Reforms and Employment in The Egyptian Labor Market: Evolution by Age From 1988 to 2006 *

Irène Selwaness†

This version: November, 2012

Abstract

This paper aims to study the evolution in the age composition of males' employment in the aftermath of the public sector downsizing in the 1990s - during the Economic Reform and Structural Adjustment Policies - and the new labor law in 2003. Employment, formality and hours-of-work are simultaneously estimated by maximum likelihood to control for the self-selection, using three repeated cross-sectional samples from Egyptian Datasets conducted in 1988, 1998 and 2006. Results show that males aged (15-29) and those aged (50-59) were less likely, as compared to their peers in middle age (30-49), to be employed in 1998 than in 1988 (before the first reform). While informality has affected all age groups, the 30 to 49 years old were the category that experienced the most rapid increase in informality as compared to the other two age-groups. Findings also show evidence of negative correlation between the probability of employment and the probability of having a formal job, indicating that those who have more incidence to work in formal jobs are more likely to remain unemployed or inactive.

JEL classification: J14, J21, J26

Keywords: Older Workers Labor Supply, Structural Adjustment Programs, Formal/Informal Employment.

*I owe thanks to my Phd supervisor Véronique Simonnet for her discussions, her important help and continuous encouragement. I am also very grateful to Antoine Terracol for his help and his time

†Assistant Professor, Faculty of Economics and Political Science, Cairo University, Cairo, Egypt. Email: irene.selwaness@gmail.com

1 Introduction

Since the early 90s, Egypt has implemented an Economic Reform and a Structural Adjustment Program (ERSAP) to resolve the economic problems experienced at the end of the 80s. Large and unsustainable budget deficits and external debts were among the most serious issues that need to be addressed. The main reforms introduced were the reduction in the public expenses, downsizing the public sector (PS), the privatization of the State Owned Enterprises (SOEs), and liberalizing international trade. The rationale of the ERSAP was to re-orient the Egyptian economy towards a free market economy through the reduction of the State role in the economy and the stimulation of the private sector.

Indeed, such change in the macroeconomic environment has influenced the labor market mechanisms, as witnessed in other developing countries that applied such reform program. For instance, downsizing the public sector was achieved by the slowdown in hiring workers. The state committed such responsibility since the 1960s by guaranteeing public jobs for all university and vocational schools graduates, i.e. new entrants. Restricting the entry to public employment was put in place gradually by longer waiting queues, implying harder and more limited access for the new entrants and the young people. The privatization of the Stated Owned Enterprises (SOEs) was among the other measures that affected the labor market. As a matter of fact, the SOEs usually recruited workers in excess. Thus, the first step inroad the sale and privatization of such companies was to restructure such surplus labor. To achieve this purpose, early retirement incentives have been introduced in these companies in order to encourage older workers to voluntarily quit their jobs. Such solution was the most adequate and feasible, given the employment protection legislation and since that workers' layoffs were almost prohibited by the law.

At the same time of such contraction in the public sector job opportunities, the growth of the formal private sector was not labor intensive. Hence, it did not succeed in absorbing the flow of labor supply, whether those shifted from the public sector or the new entrants who would have been allocated to the public jobs. Moreover, the rigidity of the employment protection legislation, especially in regards to the hiring and firing regulations may have hindered the capacity of the private sector to

employ the integrity of the surplus in the labor supply. This has limited the formal job opportunities and hence accelerated the labor movement into unprotected jobs with flexible entry, i.e. informal employment (Assaad, 2002; Wahba and Mokhtar, 2002). Effectively, according to Assaad (2002), the majority of the jobs created between 1988 and 1998 were not protected by legal contracts. Moreover, in the private non-agricultural sector, the growth rate of the unprotected regular employment represented the highest share in the total employment growth rate.

Consequently, the fiscal tightening measures implied by the ERSAP such as the downsizing of the public sector and the SOEs privatization may have affected the employment of some workers' categories like, *a priori*, the new entrants or young workers (15-29) and the older workers (50-59). Put differently, one could expect that the age composition of the employment has changed due to the implementation of the ERSAP. Likewise, the growth in GDP achieved after such reform policies did not only result in an insufficient employment growth, but also the expansion of unprotected kinds of employment, such as the informal employment.

While suspecting that the labor market rigidities could be the reason behind the increase in informality, the government has passed a new labor code (Law No. 112 for 2003) in 2003. This law brought more flexibility in hiring and firing procedures. Therefore, its objective was to encourage employers to formalize their workers or to formally employ their newly hired ones. A formal recruitment of a worker means that he has either a legal contract or he has been affiliated to the social security by his employer[1]. Assaad (2009) states that the share of informal wage employment declined from 75% to 70% in the private sector, over the period 1998 to 2006. Likewise, over the period 1998 to 2006, Wahba (2009) found that the likelihood of moving from informal [2] to formal employment was higher after 2003, i.e. the introduction of the new law, than in the years before. Yet, informal employment represents an important and increasing share of total employment. According to Assaad (2009), it is around 57% and 61% of overall employment in 1998 and 2006, respectively.

For this purpose, this paper focuses on the evolution in the age composition of

[1]According to the law, the social security affiliation of wage workers should be made by the employer

[2]The study found a significant result only for those who were previously employed in the informal private non-agricultural sector and the informal private non-agricultural waged sector

males' employment during the ERSAP period (1988-1998) and three years after the adoption of the new law by studying the change over the 1998 to 2006 period. It aims to study if young and older-age groups were the most likely to bear the brunt of such reforms in terms of employment. Moreover, the form of employment also changed in this period of time. This is why the paper also tackles the evolution of informal employment and working hours across the age-groups. To analyze employment, informality and hours-of-work, a simultaneous equation methodology is followed in order to correct for self-selection. These three key-variables are simultaneously estimated by maximum likelihood, relying on three cross-sectional samples of males aged 15 to 59 years old from Egyptian employment surveys conducted in 1988, 1998 and 2006. The impact of the reforms and the macroeconomic environment change on males' employment and its age composition is interpreted using a difference-in-difference approach. I consider the young age group (15-29) and the older age group (50-59) to be the "treatment" groups, as compared to the "control group" which is the prime age group (30-49). This is not a standard difference-in-difference approach in two regards. First, the control group, being the prime age population (30-49) is not comparable to the two treatment groups: the young and older age groups. Second, the set of reforms, whether ERSAP or the new labor law, has concerned all the three age groups. This means that there is not a single age group that was not influenced by the reforms, suggesting that even the control group could have been affected. However, it is expected that the response of each of the age-groups to the reforms is different, and consequently the intensity of the impact could be distinguished across age-groups. Such different responses across age-groups permit using the difference-in-difference approach to interpret the results. I introduce dummies for the years 1988 and 2006, dummies for both the treatment age groups (15-29) and (50-59) and the interaction between both kind of dummies: years and age-groups' ones. This allows comparing the evolution in employment, formality trends and hours of work for the youth (15-29) and the older (50-59) age groups as compared to the prime age group (30-49) during the first period (1988-1998) and the second one (1998-2006). The used technique allows analyzing if employment of the young or the older individuals has effectively declined, whether they are more allocated in formal or informal jobs, and how the hours-of-hours have changed accordingly, after

the 1990s and after the 2000s reforms.

This paper contributes to a growing literature that investigates the impact of the Structural Adjustment Programs in developing countries. The change in the gender composition of employment was one of the main impacts of the ERSAP, as found in studies concerning Latin America and the Middle East countries (Cagatay and Osler, 1995; Cerruti, 2000; Assaad and Arntz, 2005). Likewise, the impact of ERSAP on poverty and income inequality was another point of focus (Handa and King, 1997). El-Hamidi and Wahba (2005) also studied the impact of ERSAP on the youth unemployment during 1988 to 1998. The age composition of the employment and its evolution in the period of reforms is a new dimension analyzed by the paper. It is also a contribution to the existing literature on informal employment in Egypt (Wahba and Mokhtar, 2002; Assaad and Arntz, 2005; Wahba, 2009).

Findings show that between 1988 to 1998, there was a significant decline in employment among the 15 to 29 and the 50 to 59 years old males, as compared to the prime age group (30-49). At their turn, the 30 to 49 years men experienced a significant decline in their probability of having formal jobs. The young having the lowest formal jobs opportunities witnessed more informality as well, but as compared to the prime, their decline was not as important. The 50 to 59 years old men experienced a relative increase in their formal employment in 1998 as compared to the 30 to 49. In the second period, the age composition of employment did not significantly change than 1998 ecept for the young who experienced an increase in employment. Nevertheless, the decline in formal employment continued for the prime-age workers. The difference in formality between each of the young or old and the prime was not significantly different in 2006 than 1998. Results also show evidence of negative correlation between the probability of employment and the probability of having a formal job, indicating that those who have more incidence to work in formal jobs are more likely to remain unemployed or inactive. Likewise, informal jobs are positively correlated with performing longer hours of work.

The paper is organized as follows. Section 2 describes the Egyptian context, mainly the structural adjustment policies and the new labor law drawing on recent literature. The description of the data sources and main stylized facts are presented in section 3. Then, section 4 tackles the methodology while introducing with dis-

cussion on the theories explaining the presence of informal jobs and the expected impacts for Egypt. Estimations results are presented in section 5. Finally, section 6 concludes.

2 Egyptian labor market Context in the Light of ERSAP

2.1 Egyptian labor market Context in the Light of ERSAP

The ERSAP goals were to introduce more market-oriented economic policies in order to address many fiscal imbalances and to help economic growth. In doing so, the role of the state was reduced, including its role as a dominant employer. As a matter of fact, since the early sixties, the Egyptian state guaranteed jobs for all university as well as vocational secondary school graduates in government offices (local or central) or in Stated-Owned Enterprises (SOEs). The public sector "PS" has two components which are the government and Stated Owned Enterprises "SOEs". Both components have remained the main employer, by providing more than one third of total employment opportunities (Assaad 2002 and Assaad 2009). Such a hiring responsibility leaded to a labor excess in the SOEs, estimated to be about 30% to 60% of their work force (Carana, 2002). In the light of the ERSAP, the reforms that concerned the PS were twofold: the slowdown in its hiring responsibilities and the labor restructuring in the SOEs. The slowdown in the PS hiring was important in order to reduce the role of the state, to alleviate the pressure on SOEs and to cut public expenses. Thus, it was introduced gradually by increasing waiting periods for new entrants and fresh graduates (Assaad, 1997). Moreover, labor restructuring inside the SOEs was also crucial in order to restore their profitability and efficiency, and hence to take a step towards their privatization. In order to carry on such restructuring, the Egyptian government implemented, among other tools, a program of early retirement incentives to encourage eligible older workers to voluntarily quit their job.[3]

[3]Workers with at least 20 years of contributions can claim their early retirement. In case of early retiring, pensions are reduced according to the insured's age at the date of claim. The reduction is 15% if younger than age 45, 10% if younger than age 50, 5% if younger than age 55, and no

According to Assaad (2002), yearly employment growth during the period of Structural Adjustment was about 2.5%. The PS recorded the highest share of employment growth between 1988 and 1998, although all the efforts of cutting down the public spending. The reason behind such increase is that governement employment continued to increase by 4.8% per year. On the other hand, the SOEs employment effectively contracted by 2.5% per year but it did not outweigh the increase in the governement employment, leading to an overall increase in the PS employment. Between 1998 and 2006, the PS has significantly contracted since the SOEs employment continued to decline along with an increase in governement employment but with slower pace than its increase during 1988 to 1998 and by smaller rates than the total employment growth (Assaad, 2002; Assaad, 2009).

Concerning older workers, around 200,000 workers in over 200 SOEs have claimed their early retirement, since 1990, and particularly starting from 1996 when the early retirement incentives program became fully operational until 2001 (Carana 2002) Moreover, urban men in their late forties and fifties experienced a trend of early retirement between 1988 and 1998. During 1998-2006, such trend has been reversed for this age group while it remained prevailing for those in their late fifties and sixties. Similarly, early retirement trend was observed for rural men above fifty years old during 1988-1998, whereas it was also reversed during 1998-2006. Such findings reflect that there was a change in older workers' (50-64) employment after the introduction of Economic Reforms that is distinguished between 88-98 and 98-06. [4]

2.2 Informality in Egypt

The definition of informality is arbitrary and depends on the research context and objectives. The main aspects of informality can be resumed in firm or sector size, legal registration, presence of legal contract and social security coverage. The

reduction if aged 55 or older. Eventually, employers and self-employed workers could also claim for their earlier old age pensions, i.e. early withdrawal from the labor force, conditional on being 65 years old with contributions payments during 120 months (10 years) (El-Hamidi, 2007; Maait et al., 2000)

[4] In order to conduct a general investigation of the ERSAP impact on all Egyptian older workers' LFP, I assume that changing labor market conditions influenced all older workers, not only those in public sector

concept "informal" is often used to describe the economy, the sector, the job or the employment. According to Castells and Portes (1989, p.12), informal economy is defined as "*a process of income generation characterized by one central feature. It is unregulated by the institutions of society, in a legal and social environment in which similar activities are regulated*". The International Conference of Labor Statisticians defined the informal sector in 1993 as all firms who have fewer than 5 to 10 employees, since such small firms are usually not subject to any regulation and thus informal. This is considered to be the firm-level definition. Such definition does not capture the informal workers in formal firms, the so-called informal employment. The latter is job-based definition that conditions the formality of the job on the compliance with the employment protection system. Specifically, the job is considered formal when the worker has either a legal contract or a social security coverage. When both conditions do not exist, such employment is considered informal. This paper relies on such worker-level definition that was also used in previous studies on Egypt such as Wahba and Mokhtar (2002), El Mahdi (2002), Assaad (2009), and Wahba (2009).

