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Gender Wage Disparities in Egypt: Evidence from ELMPS 2006 and 2012

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Abstract

This paper focuses on estimating wage differentials between males and females in Egypt to understand the determinants of the gender wage gap. The methodology depends on Oaxaca-Blinder and Neuman-Oaxaca decomposition techniques, using the data of the Egypt Labour Market Panel Survey 2006 and 2012 (ELMPS 2006, 2012). The findings of this paper determine the differences in wages due to real variations in characteristics between both genders, for example, education, experience, living in urban or rural areas, the marital status and the sector of employment and other differences, due to discrimination against women in addition to unobservables differences. It is estimated that the wage gap between males and females was 25% and 21% in 2006 and 2012, respectively, and that is a sign of improvement. Part of this gap can be explained by the fact that females are less likely to have high-level and high-paying jobs than males. Moreover, unobservables like non-cognitive skills or psychological characteristics are considered innovative explanations for the gender wage gap.

Keywords: Income Inequalities, Wage differentials, Oaxaca decomposition technique, Egypt.

1. Introduction

In recent decades, male-female earning differentials have been studied in many developed and developing countries around the world. Accordingly, gender wage inequality has received great attention in the economic literature. The importance of this issue stems from the fact that it affects a substantial number of people, i.e. it affects women, their children and future generations as well. If the determinants of the gender wage gap are captured, policy could be implemented to reduce income disparities.

The existence of such differentials may be attributed to discrimination against women in the labour market. It has been asserted that discrimination has important economic, political and social consequences which call for corrective actions. Female jobs do pay less than male jobs, but 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 labour market discrimination. However, it could reflect additional unobserved or unmeasured differences in worker and job characteristics between males and females (Wood et al., 1993 and 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 that are unique to a firm, or occupations where skills do not depreciate significantly because of career interruptions, helps in explaining the selection bias 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 and ILO, 2010).

This paper focuses on estimating wage differences between male and female workers in Egypt, in order to understand the determinants of the gender wage gap and allow for this variation. The methodology depends on using Oaxaca-Blinder decomposition technique and examining the selection bias effect by using Neuman-Oaxaca decomposition technique. The selectivity-corrected wage equation is used to allow for any bias or inconsistency in estimators. 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. The selection bias can be measured by examining correlations between exogenous variables and a treatment indicator, as illustrated by Heckman (1979). It is estimated that the wage gap between males and females is 25% and 21% in 2006 and 2012, respectively. This wage gap can be totally explained by the discrimination effect, if the unobservables are not taken into consideration. Actually, uncontrolled factors, like non-cognitive skills or psychological characteristics, are considered to be innovative explanations for the gender wage gap. The results ascertain that public sector employees earn more than private sector workers. Moreover, marital status narrows the wage differential.

This paper proceeds as follows; section two presents the literature review. Section three introduces some stylised facts about the public wage system in Egypt and the profile of the Egyptian labour market. The fourth section explains the data and the characteristics of the male and female samples. Section five proposes the empirical model, its estimation and the results of the regression analysis. Section six concludes.

2. Literature Review

There are large numbers of previous studies into 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 labour 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 labour 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 labour 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 favour 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 programmes, 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-paying 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 Egyptian and Moroccan markets using joint models of educational choice and wage determination. Their empirical analysis is based on the 1988 and 1998 Egypt Labour 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 liberalisation 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 jumped extremely 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 Stelcnery (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 analysed the gender earnings differential using Canadian census data. They found that adding additional allowances for field of study did not significantly affect the decomposition analysis, but there was some reduction in discrimination when additional allowances for occupation and industry were added.

Hass (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 a country's economic development, 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 analysed the relationship between 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 emphasises 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 analysed the determinants of gender wage discrimination in Pakistan using descriptive and regression analysis, based on the cross-sectional data of the Pakistan labour force survey. It concluded that illiteracy, poor and low levels of education, as well as low vocational, technical and professional competence are important features of labour market participants in Pakistan. The results of empirical analysis showed that dissimilarity in 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, as compared to men in some cases.

Goldin and Katz. (2016) investigated the gender wage gap and penalty to part-time work, particularly in pharmacy. The data used in their analysis included American community and population surveys, the census of the United States, in addition to some other pharmacists' surveys. They found that, pharmacy occupation is the most equitable among other jobs i.e. a "female-friendly profession". The authors argued that, in order to decrease the wage gap and penalty to part-time work, pharmacy employment in hospitals and retail markets should be increased and independent pharmacies should be decreased.

Blau and Kahn (2017) estimated the wage gap in the United States by using the Michigan Panel Study of Income Dynamics for the period 1980 to 2010. The authors found that the wage gap decreased significantly during this period. The results showed that the human capital characteristics and other non-cognitive skills and abilities play a slight role in explaining the gender wage gap. On the contrary, occupation and industry effects, differences in gender roles and discrimination effects are the most important factors that can explain the gender earnings gap.

