

**PUBLIC WAGE PREMIUM IN EGYPT:  
MIRAGE OR REALITY?**

Tarek El-Ghamrawy and Ziad Amer  
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## Abstract

Contrary to economic intuition, public sector wages appear in the data to be higher on average than private sector wages. This paper investigates the validity and reasons behind this finding through an analysis of the ELMPS 2006 dataset. More importantly, the paper attempts to identify wage determinants in the public and the private sectors in the framework of the human capital theory. This helps to point out whether wages in any of the sectors are determined by productivity as measured by human capital variables, namely, education, skills and experience. The main findings are that workers' characteristics in both sectors differ significantly, including formality of employment, levels of education, nature of occupations and economic activities. When all characteristics are taken into account, the public wage premium statistically disappears. Wage regressions show that private sector wages are more efficient, in the sense that they are based on education, skills and experience, while public sector wages are primarily based on experience in addition to several institutional factors. Besides, formality of employment, which is more prevalent in the public sector, plays an important role in raising wages. The paper concludes with several policy implications.

## ملخص

خلافًا للبيانات الاقتصادية، تشير البيانات في مصر إلى ارتفاع متوسط الأجور في القطاع العام مقارنة بالقطاع الخاص. وتبحث هذه الدراسة في مدى صحة ذلك والأسباب التي أدت إليه، وذلك من خلال إجراء تحليل لبيانات مسح سوق العمل التتبعي لعام ٢٠٠٦ (ELMPS 2006). ومن هذا المنطلق، تُعنى الورقة ببيان محددات الأجور في القطاعين العام والخاص في ضوء نظرية رأس المال البشري، الأمر الذي يساعد على معرفة ما إذا كانت الأجور تتحدد في أي من القطاعين وفقًا للإنتاجية مقيسة بمتغيرات رأس المال البشري، وهي التعليم والمهارات والخبرة. وتشير النتائج الرئيسية للدراسة إلى تباين خصائص العمالة بصورة كبيرة في كلا القطاعين، بما في ذلك مدى رسمية التشغيل والمستوى التعليمي وطبيعة المهن والأنشطة الاقتصادية. وعند أخذ كافة الخصائص في الاعتبار، فإن تفوق الأجور في القطاع العام يتلاشى من الناحية الإحصائية. أما اندحارات الأجور فتوضح أن كفاءة الأجور في القطاع الخاص أعلى مقارنة بالقطاع العام، بمعنى أنها تعتمد بدرجة أكبر على التعليم والمهارات والخبرة في حين أن الأجور في القطاع العام تعتمد بصفة رئيسية على الخبرة بالإضافة إلى عدد من العوامل المؤسسية. كما أن رسمية التشغيل، وهو الغالب في القطاع العام، تلعب دورًا مهمًا في زيادة الأجور. وتختتم الدراسة بطرح عدد من التوصيات.

**JEL classifications:** J24, J31, J41, J45

**Keywords:** wage differential, public and private sectors, human capital, informal employment, ELMPS (2006)



## **1. INTRODUCTION**

The relation between public and private wages is complex. On one hand, economic theory is not decisive about factors that primarily affect wage determination in both sectors. On the other hand, while economic intuition says that productivity in the private sector is higher and thus its workers are better paid, especially in countries where the public sector has historically been geared toward a social role rather an economic role, empirical evidence indicates that public pay in Egypt is higher than private pay. Data at both the macro and micro levels confirm this relation.

In addition, literature addressing the question of public-private wage differential has reached the same finding. For instance, using the 1988 labor survey Assaad (1997) found wages in the government and public enterprises to be higher than in the private sector. He attributed this to the difference in education levels between public and private sector employees. Theory suggests the opposite because the private sector seeks high productivity and hence seeks to employ highly educated and highly skilled people whereas the public sector relies on a different institutional setup where high productivity is not a priority. Assaad (1997) mentioned that the guaranteed employment scheme skewed “the composition of public sector employment toward more graduates” (p. 93). This scheme attracted graduates and post-graduates more than other education levels because they were confident to find a job in the government even if they waited in queue for several years.

Using the 1998 and 2006 labor surveys, Said (2007) found that there existed a public wage premium for males and females in both surveys. The differential has even increased in 2006 compared to 1998. The author here goes one step further by correcting for differences among workers in the government, the public enterprise sector and the private sector. Although these corrections narrow the gap between the government and the private sector and between public enterprises and the private sector, these two differentials remain positive for males and females, except for the government-private sector differential for males where it is close to zero.

These results raise two questions: first, is the observed public wage premium in Egypt a reality? And second, to what extent is wage determination efficient in each sector? By efficiency we mean that it is based on elements that reflect productivity, namely experience, education and skills. We use the Egyptian Market Labor Survey (ELMPS) 2006.

For these purposes, the paper first describes some stylized facts about the public-private wage differential. It then analyzes several important differences between the public and the private sectors, which are likely to affect their wage differential. This analysis shows that the public and the private sectors are two heterogeneous groups. One major difference is a large share of informal employment in the private sector, defined as people working without a legal contract, versus an almost entirely formal public employment. Related to that, workers in both sectors also differ in education levels, occupational posts and economic activities. Besides, each sector is divided into several components that differ in these characteristics. The public sector is divided into government and public enterprises, while the private sector is divided into private formal domestic, private informal domestic, and foreign and joint ventures. All these factors make the crude comparison between the public sector and the private sector of little use. When we limit comparison to subsectors and control for as many as possible of these characteristics, non-parametric tests show that the difference in wages statistically disappears.

Secondly, we use wage regressions to answer our second question, by identifying wage determinants in each sector. After controlling for selection bias problems, we run a set of regressions to compare public versus private sector wage determinants. Results show that wage variations in the public sector depend on experience but not on education. The aggregate higher level of education in the public sector, which is due to the employment guarantee scheme, coincides with higher wages that are due to political and social reasons, hence reflecting correlation rather than causality between wages and education in the public sector. In the private sector, education and experience both impact wages and wages increase with higher levels of education.

Finally, we conclude and draw some policy implications. First, education plays a pivotal role in enhancing living standards in an efficient wage policy context. It hence should continue to be at the center of any policy agenda, especially high-skills vocational training and education. Second, it is the informal employment that is contributing to the low wage level, not the private sector. Therefore, attention should be directed to encouraging the private sector to turn informal employment into formal. Third, there is a need for a thorough revision of the minimum wage

policy to ensure a minimum level of decent life for all wage workers, whether in the private or the public sector.

Organizationally, the paper consists of four sections besides this introduction. Section 2 describes stylized facts about the public-private wage differential, analyzes public and private sectors' characteristics and shows the results of non-parametric tests. Section 3 briefly describes the human capital theory, which is the base of our wage equations. Section 4 first runs the probit models for correction of selection bias and then runs the wage equations and discusses their results. Section 5 concludes.