Informal employment is widespread in Egypt where workers are increasingly employed in the private sector formal enterprises without contracts nor social security coverage. In the 1990s, the growth of the private sector employment was not sufficient to absorb the new entrants and the labor supply that would have been absorbed by the public sector. In an environment characterized by highly restrictive labor regulations, informal hiring or subtracting to the informal sector might be the resort for the private sector enterprises to escape the rigid regulations and minimize their compliance-related costs. This could be one of the possible reasons of the increase in the share of informal employment in overall employment during this decade. Likewise, the increase in the small and medium enterprises, whose majority is informal has also contributed in expanding the share of informal employment in the formal private sector. El Mahdi (2002) mentioned that more than 80% of micro and small enterprises in Egypt are informal as well as Assaad (2009).

In 2003, a new labor law was adopted in order to reduce potential causes of informal hiring practices and provide employers with greater flexibility in hiring and laying-off workers. Consequently, Assaad (2009) states that the share of informal wage employment in the private sector declined from 75% to 70% of overall em-

ployment in this sector, over the period 1998 to 2006. This improvement is also empirically studied by Wahba (2009) who found that those who were previously employed in the private non-agricultural sector and the private non-agricultural waged sector in 1998 have significantly higher likelihood to move to a formal job after the law than prior to it.

Consequently, the fiscal tightening measures implied by the ERSAP such as the downsizing of the public sector and the SOEs privatization may have affected employment trends of some workers' categories like, *a priori*, the new entrants or young workers (15-29) and the older workers (50-59), as compared to the prime age working group (30-49) who, being not directly subject to any policy, can be expected to have relative stable paths. Likewise, informality trends are expected to change during the 1990s, but also after 2003, differently for these age groups. This is due to the labor demand contraction in the public sector combined with the labor market rigidity in the 1990s, in addition to the flexibility introduced by the new labor law in 2003 as a solution and a trial to push informality down. Hours-of work may have changed accordingly with the change in the distribution between formal and informal jobs, and thus represents the third aspect of study besides the employment and the formality status.

3 Data, Definitions and Stylized Facts

This paper relies on three Egyptian microeconomic datasets: the Labor Force Sample Survey (LFSS 1988), the Egyptian Labor Market Survey (ELMS 1998) and the Egyptian Labor Market Panel Survey (ELMPS 2006). Those datasets were carried out on nationally representative samples of 28286, 23997 and 37140 individuals, respectively. ELMS 1998 was designed to be comparable to the special round of the LFSS carried out in October 1988. The "ELMPS 2006" is the second round of what is intended to be a periodic longitudinal survey that tracks the socio-economic and the demographic characteristics of the households and individuals interviewed in 1998. It was done on 3684 households from the original ELMS 98 to form a panel data; on any new households that might have formed as a result of splits from the original households (2167 households); as well as on a refresher sample of households

(2498) to ensure that the data continue to be nationally representative.[5]. This paper relies on the 15 to 59 years old cross-sectional samples of males extracted from the LFSS 88, the ELMS 98 and the ELMPS 06. Males samples are about 7617, 7320 and 11756 individuals in 1988, 1998 and 2006, respectively. While the empirical analysis relies on the males' samples in these three mentioned years, stylized facts are presented both for men and women to show the evolution by gender.

In the analysis, older workers are considered to be those aged between 50 and 59 years old. At 50 years old, most of the insured workers are eligible to claim for their early retirement pensions. The mandatory age of retirement is at 60 years old for most of workers (mainly wage workers according to the Social Insurance Law). Therefore, the upper limit in this study is chosen at 59 since it is expected that at the retirement age "60", employment will naturally drop for this category of workers and independently than any reforms.

3.1 Evolution of The Employment-to-population Ratio

Employment is defined according to the extended definition of labor force which is "the production and processing of primary products, whether for the market, for barter, or for their own consumption; the production of all other goods and services for the market; and the corresponding production for own consumption in the case of households producing such goods and services for the market" (Assaad, 2009, p.5). Relying on the extended definition enables to integrate data from LFSS 1988 in the study, since this dataset provides only information on the extended labor force participation.[6]

The employment-to-population ratio is the variable of concern studied in the ensuing analysis. This ratio is defined as being the number of employed individuals among the working age population. This notion is different than the "labor force

[5]More details on the data are provided in Barsoum (2007), Assaad (2009) and Assaad and Roushdy (2009)

[6]There are two definitions for the labor force, the market labor force and the extended labor force. The former includes all those who are either engaged in economic activity for purposes of market exchange or seeking such work. The latter includes those engaged in "the production and processing of primary products, whether for the market, for barter, or for their own consumption; the production of all other goods and services for the market; and the corresponding production for own consumption in the case of households producing such goods and services for the market"(Assaad, 2002; Assaad, 2009, p.5)

participation" (LFP) which considers the number of both employed and unemployed to the working age population.[7]

There was a slight decline in the employment to population ratio from 56.8% in 1988 to 55.6% in 1998. In 2006, it re-increased to 59.4% (Table 1). Men and women show different patterns of employment-to-population ratio during this period. While males' employment-to-population ratio has declined in 1998, as compared to 1988 then re-increased in 2006, females' employment continue to increase in 1998 but slightly declined in 2006, however keeping a higher level than the 1988 employment level. It is also obviously observed that employment-to-population ratio is far higher for males than females.

Moreover, the employment-to-population ratio by age groups and its evolution over time also differ between men and women. As shown in Table 1, young (15-29) and older (50-59) men experienced a decline in their employment levels in 1998, as compared to 1988. Then, in 2006, their employment-to-population ratio re-increased, albeit with higher growth rate for young men than their older peers. On the other hand, from 1988 to 2006, employment of the prime-age group almost remained unchanged (Figure 1). For women, young ones have seen their employment falling during all this period from 1988 to 2006 while the prime and the older age groups experienced an increase in their employment-to-population ratio in 1998 and 2006, as compared to 1988. Thus, females participation shows different trends in regards to males.

[7]In the interest not to repeat the word employment, the author may sometimes replace with "participation" or "work", both used to reflect being employed

Figure 1: The Evolution of Employment-to-Population Ratio during 1988-2006, Men (15-59)

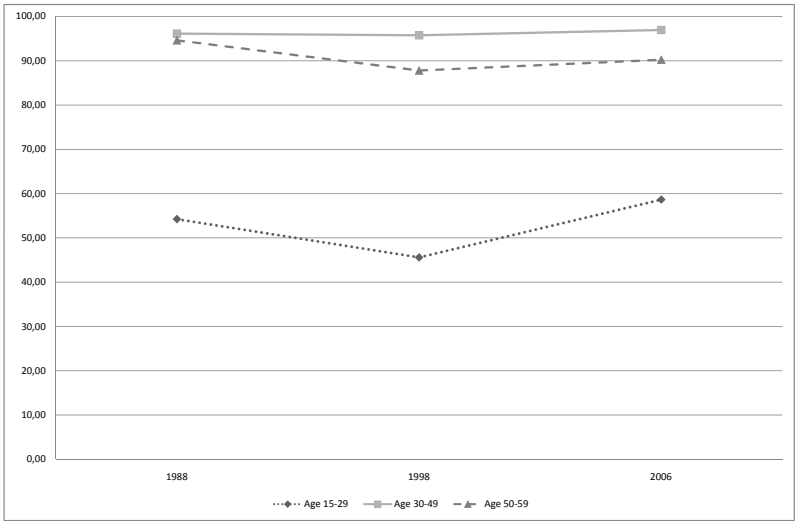
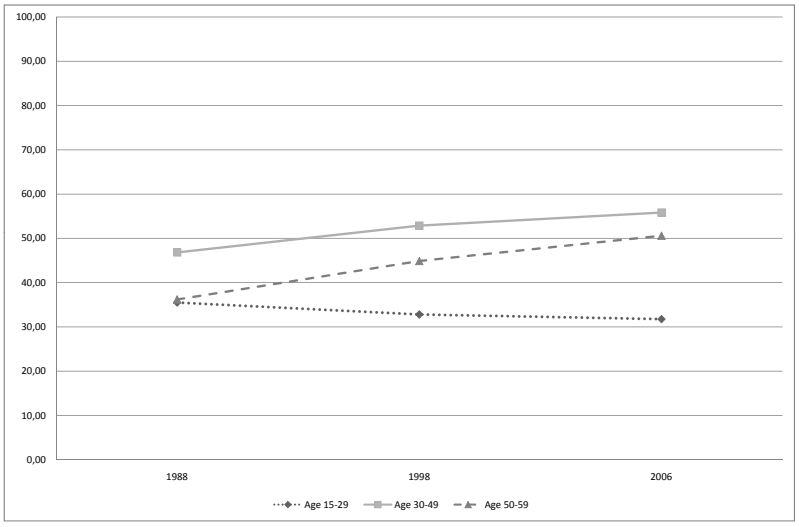


Figure 2: The Evolution of Employment-to-Population Ratio during 1988-2006, Female (15-59)



Source: Constructed by The Author using LFSS88, ELMS98 and ELMPS06

Table 1: Employment-to-Population Ratio by Individual Characteristics, Age(15-59), LFSS 88, ELMS 98 & ELMPS 06

	Total			Males			Females		
	1988	1998	2006	1988	1998	2006	1988	1998	2006
Male	73.92	68.88	76,58						
Female	39.87	42.28	42,52						
Age 15-29	45.06	39.45	44.91	54.23	45.59	58.65	35.51	32.81	31.77
Age 30-49	70.56	73.40	76.91	96.13	95.76	96.95	46.83	52.86	55.82
Age 50-59	64.60	65.44	69.41	94.60	87.80	90.23	36.21	44.89	50.60
Illiterate or RW	61.19	63.80	68.05	88.32	88.30	91.67	42.57	49.52	53.75
Less than intermediate	36.07	40.72	44.62	48.34	52.60	59.62	15.64	24.56	25.11
Intermediate	52.57	47.38	57.34	61.35	57.33	75.88	39.70	34.29	36.50
Above intermediate	70.65	70.25	65.50	78.02	81.93	84.31	58.98	55.82	42.79
University&Above	77.94	76.38	68.58	85.96	85.02	83.32	62.55	61.64	48.84
Greater Cairo	46.81	45.37	48.38	71.24	67.50	74.10	22.89	23.12	23.60
Alx, Suez Canal Cities	47.95	42.48	48.15	71.66	65.45	73.60	24.70	19.76	23.70
Urban Lower Egypt	48.52	51.88	52.56	68.97	68.83	73.72	28.58	35.01	32.61
Urban Upper Egypt	47.18	57.19	53.99	68.71	70.18	75.23	25.95	44.02	32.46
Rural Lower Egypt	67.24	60.68	65.74	77.45	69.43	77.21	57.16	51.82	54.29
Rural Upper Egypt	63.51	62.37	66.56	76.31	70.06	80.00	50.71	54.93	53.35
Urban	47.38	48.31	50.87	70.66	67,87	74,24	24,57	28.72	28,18
Rural	65.44	61.39	66.09	76,90	69,69	78,40	54,06	53,15	53,88
Total	56.78	55.56	59,41	73.92	68.88	76,58	39.87	42.28	42,52
Sample	8156	7536	13246	5319	4807	8621	2837	2729	4625

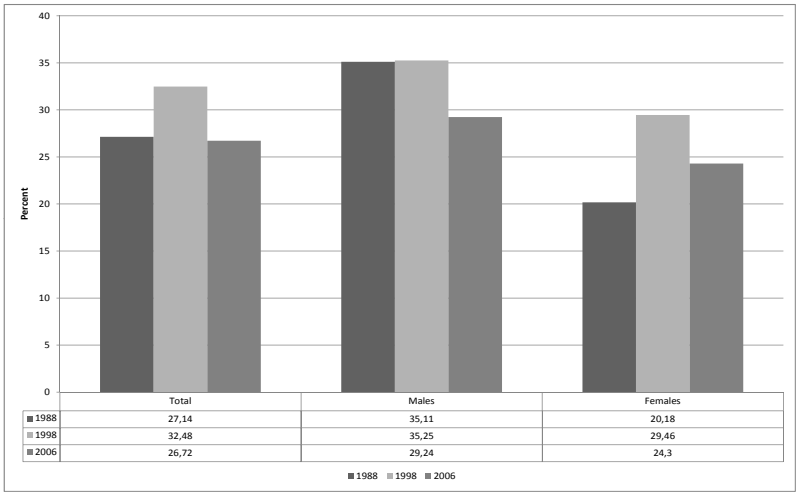
Source: Tabulations are constructed by the author.

Particularly for the young age group (15-29), it is important to see the evolution of their educational enrollment while seeing their participation rates and unemployment rates, since any decline in their participation rates could be due to an increase in their education enrollment which makes them out of labor force. To examine whether the increase in education enrollment among the young-age group was the responsible for the declining participation (employment to population ratio) witnessed during 1988 and 1998, Figure 3 represents the share of students among the young age (15-29) sample by gender and its evolution with time. Overall, the share of students among of young people have increased from 27.1% in 1988 to 32.5% in 1998. Looking closely by gender, it is observed that the share of students for males did not barely change (only an increase by 0.14 percentage point). Young women have experienced an increase in their share of students or those who are enrolled by around 9 percentage points. During the second period from 1998 to 2006, the share of students among young men and women have declined, leading to an overall fall in the share of students among those aged 15 to 29. Thus, the fall in employment-to-population ratio observed between 1988 and 1998 among the 15 to 29 years old men is unlikely to be caused by the increase in educational enrollment.