As mentioned above, a large number of authors have studied the gender wage differentials between males and females in different countries. It is a fact that, in some countries, on average, males have higher wages than females. There are some factors, for example, human capital and occupational variances, that can explain a part of this wage gap. In this paper, I focus on estimating wage differences between males and females in Egypt, in order to understand the determinants of gender wage gap. The study helps in determining differences in wages, due to real variations in characteristics between both genders and other differences due to discrimination against women or other unobservables, by using Oaxaca-Blinder decomposition technique and examining the selection bias effect using Neuman-Oaxaca decomposition technique, depending on ELMPS 2006 and 2012.

3. Stylised Facts

The Egyptian Labour Market: Trends and Profile

The main components of the labour market in Egypt are a large public sector, a growing private sector and an informal sector. For a long time, the government guarantees 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 programme, initiated in 1991. The government has increased the waiting period for government appointments. As a result, public sector work force growth rate declined and private sector growth rate increased, resulting from the privatisation process. Moreover, pay and work conditions have changed, resulting from the changes in the labour market structure (Assad, 1997).

Gender differences in labour 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, male and female 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 labour market (World Development Report, 2012).

In Egypt, it is a fact that marriage has usually been associated with a decline in female labour force participation. Some women rejoin the labour 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 government employees. Moreover, increases in the age of marriage and declines in the percentage of fertility are, thus, likely to have contributed to higher participation rates. To summarise, the impact of economic development and changes in the levels of education and family formation on female labour force participation vary across individuals and regions and depend on institutions and individual preferences. Work in the public sector is more compatible with women's needs since it offers shorter hours, more access to childcare and greater assistance with maternity leave. 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).

The labour force in Egypt has increased from 19.3 million in 2001 to 28.9 million in 2016; however, the female labour force has only increased from 4.1 million in 2001 to 7 million in 2016. In contrast, male labour force participation rates have been increasing over this period; in fact, the male labour force has increased from 15.2 million in 2001 to 21.9 million in 2016 (See table 1).

Table (1): Labour Force Participation by Gender (2001-2016)
(Unit used: Million)

	2001	2006	2011	2012	2016
Total Labour Force	19.3	22.9	26.5	27	28.9
Male Labour Force	15.2	17.8	20.5	20.9	21.9
Female Labour Force	4.1	5.1	6	6.1	7

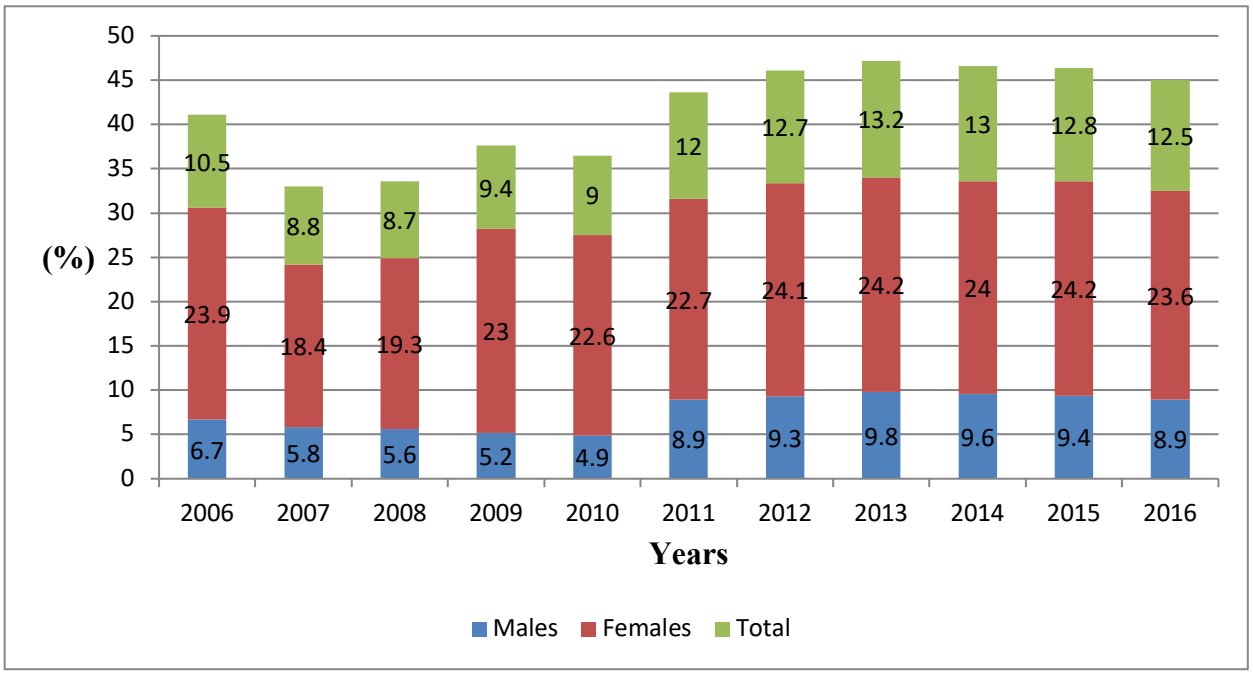
***Source**: Carried out by the author based on CAPMAS, Egypt in Figures, 2018, 2017 and 2010 and Labour Force Sample Survey (LFSS), 2001.*

There have been substantial changes to the composition of employment over time in Egypt. The public sector employed 25% of the workforce in 2006 and 26% in 2012. Public enterprises continued to decrease, from 5% in 2006 to 4% of employment in 2012. Moreover, formal private regular wage employment has increased from 9% in 2006 to 11% in 2012, while the informal private regular wage employment has decreased from 17% in 2006 to 15% in 2012. Comparing between ELMPS 2006 and 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% in 2012. Regarding males and females, there has been a minor decrease in the share of the public sector in male and female employment over the period from 2006 to 2012. A small increase in formal private regular work has occurred over time among males and females. Informal private regular wage work decreased among males over the period from 2006 to 2012. 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 were engaged in irregular wage work over the period of 2006 to 2012 (Assaad and Krafft, 2015).