## **2. STYLIZED FACTS**

### ***2.1 A Public Wage Premium***

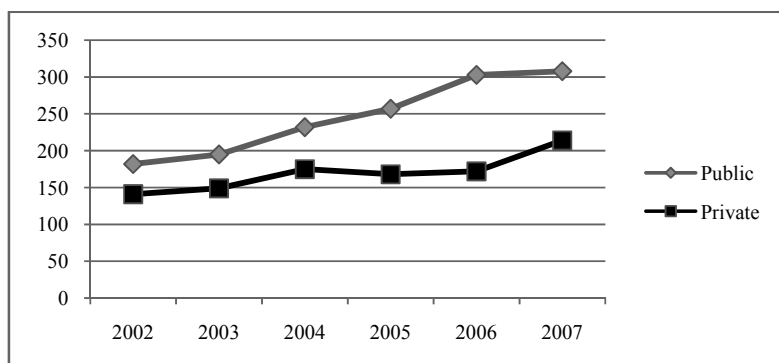
A theoretical intuition is that workers' productivity in the private sector is higher than in the public sector, at least in countries where the public sector has historically shifted from an economic role to a social role, such as Egypt. In such a context, the public sector no longer seeks efficiency while the private sector does. Consequently, private wages would be higher than public wages.

However, official data at both the macro and micro levels suggest the opposite: public wages are higher than private wages. Based on the CAPMAS wage bulletin, Figure 1 shows average weekly wages in the public and private sectors during the period 2002–2007. Public wages are found to be higher and the gap has even widened in recent years. This is true for most economic activities and in most years. The only exceptions are mining and quarrying, brokerage, real estate activities and education, where private wages are higher than public wages.<sup>1</sup>

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<sup>1</sup> CAPMAS data do not clarify why at the macroeconomic level these sectors show a higher private wage. However, in our micro level dataset, these sectors, like other sectors, show a higher public wage for the reasons that will be stated in the next section.

**Figure 1. Average Weekly Wages at the National Level in LE/Week (2002-2007)**



Source: Authors' illustration based on CAPMAS wage data (available at: [www.capmas.gov.eg](http://www.capmas.gov.eg)).

At the microeconomic level, the ELMPS (2006) provides rich data about individual wages, using hourly and monthly measures. Below are the summary statistics for hourly wages for the whole sample in the public sector and the private sector. The following table shows a higher average public wage.<sup>2</sup>

**Table 1. Average Hourly Wages in the Public and Private Sectors in 2006 (LE/Hour)**

	Total	Public	Private
Mean	3.56	4.38	2.71
Standard deviation	6.30	7.33	4.86
Observations	6916	3525	3390

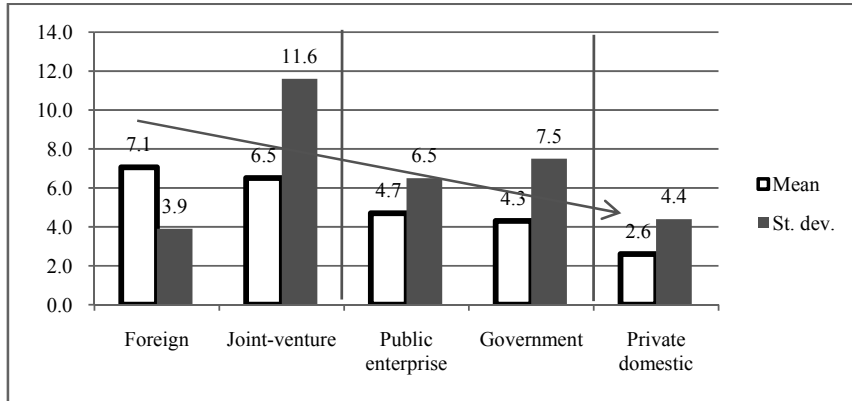
Source: Authors' calculations based on ELMPS 2006.

The public sector can be disaggregated into government and public enterprises. The private sector also can be disaggregated into private, joint-venture and foreign firms. The following figure compares the average wage for these subsectors. Private joint-venture and foreign sectors show the highest wages while the private domestic sector shows the lowest.

<sup>2</sup> We removed outliers by omitting ten observations where hourly wages reached on average around 400 LE/hour. They were all found to be in the public sector and they caused a very large standard deviation in the public wage data. Besides they were mainly for people of intermediate education and working in the government, which made them unrealistic.



**Figure 2. Hourly Wages: Averages and Standard Deviations in Subsectors (LE/Hour)**



Source: Authors' illustration based on ELMPS.

Table 2 shows the t-tests for the difference in wage means between the public sector and the private sector. It shows high significance of a higher public sector wage. This test was repeated for the components of the public and the private sectors.<sup>3</sup> Regarding the difference between the government and each of the private subsectors, results show that the difference in average wages between the government and each of the joint venture and foreign sectors is significantly in favor of joint-venture and foreign, while it is in favor of higher average wage in the government sector compared to the private domestic sector. As for the test between public enterprises and each of the private subsectors, it is in favor of public enterprises compared to the private domestic sector, while the other differences are insignificant. All this means that the difference between the public and the private sectors comes from the difference between the public and the private domestic sectors.

**Table 2. T-test for Mean Hourly Wages in the Public and the Private Sectors (LE/Hour)**

	Obs.	Mean	St. error	t-statistic
Public	3525	4.35	0.12	11.23
Private	3390	2.71	0.08	
Diff.		1.64	0.15	

Source: Authors' calculations.

<sup>3</sup> Results are available upon request.

To identify the sources of this difference, we need to dig deeper into the ELMPS data. In the next section, we investigate individual characteristics as well as employment characteristics that may well affect wages of workers in the public and the private sectors.

## ***2.2 Different Characteristics of the Public and the Private Sector***

As shown in Table 3, a major difference between the public and the private sectors is the dominant share of informal employment in the private sector while the public sector is almost entirely formal. The measure for informal employment is having (or not having) a legal job contract. Informal workers are likely denied much of the wage and non-wage benefits that formal workers enjoy.

**Table 3. Structure of Employees According to Legal Contracts**

	<i>Have a legal contract</i>	<i>Do not have a legal contract</i>
Private sector	24.9%	75.1%
Government	97.6%	2.4%
Public enterprise sector	94.0%	6.0%

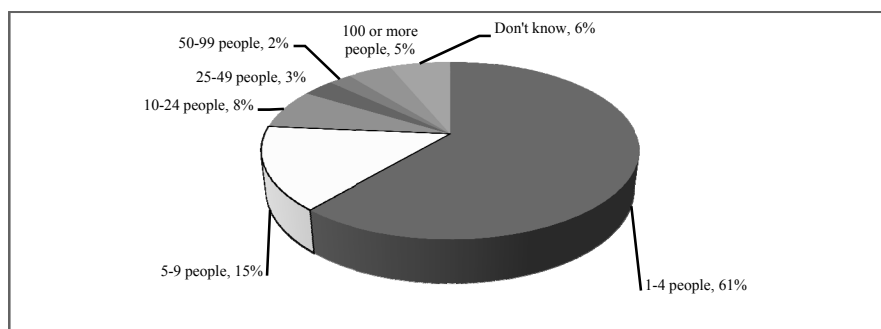
*Source:* Authors' calculations.

Another measure of informality is the size of firms, which is only a proxy, as nearly all informal entities are small sized, but not all small sized firms are informal. Data show that most of the domestic private sector consists of small entities, specifically small and micro enterprises employing less than 10 people. Data for the number of employees by entity in the government and public enterprise sector is scarce,<sup>4</sup> so we do not show it here. But obviously, the case of small entities is not the case of the government or public enterprises, which both consist of large entities. Figure 3, which describes the structure of companies in the domestic private sector according to the number of employees, shows that 61 percent of private sector workers work in micro enterprises comprising one to four people. If we add the 5-9 people group, we end up with three quarters of private sector workers. The total share of people of the private sector working in large entities does not exceed 7 percent. About one third of these are in joint-venture and foreign firms.

