equations adopted Heckman's two step estimates with correction for selection bias. The fact that some people have chosen to work as employees in the public/private sector could be a random choice. However, problems arise when those employees have some common characteristics that are responsible for their particular choice. In order to account for the selection bias effect on the earnings function, the two-stage selectivity correction method is used (Heckman, 1979). This method can be illustrated by equation (8), in which:

$$\ln \bar{W}_m - \ln \bar{W}_f = (\bar{X}_m - \bar{X}_f) \hat{B}_m + (\hat{B}_m - \hat{B}_f) \bar{X}_f + (\hat{\theta}_m \hat{\lambda}_m - \hat{\theta}_f \hat{\lambda}_f) \quad (8)$$

where  $\ln \bar{W}$  is the mean value of log wage,  $\bar{X}$  is the mean vector of wage determining variables i.e. the number of years of education and the number of years of experience,  $\hat{B}$  is vector of coefficients i.e. the estimated returns to the wage determinants,  $\hat{\theta}$  is an estimate of  $\rho\sigma_u$  and  $\hat{\lambda}$  is an estimate of the mean Inverse Mills Ratio (IMR). The first two terms in this equation are the

discrimination and human capital components. Moreover, the last term signifies the selectivity bias effect.

According to this method, a selection equation using the two-stage Heckman selection model of the probability of employment in the private sector is estimated for males and females separately [see tables (7) and (8)]. The explanatory variables are the number of years of education, age, dummy variable for residence in urban or rural areas and marital status. Then, the Inverse Mill's Ratio (IMR) is calculated and the earnings functions are re-estimated separately for males and females and subtracted by parts to get the new decomposition of the gender earnings gap that includes a third component, corresponding to selectivity.

**Table (7): Heckman Selection Model -- Two-Step Estimates (Sample of Males)**

	Coefficient	Std. Err.	z	P> z	[95% Conf. Interval]	
ln W						
S	0.0460321	0.0093177	4.94	0.000	0.0277697	0.0642944
experience	0.0494474	0.0068097	7.26	0.000	0.0361006	0.0627942
expexp	-0.0006405	0.0001008	-6.36	0.000	-0.000838	-0.000443
_cons	5.141805	0.1002343	51.30	0.000	4.945349	5.33826
Sector of employment						
S	-0.0728771	0.0047995	-15.18	0.000	-0.0822839	-0.0634703
age	-0.0646856	0.0027429	-23.58	0.000	-0.0700616	-0.0593095
urban/rural	0.3587335	0.0477924	7.51	0.000	0.2650622	0.4524048
marital status	-0.2777026	0.05833	-4.76	0.000	-0.3920274	-0.1633778
_cons	2.935747	0.1086344	27.02	0.000	2.722828	3.148667
mills						
lambda	0.030174	0.1164952	0.26	0.796	-0.1981523	0.2585004
rho	0.04754					
sigma	0.63467632					
lambda	0.03017405	0.1164952				

Source: Author's calculations based on ELMPS 2006.

**Table (8): Heckman Selection Model -- Two-Step Estimates (Sample of Females)**

	Coefficient	Std. Err.	z	P> z	[95% Conf. Interval]	
ln W						
S	0.0903815	0.0089856	10.06	0.000	0.0727701	0.107993
experience	0.039431	0.0074317	5.31	0.000	0.0248651	0.0539969
expexp	-0.0001053	0.0001609	-0.65	0.513	-0.0004207	0.0002101
_cons	4.109094	0.1979487	20.76	0.000	3.721122	4.497067
Sector of employment						
S	0.1050601	0.0140692	7.47	0.000	0.077485	0.1326352
age	0.0636172	0.0051356	12.39	0.000	0.0535517	0.0736828
urban/rural	-0.4610893	0.1149472	-4.01	0.000	-0.6863817	-0.2357969
marital status	0.8008961	0.0936082	8.56	0.000	0.6174273	0.9843648
_cons	-2.892989	0.2618105	-11.05	0.000	-3.406128	-2.37985
mills						
lambda	0.0351295	0.1045332	0.34	0.737	-0.1697518	0.2400108
rho	0.06306					
sigma	0.55709517					
lambda	0.03512947	0.1045332				

Source: Author's calculations based on ELMPS 2006.