In terms of unemployment, the male unemployment rate as reported by the Labour Force Sample Surveys (LFSSs) conducted by Central Agency for Public Mobilisation 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 25th of January Egyptian revolution. It then increased in 2012 to 9.3% and it reached 8.9% in 2016. 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. In particular, the female unemployment rate was not heavily affected by the revolution; it increased from 22.6% in 2010 to 22.7% in 2011 and reached 24.1% in 2012 and 23.6% in 2016. Furthermore, the overall unemployment rate increased from 10.5% in 2006 to 12.7% in 2012 and it reached 12.5% in 2016 (CAPMAS,

Egypt in Figures, 2018, 2017 and 2010, CAPMAS, Annual Statistical Book, 2013 and Labour Force Sample Survey (LFSS), 2012).

Figure (1): Unemployment Rates by Gender in Egypt (2006-2016)



Source: Carried out by the author based on CAPMAS, Egypt in Figures, 2018, 2017 and 2010, CAPMAS, Annual Statistical Book, 2013 and Labour Force Sample Survey (LFSS), 2012.

4. Data, Methodology and Analysis

4.1 Data

The data used in the analysis is obtained from the national data ELMPS 2006 and 2012, which was presented by CAPMAS in cooperation with the Economic Research Forum (ERF). The questionnaire of the ELMPS 2006 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 ELMPS 2012 intends to analyse the characteristics of the Egyptian labour market. It is considered as a follow-up survey to the same households that were interviewed in 2006, in addition to a new sample, which was selected within a random sample to participate in the survey, in order to be able to analyse the evolution of the labour market in Egypt over time. The questionnaire of the ELMPS 2012 consists of three chapters. The first chapter introduces the household questionnaire that contains information on basic characteristics, housing

services and facilities, and durable goods. The second chapter presents the individual questionnaire that includes information on father's and mother's characteristics, siblings and health, in addition to detailed education histories and earnings. The third chapter proposes information about migration, remittances, non-agricultural and agricultural enterprises.

The size of the male sample is 5107 and 5853 individuals and the size of the female sample is 1465 and 1729 individuals in 2006 and 2012, respectively. The samples contain waged workers whose ages range from 15 to 64 years. Those individuals answer all the questions needed for the estimation of Mincerian equation and basic earnings functions and the equation that determines the wage differentials between males and females.

4.2 Methodology and Descriptive Statistics

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 analysing wage differentials between males and females by using Oaxaca and Blinder decomposition technique. Oaxaca and 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:

- *Age*: The age of the male sample ranged from 15 to 64 years old in 2006 and 2012, while for the female sample, it varied from 15 to 62 years in 2006 and from 15 to 64 years in 2012. In addition, the mean values of age were 35.86 years in 2006 and 36.5 years in 2012 for males. On the other hand, the mean values of age for females were 36.34 and 37.43 years in 2006 and 2012, respectively.
- *W*: The wages of males ranged from 90 to 20340 Egyptian pounds per month in 2006 and from 300 to 34000 Egyptian pounds per month in 2012, while it ranged from 85 to 15000 Egyptian pounds per month for females in 2006 and from 240 to 28581 Egyptian pounds per month in 2012. Moreover, the mean values of wages were 709.5 and 536.4 Egyptian pounds per month for the samples of males and females, respectively in 2006. They reached 3576.79 and 2980.26 Egyptian pounds per month for the samples of males and females, respectively in 2012. It is clear that the monthly wages of males are greater than for females and this is the wage gap, which will be decomposed.
- *lnW*: The mean values of the log wages were 6.2 and 5.95 for males and females, respectively in 2006. In 2012, these values were 7.95 and 7.75 for males and females, respectively.
- *S*: The number of years of schooling (*S*) ranged from 0 to 20 years for both genders in 2006 and it ranged from 0 to 16 years for males and females in 2012. Tables (1) and (2) show that the mean value of *S* was greater for females than males in 2006 and 2012.
- *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 values of *T* were 19.9 and 16.9 years for males in 2006 and 2012, respectively, they were 17.3 and 17.9 years for females in 2006 and 2012, respectively. Potential experience may differ from the actual experience, especially for women, because of the discontinuity in labour force participation, due to their household and motherhood responsibilities.

- *U/R*: This variable identifies whether an individual lives in urban or rural areas, while *MS* refers to the marital status of the individual. Moreover, *SE* denotes the sector of employment (governmental/private sector).
- *ND*: It symbolises the number of working days per week, whereas *NH* represents the number of working hours per day.