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<sup>4</sup> Only 52 out of 3638 individuals responded to this question.

**Figure 3. Structure of the Domestic Private Sector by Firm Size**



Source: Authors' illustration, based on ELMPS (2006).

There is increasing correlation between the size of a firm according to the number of employees and the presence of legal contracts, as demonstrated in Table 4 below.

**Table 4. Correlation Between Firm Size and Presence of a Legal Contract**

Firm size	1-4	5-9	10-24	25-49	50-99	100 or more
Pair-wise Correlation	-0.4438	-0.1345	0.0845	0.1921	0.219	0.4734

Source: Authors' calculations.

Note: The above correlations were all significant at the 1 percent level.

One implication of the relatively large firm size in the private sector is that in general the informal employment would be characterized by lower monitoring costs than the formal one. According to the so called shirking model,<sup>5</sup> wages in the private informal employment would generally be lower than the private formal sector. This monitoring costs argument is one among other factors affecting the wage differential. Depending on wage policy in each sector and related to human capital variables as well as institutional factors, other factors will help explain the wage differential when we analyze the wage regression results in Sections 4 and 5.

Evidence of being employed formally or informally affects wages enormously as shown in Table 5, which reports t-test for the difference between formal and informal employment average wages.

<sup>5</sup> The shirking model is based on an institutional framework that models the degree of wages paid by an employer to his employee based on several factors; monitoring cost, probability of employee shirking, degree of unemployment outside, worker's reputation if he gets fired, rigidity of labor market in terms of firing employees and the degree of job security provided to workers.

**Table 5. Mean Wage t-test, Formal vs. Informal**

	Obs.	Mean	St. error	t-statistic
Informal	2656	2.35	0.08	-14.37
Formal	4298	4.31	0.11	
Difference		-1.96	0.14	

Source: Authors' calculations.

In Table 6, we compare public sector wages with those in the private sector, controlling for job formality, by taking only formally employed workers. As shown in Table 6, the gap is reduced (compared to Table 2) but does not disappear.

**Table 6. Mean Wage t-test, Public vs. Private Formal**

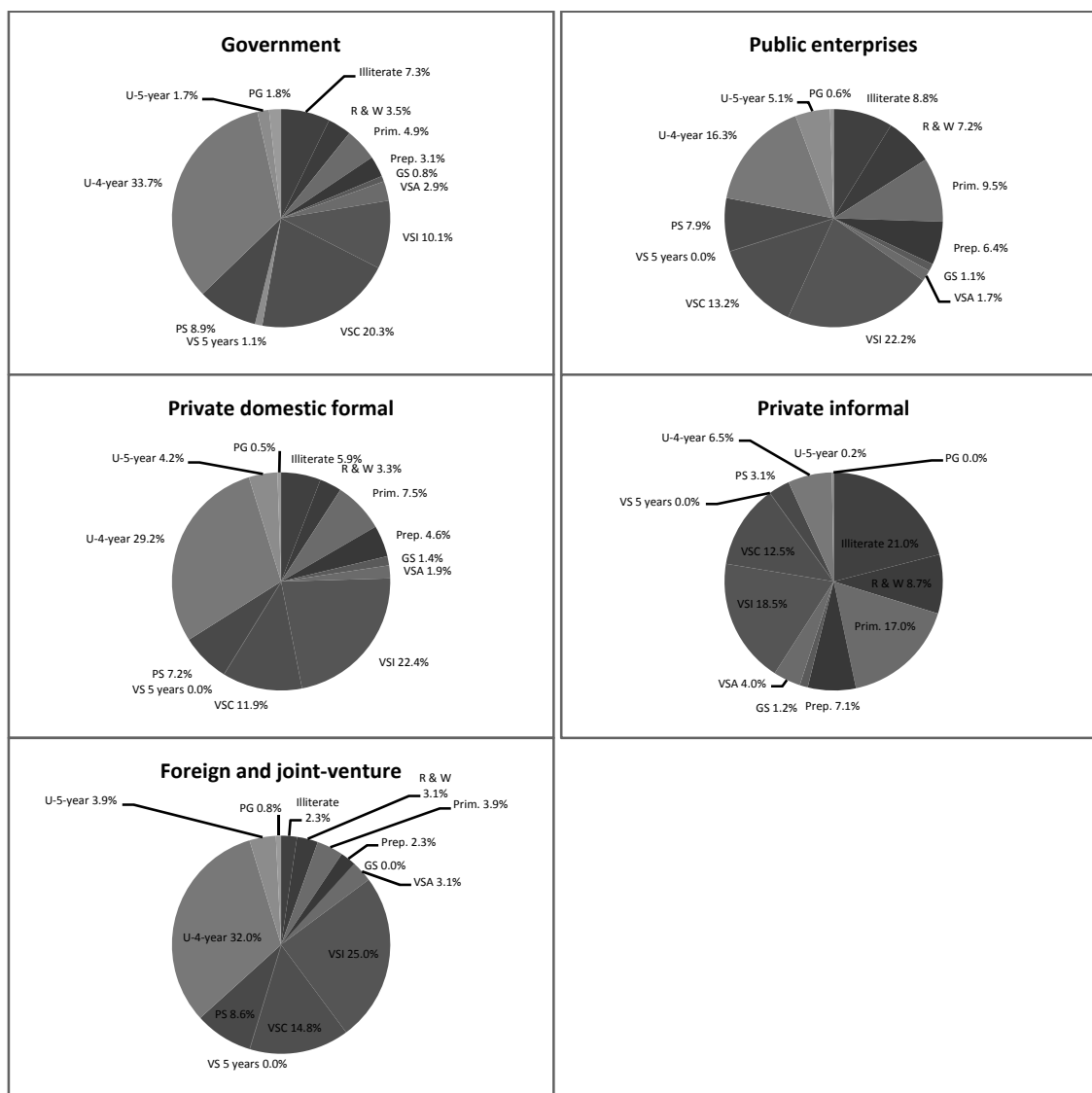
	Obs.	Mean	St. error	t-statistic
Public formal	3424	4.43	0.13	2.22
Private formal	846	3.86	0.22	
Difference		0.57	0.25	

Source: Authors' calculations.

This implies that other factors have to be taken into consideration. In fact, there are considerable differences between the public sector and the private sector in terms of education levels, the nature of occupations and economic activities.

In the following set of figures, we disaggregate the data for education, occupations and economic activities for the government and the public enterprise sector (henceforth PE) as components of the public sector, as well as for the private domestic formal sector (PDF), the private informal domestic sector (PI) and the joint-venture and foreign private sector (FJV), as distinct components of the private sector.

**Figure 4. Educational Patterns in Each of the Five Subsectors**



Source: Authors' illustration, based on ELMPS 2006.

Note: R&W = read and write; prim. = primary; prep. = preparatory; GS = general secondary; VSA = vocational secondary agriculture; VSI = vocational secondary industry; VSC = vocational secondary commerce; VS years = vocational secondary 5 years; PS = post-secondary; U-4 (5) year = university 4 (5) years; PG = post graduate.