Employment-to-population ratio is the highest among those with university and

above educational levels, followed by those with above than intermediate and then by the illiterate or those who can read or write. Those who have an above than intermediate and university or above educational levels experienced a decline in their employment in the 1998 and 2006. This trend might be due to the increase in university education enrollment in Egypt in the 1990s. On the other hand, the illiterate, those who read and write and with less than intermediate experienced an increase in their employment during this period. The intermediate level has a U-shaped trend of employment. Overall the sample of men and women, the levels of employment-to-population ratio are the highest in rural areas, whether lower or upper Egypt, as compared to urban areas and to the metropolitan cities (Cairo and Alexandria). However, for males, the levels of employment are almost similar between urban and rural areas in contrary to females whose gap is very wide in favor for rural ones.

Figure 3: The Share of The Enrolled in Education among the (15-29) Age Group, by Gender



Source: Constructed by the author using LFSS88, ELMS98 and ELMPS06

3.2 Evolution of the Proportion of Formal Employment

Overall, the share of formal employment declined from 47.20% of overall employment in 1988, to 39.9% in 1998 and 36.8% in 2006. Across gender, the same trend

was observed for males where formal employment has overall declined from 52.7% to 44.8% (around 8 percentage points) during 1988-2006 where the decline during 88-98 was by around 2 percentage points, whereas for female, formal employment decreased between 1988 and 1998 from around 34% to 23.6% (around 10 percentage points) but re-increased very slightly in 2006 by 0.5 percentage point. All age groups have experienced a decline in their formal employment between 1988 and 1998. For instance, the share of formal workers among the 15 to 29 years old workers has fallen from 31.7% to 21.7% during this period. The share of formal employment among the prime age and the older age workers almost declined by 8 percentage point for each of both groups. Between 1998 and 2006, formality remained the same for the young age group. However, it continued to decrease for the 30 to 49 and the 50 to 64 years old workers. It is important to note that the share of formal employment among the prime age workers is the highest, followed by the share of formal employment among the older workers while workers ageing 15 to 29 years have the lowest share of formal employment, witnessing the characteristic phenomenon of the Egyptian Labor market that the new entrants are the most likely to be informal.

Formal employment is positively correlated with the education levels, where the share of formal employment is higher for every higher education level. Rural areas lack behind urban ones in terms of formal employment. The only region that witnessed an increase in formal employment in 1998 was Alexandria and Canal cities, while all the other regions experienced a decline in the proportion of the formal jobs in all jobs, especially rural Upper Egypt. Between 1998 and 2006, there was a decline in almost all the regions in terms of formality.

Figure 4 shows the evolution of the share of formal employment in total employment across age-groups for males. The share of formal employment decreased from 1988 to 2006 for all the age-groups. The only exception was for the 50-59 who experienced an increase in their formal employment between 1988 and 1998. During 1988 to 1998, the share of those formally employed among the young declined by around 5 percentage points while it declined around 3.5 percentage points for the the prime age workers. During the second period, i.e. from 1998 to 2006, the 30 to 49 witnessed their share of formal employment decreasing by 6 percentage points as compared to a decrease by 2 and 4 percentage points for the 15 to 29 and the 50 to

Table 2: The Distribution of the Share of Formal Employment by Main individual Characteristics

	Total			Males			Females		
	1988	1998	2006	1988	1998	2006	1988	1998	2006
Male	52.75	50.58	44.77						
Female	33.95	23.64	24.11						
Age 15-29	31.66	21.69	21.18	31.57	26.10	24.69	31.86	15.06	14.99
Age 30-49	58.11	50.37	47.52	65.51	61.93	55.79	39.22	31.15	32.41
Age 50-59	55,17	50,63	48,07	64,21	67,74	63,64	19,3	19,87	22,99
Illiterate or RW	30.48	16.52	15.17	41.40	31.02	26.72	6.53	1.46	3.28
Less than intermediate	47.29	34.84	27.90	48.66	43.81	35.03	37.61	8.69	5.85
Intermediate	73.54	56.07	43.38	67.85	58.47	45.60	85.63	50.78	38.19
Above intermediate	82.40	80.24	72.59	81.01	75.84	71.09	85.26	88.23	76.16
University&Above	87.47	87.16	79.79	86.33	87.14	79.47	90.47	87.23	80.53
Gr. Cairo	69.81	68.47	65.29	69.23	66.88	62.74	71.58	73.13	72.97
Alx, Sz C.	63.93	71.48	63.37	62.08	70.22	60.56	69.37	75.60	71.74
Urb. Lwr.	63.11	54.62	49.33	64.99	60.45	52.01	57.92	43.22	43.63
Urb. Upp.	64.51	52.62	54.52	61.42	60.04	55.89	77.93	40.63	51.30
Rur. Lwr.	30.47	31.41	29.08	40.76	44.81	39.94	14.09	13.24	13.68
Rur. Upp.	34.92	19.56	19.44	41.76	31.87	28.97	12.06	4.36	5.40
urban	66.89	62.35	57.89	66.26	64.76	57.90	68.82	56.64	57.87
rural	32.33	26.35	24.90	41.23	39.41	35.14	13.48	9.33	10.14
Total	47.20	39.90	36.83	52.75	50.58	44.77	33.95	23.64	24.11
Sample	3238	3570	5258	2546	2691	3960	692	879	1298

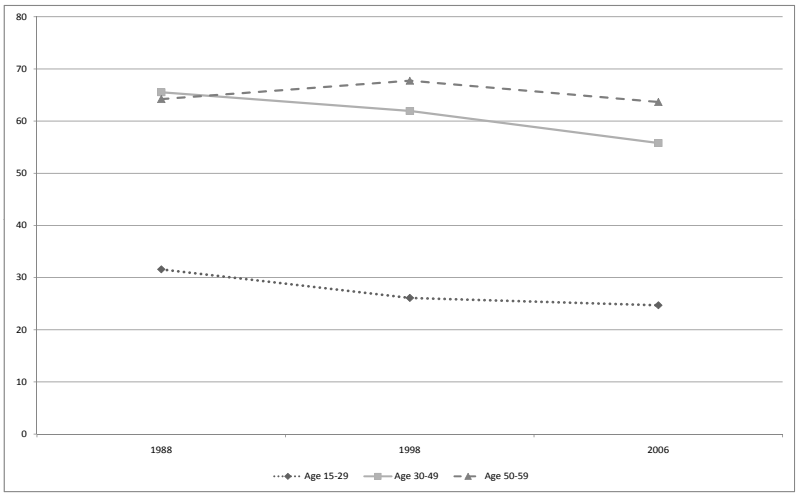
Source: Tabulations are constructed by the author.

59 years old workers, respectively.

The prime age group (30-49) had the highest share of formal employment in 1988. The share of formal employment among older workers (50-59) increased in 1998 to be the highest as compared to the other age groups and kept the highest in 2006, inspite of the decline.

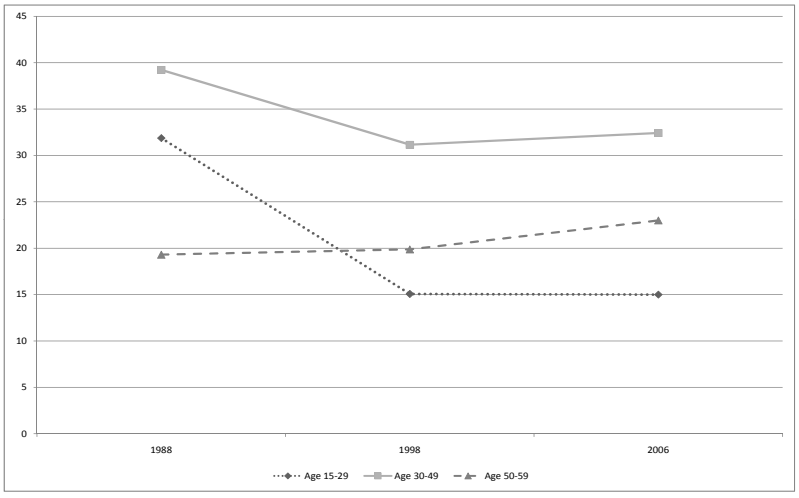
Females have almost the same pattern of evolution as males during the period 88-98, where formal employment among the 15-29 and 30-49 years old workers decreased while it increased for the the older category (50-59). Yet the decline rate was much more important for females than males. However during 1998 to 2006 and inversely to males, the decline in formal employment did not continue, implying a slight increase in formality among women. It is worth mentioning that the 50 to 59 female workers had the lowest share of formal employment in 1988. While it kept increasing over all the period from 1988 to 2006, it was still lower than the formality level of the prime age workers level. This is different than the 50 to 59 male workers trend where their share of formal employment exceeded the shares of the other two age-groups. Moreover, the low share of formal employment among the 50-59 female workers at 1988 may reflect that the majority of those who worked at that time were involved in subsistence activities which are by default informal.

Figure 4: The Evolution of the Share of Formal Employment during 1988-2006, Working Men (15-59)



Source: Constructed by the author using LFSS88, ELMS98 and ELMPS06

Figure 5: The Evolution of the Share of Formal Employment during 1988-2006, Working Females (15-59)



Source: Constructed by the author using LFSS88, ELMS98 and ELMPS06

Thus, to resume the evolution, young and older male workers experience fewer chances of employment in 1998. Older had more incidence of formality in 1998 than 1988 inversely to the young and prime age who witnessed an increase in their share of informal jobs. In 2006, the employment of the older age-group did not change much (slight increase) as compared to an increase in the employment of the young age-group. Informality has increased for all age-groups of workers in 2006. While employment of the control group did not change from 1988 to 2006, the growth of informal workers among this age group was more important than the young or the older in 2006.

Concerning females, prime and older workers experience more chances of employment in 1998 and 2006 whereas the employment of the young females decreased. Just like men, older women had more incidence of formality in 1998 than 1988 inversely to the young and prime age who witnessed an increase in their share of informal jobs. Inversely to men, informality has stopped to increase in 2006 for all age-group workers.

Apparently, men and women have different trends during the period 1988 - 2006, while older men workers might go out of the labor market more importantly, women hold on to jobs in their older age stage (50-59). Employment of the prime age female workers (30-49) evolves over time and has a variant trend as compared to the more or less stable trend for their male peers. Also, young females (15-29) witnessed a significant increase in the education enrollment in the 88-98 period by around 9 percentage point relative to 0.14 percentage point of increase for young males.

3.3 Evolution of the Employment by Sector

The evolution in the formality level may mask the sectoral changes between public and private sector that may arise during the same period, given that the majority of jobs in the public sector is formal and that informality is mainly a characteristic of the private sector whether in wage or non-wage employment. The public sector only recruits wage workers. The private sector encompasses wage workers and extends to the employers, self-employed, and the unpaid family workers who are considered as non-wage workers. Table 3 shows the same evolutions of sector as shown in the

previous section.

Table 3: the Distribution of Employment by Sector, 1988-2006, Age (15-60)

	Total			Males			Females		
	1988	**1998**	**2006**	**1988**	**1998**	**2006**	**1988**	**1998**	**2006**
Public Wage Employment	28,23	29,78	25,12	32,97	34,81	27,61	19,57	21,6	20,71
Private Sector:									
Wage Employment	23,69	25,28	28,94	31,43	36,86	40,24	9,58	6,46	8,92
Non-wage employment:									
Employer	14,39	7,88	10,14	17,97	12,14	14,78	7,86	0,95	1,93
Self-employed	9,91	6,92	8	6,99	9,06	8,98	15,24	3,44	6,25
Unpaid Family Worker	23,78	30,15	27,81	10,64	7,14	8,38	47,75	67,54	62,19
Total	100	100	100	100	100	100	100	100	100

Source: Tabulations are constructed by the author.