The results of the estimation of gender wage differentials using Neuman-Oaxaca wage decomposition technique are displayed in table (9). The estimation of the model implies that, without discrimination against women, their monthly wages should be equal to 797.5 Egyptian pounds. This means that, due to discrimination; females are receiving 261.1 Egyptian pounds less in terms of their real monthly wages. Furthermore, the value of selectivity bias effect is -34.8 Egyptian pounds; this value is small but it reduces the gender wage gap.

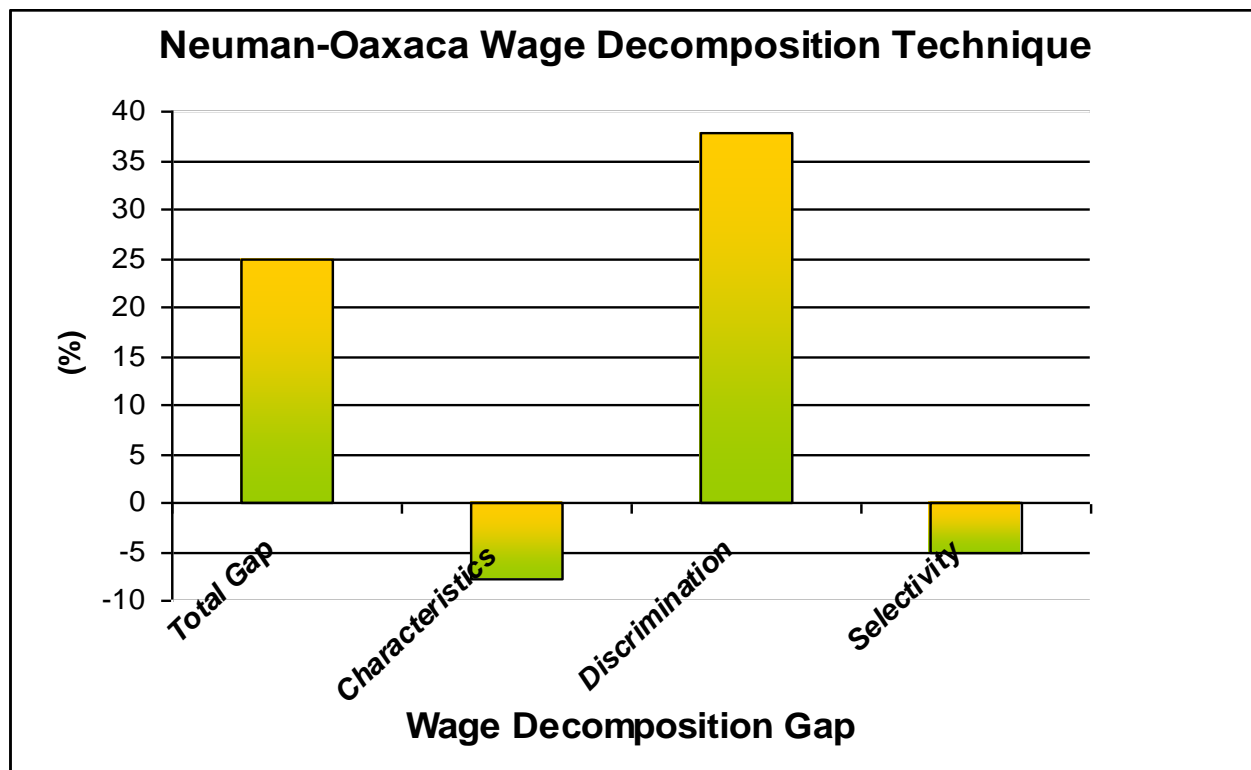
**Table (9): Neuman-Oaxaca Wage Decomposition Results**

Wage Decomposition components	Males	Females
Mean value of real monthly wages	709.5	536.4
Overall wage gap	173.1	
Endowments effect		-53.2
Selectivity effect		-34.8
Discrimination effect		261.1
Wage without discrimination effect		797.5

Source: Author's calculations based on ELMPS 2006.  
All values in the table are in Egyptian pounds.