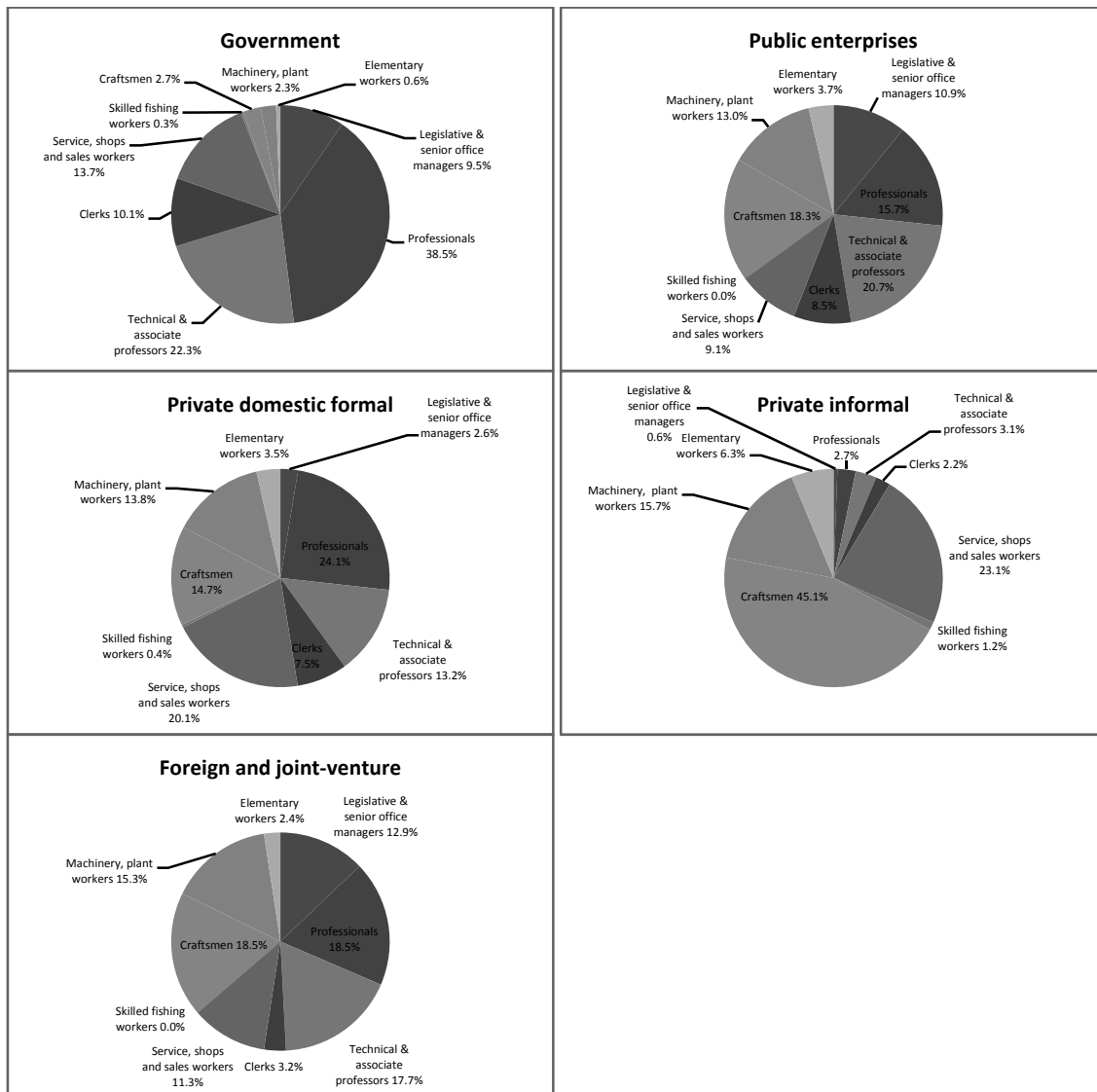
**a. Education**

The figure illustrates similarity between the educational structure of the government, PDF and FJV, whereas PE gives relatively more weight to vocational education, and PI has a large share of illiterate and primary education.

**b. Occupations**

Figure 5 shows that occupations in PE, PDF and FJV are similar. On the contrary, occupations in the government lean relatively more toward professionals and technical and associate professors. Occupations in PI are concentrated in craftsmen.

**Figure 5. Occupational Patterns in Each of the Five Subsectors**

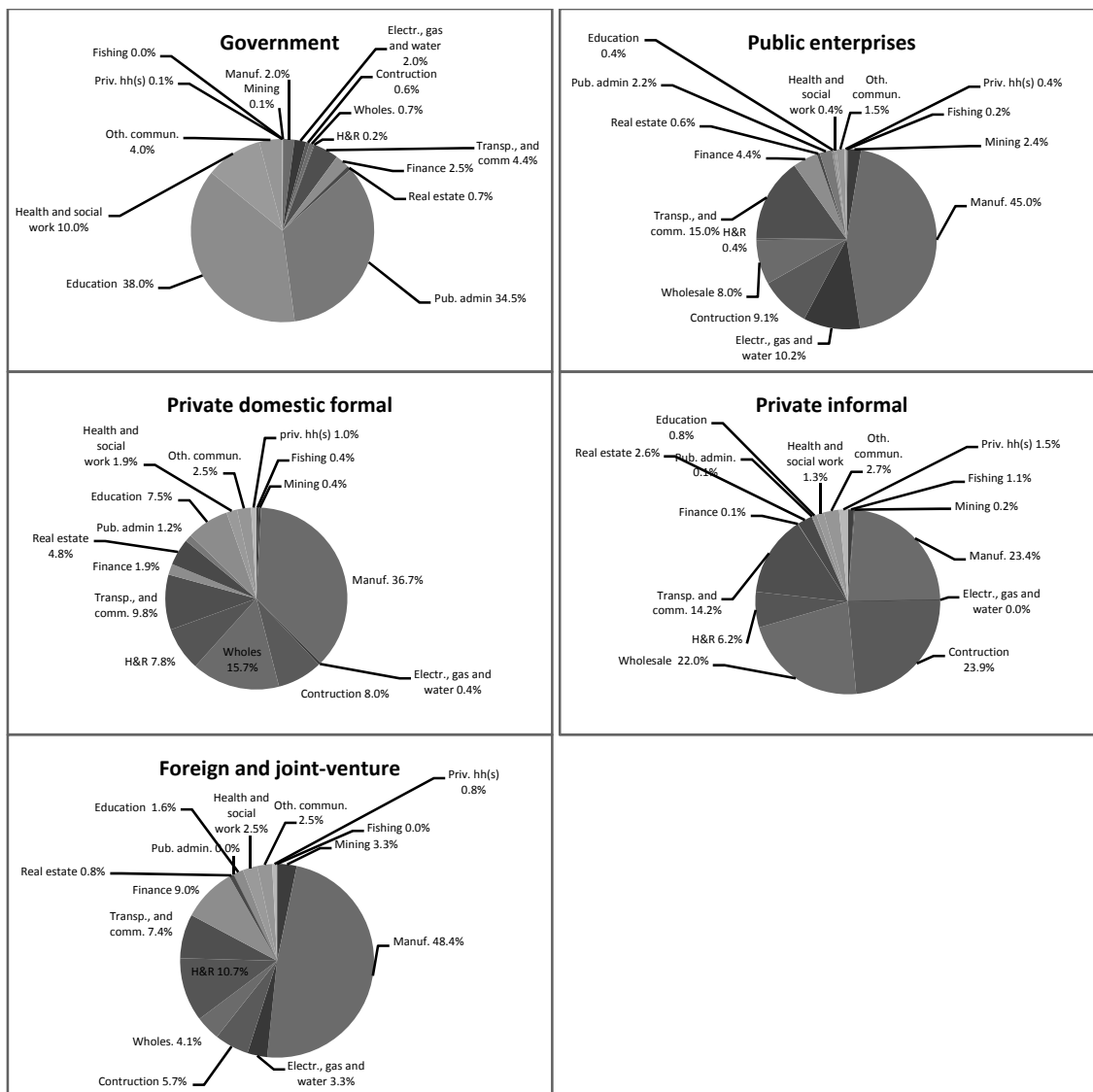


Source: Authors' illustration, based on ELMPS 2006.