The share of the public sector in total employment kept growing between 1988 and 1998, even slowly, from 28.2% to 29.8% for the whole sample and from 33% to 34.8% for the males' sample. Such finding of continuing growth in the public sector in the period 1988-1998 was also confirmed by Assaad (2002) stating that while the share of employment in stated owned enterprises (SOEs) has significantly declined in 1998 as compared to 1988, the employment in the government sector increased with a higher pace than the decrease in the SOEs employment resulting in an overall increase in the public sector share of employment. During the second period (1998 - 2006), the effect of the downsizing policy of the public sector began to show through a decline in the share of public sector in overall employment. The share of the private wage employment among all employment increased from 23.7% to 25.3% in the first period then continued to increase reaching 28.9% in 2006. For the males' sample, their share of private wage employment is higher than the average pattern. Thus, the increase in informality during 1988 to 1998 was accompanied in parallel with a slight growth in the public wage employment as well as in the private wage employment. The growth of the private wage employment is observed to be more important than in the public wage employment. During 1998 to 2006, the informality continued to increase in parallel with a decline in the public wage employment, an increase in the private wage employment, and an increase in the share of employers and self-employed (forms of non-wage employment). Seemingly, the growth in the private wage employment in the first and second period is associated with an increase in the share of informal employment overall the sample and particularly for males

3.4 Evolution of the Unemployment Rate

While the unemployment problem is beyond the scope of the empirical analysis of this paper, however it is important to see the evolution of the unemployment rate, especially for the young age group (15-29). This analysis relies on the standard definition of unemployment which considers every individual in the working age population unemployed if he/she meets three conditions: not working in the week prior to the questionnaire interview or being not attached to any job, desiring and available to work, and actively searching for a job in the three months that precedes the questionnaire. As mentioned above, the extended definition of the labor market is used, i.e. considering those who have subsistence activities as working even though not having a market job. Table 4 shows that after being 5.3% in 1988, unemployment rate increased on average to 7.9% in 1988, then fell down to 6.15% in 2006. Such inverted U-shape trend is also observed separately for males and females, for the young age group and the old age group, cutting across different educational levels - except for the less than intermediate education level which followed a decreasing trend during all the period and the university and above, whose unemployment rate continued to increase from 1988 to 2006. Moreover, this trend was observed across different regions except Cairo and Urban Upper Egypt. It is worth mentioning that, over the period 1988 to 2006, females have had higher unemployment rate than males, reaching a peak of 9.37% in 1998 then declining to 8.7% in 2006. Likewise, the male unemployment rate also increased reaching around 7.2% in 1998 then declined in 2006 (4.7%). The 15-29 years old have the highest unemployment rate, as compared to very small levels of unemployment rate among the 30-49 and the 50-64 years old. It increased to 17.6% in 1998, relative to 10.5% in 1988 and then declined in 2006 to 12.5%. Effectively, the unemployment of the new entrants is considered as one of the main challenges in the Egyptian labor market. Moreover, as studies about the Egyptian labor market always found, the unemployment rate for the better educated is the highest one as compared to other educational levels. The same finding is also presented in Table 4 showing that those with intermediate and above than intermediate educational levels (mainly the technical secondary schools ' graduates) have the highest unemployment rates. Unemployment among females

Table 4: Unemployment Rate by Individual Characteristics, Age(15-59), LFSS 88, ELMS 98 & ELMPS 06

	Total			Males			Females		
	1988	1998	2006	1988	1998	2006	1988	1998	2006
Male	3,97	7,19	4,72						
Female	7,88	9,7	8,99						
Age 15-29	10.46	17.58	12.46	7.61	15,8	9,51	14.64	20,12	17,23
Age 30-49	1.90	2.31	2.37	1.90	1,97	1,62	1.89	2,86	3,69
Age 50-59	0.51	1.35	0.36	0,39	2,04	0,59	0,8	0,09	0
Illiterate or RW	2.03	2.38	0.72	2.15	3.53	1.24	1.86	1.16	0.18
Less than intermediate	5.94	4,15	1.85	4.30	4.73	1.91	13.57	2.41	1.68
Intermediate	15.38	18.46	10.34	8.82	13.90	6.51	27.25	27.35	18.16
Above intermediate	12.68	13.95	9.44	6.84	9.11	5.62	22.81	21.53	17.39
University&Above	6.95	9.46	13.80	4.83	6.58	9.73	12.12	15.58	21.85
Gr. Cairo	9.89	8.92	9.41	5.90	5.62	7.04	20.21	17.40	15.87
Alx, Sz C.	8.04	12.01	10.06	6.12	8.84	7.22	13.12	21.03	17.57
Urb. Lwr.	7.87	11.95	11.12	5.82	7.98	6.07	12.37	18.82	20.23
Urb. Upp.	9.39	7.08	7.49	4.97	6.55	5.39	19.21	7.93	12.07
Rur. Lwr.	2.74	9.61	5.24	1.86	9.16	4.31	3.88	10.22	6.52
Rur. Upp.	2.72	3.32	3.13	2.84	4.77	2.35	2.54	1.45	4.27
urban	9.12	9,9	9,24	5,84	6,94	6,38	17,23	16,2	16,3
rural	2,73	7,03	4,34	2,33	7,38	3,46	3,28	6,56	5,57
Total	5,29	7,9	6,15	3,97	7,19	4,72	7,88	9,7	8,99
Sample	509	703	964	243	375	455	275	328	509

Source: Tabulations are constructed by the author.

with these educational levels is much more occurring than among their male peers. Unemployment rate is also higher in urban areas than rural ones, the gap is mainly pronounced for females where unemployment among urban females is almost five times higher than their rural peers unemployment rate.

While it was important to describe stylized facts about the men and women situation on the labor market, the empirical analysis of this study focuses on men.

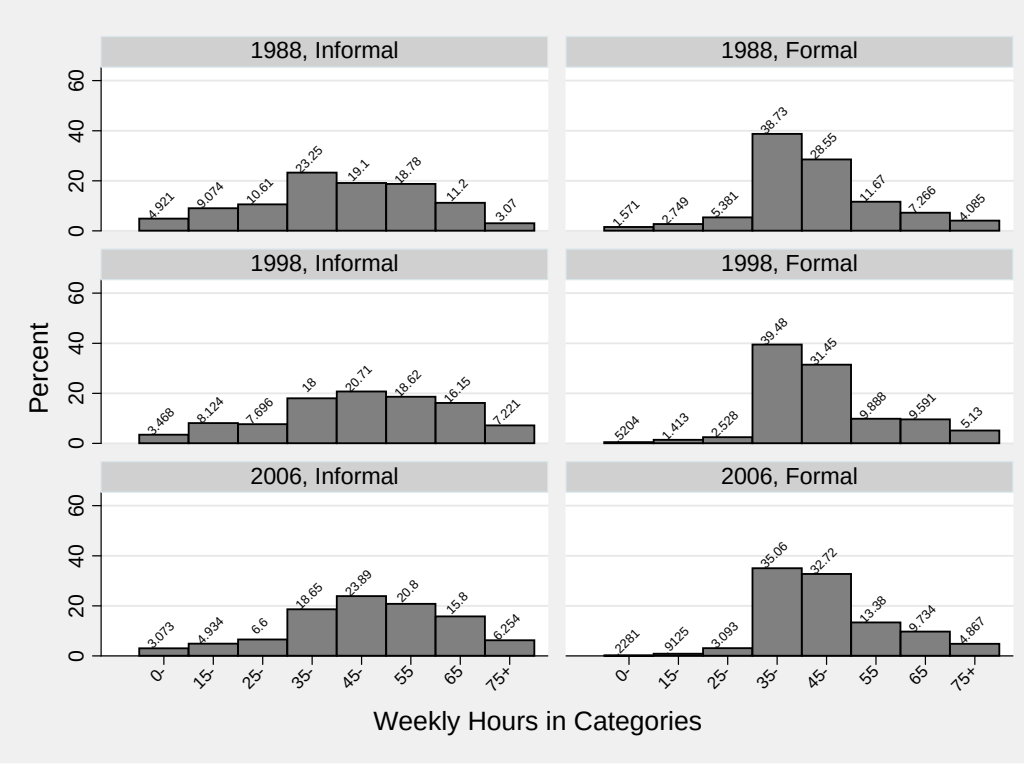
3.5 Evolution of the hours-of-Work

Hours of work[8] show different trends across the formal and the informal jobs, the public and the private sector as well as across age-groups. First, Figures 6 and 7 show the distribution of weekly hours-of-work that are indicated by every male worker aged between 15 and 59 years. Weekly hours presented in these figures are composed of 7 main categories of hours: 0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 75 and above. It shows that the formal jobs and the public sector follow similar trends in comparison to informal jobs and the private sector, respectively. Generally and irrespective of the formality status or the sector, hours of work tend to increase over the 1988 to 2006 period. Cutting down by sector or formality, it is observed that the majority of workers in formal jobs or in the public sector perform between 35 to 44 or 45 to 54 hours per week. The distribution of hours has more variability in the informal jobs or the private sector than in formal jobs or the public sector.

Across age-groups, there was an increasing trend in the weekly hours of work in formal jobs from 1988 to 2006 for the young and the prime age groups, while it was almost constant for the older-age group. Regarding informal jobs, all the age groups experienced an increase in their hours of work from 1988 to 1998. However, during 1998-2006, the evolution in hours of work followed different patterns across age-groups. In 2006, informal young workers perform lower hours than their formal peers. On the other hand, informal prime age and older age workers perform higher hours than their formal peers. It is interesting to see that informal prime age workers performed higher hours than their formal peers since 1988 and that the hours gap between informal and formal workers increases. Hours of work for informal older age workers were lower in 1988, as compared to their formal ones.

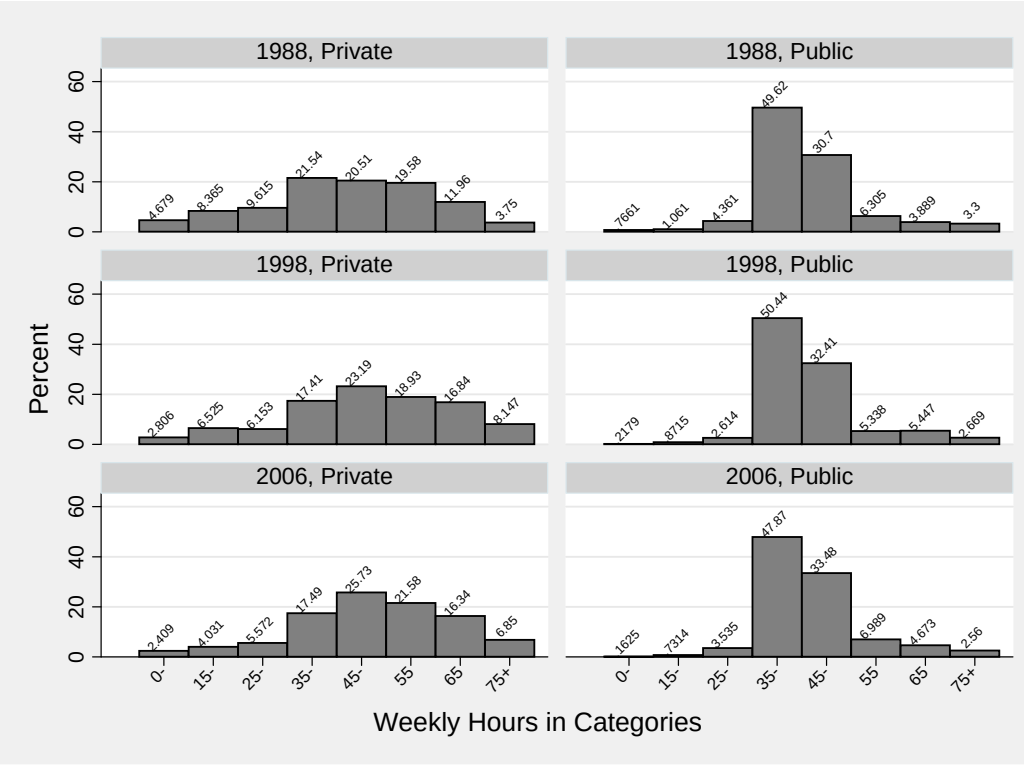
[8]Stylized facts about hours-of-work are presented for men only. This is to confuse the reader with too many descriptive statistics and to remain focused on the objective

Figure 6: The Distribution of Weekly Hours for Working Men (15-59), By Year and Formality



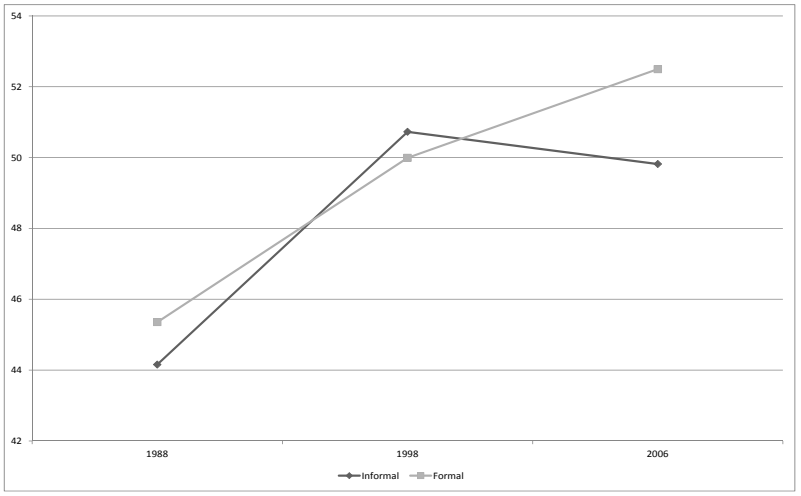
Source: Constructed by The Author using LFSS88, ELMS98 and ELMPS06

Figure 7: The Distribution of Weekly Hours for Working Men (15-59), By Year and Sector of Work



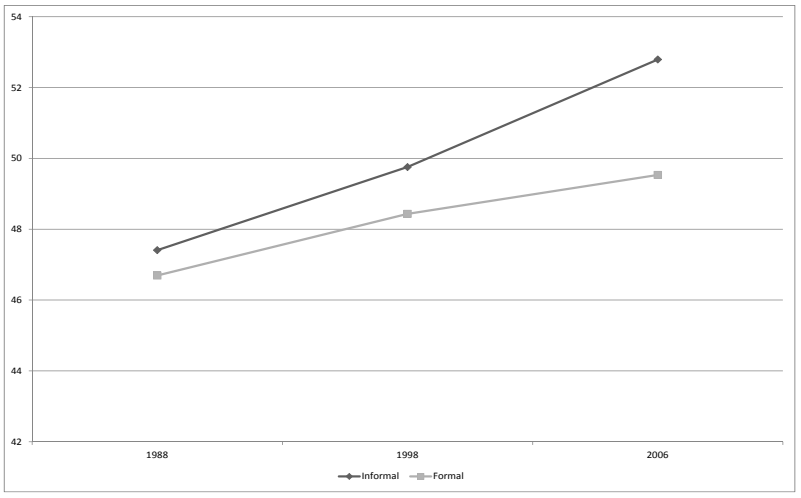
Source: Constructed by The Author using LFSS88, ELMS98 and ELMPS06