Figure (4) demonstrates the results of the Neuman-Oaxaca wage decomposition. It is estimated that, the endowments or characteristics effect is -7.7%, where  $(\bar{X}_m - \bar{X}_f)\hat{B}_m = -0.077$ , the selectivity effect is -5%, where  $(\hat{\theta}_m\hat{\lambda}_m - \hat{\theta}_f\hat{\lambda}_f) = -0.05$  and the discrimination effect is 37.7%, where  $(\hat{B}_m - \hat{B}_f)\bar{X}_f = 0.377$ . The results illustrated in figure (4) take into account the issue of selectivity in the private/public sector jobs, using the Neuman and Oaxaca (2004) method of decomposition. It appears that the effect of selectivity is small, but it tends to reduce the gender gap. For example, without selectivity in 2006 the earning gap as a proportion of the average male wage (LE709.5) would be 5% higher (i.e. LE745). Again, the observed wage gap is attributed totally to the discrimination effect, while differences in human capital characteristics tend to decrease the earnings gap between the two genders.

**Figure (4): Neuman-Oaxaca Wage Decomposition Technique**



Source: Author's calculations based on ELMPS 2006.

## 5. CONCLUSION

This paper concentrates on wage gap differentials in Egypt in order to help government and decision-makers involved in the design of the wage policy control for the income inequalities and distortion of wages between males and females in the Egyptian labor market. The findings of this paper help in understanding the wage gap between males and females in Egypt by determining differences in wages due to real variations in characteristics between both genders and other differences due to discrimination against women. This study uses ELMPS (2006) to estimate the size of the gender wage gap in Egypt. The data shows that the real monthly wages are higher for males than females.

The Oaxaca-Blinder decomposition of the gender wage gap demonstrates that the gap is due to the discrimination against women in the labor market, not to low levels of human capital characteristics (i.e. lower education levels or less experience). Using the Neuman and Oaxaca (2004) method of decomposition, it appears that the effect of selectivity is small, but it tends to reduce the gender gap. For example, without selectivity in 2006 the earning gap as a proportion of the average male wage would be 5% higher. Again, the observed wage gap is attributed totally to the discrimination effect, while differences in human capital characteristics tend to decrease

the earnings gap between the two genders. To decrease this wage gap, labor standards need to be promoted, especially in the private sector. There is a need for stronger versions of anti-discrimination legislation, such as an equal pay rule and a regulation which forbids discrimination in job ranks, pay scales and the criteria for entrance into the labor market. Actually, article 35 of the unified labor law of 2003 prohibits wage discrimination based on gender, but this law should be more strongly enforced.

The main recommendation of this paper is that several costs, which make the employment of females more expensive to the employer, should be decreased in order to give males and females an equal opportunity in the labor market. Given the encouraging environment (e.g. benefits of contracts, paid vacations for child care and sick leave and medical insurance) for women in the government and publicly owned enterprises compared to the private sector and the lower levels of discrimination in that sector, it is expected that the burden of privatization and civil service downsizing may negatively affect the already low levels of participation rates of females, unless efforts are made to reduce gender discrimination in the private sector. At present, changes in wage policy are driven by a philosophy that fits poorly with how labor demand and labor supply are changing. For future policy, the key challenge is to work with institutional arrangements and do the best that is possible to capture the benefits of both coordination and flexibility. This will provide a basis for generating labor market standards appropriate to males and females as well. Finally, there is an essential need for wage policy reform, based on linking wages to productivity.