**c. Economic activities**

Like occupations, there are similarities between the PE, PDF and FJV in economic activities, where manufacturing plays a major role. Conversely, government is concentrated in public administration and education, while PI is mainly distributed between manufacturing, construction, trade and transportation.

**Figure 6. Activity Patterns in Each of the Five Subsectors**



Source: Authors' illustration, based on ELMPS 2006.

Note: Manuf. = Manufacturing; Wholes = Wholesale trade; H & R = Hotels and restaurants; Transp. and comm. = transportation and communications; Priv. hhs(s) = Private household employment

### 2.3 Comparison according to Scenarios of Characteristics

All the above-mentioned differences must be taken into account simultaneously when comparing wages in the public and the private sectors. Other differences, even though less striking, also count, such as average experience. Below are some scenarios involving several combinations of these individual characteristics and controlling in some instances for experience. T-tests compare wages between the different subsectors according to these scenarios.

#### 1. Test of Mean Wage between PDF and Government

Scenario of characteristics		Obs.	Mean	St. error	t-statistic
U-4, professionals, transportation sector, less than 15-year experience	PDF	9	5.04	1.07	-0.58
	Government	7	6.14	1.63	
	Diff		-1.09	1.87	
U-4, professionals, manufacturing sector, less than 15-year experience	PDF	23	3.03	0.41	-0.87
	Government	5	3.91	1.05	
	Diff		-0.87	1.00	

Source: Authors' calculations.

After controlling for education, occupation, economic activity and experience, the wage difference is statistically insignificant.

#### 2. Test of Mean Wage between PDF and PE

Scenario of characteristics		Obs.	Mean	St. error	t-statistic
U-4, professionals, manufacturing sector, less than 10-year experience	PDF	19	3.10	0.47	0.21
	PE	8	2.94	0.48	
	Diff		0.17	0.79	
Vocational secondary industrial, craftsman, construction sector, less than 15-year experience	PDF	8	2.59	0.28	0.41
	PE	3	2.39	0.005	
	Diff		0.19	0.47	

Source: Authors' calculations.

Same result.

#### 3. Test of Mean Wage between PI and Government and PE

Scenario of characteristics		Obs.	Mean	St. error	t-statistic
Primary, craftsmen, construction sector	PI	88	2.46	0.11	-5.03
	Government	4	5.52	1.81	
	Diff		-3.06	0.61	
Primary, craftsmen, construction sector	PI	88	2.46	0.11	-2.61
	PE	4	4.49	3.13	
	Diff		-2.02	0.77	

Source: Authors' calculations.



In the test between PI and Government, there is a significant wage premium in the government over the private informal employment, for individuals having the above characteristics. In this test we did not control for experience because of the very small number of observations remaining in the government after controlling for the other characteristics. This reflects the very low similarity between the government and the informal employment, because the characteristics we controlled for here are shown to be common in the informal employment but not in the government. The test between PE and PI shows a similar result to the previous test. It shows a significant public enterprise wage premium over the informal employment, for the controlled individuals.

To sum up, when we control for formality and for differences between public and private sector workers, the public wage premium disappears. Conversely, it persists when we are controlling for the characteristics without controlling for formality, i.e., public formal vs. private informal.

The next question is thus whether wages in the public and the private sectors, regardless of their differences, are equally efficient, i.e., based on experience, education and skills. We will attempt in the following two sections to provide an answer to this question.

### **3. THEORETICAL FOUNDATIONS OF THE PUBLIC-PRIVATE WAGE DIFFERENTIAL: THE HUMAN CAPITAL THEORY**

Wages, long considered the price of labor in the market, have been under extensive study in several countries. Theories on wage differentials do not agree on a must-be wage differential between sectors, industries or countries or even the direction of wage premium (in favor of which sector). However, these theories provide economic intuition behind possible differences in wages in general and each theory attributes such differences to a number of factors. As this paper is concerned with determining the efficiency of wages in the public and private sector, we shed some light on the human capital theory.

Originally referred to by Schultz (1961) and then extensively developed by Becker (1964), the human capital theory postulates that enhancing human capital raises the productivity of workers by giving them useful knowledge and skills, hence raising their income. Human capital

can be divided into two main components: general abilities and specific abilities. General abilities affect production of various firms in different sectors, like education for instance. They are usually paid for by the worker and their net present value of future return is high. In contrast, specific abilities, like training courses, affect production in a specific firm in a given sector. Their cost could be paid fully by the employer or shared between the worker and the employer. In this case, the future return—measured also here by the net present value—is expected to be lower than that in the general abilities case, since here the employer is paying part of its costs.

Large spending on education, training and health is thus considered an investment in the current term in anticipation of a higher return on the long term. The theory predicts that human capital explains much of the wage differentials that exist between different types of labor. According to Chan (2001), the theory explains why the wages of blue collar workers are normally lower than those of white collar workers. It shows that workers with higher education, better know-how and longer experience perform better in terms of generating income and hence should be better paid.

In a nutshell, the theory models wage as a function of the individual's human capital, as shown in the following equation:

$$w_t = r_t H_t \quad (1)$$

where  $w$  is the individual's wage,  $r$  is the rate of return to human capital and  $H$  is the stock of human capital acquired by the individual, with  $t$  being a subscript for time.

Since human capital variables reflect productivity as the theory postulates, it is important to find out whether or not wages in the public sector and the private sector are based on human capital. Indeed, we have noticed relatively high education levels in the public sector, but this does not necessarily imply that the public sector bases its wages on education. Also, given the profit incentive of the private sector, does the private sector base its wages on human capital or is it not the case due to the large share of informal employees (with no legal contracts)? This will be addressed in the regression results in the next section.

#### **4. WAGE DETERMINANTS: PUBLIC VERSUS PRIVATE AND FORMAL VERSUS INFORMAL**

##### ***4.1 The Selection Problem***

Our wage regressions are based on traditional Mincerian equations, which model wages as a function of variables measuring education and experience, plus other control variables. We run these regressions for the public sector versus the private sector.

However, running OLS regressions directly might yield biased results due to selection problems. Because our sample is not random, the bias originates from the fact that we are only observing people who are already waged workers and already working in the public or the private sectors. Ideally, a correct wage regression is supposed to represent all people of working age whether or not a person is working at the time of the survey and regardless of the fact whether he/she is in the private or the public sector. Yet, since we only have data for waged workers already employed, we have a non-random sample.