Figure 8: The Average Weekly Hours for Working Men (15-29), By Legal Employment Status



Source: Constructed by the author using LFSS88, ELMS98 and ELMPS06

Figure 9: The Average Weekly Hours for Working Men (30-49), By Legal Employment Status

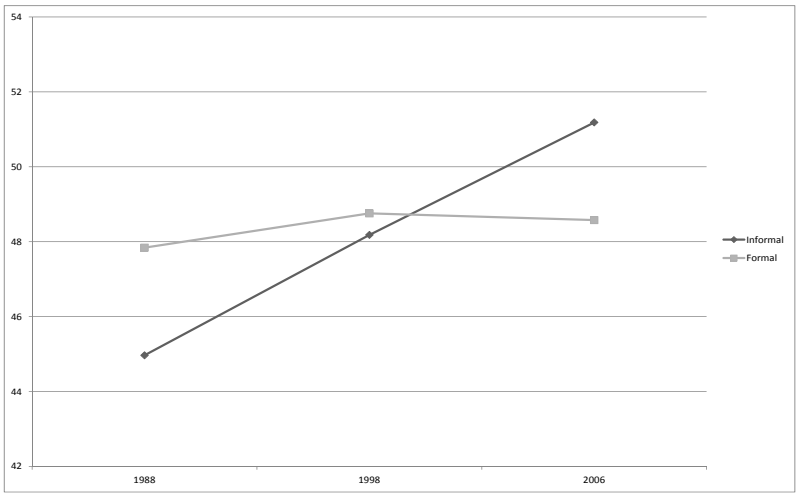


Source: Constructed by the author using LFSS88, ELMS98 and ELMPS06

4 The Methodology

The main objective of the paper is to analyze the evolution of the the employment of particular age groups, mainly youth and older age groups in the aftermath of the ERSAP reforms introduced in the 1990s and the new labor law of 2003. Three

Figure 10: The Average Weekly Hours for Working Men (50-64), By Legal Employment Status



Source: Constructed by The Author using LFSS88, ELMS98 and ELMPS06

employment related issues are studied: the employment-to-population ratio, the formality status of the employment and the weekly performed hours-of-work. The model simultaneously estimates the probability of participation to the labor market, the probability of having formal employment and the hours-of work performed. Thus in the estimation of the probability of having a formal job, the selection into labor market is taken into account. Moreover, in the estimation of the hours of work, the selection into formality and labor force participation is also accounted for.

4.1 Theoretical Discussion and Expectations

The used methodology of simulatenously estimating employment, informality and hours-of-work is not explicitly specified by an underlying structural economic model. The conventional approach of utility maximization through the life cycle is followed (Heckman 1978; Heckman 1993). The individual allocates his time between work and leisure. He is also supposed to maximize his utility by choosing whether to have a formal job or not and how many hours of work to perform. The introduction of the formal versus informal employment choice broadens the discussion to another family of models that analyze the existence and the nature of the informal sector and jobs.

The presence of the formal and informal employment or sector in the economy can find its explanation in the dual labor market theory where there is a high productivity "primary" and a low productivity "secondary" sector. The dualistic labor market finds its first illustrations in the Lewis model (1945) which explains that the market can be segmented in two labor markets: the modern industrial sector "capitalist" and the traditional -agricultural - sector. The higher wage offered in the industrial sector will attract the surplus labor in the traditional one, up to the point that the wage in the traditional one will rise and poverty will be reduced. The model thus supposed that all those who cannot find a job in the modern sector will take up a job in the traditional "lower quality" sector. Thus, unemployment does not exist in such model. Then this dualistic approach has been further elaborated and developed. For instance, Harris and Todaro (1970) introduced the idea of the presence of unemployment besides the idea of migration. The modern industrial sector is urban while the traditional one is rural. Wages in the modern sector are higher than the market-clearing level due to institutional reasons such as minimum wages or strong unionization, etc. Therefore, individuals prefer the modern sector than the traditional sector and rural residents migrate to urban areas in order to get a job in the better paid sector. However, there are not enough opportunities for all the rural migrants. Therefore, urban unemployment is observed. This model explained the presence of three states in the labor market: a modern one that can be called a "formal" sector, a traditional one symbolizing the "informal" sector and the urban unemployment state that is what rural migrants afford in case of not finding a job in the modern sector. However, this model lacked the presence of an informal job in the urban sector. Fields (1975) proposed an extended model for Harris and Todaro (1970) with a fourth state which is the urban informal sector. In the absence of social transfers in case of unemployment, urban job-seekers who cannot afford not having a steady labor income would recur to what is called the informal sector jobs which are mainly with easy entry. Such jobs are necessarily of lower quality than formal sector jobs, in terms of benefits, wages, stability, etc. Such models family concludes that because of the above market-clearing wages set due to efficiency wage theories or to institutional reasons (the minimum wage or the strong unionization, etc), segmentation between formal and informal jobs can exist. However, recent

studies did not content only with the distinction between the formal sector as the primary better one and the informal sector as the secondary one. Rather, they suggested that the informal sector is heterogeneous in the sense that it can encompass an "upper-tier" employment that is chosen and an "easy entry" one that is undergone or endured [9] (Fields, 1990; Maloney 2004; Cunningham and Maloney, 2001). The informal sector is not always viewed as the disadvantaged or the less-advantaged sector in a dual segmented market. Many workers have taste for informality, thus voluntarily sorting themselves into informal jobs - mainly self-employment or being entrepreneurs - as they may seek greater flexibility or independence. Thus, some individuals have sort of "comparative advantage" in working in the informal sector or informal employment. Maloney (2004) states examples of such preference for certain types of informality. For instance, being an entrepreneur or owning oneself own business might be of higher social value and prestige in some countries. Likewise, informal jobs can represent for the older workers a "safety net" since they cannot come back to the formal jobs because they exceeded the retirement age. More specifically, it was found that older workers prefer moving to informal employment opportunities after the economic reforms of the structural adjustment in the 1990s. This is because their skills were not as much as valued or demanded by the post-reforms emerging sectors or companies, rather were considered as out-dated. According to Maloney (2004), this implied that the taste for informality may be a cause of labor market dualism rather than the other way round which sees segmentation (i.e. the wage difference between two sectors) as the root cause for informality. Self-employment being attractive for some workers leaves space for market segmentation. It is also observed that some workers prefer the informal sector as a safety net during the crisis times. The non-pecuniary aspects of formal jobs may not be important enough to outweigh the drop in wages of formal jobs in times of recession. Therefore, individuals choose the informal jobs where the benefit is all pecuniary (i.e. monetary). This happens when social security/health provisions systems are not efficient enough or when social benefits are very weakly linked to contributions, which is the case in Egypt and many developing countries (Gindling, 1991; Dickens and Lang, 1985; Pradhan and van Soest, 1995; Tansel, 2005; Arias and Khamis, 2008).

[9] due to the above mentioned explanations

The Egyptian labor market during the 1990s and the 2000s shared many features of the discussed theories but can also be different in many regards. The Egyptian labor market may lie under the higher than market-clearing wage set institutionally (Fields 1990). First, the old labor code (before 2003) prohibited dismissing workers, except in the rarest conditions. Moreover, the dismissal procedures were very complicated. Thus, the labor market was marked by highly restrictive employment protection. Second, the public sector "pay policies" (Fields 2009, p.11) play an important role in creating a strong preference for the formal public jobs. The Egyptian public sector (mainly governmental jobs) does not offer a better paid job. Rather it provides a package of benefits (pecuniary and non-pecuniary) that attract the individuals for this kind of jobs. According to what happened during the 1990s, the state began to gradually reduce its recruiting responsibility in the government and the SOEs job opportunities. This type of job was and still the first preference for the new entrants to the labor market because of its benefit packages, the stability, and the guarantee of holding this job for the lifetime (until reaching the retirement age). Drawing on the Egyptian studies and the stylized facts, the labor supply pressure was greater than the employment growth in the private sector (the other alternative to the public sector). It might be also that the skills of the newly graduates do not match the requirements of the private sector leading that a minority can reach these jobs but the rest of new entrants have limited access to such private sector jobs. Thus the reduction of the labor allocation in the public sector jobs in addition to the low employment growth in the private sector may have leaded to two potential results: longer waiting queues for public jobs that may be translated into higher unemployment, and for those who cannot afford unemployment, more recurrence to temporary [10], unprotected, and mis-matching to education jobs. While the Harris and Todaro model (1970) supposed that anyone who wants a job in the rural sector will find it due to its free-entry nature, this might be not plausible in the Egyptian labor market. With the developing trend of informality in formal firms, opportunities of informal jobs inside the firms become limited and thus not at the reach of job-seekers. Unemployment may also arise not because waiting for the public jobs

[10]Temporary jobs usually involve not affiliating the worker to the social security, and to a greater limit writing him a contract

nor being unable to have a good job in the private sector, but also being unable to have even an informal job in the private sector.

The first subject to these reforms are the young persons, or the new entrants, with no experience/not enough developed skills, and not enough connections to make them reach a public job opportunity or a private one, etc. Thus, the first expected result of the ERSAP reforms on the labor market is more informality for young people who cannot afford staying in unemployment. Informal jobs being not regulated and not protected may involve higher number of hours than the formal jobs. Thus, higher hours of work are also expected to be observed in this period.

The second reform which is restructuring the labor excess in the SOEs can affect the employment of the older workers. As discussed by Maloney (2004), they may have hard time joining the private sector due to lack of required skills. Thus, they either end up in inactivity or in informal employment.

The prime age working group aged of 30 to 49 years may be the most stable category. Those who work among them have passed the challenge faced by new entrants. The reforms in the public sector, for instance, did not affect them. From the private sector side, they may be more demanded than the 15 to 29, given their more developed and customized skills, especially those in the early 30s. There is no expectation, *a priori* for their informality trends.

During the 2000s, the passage to a new labor aimed to reduce informality by rendering laying-off workers permitted with more flexible conditions and by simplifying the hiring conditions. The expected trend would be more formalization among the already-employed persons, of any age-group. It also may increase the likelihood of finding a formal job for the new entrants. The latter expectation should, however, be strengthen by favorable paths of both GDP and employment growth rates.

4.2 The Model

The methodology consists of simultaneously estimating three reduced form equations: one equation of weekly hours-of-work and two reduced-form equations explaining the selection mechanism (the first is the decision of employment or labor force participation and the second is the decision of working in formal or informal em-

ployment). The simultaneous estimation of the three equations is fitted through maximum likelihood approach. Such methodology permits to correct the problem of self-selection and unobserved heterogeneity (Heckman, 1993). The formality status of employment and hours-of-work are only observed for the working individuals while they are not known for the non-working population. Hence, there might be some unobserved characteristics that jointly determine the working decision and the allocation into formal and informal, or the working decision and the hours of work. Likewise, the formality status of employment and the hours of work might be correlated leading that there are some unobserved factors which influence the formal or informal employment and the choice of performed hours-of-work. Thus, when estimating the probability of formal employment, the probability of not working is taken into account. Furthermore, when hours of work are being estimated, the non-work status and the formality status of the employment are taken into account. Moreover, the simultaneous equation technique permits the estimation of the correlations between the stochastic components of the hours-of-work equation and the stochastic components of the participation/employment and formality equation.

1. Participation Equation for any individual i is:

$$\begin{aligned} P_i^* &= X_i'\beta + \epsilon_{pi} \\ P_i &= I(P_i^* \geq 0) \end{aligned} \tag{1}$$

2. Formal/Informal Equation :

$$\begin{aligned} F_i^* &= Z_i'\gamma + \epsilon_{fi} \\ F_i &= I(F_i^* \geq 0) \end{aligned} \tag{2}$$

If and only if

$$P_i^* \geq 0$$

P^* denotes the propensity to work (participate in the labor market),whereas P is the corresponding observed variable. The latter equals 1 if the corresponding

propensity is greater than zero (i.e. the individual is employed) and 0 if it is lower than zero (i.e. in case of unemployment or inactivity). Likewise, the observed variable of formal employment F equals 1 if the corresponding propensity F^* is greater than 1 (i.e. formal job) and 0 if otherwise (informal job).

Moreover, the hours-of work performed by the individual given being employed and taking into account whether the job is formal or not is given as follows:

$$H_i = K_i'\theta + \epsilon_{hi} \tag{3}$$

Weekly Hours H are only observed for working individuals and for both formal and informal employment.