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

Variable	No. of Observations		Mean		Std. Dev.		Min.		Max.	
	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012
Age	5107	5831	35.86	36.48	11.28	10.85	15	15	64	64
W	5107	5831	709.5	3576.79	1247	3184.8	90	300	20340	34000
lnW	5107	5831	6.2	7.952	0.702	0.654	4.5	5.7	9.9	10.4
S	4675	5830	10.9	11.3	5.05	4.61	0	0	20	16
T	5107	5759	19.9	16.9	12.89	11.13	0	0	58	58
T^2	5107	5831	561.1	404.3	637.7	479.8	0	0	3364	3364
U/R	5107	5831	0.602	0.524	0.489	0.499	0	0	1	1
MS	5107	5831	0.724	0.794	0.447	0.404	0	0	1	1
SE	4373	5831	0.566	0.500	0.496	0.500	0	0	1	1
ND	5106	5751	5.926	5.77	0.677	0.867	2	1	7	7
NH	5106	5751	8.581	8.695	1.957	2.355	1	1	24	24

***Source**: Author's calculations based on ELMPS 2006 and 2012.*

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

Variable	No. of Observations		Mean		Std. Dev.		Min.		Max.	
	2006	2012	2006	2012	2006	2012	2006	2012	2006	2012
Age	1465	1728	36.34	37.43	10.8	10.9	15	15	62	64
W	1465	1728	536.4	2980.26	839.5	2580	85	240	15000	28581
lnW	1465	1728	5.95	7.746	0.715	0.714	4.4	5.5	9.6	10.3
S	1412	1723	13.49	13.55	3.14	3.44	0	0	20	16
T	1465	1728	17.34	17.91	11.42	11.91	0	0	54	58
T²	1465	1728	431.2	462.6	461.3	496.5	0	0	2916	3364
U/R	1465	1728	0.773	0.679	0.419	.467	0	0	1	1
MS	1465	1728	0.661	0.718	0.474	0.450	0	0	1	1
SE	1450	1728	0.761	0.818	0.427	0.386	0	0	1	1
ND	1464	1701	5.781	5.485	0.567	0.660	1	1	7	7
NH	1464	1701	7.547	7.178	1.552	1.531	1	1	15	14

Source: Author's calculations based on ELMPS 2006 and 2012.

5. 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 labour market?" In order to do that, two methods of decomposition will be used. These methods 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.

5.1 The Empirical Model

The simple earnings function is,

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

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 represents the number of years of experience for individual j. It is assumed that this function exhibits positive but diminishing marginal returns from experience. The number of years of experience (T_j) is calculated by using a simple rule, that is,

$$T_j = A_j - S_j - 6. \qquad (2)$$

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,

$$\ln W_{mi} = b_0 + b_1 S_{mi} + b_2 T_{mi} + b_3 T_{mi}^2 + b_4 UR_{mi} + b_5 MS_{mi} + b_6 SE_{mi} + b_7 ND_{mi} + b_8 NH_{mi} + u_{mi} \quad (3)$$

$$\ln W_{fi} = B_0 + B_1 S_{fi} + B_2 T_{fi} + B_3 T_{fi}^2 + B_4 UR_{fi} + B_5 MS_{fi} + B_6 SE_{fi} + B_7 ND_{fi} + B_8 NH_{fi} + u_{fi} \quad (4)$$

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

$$\Delta \ln W = \ln \overline{W}_m - \ln \overline{W}_f \qquad (5)$$

The Oaxaca-Blinder decomposition equation is,

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

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

The selectivity-corrected wage equation is,

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

Where the term $(\hat{\theta}_m\hat{\lambda}_m - \hat{\theta}_f\hat{\lambda}_f)$denotes the selectivity bias effect. The selectivity-corrected wage equation is used to allow for any bias or inconsistency in estimators. The term $(\hat{\theta}_m\hat{\lambda}_m - \hat{\theta}_f\hat{\lambda}_f)$ is composed of two symbols i.e. $\hat{\theta}$ and $\hat{\lambda}$, in which, the parameter ($\hat{\theta}$) is identified as the product of the standard deviation of the errors in the wage equation (σ_u) and the correlation between the wage equation error and the selection equation error (ρ), and $\hat{\lambda}$ is an estimate of the mean Inverse Mills Ratio (IMR). Heckman (1979) stated that the selection bias can be measured by examining correlations between exogenous variables and a treatment indicator.