In this regard, we have two selection problems: participating in waged work and choosing either the public or private sector. Literature traditionally corrects for these selection biases through two steps (see, e.g., Heitmueller 2004; Assaad 1997). The first step consists of running a bi-variate probit model for the two selection problems where participation in non-agricultural waged work and in the private sector are respectively the two dependent variables.<sup>6</sup> An inverse Mills ratio<sup>7</sup> (IMR) is estimated thereof for each selection problem. The second step is to run the wage equations including the calculated IMRs among the regressors. Results of the bi-probit models are reported in Table 7.

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<sup>6</sup> They take respectively the value of 1 if the person is participating in waged work and zero otherwise; and the value of 1 if the person is participating in the private sector and zero otherwise.

<sup>7</sup> The inverse Mills ratio is the ratio of the probability density function over the cumulative distribution function of a distribution.

**Table 7. Bi-variate Probit Results, for Males and Females**

Variables	Males		Females	
	1 Entry into non-agricultural waged work	2 Entry into private sector	3 Entry into non- agricultural waged work	4 Entry into private sector
Read & write	0.0780 (0.0659)	-0.0971 (0.0631)	0.232* (0.124)	-0.0771 (0.102)
Primary	0.158*** (0.0587)	-0.274*** (0.0575)	0.179 (0.110)	-0.0769 (0.0844)
Preparatory	0.0149 (0.0696)	-0.634*** (0.0680)	0.361*** (0.126)	-0.372*** (0.118)
Vocational secondary 3 years	0.408*** (0.0507)	-0.544*** (0.0499)	1.553*** (0.0632)	-0.0928 (0.0619)
General secondary	-0.501*** (0.118)	-0.924*** (0.111)	0.645*** (0.175)	-0.554*** (0.203)
Technical institute	0.481*** (0.0824)	-0.868*** (0.0784)	1.850*** (0.0884)	-0.195 (0.123)
University 4 years	0.465*** (0.0574)	-1.074*** (0.0570)	2.100*** (0.0715)	-0.0592 (0.0797)
University 5 years	0.617*** (0.139)	-0.931*** (0.132)	2.442*** (0.229)	0.554** (0.248)
Post-graduate	0.575*** (0.198)	-1.344*** (0.200)	2.271*** (0.277)	0.163 (0.344)
Alexandria-Suez	-0.00789 (0.0602)	0.00312 (0.0570)	0.102 (0.0722)	-0.0770 (0.0809)
Urban-lower	-0.272*** (0.0577)	-0.00632 (0.0553)	0.113 (0.0688)	-0.193** (0.0782)
Urban-upper	0.0183 (0.0556)	-0.157*** (0.0524)	0.182*** (0.0651)	-0.158** (0.0743)
Rural-lower	0.0593 (0.0551)	-0.354*** (0.0520)	0.0517 (0.0673)	-0.172** (0.0705)
Rural-upper	0.0897 (0.0608)	-0.379*** (0.0573)	-0.137 (0.0865)	-0.133* (0.0776)
Age	0.176*** (0.00771)	0.0647*** (0.00653)	0.244*** (0.0117)	0.0927*** (0.00894)
Age squared	-0.227*** (0.00883)	-0.109*** (0.00728)	-0.274*** (0.0144)	-0.114*** (0.0107)
Married	0.315*** (0.0528)	0.451*** (0.0514)	-0.554*** (0.0545)	-0.502*** (0.0519)
Father self-employed	-0.225*** (0.0379)		-0.107** (0.0481)	
Constant	-3.125*** (0.147)	-0.393*** (0.126)	-6.692*** (0.232)	-2.689*** (0.184)
Athrho		-0.215*** (0.0219)		0.651*** (0.0372)
Observations	7,354	7,354	9,684	9,684

Source: Authors' calculations. Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The most important findings in Table 7 are as follows:

1. Nearly all education coefficients are significant and positive in *entry into non-agricultural waged work equations*, whether for males or females (columns 1, 3), reflecting a clearly positive impact of education on labor participation. In addition, the coefficients are larger for higher levels of education, indicating that the probability of participating in non-agriculture waged work increases with education.
2. For males, probability of entering into the private sector is negatively associated with education. This implies that the probability of entering into the public sector is positively associated with education, which is consistent with the guaranteed employment scheme that has created a relatively higher level of education in the public sector, as observed in the previous sections.
3. For females, probability of entering into the private (public) sector is significantly and negatively (positively) associated with having a preparatory or general secondary certificate, while it is the inverse for 5-year university degrees. This might be linked to some occupations in the public sector that are suitable for women and require less than intermediate education, especially in public administration and education sectors.
4. For both genders, age positively affects the probability of participating in non-agriculture waged work and private sector, as shown from the age coefficient in all columns. In line with the literature, this positive effect slows down as age increases, as shown from the significant negative coefficient of age squared, reflecting a non-linear effect. The intuition is that as people get older they are relatively less keen to enter the labor market.

#### **4.2 Wage Regressions**

We regress the hourly wage (logged) on the following variables: experience, educational levels, geographical regions, occupational posts and economic activities in addition to the selection terms and a dummy for “having a legal contract.” Experience is the difference in number of years between 2006 and the year of entry into labor force. Educational levels are dummy variables, each of which takes the value of 1 at the corresponding level and zero otherwise. The benchmark level is being “illiterate”. The same applies for regions, occupations and activities. The benchmark category for regions is “Cairo,” for occupations “skilled fishing workers,” and for

activities “education.” Regressions are run for the private sector versus the public sector for both genders, which gives a total of four wage regressions.

#### 4.2.1 Results

Regression results are shown in Table 8.

**Table 8. Wage Equations Results**

Variables	Males		Females	
	(1) Private	(2) Public	(3) Private	(4) Public
<b>Human capital</b>				
Experience	0.0217*** (0.00577)	0.0285*** (0.00575)	0.0416 (0.0271)	0.0393*** (0.0141)
Experience squared	-0.0243** (0.0111)	-0.0326*** (0.0121)	-0.0765 (0.0668)	-0.0331 (0.0324)
Read & write	0.0823 (0.0571)	-0.0261 (0.0808)	-0.577* (0.344)	-0.420 (0.328)
Primary	0.0674 (0.0648)	-0.0633 (0.0891)	0.262 (0.276)	-0.0294 (0.421)
Preparatory	0.252*** (0.0975)	-0.169 (0.129)	-0.388 (0.385)	-0.485 (0.303)
Vocational secondary 3 years	0.210* (0.110)	0.0598 (0.135)	-0.423 (0.317)	-0.353* (0.213)
General secondary	0.269* (0.159)	-0.0246 (0.196)	-0.242 (0.641)	-0.339 (0.368)
Technical institute	0.368** (0.161)	0.210 (0.187)	-0.654 (0.548)	-0.469* (0.262)
University 4 years	0.669*** (0.174)	0.273 (0.206)	-0.155 (0.491)	-0.487* (0.275)
University 5 years	1.253*** (0.214)	0.226 (0.220)	0.807 (0.673)	0.302 (0.310)
Post-graduate	0.550 (0.466)	0.459* (0.261)	0.461 (1.068)	-0.156 (0.342)
<b>Region</b>				
Alexandria-Suez	0.0906* (0.0462)	-0.0111 (0.0575)	-0.368* (0.193)	-0.275*** (0.0971)
Urban-lower	0.0293 (0.0555)	-0.154** (0.0637)	-0.450* (0.232)	-0.219** (0.103)
Urban-upper	0.0189 (0.0485)	-0.135** (0.0531)	-0.345 (0.258)	-0.102 (0.101)
Rural-lower	0.0208 (0.0579)	-0.314*** (0.0662)	-0.546** (0.222)	0.231** (0.0984)
Rural-upper	0.000382 (0.0627)	-0.287*** (0.0724)	-0.364 (0.383)	-0.0254 (0.136)
<b>Occupational post</b>				
Legislative & senior office managers	0.618 (0.598)	0.733*** (0.233)	0.707 (1.114)	0.666 (0.478)
Professionals	0.391 (0.595)	0.688*** (0.231)	0.237 (1.038)	0.594 (0.475)
Technical & associate professors	0.382 (0.593)	0.569** (0.229)	0.419 (1.016)	0.439 (0.471)
Clerks	0.130	0.517**	0.0282	0.480