The vectors of explanatory variables are given by X, Z, K whereas β, γ, and θ are the parameters vectors. The errors terms $\epsilon_p, \epsilon_f, \epsilon_h$ are jointly normally distributed as follows:

$$\begin{pmatrix} \epsilon_p \\ \epsilon_f \\ \epsilon_h \end{pmatrix} \sim \mathrm{N} \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \ \Sigma$$

Where Sigma is given by :

$$\begin{pmatrix} \rho_{pp} & \rho_{fp} & \rho_{ph} \\ \rho_{fp} & \rho_{ff} & \rho_{fh} \\ \rho_{ph} & \rho_{fh} & \rho_{hh} \end{pmatrix} \tag{4}$$

The correlation between the error terms of the three equations are given by ρ_{fp}, ρ_{ph} and ρ_{fh}. It reflects the possibility that some unobserved factors influence decisions of work and formality, work and hours-of-work and formality and hours-of-work, respectively. Variances are given by ρ_{pp}, ρ_{ff} and ρ_{hh}. Variances of the participation equation and of the employment formality are normalized to 1 (ρ_{pp}, ρ_{ff} respectively). Since the three equations of participation, formal employment and

hours are in reduced form (i.e. not containing wage variables), then set of covariates X, Z, and K include all variables in the wage equation (Pradhan and van Soest, 1995) It includes individual-level characteristics such as: dummy variable the age groups (15-29 and 50-64), dummies for education level (less than intermediate, intermediate, above than intermediate) and five regional dummies (Alex and Canal cities, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt and Rural Upper Egypt). As exclusion variables in the employment equation, X include the number of dependents aged 0 to 14 in the household. Although this variable might be correlated with the decision of formality of the employment, it will not affect it directly, rather indirectly through the employment or the participation decision. The problem with this exclusion variable is its potential influence on the hours-of-work equation. However, it is not easy to find other plausible variables that can explain the selection into labor market or into work and not, without jointly affecting the formality status. Moreover, in order to identify the hours equation, the used instrument in the regressors vector Z in the equation of the formal employment is the incidence of the presence of formal workers in the household.[11] Having formal workers or not in the family is likely to affect the decision of formality status of the individual without directly determining hours. For instance, estimating the model on only males may reduce the problem of interdependent household decisions between spouses. This is why the instruments proposed might be considered, in this particular situation, as exogenous, whether the number of dependents aged (0-14) in the household or the incidence of formal workers in the household.

In this setting, the complete log-likelihood function will contain three main components:

$$\begin{aligned} LogL &= \sum_{P=0} \ln Pr(P_i = 0) \\ &\quad + \sum_{P=1,F=0} \ln Pr(P_i = 1, F_i = 0, H_i = H^*) \\ &\quad + \sum_{P=1,F=1} \ln Pr(P_i = 1, F_i = 1, H_i = H^*) \end{aligned} \tag{5}$$

[11] Incidence of formal workers is a dummy variable coded 1 if there is at least one formal worker in the household, and 0 if not

Where H^* indicate the observed hours of work. Equation 5 can be written as such:

$$\begin{aligned} LogL &= \sum_{P=0} \ln Pr(\epsilon_{pi} \prec -X_i'\beta) \\ &+ \sum_{P=1,F=0} \ln Pr(\epsilon_{pi} \geq -X_i'\beta, \epsilon_{fi} \prec -Z_i'\gamma|\epsilon_{hi}).f_h(h_i) \\ &+ \sum_{P=1,F=1} \ln Pr(\epsilon_{pi} \geq -X_i'\beta, \epsilon_{fi} \geq -Z_i'\gamma|\epsilon_{hi}).f_h(h_i) \end{aligned} \tag{6}$$

Where $f(h_i)$ is the probability density function for the hours-of-work variable and can be written as $\frac{1}{\sigma_h}\phi(\frac{H_i - K_i'\theta}{\sigma_h})$.

Then, the complete log-likelihood function can be written as: [12]

$$LL = \begin{cases} \sum_{P=0}[ln\Phi(-X_i'\beta)] \\ + \sum_{P=1,F=0} ln(\frac{1}{\sigma_h}\phi\left(\frac{H_i - K_i'\theta}{\sigma_h}\right)) + ln(\Phi_2\left(-\frac{Z_i'\gamma+\mu_f^*}{\sigma_f^*}, \frac{X_i'\beta+\mu_p^*}{\sigma_p^*}, -\rho_{pf}^*\right)) \\ + \sum_{P=1,F=1} ln(\frac{1}{\sigma_h}\phi\left(\frac{H_i - K_i'\theta}{\sigma_h}\right)) + ln(\Phi_2\left(\frac{Z_i'\gamma+\mu_f^*}{\sigma_f^*}, \frac{X_i'\beta+\mu_p^*}{\sigma_p^*}, \rho_{pf}^*\right)) \end{cases}$$

The model is estimated by maximizing the above log-likelihood function. In order to study the age composition of employment and its evolution during the period 1988 to 2006, we introduce dummy variables for age groups (15-29) and (50-59), for the years (1988) and (2006) as well as interactions between these age-groups and both years. As explained above, these dummies are controlled for, besides other individual variables such as education level, region, and some household characteristics as exclusion variables. Hence, the outcome Y whether employment, formal status, or hours of work can be given by:

$$Y = \alpha + D_{age_a}\beta_{age_a} + D_{time_j}\beta_{time_j} + (D_{age_a} * D_{time_j})\beta_{agetime_{aj}} + X\beta + \epsilon_p \tag{7}$$

Where "α" is the constant in the outcome equation. The age Category is represented by "a", which can be: $15-29$, or $50-59$. Finally, the time, that is the year of the survey, is represented by "j", which can be either 1988 or 2006. Thus, D_{age_a} is the dummy variable taking on 1 if age_i occurs and 0 otherwise. D_{time_j} is a dummy

[12] See Appendix for full details of the simultaneous equation model

variable for the year indicating the year of the sample used. It equals 1 for the period $time_j$ and 0 otherwise. The interaction term "$D_{age_a} * D_{time_j}$" between an age category and a certain year shows the difference in the coefficients between the treatment and group control in the year j as compared to the year i, hence can be interpreted relying on a difference-in-difference approach. By choosing the reference year to be 1998, the change during the first period (1988-1998) is distinguished from the change in the second period (1998-2006).

In a trial to better link the coefficients results with the structural adjustment reforms or the new law, number of precautions are taken. First and as mentioned before, the age limit of this study is 60 years old that is the the mandatory age of retirement for wage workers. Such limit is set to eliminate the natural drop in employment which will occur to older workers after 60. Moreover, the estimation will be fit on the out of schools individuals, i.e. excluding all those who are currently in school or college. Modeling employment decisions only for the out of school individuals permits excluding the effect of any change in the educational enrollment trends that could influence the participation or the employment of the young people. However excluding the students relies on the assumption that the schooling decision is independent of the participation decision. While such assumption might be strong and not realistic, this is the only feasible solution to isolate the other factors than the reforms that can affect the participation of the young. It is worth reminding that the empirical analysis is conducted on the males' cross sectional samples for 1988, 1998, and 2006. The evolution of female employment, their formality status and their hours of work can be due to various reasons throughout the period. Thus, it is harder for us to limit the other factors' effects as what we attempt to do for men.

5 Estimation Results

5.1 Work, Informality and Hours

Table 9 shows the results of the simultaneous estimation of the employment probability, the formality status of the job and the weekly hours-of-work. The esti-

mations are fit on the pooled sample of males aged 15 to 59 years old in 1988, 1998 and 2006. The reference category is an illiterate person, aged between 30 and 49 years and living in greater Cairo -the capital- in 1998. Consequently, changes over time during (1988-1998) and (1998-2006) for the reference group (males aged 30 to 49 years) are given by the coefficients of time dummies ($D_{time_{1988}}$ and $D_{time_{2006}}$), respectively. Coefficients of age-groups dummies ($D_{age_{15-29}}$, and $D_{age_{50-59}}$) explain the difference between each of these age groups and the reference age-category $(30-49)$ in the reference year 1998. Coefficients of the interaction between the age-group and the year can be interpreted as a difference-in-difference.

[Table 9 is about here]

Findings on the non-students males' samples show that the probability of employment did not significantly differ between 1988 and 1998 for the prime age individuals (reference group) while their probability of formal employment significantly declined in 1998 than in 1988, as observed in the coefficients of the year dummy D_{1988}, *ceteris paribus*. This indicates that, in the (88-98) period, the 30 to 49 years old were more exposed to informality while their employment chances were the same. The latter result was also observed in the stylized facts: the trend of employment for the prime age men was roughly stable. In 2006, their probability of employment increased relative to 1998 but their probability of holding a formal job continues to decrease. Their weekly hours have significantly increased in 1998 and in 2006 as compared to 1988.

Concerning the young individuals aged 15 to 29 years, they are significantly (at the 1% significance level) less likely to work and in the same time to hold a formal job in 1998 as compared to the reference middle age-group. The decrease in their employment likelihood during the period (1988 to 1998) was very important as compared to the slight or quasi inexistant change in the prime-age employment likelihood. This can be seen in the positive coefficient of the $D_{15-29} * D_{88}$. The positive significant interaction coefficient $D_{15-29} * D_{06}$ in the equation of work suggests that the difference in the probability of employment between the prime and the young age groups has decreased in 2006 in favor of the young. In other words, the likelihood of working has more increased more for the young than for the prime

age individuals in 2006 than in 1998.

While the young males have significantly lower probability of formal employment than the prime-age ones in 1998 (as seen in the negative significant coefficient of D_{15-29}), the negative significant interaction term $D_{15-29} * D_{88}$ in the equation of formal employment shows that the young were even less likely to formally work in 1988 than in 1998, as compared to their prime-age peers. Combining both coefficients, i.e. the age-group dummy and its interaction with 1988, indicates that while the young (15-29) are more inclined to informal jobs and face higher likelihood of being informal in 1998 than in 1988, their informality gap with the 30 to 49 was worse in 1988 than in 1998.[13] Between 1988 and 1998, the young people were increasingly excluded out of employment (i.e. more pushed to whether unemployment[14] or inactivity) at the same time that their jobs became more informal. However, the decline in their employment partly outweighed the increase in their informality leading to a share of informal employment that is increasing but at slower pace than the increase in informality of the 30-49 whose share in employment was stable and roughly the highest on the labor market.

The higher incidence of informal jobs observed among the 30 to 49 years old can not only be explained by the undergone reforms of the public sector reduction, but also a cohort effect can be suspected. Informality traces among the youth cohort in 1988 might have remained omnipresent as they moved into older age in 1998 and become a part of the 30 to 49 years old. This may have leaded to a decline in their probability of formal employment, that is more strengthen by the economic reforms.

Between 1998 and 2006, the change in the probability of formal employment for the young age (15-29) was not significantly different than the change for the prime age (30-49), indicating that the status of the young males relative to their prime age peers did not change between 1998 and 2006.

In regards to the hours-of-work, young workers performed lower number of hours in 1998 than the prime age workers. The change in their hours of work during 1988-1998 and 1998-2006 was not significantly different than the change in the reference age group's hours.

[13]The author uses the term "informality gap" to designate the difference in the probability of having an informal job between the young and the prime age group

[14]If excluding the students, the more relevant state is the joblessness

The older males (50-59) were significantly less likely to work in 1998 relative to the prime-age group. The gap in the employment probability in regards to the 30 to 49 years old was smaller in 1988 than in 1998, as seen in the positive coefficient of the interaction term $D_{50-59} * D_{88}$. Regarding the formality status, workers aged 50 to 59 years had always higher probability than the 30-49 workers to be formally employed. As shown in Table 6, while their probability slightly declined in 1998 relative to 1988, the difference in their likelihood of formality with the prime age increased. It is worth to remind that the prime age experienced a decline in their likelihood of formal employment, this is why the difference with the older was dug. In 2006, the difference in employment and formality probabilities between the two age-groups did not change relative the difference in 1998. It is however observed that the age dummy coefficient (50-59) in the equation of formal employment is smaller in magnitude in 2006 $(0,5044)$ than in 1998 $(0,648)$, as shown in (Table 6).

In 1998, older workers (50-59) performed much lower hours than the prime-age workers (30-49). They have longer of hours in 1988 than in 1998, relative to the prime age workers. Between 1998 and 2006, their hours of work did not significantly change relative to the change in the hours of the 30 to 49 years old workers .

To bring more clarification on the estimation results, the below tables calculate the estimated coefficients for each age group per year, the difference between periods and those between groups, based on Table 9.

Table 5: Estimated Coefficients and DID Estimates of the Effect of Age Groups on the Probability of Working

	1988	1998	2006	Difference between (1998-1988)	Difference between (2006-1998)
30-49	1,749	1,689	2,005	-0,06	0,316
15-29	0,617	-0,118	0,373	-0,735	0,491
50-59	1,936	1,173	1,48219	-0,763	0,30919
Difference between Young and Prime	-1,132	-1,807	-1,632	**-0,675*****(DID)	**0,175****(DID)
Difference between Old and Prime	0,187	-0,516	-0,5228	**-0,703*****(DID)	**-0,00681**(DID)

Source: Constructed by the author basing on the estimations results on the out-of-schools men sample given in Table 9
Note: *** represent statistical significance at the 1% for the DID estimate, as shown in the estimation results

To resume, during the first period (1988 to 1998), the 30 to 49 years old individuals were more likely to work informally, maintaining the same level of employment than 1988. In comparison, young individuals were less likely to be employed, but their increase rate in informality was slower than for the prime age (30-49). Finally, the 50 to 59 years old employment has declined while the difference in their likeli-

Table 6: Estimated Coefficients and DID Estimates of the Effect of Age Groups on the Probability of Having a Formal Job

	1988	1998	2006	Difference between (1998-1988)	Difference between (2006-1998)
30-49	0,589	0,163	-0,037	-0,426	-0,2
15-29	-0,376	-0,611	-0,7444	-0,235	-0,1334
50-59	0,694	0,648	0,5044	-0,046	-0,1436
Difference between Young and Prime	-0,965	-0,774	-0,7074	**0,191*****(DID)	**0,0666**(DID)
Difference between Old and Prime	0,105	0,485	0,5414	**0,38*****(DID)	**0,0564**(DID)

Source: Constructed by the author basing on the estimations results on the out-of-schools men sample given in Table 9
Note: *** represent statistical significance at the 1% for the DID estimate, as shown in the estimation results

hood of formal employment has increased in regards to the prime age workers. These latter results confirm findings of Wahba (2002) indicating that individuals aged 50-59 were the first to be pushed out of the labor market during the adjustment period, since they had higher mobility rates between 1991-1998 than between 1981-1988.[15] In 2006, the trend in differences was not statistically different than the 1998's except for the young males who have seen their difference in employment with the prime reduced. In 2006, the probability of working increased.