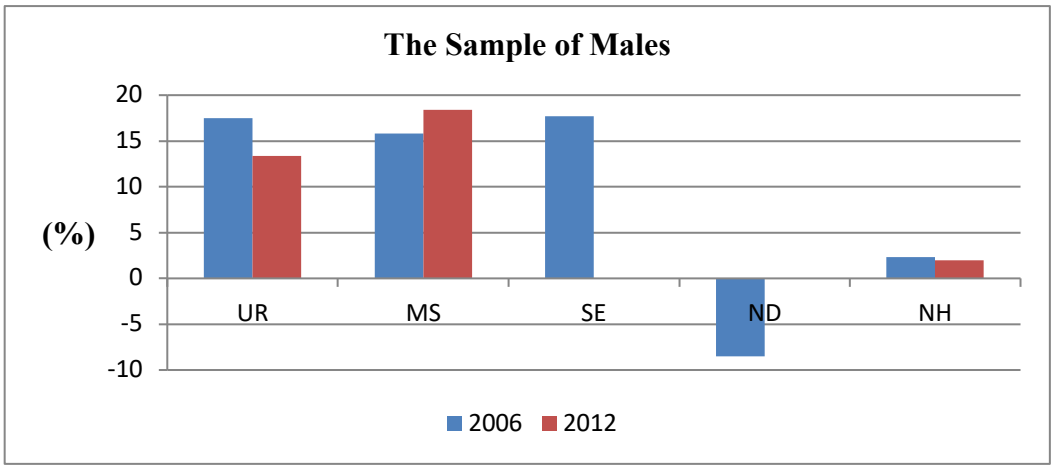
5.2 Estimation and Results

5.2.1 Results of Wage Function 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 was 4.9% in 2006 and 3.9% in 2012 for males, while it reached 8.6% in 2006 and 8.3% in 2012 for females. It is clear from the results that there is a positive relationship between the number of years of experience and the wages for both genders. Moreover, the rate of return to the number of years of experience was 2.3% for males and 3.5% for females in 2006. In 2012, the rate of return to the number of years of experience was 0.95% for males and 2.3% for females.

The results ascertain that, at 5% significance level, the individual who lives in urban areas gained more earnings than the one who lives in rural areas by 17.5% and 21.2% in 2006 and 2012, respectively, for the sample of males and by 13.4% and 18.3% in 2006 and 2012, respectively, for the sample of females. The marital status of an individual plays an important role in determining his/ her earnings. In 2006, the married individual earned more than the single person, by 15.8% for males and 12.1% for females. In 2012, the married individual earned more than the single person, by 18.4% for males and 7.9% for females.

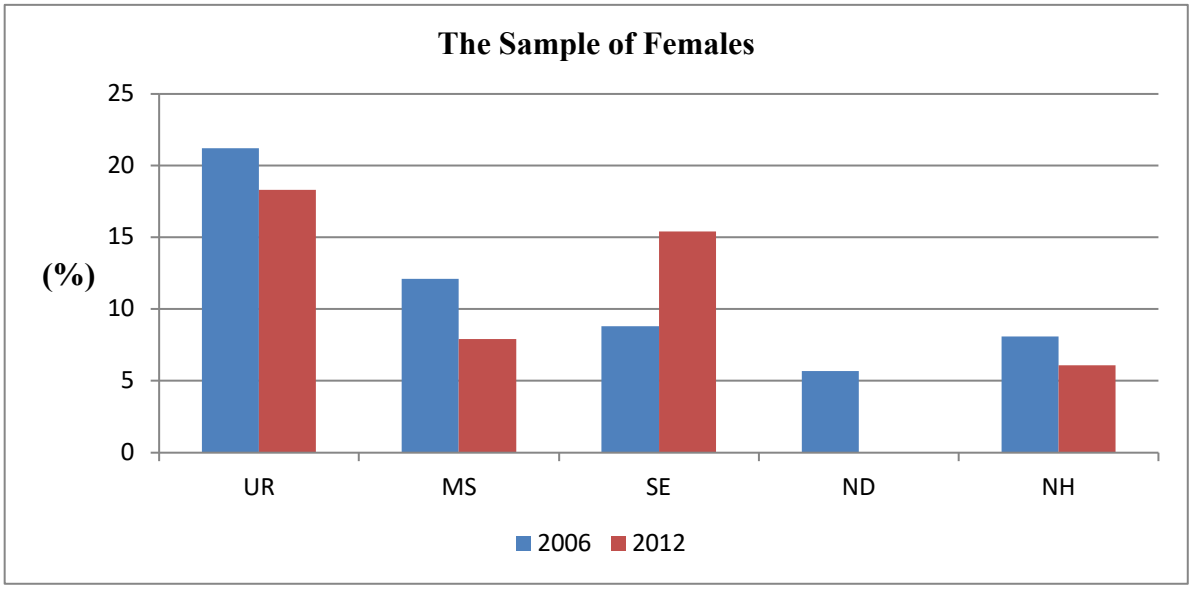
Figure (2): Results of Male Wage Function Estimation



Source: *Author's calculations based on ELMPS 2006 and 2012.*

The variable of sector of employment is considered to be one of the important determinants of the earnings of an individual, i.e. males who are working in governmental or public enterprises earned more than others who are working in the private sector by 17.7% in 2006, while females who are working in governmental or public enterprises earned more than others who are working in the private sector by 8.8% (at 10% significance level) and 15.4% in 2006 and 2012, respectively. On the other hand, there is a negative relationship between the number of working days and the earnings of male workers in 2006. On the contrary, more working days per week for female workers increased their earnings by 5.7% in 2006. However, this variable is not significant in 2012 for both genders. Furthermore, working for long hours per day is associated with higher levels of earnings for an individual by 2.3% and 8.1% for males and females in 2006 and by 2% and 6.1% for males and females in 2012.