	(0.595)	(0.232)	(1.031)	(0.471)
Servicemen & sales workers	0.137	0.256	-0.559	-0.162
	(0.591)	(0.227)	(0.985)	(0.509)
Craftsmen	0.403	0.624***	0.431	-0.0597
	(0.591)	(0.233)	(1.039)	(0.672)
Machinery workers	0.243	0.412*	0.335	-
	(0.592)	(0.234)	(1.029)	
Elementary workers	0.0231	0.517**	-2.308*	-
	(0.593)	(0.260)	(1.338)	
<b><i>Economic sector</i></b>				
Mining	0.328	0.772***	-	-
	(0.249)	(0.207)		
Manufacturing	0.151	0.216***	0.262	0.202
	(0.159)	(0.0615)	(0.286)	(0.167)
Electricity & water sanitation	0.443	0.223***	-	0.653***
	(0.270)	(0.0819)		(0.222)
Construction & real estate	0.319**	0.144	0.237	0.367
	(0.161)	(0.0923)	(0.363)	(0.234)
Retail	0.127	0.336***	0.490**	0.107
	(0.161)	(0.104)	(0.247)	(0.286)
Hotels & restaurants	0.312*	0.565**	1.054**	-
	(0.168)	(0.279)	(0.460)	
Transportation & communications	0.497***	0.285***	0.407	0.166
	(0.163)	(0.0666)	(0.383)	(0.177)
Finance	0.803***	0.628***	1.019**	0.0881
	(0.215)	(0.0936)	(0.440)	(0.150)
Public administration & defense	-0.518*	0.00335	-	-0.0345
	(0.305)	(0.0452)		(0.0683)
Healthcare	-0.110	0.00142	0.675**	-0.0584
	(0.242)	(0.0755)	(0.311)	(0.0895)
Private household employment	-0.0528	0.340	1.363***	-
	(0.202)	(0.343)	(0.359)	
Other economic activities	0.235	-0.401***	1.260***	0.0817
	(0.178)	(0.0765)	(0.461)	(0.285)
Fishing	0.702	-0.195	-	-
	(0.624)	(0.479)		
<b><i>Job formality</i></b>				
Legal contract dummy	0.225***	0.290***	0.369**	0.153
	(0.0376)	(0.101)	(0.171)	(0.180)
<b><i>Selection terms for non-agriculture waged work and for private vs. public</i></b>				
Male entry into non-agr. waged work	-0.0438	-0.00526		
	(0.122)	(0.136)		
Male entry into private sector	-0.254	0.368*		
	(0.161)	(0.220)		
Female entry into non-agr. waged work			-0.289	-0.592**
			(0.559)	(0.293)
Females entry into private sector			2.507*	2.413**
			(1.431)	(0.937)
Constant	-0.611	0.00549	0.276	0.285
	(0.634)	(0.349)	(1.192)	(0.565)
Observations	1,889	2,145	201	982
R-squared	0.259	0.281	0.422	0.243

Source: Authors' calculations. Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 8 shows several important features as explained in the analysis below. The following two subsections discuss results for males then females.

#### 4.2.2 Males

In the private sector (column 1), experience and education play a significant role in determining wages, in addition to some economic activities and the legal contract variable. Selection correction terms are not significant, reflecting the absence of selection bias in this subsample. An important finding is that the coefficients on education generally *increase* with further development in education.

Contrary to the private sector, public wages (column 2) varied with experience, occupations, some economic activities and the legal contract variable, while coefficients on education were *not significant*. As for the selection terms, only the selection term for entering the private sector was significant and it was positive, meaning that there is positive bias in public sector wages as this coefficient reflects a positive relationship between the probability of entering public sector and wages in the public sector.<sup>8</sup>

The structure of the public sector consisted of high education categories while the inverse for the private, which would have suggested that education plays a significant role in public wages and not a significant role in private wages. The answer to this is that the relation between high education levels and high wages in the public sector is just a correlation and not causality. Historically, the public sector has guaranteed employment for university graduates, which skewed the structure of public sector employment toward high-education people. In the meantime, for social and political reasons, the public sector has given high wages relative to the average private sector. The regression shows that the variations in wages in the public sector are only based on variations in experience, which is consistent with the public wage schedule, which ties public wages to job grades. It is noteworthy that the above-mentioned correlation has been captured by the selection term of entry in the private sector that accounts for the selectivity bias from which such a correlation can emerge. Applying equation (1):  $w_t = r_t H_t$ , the above findings

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<sup>8</sup> This is because the probability is inversely related to the IMR ( $\lambda$ ). So in the public sector equation a positive coefficient on IMR means that public wages increase if the IMR increases, i.e., if the probability of entering the private sector decreases and the probability of entering the public sector increases.



imply that in the public sector, the stock of human capital  $H_t$  is high but the return to human capital  $r_t$  is low. We can add a constant term  $c$  to the equation, where  $c > 0$ , to express the wage premium that is due to pure political and social factors unrelated to human capital. This term would reflect the positive and significant selection term in the public sector equation.

On the contrary, in the private sector equation the selection terms were insignificant, indicating that higher wages in higher educational categories are not due to correlation, as there was no employment guarantee for holders of higher education in the private sector. The only incentive for them to go into the private sector is that it rewards higher education efficiently. Again, in equation (1), this means that although  $H_t$  is low,  $r_t$  is high and  $c$  is low.

Despite the fact that law 47/1978 for state employees stipulates that if a government employee obtains a higher education certificate, he/she will get a salary increase (as in article 25 of the law for instance), the above findings suggest that these wage increases are either not effectively applied or they are insignificant so that they do not really differentiate between various levels of education. This latter possibility is more probable, because the difference between the wages of different grades is small, so increases to wages of the same grade would even be less significant.

In addition to education and experience, economic activity does not affect wages significantly in the private sector except in a few sectors that seem to grant significantly higher wages than the reference sector, i.e., education, particularly construction and transportation that comprise much of the informal employment. The financial sector also has the highest wage premium relative to education. On the contrary, wages in the public sector vary significantly across economic activities. They are relatively larger in mining and finance and relatively smaller in manufacturing.

Similarly, occupations in the private sector do not affect wages significantly, whereas they do in the public sector. This might be particularly true for the public enterprise sector where occupations vary a lot more than in the government. In the private sector, differences in wages between different occupations are caused by educational differences related to occupations.