For further investigation of the reliability of the results, estimations were fit including individuals who are currently enrolled. As shown in (9), the main difference is that some variables in the participation equation become significant. More specifically, the insignificant positive D_{88} in the out of schools regression turned to be significant, showing that the probability of employment for the reference group significantly declined in 1998 than 1988. Also if we look at the coefficient of the 15 to 29 age group in 1998, its magnitude became -1.729 instead of -1.087, both significant at the 1% significance level. Thus, not controling for the increase in educational enrollment leads to the overestimation of some coefficients in the work equation. Moreover, when including the students, it is also noticed that, in 1998, those with less than intermediate education level have significantly lower likelihood to work. Once excluded, the impact of this education level become insignificant. This is mainly due to the fact that those with less than intermediate educational level in 1998 are more likely to be continuing their education up to higher levels and thus not working. Therefore, the impact of this educational level on the participation is also overestimated if we do not exclude the students. Excluding those who are currently in education seem to be a pertinent solution in order to take into

[15]The results of Wahba (2002) was based on the LFSS88 and the ELMS98

account the increase in education throughout the 1990s and the 2000s.

In general, the model's result is very coherent with the evolution trend of the employment-to-population ratio and the share of formal employment by age groups presented in Figures 1 and 4.

5.2 Work, Public Sector and Hours

In order to further understand about the effects of the reforms in regards to the distribution of employment between public jobs and private ones, a second specification was fit where the equation of the probability of formal employment in the simultaneous modeling is replaced by the probability of having a public job. This aims to assess the change in age composition of employment in the public sector versus the private one. Findings shown in Table 11 go together with the first model results (Table 9).

[Table 11 is about here]

Between 1988 to 1998, the prime age (30-49) employment has not significantly changed. However, they were more reported and allocated in private sector jobs with higher rates than the young ones (15-29). The latter group experienced an important drop in their employment probability same as shown in the above results. The coefficient of the age dummy (15-29) in the equation of the probability of public employment was around -1.205 and -1.226 in 1988 and 1998, respectively (Table 8). They had same lower likelihood of being in a public job in the two years. Hence, with the decline in their probability of working, this leads to a more rapid decline in the probability of public employment for the prime age (30-49) than for the (15-29). In 2006, the young men experienced a more rapid increase in their probability of employment than what the prime age witnessed. They also experienced lower likelihood of being in the public sector in 2006 than in 1998 but their difference with the prime age in regards to this matter was not significant, albeit negative.

The older age (50-59) experienced a decline in their employment chances between 1988 and 1998 relatively to the prime age workers. The likelihood of being in the public sector slightly increased in 1998, as compared to 1988. This also leads to a

higher rate of decline in public employment for the prime age males than for the older males. In 2006, the higher rate of decline for the prime age continues to exist but the difference was smaller in magnitude: The difference in the probability of having a public job between the older and the prime age workers became 0.166 between 1998 and 200, instead of 0.41 between 1988 and 1998. Looking closely to the probability of public employment for the older, it actually declined in 2006 relative to 1998.

The results confirm also the stylized facts mentioned in section 3. The public sector employment opportunities have effectively declined for all the age groups in the 1990s and the 2000s. The relative decline between age-groups is the reason of the positive interactions terms of age and years. In regards to the private sector, it could not absorb the integrity of the new entrants, rather the prime age workers had more access to its jobs.

Same results for employment and hours are also concluded.

Table 7: Estimated Coefficients and DID Estimates of the Effect of Age Groups on the Probability of Working

	1988	1998	2006	Difference between (1998-1988)	Difference between (2006-1998)
30-49	1.7103	1.725	2.011	0.0147	0.286
15-29	1.3823	0.671	1.149	-0.7113	0.478
50-59	1.8553	1.209	1.49338	-0.6463	0.28438
Difference between Young and Prime	-0.328	-1.054	-0.862	**-0.726***(DID)**	**0.192***(DID)**
Difference between Old and Prime	0.145	-0.516	-0.518	**-0.661***(DID)**	**-0.00162(DID)**

Source: Constructed by the author using the estimations results on the out-of-schools men sample given in Table11
Note: *** represent statistical significance at the 1% for the DID estimate, as shown in the estimation results

Table 8: Estimated Coefficients and DID Estimate of the Effect of Age Groups on the Probability of Having a Public Job

	1988	1998	2006	Difference between (1998-1988)	Difference between (2006-1998)
30-49	-0.34	-0.74	-0.952	-0.4	-0.212
15-29	-1.205	-1.226	-1.5068	-0.021	-0.2808
50-59	-0.307	-0.297	-0.343	0.01	-0.046
Difference between Young and Prime	-0.865	-0.486	-0.5548	**0.379***(DID)**	**-0.0688(DID)**
Difference between Old and Prime	0.033	0.443	0.609	**0.410***(DID)**	**0.166***(DID)**

Source: Constructed by the author using the estimations results on the out-of-schools men sample given in Table11
Note: *** represent statistical significance for the DID estimate

5.3 Correlations Analysis

Regarding the correlations, Tables 9 and 11 show that the correlation between working and being in a formal job, and working and being in a public job, respectively. Both correlations are significantly negative, suggesting that unobserved

characteristics that can increase the probability of not working, raise the probability of formal employment/public employment at the same time. In effect, those who do not work could be the unemployed individuals who can afford waiting for formal/public employment. On the other hand, those who cannot afford waiting, accept working in informal jobs. One could think of the unobservables that determine such negative correlation to be the "perseverance" level, or the poverty level. For instance, the decline in employment for the young men aged (15-29) can serve as an example to better clarify such negative correlation. First, it implies that there is a part of them who, by getting discouraged to find a formal job, move to inactivity. Second, the other category keeping hopes to find a better job other than the informal ones remain unemployed. This is actually confirmed in the stylized fats presented earlier where the male youth unemployment rate almost doubled in 1998. By remaining unemployed, they may experience better chances of getting formal jobs than by accepting informal ones, through two possibilities: either by waiting for the public job or by having a better-tuned and more effective job-search while unemployed than while employed in an informal job. The effectiveness of the job-search in unemployment state was argued in Fields (1990) who found that those who accept an informal job have less time to search for better jobs than those unemployed. From the older individuals' side, they were more pushed towards inactivity after the contraction of formal jobs, confirming the finding of Maloney (2004). This can be also confirmed by the stylized facts, where older unemployment rate did not barely change and was very small.

Moreover, there is a negative correlation between the probability of being a formal worker and the hours-of-work, i.e. an informal worker tends to perform longer hours. This was clearly seen in the results where the hours happen to increase whenever the probability of formal employment declines and vice-versa. Since the public sector (government and SOEs) recruits higher share of formal workers than the private sector and since it has shorter hours of work, thus hours will be positively correlated with formal status. The unobservable here may reflect the regulations in each sector. This was endorsed in the second specification results (Table 11). Lastly but not least, there is a positive correlation between employment and hours, which means that those who have more chances to work, perform higher number of weekly hours.

Since those who have more probability to be employed have less chances to be formally working, they consequently perform higher number of weekly hours.

6 Conclusion

This paper conducts an empirical analysis of the males' employment evolution after the Economic Reforms and Structural Adjustment Program in the 1990s, as well as after the passage to a new labor law in 2003. Economic Reform and Structural Adjustment Program usually leads to public sector downsizing through two ways: either by the slowdown in hiring mechanisms, or by restructuring its labor. In this sense, the Egyptian government has put in place a plan for such downsizing which was built on two axes. The first is to limit the access to public sector employment which was guaranteed to secondary and university graduates according to the Egyptian social contract. The second is to restructure labor through implementing an early retirement incentives program, targeted to older workers for they voluntarily quit their jobs. After the change in the share of employment in the public and the private sector over the period of reforms (1988 to 2006), employment may have changed differently for the following categories: the young age (15-29), the prime age (30-49), and the older age (50-59). This analysis studies the evolution of employment-to-population ratio, informality, employment distribution by sector, and hours-of work using three cross-sectional Egyptian databases in three points of time (before, during and after reforms, namely in 1988, 1998 and 2006). In a first specification, the probability of working, having a formal job were estimated simultaneously with the weekly hours-of-work. In the second one, the probability of working, of having a public job and the corresponding hours-of-work were also jointly estimated.

The period during which the structural adjustment program was implemented has witnessed a decline in employment for the young (15-29) and the older (50-59) males. The former group has high incidence of working in informal jobs that grow significantly in 1998 than in 1988. The 50-59 did not see their probability of informality increasing significantly. As to the prime age category, they were always working, and hence they were also affected by the informalization trend. The drop

in their formality probability was important even exceeding the drop for the young. These results are in difference, meaning that the prime age's probability of being formal has always remained higher than the young's one.

Results show that effectively and according to what the literature on the Egyptian market mentions, growth in the private sector employment did not outweigh the decline in the public sector guaranteed employment which was translated by pushing new entrants towards unemployment or inactivity if they don't work in informal jobs.

The law 2003 did not have a shown positive impact for the formality status of the young, except that it stopped their widening gap towards the prime age. It seems that flexibilizing contracts have translated into more employment. However, this result should be taken with precaution since the business cycle in this period was very favorable.

Finally, this paper is considered as a first step towards investigating the impact of several policies and reforms. Yet, the witnessed evolution cannot be considered with certitude as the direct impact of the reforms since there are many other factors like the business cycle who can play simultaneously. The proposed difference-in-difference methodology can however eliminate some of these business cycle effects. However, the need to have another year of study before the reforms is crucial in order to ensure that the underlying trends in the outcome variables are the same between the prime age groups and both young and older age groups. Further extension of this study will take into account methods to test this assumption.

References

Arias, Omar, & Khamis, Melanie. 2008 (Dec.). *Comparative Advantage, Segmentation and Informal Earnings: A Marginal Treatment Effects Approach.* IZA Discussion Papers 3916. Institute for the Study of Labor (IZA).

Assaad, Ragui. 1997. The effects of public sector hiring and compensation policies on the Egyptian labor market. *World Bank Economic Review*, **11(1)**, 85–118.

Assaad, Ragui. 2002. The Transformation of the Egyptian Labor Market: 1988-

1998. *Pages 3–64 of:* Assaad, Ragui (ed), *The Egyptian Labor Market in an Era of Reform*. Cairo: American University in Cairo Press.

Assaad, Ragui. 2009. Labor Supply, Employment and Unemployment in the Egyptian Economy, 1988-2006. *Chap. Labor Supply, Employment and Unemployment in the Egyptian Economy, 1988-2006 of:* Assaad, Ragui (ed), *The Egyptian Labor Market Revisited*. Cairo: American University in Cairo Press.

Çağatay, N., & Özler, Ş. 1995. Feminization of the labor force: The effects of long-term development and structural adjustment. *World development*, **23**(11), 1883–1894.

Carana. 2002. *Labor Restructuring & Privatization: A Study of the Early Retirement Program*. A Special Study. Carana Corporation, Privatization Coordination Support unit (PCSU).

Castells, Manuel, & Portes, Alejandro. 1989. World Underneath: The Origins, Dynamics, and Effects of the Informal Economy. *Chap. World Underneath: The Origins, Dynamics, and Effects of the Informal Economy, pages 11–37 of:* Alejandro Portes, Manuel Castells, & Benton, Lauren A. (eds), *The Informal Economy: Studies in Advanced and Less Developed Countries*. Baltimore: Johns Hopkins University Press.

Cerrutti, Marcela. 2000. Economic Reform, Structural Adjustment and Female Labor Force Participation in Buenos Aires, Argentina. *World Development*, **28**(5), 879–891.

Cunningham, Wendy V, & Maloney, William F. 2001. Heterogeneity among Mexico's Microenterprises: An Application of Factor and Cluster Analysis. *Economic Development and Cultural Change*, **50**(1), 131–56.

Dickens, William T, & Lang, Kevin. 1985. A Test of Dual Labor Market Theory. *American Economic Review*, **75**(4), 792–805.

El-Hamidi, Fatma. 2007 (Dec.). *Early Retirement in the Government Sector in Egypt: Preferences, Determinants and Policy Implications*. Working Papers 0721. Economic Research Forum.

El-Hamidi, Fatma, & Wahba, Jackline. 2005 (Feb.). *The Effects of Structural Adjustment on Youth Unemployment in Egypt*. Working Papers 339. University of Pittsburgh, Department of Economics.