Figure (3): Results of Female Wage Function Estimation



Source: *Author's calculations based on ELMPS 2006 and 2012.*

Table (4): The Regression Results of Wage Function (Male Sample)

lnW	Coefficient		Std. Err.		t		P> |t|	
	2006	2012	2006	2012	2006	2012	2006	2012
S	0.0483	0.0386	0.003	0.002	17.88	18.96	0.000	0.000
T	0.0264	0.0128	0.003	0.003	7.73	4.56	0.000	0.000
T²	-0.0001	-0.0001	0.000	0.000	-2.12	-1.11	0.034	0.266
UR	0.1615	0.1923	0.022	0.017	7.27	11.62	0.000	0.000
MS	0.1469	0.1687	0.030	0.024	4.88	7.09	0.000	0.000
SE	0.1629	-0.0014	0.026	0.019	6.16	-0.08	0.000	0.939

ND	-0.0814	-0.0076	0.018	0.009	-4.61	-0.81	0.000	0.420
NH	0.0231	0.0200	0.006	0.004	3.88	5.49	0.000	0.000
cons	5.23	6.97	0.131	0.078	39.88	89.37	0.000	0.000

Source: Author's calculations based on ELMPS 2006 and 2012.

Table (5): The Regression Results of Wage Function (Female Sample)

lnW	**Coefficient**		**Std. Err.**		**t**		**P> |t|**	
	2006	**2012**	**2006**	**2012**	**2006**	**2012**	**2006**	**2012**
S	0.0826	0.0800	0.006	0.006	14.27	14.07	0.000	0.000
T	0.0409	0.0262	0.005	0.005	7.73	5.40	0.000	0.000
T^2	-0.0002	-0.0001	0.000	0.000	-1.56	-0.49	0.119	0.625
UR	0.1255	0.1679	0.039	0.034	3.21	4.94	0.001	0.000
MS	0.1142	0.0759	0.039	0.038	2.93	2.02	0.003	0.044
SE	0.0847	0.1436	0.047	0.047	1.81	3.03	0.071	0.002
ND	0.0556	0.0232	0.028	0.024	1.96	0.96	0.050	0.338
NH	0.0781	0.0596	0.012	0.011	6.73	5.67	0.000	0.000
cons	3.10	5.38	0.221	0.201	14.04	26.81	0.000	0.000

Source: Author's calculations based on ELMPS 2006 and 2012.

5.2.2 Oaxaca-Blinder Gender Wage Gap Decomposition Results

As mentioned above, the first method of decomposition is simple and it depends on 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 estimation of gender wage differentials using 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 female sample, the estimation of the model implies that, without discrimination against women, their monthly wages should be equalled to 785.7 Egyptian pounds. This means that, resulting from discrimination; females are receiving 249.3 Egyptian pounds less in terms of their real monthly wages.

Using ELMPS 2012, it is clear that the mean value of real monthly wages amounted to 3576.79 Egyptian pounds for males and 2980.26 Egyptian pounds for females (The wage gap is: 3576.79 - 2980.26 = 596.5 Egyptian pounds). The estimation of equation (6) indicates that, without discrimination against women, their monthly wages should be equalled to 3832.4 Egyptian pounds. This implies that, resulting from discrimination; females are receiving 852.14 Egyptian pounds less in terms of their real monthly wages.

Table (6): Oaxaca-Blinder Wage Decomposition Results

Wage Decomposition components	Males		Females	
	2006	2012	2006	2012
Mean value of real monthly wages	709.5	3576.79	536.4	2980.26
Overall wage gap in 2006 and 2012			**173.1**	**596.5**
Wage without discrimination effect			785.7	3832.4
Discrimination effect			249.3	852.14
Endowments effect			-76.2	-255.64

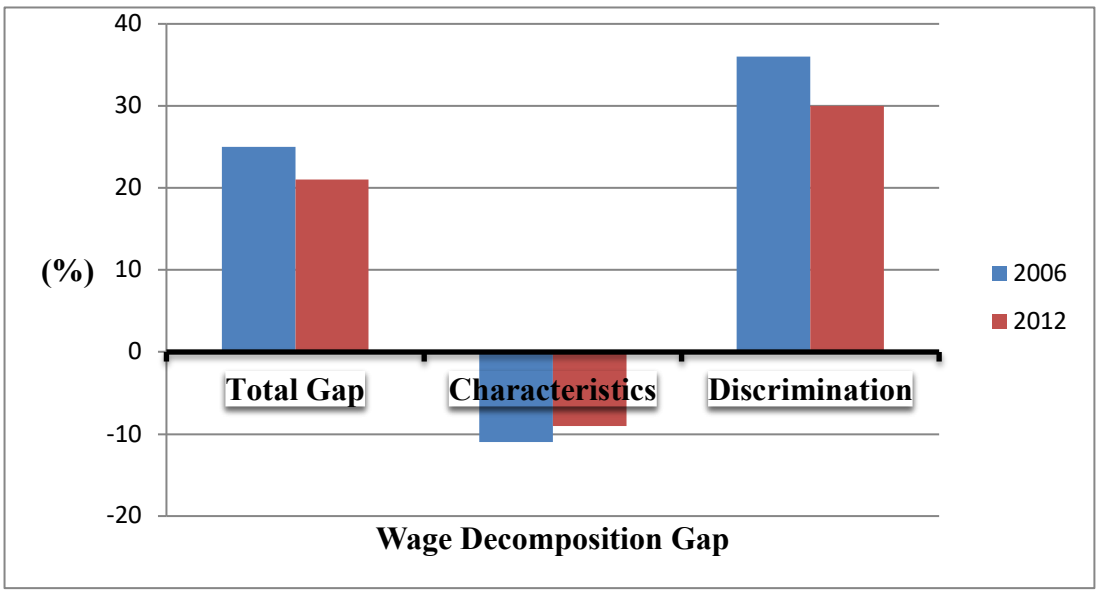
(1) All values in the table are in Egyptian pounds.
***Source**: Author's calculations based on ELMPS 2006 and 2012.*