Having a legal contract has a very significant and positive effect on wages in both private and public sectors. A person with the same profile would earn more if formally employed. This reflects the net impact of being employed formally on wages, regardless of education and skills, as these are controlled for.

To sum up, among human capital variables, only experience affects wages in the public sector while in the private sector, education, skills and experience all affect wages. This implies that wages in the private sector only are affected by productivity. In the public sector, despite their relatively high average, they are weakly affected by productivity, as measured by human capital variables. This finding indicates that public wages are less efficient than private wages.

#### *4.2.3 Females*

In the female group, the picture is different. However, because the number of observations in the female private subsample is relatively small, many dummy variables have no observations. Moreover, we have relatively high R-squared coupled with a few significant variables, which puts to question the validity of the female subsample results. Hence, we briefly discuss these results.

There does not seem to be a significant impact of efficiency variables on wages in the private sector (column 3). Significant variables include some regional variables and some economic sectors. Female private wages in Alexandria and Suez, urban Lower Egypt and rural Lower Egypt are significantly less than Cairo. Economic activity plays an important role in differentiating female wages within the private sector. Besides, the legal contract variable has a large and highly significant positive coefficient, confirming the role of formal employment in raising wages.

In the public sector (column 4), experience plays an important role. But education variables here again do not have significant coefficients except for three categories: vocational secondary, technical institute and university-4 years, which all have a negative sign. This might reflect little demand on females with technical and vocational education as well as female university graduates. The latter is consistent with the bi-probit model result which showed low probability for high education females of entering the public sector (see point 3 earlier). Regional variables

show the same pattern as in the private sector except rural Lower Egypt where public female wages are higher than in Cairo.

Economic activities do not show differentiation in wages within the public sector, as their coefficients are not significant, except for “working in water and electricity”. But this is just due to the small number of females in this sector in our sample (14 workers) with two of them having very high wages.

#### *A note on the economic activities in all regressions*

With regard to the male equations, it can be shown that the education sector (as an economic activity) is quite marginalized relative to other economic activities in terms of wage level in the public sector, whereas in the private sector, those significant economic activities with higher wages on average are fewer than in its public counterpart. We could not find external reliable data that can highlight why these specific activities were significant neither could we describe the different results in terms of significance in each sub-sample (regression equation).

## **5. CONCLUDING REMARKS**

The analysis of the determinants of the wage differential in the public and private sectors for the Egyptian economy has highlighted a number of interesting results. *First*, the public wage premium observed at the aggregate level is not a strict generalization that is present down at the disaggregate level. To the contrary, it is characteristic-specific. When we took all possible individual characteristics into account as well as employment formality, the public wage premium disappeared statistically.

*Second*, given the regression results, public sector wages do not depend on educational levels. Higher education levels in the public sector, which are the outcome of the employment guarantee scheme, coincide with artificially high wages that are due to the political and social role of the public sector historically, reflecting a correlation relationship rather than an efficiency-wage causality relationship. Conversely, although most of the employees in the private sector have no legal contract and have relatively low education and skill profiles, the private sector bases its wage policies on education and skills and wages vary significantly across educational levels. If a worker with higher educational certificates is to choose between working in the public

or the private sectors, it is better for her/him to work in the private sector, but on the condition of being employed formally as elaborated below, because she/he will be paid higher and will be differentiated in her/his salary level from other workers with less educational attainment.

*Third*, results have shown that skills are an important element in raising wages in the private sector, as illustrated by the significance of vocational education and technical education. While the educational scheme in Egypt gives an important weight to university education where thousands of people graduate each year, the demand for them has been inadequate. Several studies as well as policy sessions have highlighted the unsatisfied demand for qualified labor with vocational education and training, probably due to poor educational quality and lack of public or private spending in that regard. In addition, graduates of vocational education and training institutes have usually been found to receive “below-subsistence-level” wages,<sup>9</sup> a clear disincentive for applicants to prefer university education in addition to the social disincentive that distinguishes vocational education as below middle-class level. There needs to be a structural reform for the educational system in Egypt, with due importance given to vocational and technical education and training.

*Fourth*, the regression results as well as the non-parametric tests showed the positive effect of having a legal contract on wages for a given set of worker’s characteristics. This underlines the importance of turning informal employment into formal towards increasing the standards of living for a large number of workers that have been employed informally. This is particularly important in light of the huge share of informal employment in the private sector as per the ELMPS (2006). As informal employment contributes to low wages in the long run, having noticed its significant share in the private sector, Egyptian workers are caught between public employment, a rarity now in Egypt, and the private informal sector that cannot offer minimum subsistence level wages with a good potential for career advancement. In theory, there are multiple reasons behind the low wages of informal employment. Institutional factors such as red-tape, rigid regulations of formal employment and the profit-incentive of the employers who seek

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<sup>9</sup> USAID and TAPR-II held a conference on April 6, 2010 under the title: “Egypt’s Technical and Vocational Education and Training: Gaps and Opportunities,” highlighting that the average wage for a worker with such expertise is considered below subsistence level and is very uncompetitive compared to other jobs with higher wages that require lower education and skills certificates (such as plumbing or home delivering).

to limit wages out of greed have driven employers to hire employees without legal contracts. The case of Egypt suggests that it is the rigid regulations that are keeping employers from going formal.

This should be dealt with by offering positive and significant incentives to entrepreneurs to shift to hiring formally. Incentives could include extending tax holidays for entrepreneurs who shift to formal activity for a period of time, like 5 to 8 years, which is longer than the current 3-year holiday in the 2005 tax law. Incentives may also include eliminating red tape and extending micro credit to newly formalized companies. An institution that deals with such transformation should maintain secrecy of client information as well as keep data acquired confidential so as to attract such entrepreneurs rather than instill fear in them of being sued later on if the process of shifting to formal employment failed. Undertaking such incentives in a general equilibrium framework is necessary so that any new policy in the formal sector does not pose a disincentive for such entrepreneurs to go formal.

*Fifth*, given that wages in both the public and the private sectors are generally low, we need a minimum wage policy that could be applied, but not necessarily uniform, across sectors based on variation in productivity and labor market specifics. Where the minimum wage falls below the minimum subsistence levels, based on productivity indicators, the government could extend targeted subsidies for social protection.<sup>10</sup> More importantly, the minimum wage policy should be coordinated with employment policies to ensure wage growth, without jeopardizing employment prospects or increasing informal employment due to the high wage cost incurred by the employer, absent mitigating factors in the form of higher productivity or business incentives.

Finally, there are other factors that underscore the gap between private and public wages. The gap is certainly not limited to the human capital theory only; the shirking model also presents a wide range of factors (most of which are non-monetary) that drive this gap. That is, the cost of supervision may be higher in the public sector compared to the private sector, which demands

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<sup>10</sup> Abdelhamid and El-Baradei (2009) showed that the government pay system is complex with a lot of allowances and bonuses that are not based on education, age or experience, but are merely coincidental with election years (political motive). They also highlighted that the minimum wage policy (35 EGP per month) has not been altered since 1984, clearly a meager amount that is below subsistence level. This needs to be addressed again by applying such a policy to the formal sector.

higher wages to reduce shirking incentives. Future work should consider the specifics of measuring shirking incentives in the private and public sectors and develop some means to quantify their impact on wages in Egypt.

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