## REFERENCES

- Abdelhamid, D. and L. El Baradei. (2010). "Reforming the Pay System for Government Employees in Egypt." *International Public Management Review*, Vol. 11 (3).
- Assaad, R. (1997). "The Effects of Public Sector Hiring and Compensation Policies on the Egyptian Labor Market." *The World Bank Economic Review*, Vol. 11(1).
- Assaad, R. (1999). "Matching Severance Payments with Worker Losses in the Egyptian Public Sector." *World Bank Economic Review*, Oxford Journals, Vol. 13(1).
- Assaad, R. and C. Krafft. (2013). "The Structure and Evolution of Employment in Egypt: 1998-2012." *Economic Research Forum*, Working Paper No. 805.
- Becker, G., (1971). *The Economics of Discrimination*. Chicago: University of Chicago Press.
- Blinder, A. (1973). "Wage Discrimination: Reduced Form and Structural Elements." *Journal of Human Resources*, Vol. 8(4).
- Blau, F. and L. Kahn. (2000). "Gender Differences in Pay." *Journal of Economic Perspectives*, Vol. 14 (4).
- CAPMAS. Central Agency for Public Mobilization and Statistics. (2013). *Egypt in Figures*, Arab Republic of Egypt.
- CAPMAS. Central Agency for Public Mobilization and Statistics. (2013). *Annual Statistical Book*, Labor Force, Arab Republic of Egypt.
- Economic Research Forum and Central Agency for Public Monetization and Statistics (2006). *Egypt Labor Market Panel Survey*. Location: <http://www.erfdataportal.com/index.php/catalog/27>
- Economic Research Forum and Central Agency for Public Monetization and Statistics (2012). *Egypt Labor Market Panel Survey*. Location: <http://www.erfdataportal.com/index.php/catalog/45>
- El-Hamidi, F. and M. Said. (2005). "Wage Inequality by Education and Gender in MENA: Contrasting the Egyptian and Moroccan Experiences in the 1990s." 12<sup>th</sup> Annual Conference of the Economic Research Forum (ERF), December 19, 2005.
- Görlich, D. and A. de Grip. (2008). "Human Capital Depreciation during Home Time." *Oxford Economic Papers*, Vol. 61.
- Haas, S. (2006). "Economic Development and the Gender Wage Gap." *Illinois Wesleyan University, Department of Economics, Honors Projects*, Paper 1.
- Heckman, J. (1979). "Sample Selection Bias as a Specification Error." *Econometrica*, Vol. 47.

ILO. International Labor Organization. (2010). *Women in Labor Markets: Measuring Progress and Identifying Challenges*. ILO: Geneva.

Herrera, S. and K. Badr. (2011). "Why Does Productivity of Education Vary across Individuals in Egypt? Firm Size, Gender and Access to Technology as Sources of Heterogeneity in Returns to Education." Policy Research Working paper Series 5740, *World Bank*, Washington, DC.

International Labor Organization (1970). Minimum Wage Fixing Convention. Geneva, 54th ILC session, No. 170

Kanellopoulos, C. and K. Mavromaras. (1999). "Male-Female Labor Market Participation and Wage Differentials in Greece." *The Centre of Planning and Economic Research*, No. 70.

Mincer, J. (1958). "Investment in Human Capital and Personal Income Distribution." *Journal of Political Economy*, Vol. 66.

Mincer J. (1974). *Schooling, experience and earnings*, Columbia University Press, New York.

Neuman, S. and R. Oaxaca. (2004). "Wage Decompositions with Selectivity-Corrected Wage Equations: A Methodological Note." *Journal of Economic Inequality*, Vol. 2.

Oaxaca, R. (1973). "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review*, Vol.14 (3).

Schafgans, M. and M. Stelcner. (2006). "Selectivity and the Gender Wage Gap Decomposition in the Presence of a Joint Decision Process." *The Suntory Centre, Suntory and Toyota International Centres for Economics and Related Disciplines, London School of Economics and Political Science*, Discussion paper No. EM/2006/513.

Shaban, R., R. Assaad and S. Al-Qudsi. (1993). "Labor Markets in Arab Countries: A Survey." Paper presented to the First Annual Conference on Development Economics, Initiative to Encourage Economic Research in the Middle East and North Africa, Cairo, June 4-6, 1993.

Wood, R., M. Corcoran and P. Courant. (1993). "Pay Differences among the Highly Paid: The Male-Female Earnings Gap in Lawyers' Salaries." *Journal of Labor Economics* Vol. 11 (3).

World Development Report. (2012). *Gender Differences in Employment and Why They Matter*. Chapter 5.

World Bank. (2010). *Arab Republic of Egypt: Gender Assessment 2010: Narrowing the Gap, Improving labor Market Opportunities for Women in Egypt*. World Bank, Washington, DC.

World Bank. (2011). *Women Business and the Law: Measuring Legal Gender Parity for Entrepreneurs and Workers in 128 Economies*. World Bank, Washington, DC.

Yasin, G., I. Chaudhry and S. Afzal. (2010). "The Determinants of Gender Wage Discrimination in Pakistan: Econometric Evidence from Punjab Province." *Asian Social Science*, Vol. 6 (11).