Figure (4) presents the results of the Oaxaca-Blinder wage decomposition. In 2006, the data ascertains that males have higher potential years of experience and females have more years of education that made them better equipped in terms of overall human capital characteristics. It is estimated that, the wage gap was 25%, where $\ln \overline{W}_m - \ln \overline{W}_f = 0.25$, the

endowments or characteristics effect was -11%, where $(\overline{X}_m - \overline{X}_f)\hat{B}_m$= -0.11 and the discrimination effect was 36%, where $(\hat{B}_m - \hat{B}_f)\overline{X}_f$= 0.360. The discrimination effect includes differences in coefficients, in addition to differences in the constant term.

In 2012, the data implies that females have greater potential years of experience and also that they have more years of education that made them better equipped in terms of overall human capital characteristics. It is estimated that the wage gap was approximately 21%, where $\ln\overline{W}_m - \ln\overline{W}_f \approx$ 0.21, the endowments or characteristics effect was -9%, where $(\overline{X}_m - \overline{X}_f)\hat{B}_m$= -0.09 and the discrimination effect was 30%, where $(\hat{B}_m - \hat{B}_f)\overline{X}_f$= 0.300.

Figure (4): Oaxaca-Blinder Wage Decomposition Technique



***Source**: Author's calculations based on ELMPS 2006 and 2012.*

5.2.3 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 male and female 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 (7), in which:

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

where $\ln\overline{W}$ is the mean value of log wage, $\overline{X}$ 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 separately for males and females 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|	
	2006	2012	2006	2012	2006	2012	2006	2012
ln W								
S	0.046	0.048	0.009	0.005	4.94	10.29	0.000	0.000
T	0.049	0.007	0.007	0.004	7.26	1.55	0.000	0.121
T^2	-0.001	0.000	0.000	0.000	-6.36	0.47	0.000	0.635
_cons	5.142	7.424	0.100	0.127	51.30	58.67	0.000	0.000
Sector of employment								
S	-0.073	0.092	0.005	0.004	-15.18	21.47	0.000	0.000
A	-0.065	0.058	0.003	0.002	-23.58	28.27	0.000	0.000
U/R	0.359	-0.196	0.048	0.037	7.51	-5.28	0.000	0.000
MS	-0.278	0.274	0.058	0.052	-4.76	5.29	0.000	0.000
_cons	2.94	-3.28	0.109	0.096	27.02	-34.12	0.000	0.000

Mills								
$\hat{\lambda}$	0.030	-0.226	0.116	0.059	0.26	-3.83	0.796	0.000
P	0.048	-0.348						
Σ	0.635	0.649						

***Source**: Author's calculations based on ELMPS 2006 and 2012.*

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

	Coefficient		**Std. Err.**		**z**		**P>|z|**	
	2006	**2012**	**2006**	**2012**	**2006**	**2012**	**2006**	**2012**
ln W								
S	0.090	0.093	0.009	0.009	10.06	10.44	0.000	0.000
T	0.039	0.030	0.007	0.006	5.31	4.93	0.000	0.000
T^2	-0.000	-0.000	0.000	0.000	-0.65	-0.19	0.513	0.846
_cons	4.11	5.95	0.198	0.177	20.76	33.64	0.000	0.000
Sector of employment								
S	0.105	0.135	0.014	0.011	7.47	12.11	0.000	0.000
A	0.064	0.051	0.005	0.005	12.39	11.31	0.000	0.000
U/R	-0.461	-0.312	0.115	0.093	-4.01	-3.36	0.000	0.001
MS	0.801	0.902	0.094	0.085	8.56	10.66	0.000	0.000
_cons	-2.89	-2.99	0.262	0.246	-11.05	-12.17	0.000	0.000
Mills								
$\hat{\lambda}$	0.035	0.076	0.105	0.097	0.34	0.78	0.737	0.435

ρ	0.063 0.125
σ	0.557 0.607

Source: Author's calculations based on ELMPS 2006 and 2012.

The results of estimation of gender wage differentials using Neuman-Oaxaca wage decomposition technique are displayed in table (9). The estimation of the model using ELMPS 2006 implies that, without discrimination against women, their monthly wages should be equalled to 797.5 Egyptian pounds. This means that, resulting from 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. In 2012, it is estimated that the monthly wages of females should be equalled to 4264.2 Egyptian pounds in the absence of discrimination effect. This indicates that, resulting from discrimination, females are receiving 1283.9 Egyptian pounds less in terms of their real monthly wages. In addition, the value of selectivity bias effect is 360.7 Egyptian pounds.

Table (9): Neuman-Oaxaca Wage Decomposition Results

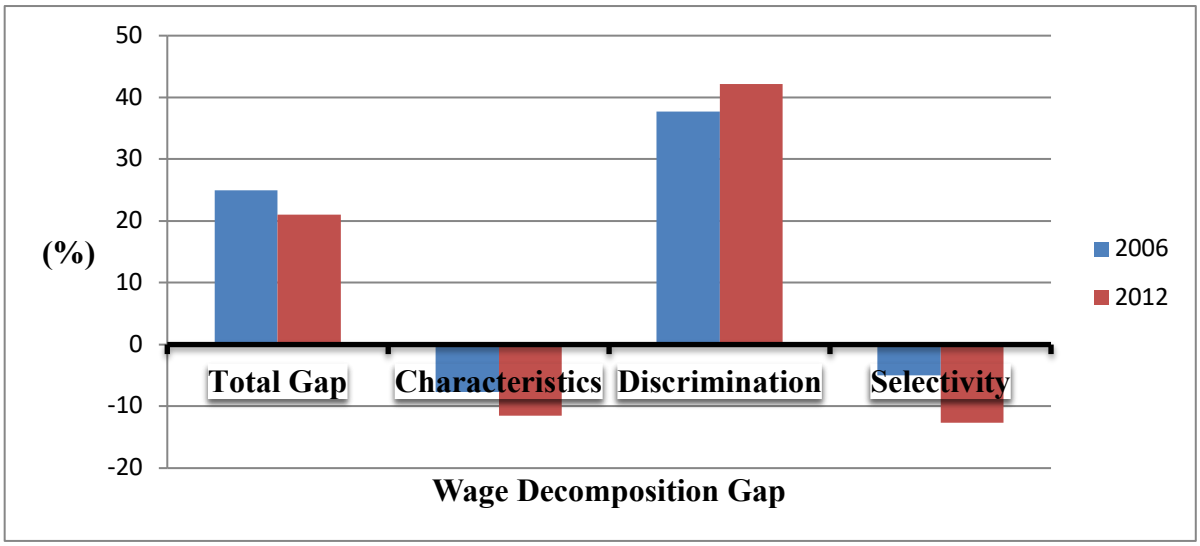
Wage Decomposition components	Males		Females	
	2006	2012	2006	2012
Mean value of real monthly wages	709.5	3576.79	536.4	2980.26
Overall wage gap in 2006 and 2012			**173.1**	**596.5**
Wage without discrimination effect			797.5	4264.2
Discrimination effect			261.1	1283.9
Endowments effect			-53.2	-326.7
Selectivity effect			-34.8	-360.7

Source: *Author's calculations based on ELMPS 2006 and 2012.*

All values in the table are in Egyptian pounds.

Figure (5) demonstrates the results of the Neuman-Oaxaca wage decomposition. It is estimated that, the endowments or characteristics effect was -7.7% in 2006 and -11.5% in 2012, where $(\overline{X}_m - \overline{X}_f)\hat{B}_m$= -0.077 and -0.115 in 2006 and 2012, respectively. The selectivity effect was -5% in 2006 and -12.7% in 2012. In addition, the discrimination effect was 37.7% in 2006 and 45.2% in 2012, where $(\hat{B}_m - \hat{B}_f)\overline{X}_f$= 0.377 and 0.452 in 2006 and 2012, respectively. The results illustrated in figure (5) take into account the issue of selectivity in 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 the earnings gap, as a proportion of the average male wage, would be 5% higher in 2006 and 12.7% higher in 2012.

Figure (5): Neuman-Oaxaca Wage Decomposition Technique



Source: *Author's calculations based on ELMPS 2006 and 2012.*

6. Conclusion

This paper concentrates on explaining 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 and 2012 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 and the wage gap decreases from 25% in 2006 to 21% in 2012. This can be attributed to better labour market endowments of females.

The Oaxaca-Blinder decomposition of the gender wage gap demonstrates that the gap is due to the discrimination against women in the labour market and not to low levels of human capital characteristics (i.e. lower education levels or less experience). Actually, this result shouldn't be interpreted as male-female wage differential/discrimination; rather it's the concentration of women in lower paying jobs that produces such large differentials. Using the Neuman and Oaxaca (2004) method of decomposition, it appears that there is an effect of

selectivity that tends to reduce the gender gap. For example, without selectivity, the earnings gap as a proportion of the average male wage would be 5% higher in 2006 and 12.7% higher in 2012. Hirsch (2016) stated that, a big part of gender wage gap remains mysterious. However, it can be explained by discrimination imposed by the employer i.e. the male-female earnings gap reflects a kind of monopsonistic wage discrimination. This term implies that employers make use of their power, without any kind of preference.

To decrease this wage gap, labour 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 rank, pay scales and criteria of entry into the labour market. Moreover, the several costs, which make the employment of females more expensive for the employer, should be decreased in order to give males and females an equal opportunity in the labour market. Given the encouraging environment (e.g. benefits of contracts, paid vacations for child care and sick leave and medical insurance) for women in 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 privatisation and civil service downsizing may negatively affect the already low levels of participation rates of females. This is unless effort is made to reduce the gender discrimination in the private sector.

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