El Mahdi, Alia. 2002. *Towards Decent Work in the Informal Sector: The Case of Egypt*. Series on The Informal Economy. ILO Employment Paper 2002/5. ILO.

Fields, G. S. 1990. Labour Market Modelling And The Urban Informal Sector: Theory And Evidence [electronic Version]. *Pages 49–69 of:* D. Turnham, B. Salomé, & Schwarz, A. (eds), *The Informal Sector Revisited*. Paris: Organisation for Economic Co-operation and Development.

Fields, G.S. 1975. Rural-urban migration, urban unemployment and underemployment, and job-search activity in LDCs. *Journal of Development Economics*, **2**(2), 165–187.

Fields, G.S. 2009. Segmented labor market models in developing countries. *The Oxford handbook of philosophy of economics*, 476–510.

Gindling, T H. 1991. Labor Market Segmentation and the Determination of Wages in the Public, Private-Formal, and Informal Sectors in San Jose, Costa Rica. *Economic Development and Cultural Change*, **39**(3), 584–605.

Greene, W.H. 1997. *Econometric analysis*. Prentice-Hall international editions. Prentice Hall.

Handa, Sudhanshu, & King, Damien. 1997. Structural adjustment policies, income distribution and poverty: A review of the jamaican experience. *World Development*, **25**(6), 915–930.

Harris, John R, & Todaro, Michael P. 1970. Migration, Unemployment & Development: A Two-Sector Analysis. *American Economic Review*, **60**(1), 126–42.

Heckman, James J. 1978. A Partial Survey of Recent Research on the Labor Supply of Women. *American Economic Review*, **68**(2), 200–207.

Heckman, James J. 1993. What Has Been Learned about Labor Supply in the Past Twenty Years? *American Economic Review*, **83**(2), 116–21.

Lewis, W. Arthur. 1954. Economic Development with Unlimited Supplies of Labour. *The Manchester School*, **22**(2), 139–191.

Maait, Mohamed A., Gala Ismail, & Khorasanee, Zaki. 2000 (25-27 September). *The effects of privatization and liberalization of the economy on the actuarial soundness of the Egyptian funded and defined benefits social security scheme.* Tech. rept. Paper presented in The Year 2000 International Research Conference on Social Security : "Social Security in the Global Village", Helsinki.

Maloney, William F. 2004. Informality Revisited. *World Development*, **32**(7), 1159–1178.

Pradhan, Menno, & van Soest, Arthur. 1995. Formal and informal sector employment in urban areas of Bolivia. *Labour Economics*, **2**(3), 275–297.

Tansel, Avsit. 2005. Public-Private Employment Choice, Wage Differentials, and Gender in Turkey. *Economic Development and Cultural Change*, **53**(2), 453–77.

Wahba, Jackeline. 2009. *The Impact of Labor Market Reforms on Informality in Egypt.* Working Papers 3. The Population Council.

Wahba, Jackeline, & Mokhtar, May. 2002. Informalization of Labor in Egypt. *Chap. Informalization of Labor in Egypt, pages 131–157 of:* Assaad, Ragui (ed), *The Egyptian Labor Market in an Era of Reform.* Cairo: American University in Cairo Press.

Wahba, Jackline. 2002. Labor mobility in Egypt: Are the 1990s any different from the 1980s? *Chap. Labor mobility in Egypt: Are the 1990s any different from the 1980s?, pages 258–286 of:* Assaad, Ragui (ed), *The Egyptian Labor Market in an Era of Reform.* Cairo: American University in Cairo Press.

Table 9: Simultaneous Equations Results for Egyptian Men (15-59)

	Excluding the Enrolled in School			**Including Enrolled in School**		
VARIABLES	Working	Formal Job	Weekly Hours	Working	Formal Job	Weekly Hours
D_88	0.0600	0.426***	-5.798***	0.440***	0.391***	-4.924***
	(0.141)	(0.0981)	(1.172)	(0.128)	(0.0962)	(1.147)
D_06	0.316***	-0.200**	3.929***	0.230**	-0.192**	4.410***
	(0.111)	(0.0947)	(1.130)	(0.104)	(0.0925)	(1.114)
Age Group 15_29	-1.087***	-0.774***	-2.434***	-1.729***	-0.513***	0.218
	(0.0545)	(0.0533)	(0.572)	(0.0512)	(0.0734)	(0.755)
Age Group 50_59	-0.516***	0.485***	-2.169***	-0.591***	0.481***	-0.983
	(0.0689)	(0.0616)	(0.678)	(0.0714)	(0.0610)	(0.676)
Age 15_29*D88	0.675***	-0.191***	0.567	0.762***	-0.388***	-2.830***
	(0.100)	(0.0690)	(0.779)	(0.0915)	(0.0759)	(0.843)
Age 15_29*D06	0.175**	0.0666	0.305	0.122*	0.0557	-1.358**
	(0.0701)	(0.0576)	(0.659)	(0.0680)	(0.0556)	(0.657)
Age 50_59*D88	0.703***	-0.380***	2.476**	0.733***	-0.374***	0.993
	(0.155)	(0.0845)	(0.974)	(0.162)	(0.0840)	(0.959)
Age 50_59*D06	-0.00681	0.0564	-0.780	-0.0243	0.0584	-0.801
	(0.0910)	(0.0772)	(0.862)	(0.0947)	(0.0764)	(0.852)
Alex & Canal Cities	-0.0987	0.124	-2.996***	-0.0489	0.0942	-2.301***
	(0.0741)	(0.0756)	(0.860)	(0.0647)	(0.0735)	(0.854)
Alex & Canal Cities*D88	0.224	-0.263**	1.794	0.361***	-0.232**	1.445
	(0.151)	(0.108)	(1.255)	(0.137)	(0.105)	(1.227)
Alex & Canal Cities*D06	0.0569	-0.0955	0.901	0.129	-0.0907	0.386
	(0.0999)	(0.0972)	(1.129)	(0.0873)	(0.0945)	(1.120)
Urb. Low. Egypt	0.0177	-0.0825	-4.387***	0.0894	-0.104	-4.157***
	(0.0694)	(0.0683)	(0.789)	(0.0602)	(0.0664)	(0.784)
Urb. Low. Egypt*D88	-0.0283	0.122	2.680**	-0.133	0.151	2.088*
	(0.134)	(0.0996)	(1.160)	(0.114)	(0.0966)	(1.131)
Urb. Low. Egypt*D06	0.0416	-0.101	0.413	0.0144	-0.0717	-0.184
	(0.0951)	(0.0894)	(1.051)	(0.0819)	(0.0871)	(1.041)
Urb. Upp. Egypt	0.130*	-0.0752	-4.925***	0.174***	-0.0992	-5.228***
	(0.0713)	(0.0688)	(0.790)	(0.0609)	(0.0666)	(0.780)
Urb. Upp. Egypt*D88	0.0679	-0.0891	-0.126	-0.0844	-0.0447	-0.391
	(0.169)	(0.105)	(1.220)	(0.128)	(0.102)	(1.184)
Urb. Upp. Egypt*D06	-0.0579	-0.0860	0.0145	-0.0791	-0.0865	-0.581
	(0.0938)	(0.0878)	(1.023)	(0.0801)	(0.0850)	(1.008)
Rur. Low. Egypt	0.0751	-0.186***	-5.487***	0.194***	-0.220***	-5.391***
	(0.0672)	(0.0654)	(0.767)	(0.0582)	(0.0635)	(0.762)
Rur. Low. Egypt*D88	0.250**	-0.215**	4.670***	0.0270	-0.189**	3.416***
	(0.126)	(0.0892)	(1.058)	(0.102)	(0.0863)	(1.030)
Rur. Low. Egypt*D06	0.152*	-0.117	1.618*	0.0991	-0.0988	0.631
	(0.0894)	(0.0830)	(0.982)	(0.0767)	(0.0806)	(0.971)
Rur. Upp. Egypt	0.143*	-0.375***	-6.251***	0.245***	-0.394***	-6.679***
	(0.0770)	(0.0740)	(0.867)	(0.0659)	(0.0717)	(0.858)
Rur. Upp. Egypt*D88	0.115	0.00137	1.156	-0.0987	0.0286	0.651

Continued on next page

Table 9 – *Continued from previous page*

	Excluding the Enrolled in School			Including Enrolled in School		
VARIABLES	Working	Formal Job	Weekly Hours	Working	Formal Job	Weekly Hours
	(0.143)	(0.0991)	(1.175)	(0.114)	(0.0961)	(1.146)
Rur. Upp. Egypt*D06	0.0955	-0.0580	0.0206	0.191**	-0.0992	-1.005
	(0.0997)	(0.0924)	(1.086)	(0.0851)	(0.0896)	(1.070)
Less Intermediate	0.0146	0.386***	0.648	-0.580***	0.527***	-0.579
	(0.0623)	(0.0560)	(0.678)	(0.0527)	(0.0548)	(0.688)
Less Intermediate*D88	-0.225*	0.0631	-0.731	-0.399***	-0.00897	-3.109***
	(0.116)	(0.0835)	(1.012)	(0.0879)	(0.0792)	(0.963)
Less Intermediate*D06	-0.0926	0.00290	-0.729	-0.0621	-0.0106	-2.061**
	(0.0837)	(0.0724)	(0.872)	(0.0689)	(0.0700)	(0.853)
Intermediate	-0.273***	0.866***	-3.378***	-0.484***	0.902***	-2.935***
	(0.0555)	(0.0555)	(0.642)	(0.0526)	(0.0541)	(0.646)
Intermediate*D88	0.140	-0.0587	0.771	-0.0191	-0.0747	-0.517
	(0.115)	(0.0841)	(0.964)	(0.0973)	(0.0812)	(0.941)
Intermediate*D06	0.105	-0.142**	1.017	0.276***	-0.186***	0.761
	(0.0731)	(0.0686)	(0.797)	(0.0680)	(0.0669)	(0.793)
Above Intermediate	-0.0681	1.137***	-4.425***	0.0733	1.077***	-4.271***
	(0.0928)	(0.0927)	(1.023)	(0.0963)	(0.0922)	(1.017)
Above Intermediate*D88	0.0847	-0.113	-0.929	0.0590	-0.0656	-1.468
	(0.239)	(0.165)	(1.784)	(0.257)	(0.161)	(1.721)
Above Intermediate*D06	-0.141	-0.0240	1.081	-0.239*	0.0112	0.956
	(0.128)	(0.119)	(1.343)	(0.128)	(0.116)	(1.332)
University	0.0260	1.416***	-5.028***	0.107	1.367***	-5.284***
	(0.0720)	(0.0745)	(0.743)	(0.0731)	(0.0744)	(0.734)
University*D88	0.257	-0.504***	2.104*	0.202	-0.433***	1.213
	(0.183)	(0.109)	(1.115)	(0.181)	(0.106)	(1.077)
University*D06	-0.397***	-0.0196	-1.215	-0.262***	-0.0408	-0.439
	(0.0909)	(0.0904)	(0.938)	(0.0914)	(0.0882)	(0.927)
HHsize	-0.0103	-0.0359***	0.0113	0.00728	-0.0363***	0.00570
	(0.0104)	(0.00765)	(0.0874)	(0.00930)	(0.00747)	(0.0862)
HHsize*D88	0.0405**	-0.00729	0.215**	0.0186	-0.00372	0.183*
	(0.0191)	(0.00972)	(0.109)	(0.0155)	(0.00948)	(0.107)
HHsize*D06	-0.0477***	-0.00333	-0.304***	-0.0397***	-0.00136	-0.288***
	(0.0135)	(0.0100)	(0.113)	(0.0120)	(0.00977)	(0.111)
Nb of dependants 0_14	0.0175			-0.0387**		
	(0.0207)			(0.0187)		
Nb of dependants 0_14*D88	-0.0627			-0.0686**		
	(0.0391)			(0.0322)		
Nb of dependants 0_14*D06	0.0995***			0.0662***		
	(0.0287)			(0.0253)		
If formal workers		0.254***			0.243***	
		(0.0321)			(0.0307)	
If any formal workers*D88		-0.00718			-0.0139	
		(0.0456)			(0.0433)	
If any formal workers*D06		0.0413			0.0385	

Continued on next page

Table 9 – *Continued from previous page*

	Excluding the Enrolled in School			**Including Enrolled in School**		
VARIABLES	Working	Formal Job	Weekly Hours	Working	Formal Job	Weekly Hours
		(0.0414)			(0.0394)	
Constant	1.689***	0.163**	53.77***	1.837***	0.167**	54.70***
	(0.0817)	(0.0729)	(0.873)	(0.0775)	(0.0713)	(0.864)
Sigma	2.794***			2.769***		
	(0.00714)			(0.00557)		
Rho12	-0.722***			-0.840***		
	(0.0579)			(0.0960)		
Rho13	0.747***			0.129***		
	(0.0417)			(0.0486)		
Rho23	-0.118***			-0.0332**		
	(0.0122)			(0.0145)		
Observations	19,937	19,937	19,937	23,450	23,450	23,450
LL	-88922	-88922	-88922	-94396	-94396	-94396

Notes: (i.)Standard errors in parentheses.

(ii.) ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

(iii.) the reference is a male aged 30 to 49 years in 1998 living in Greater Cairo, illiterate or can read or write, not head of his household and who has no formal workers in his household

Table 10: Singe Equations For Employment, Job Formality and Weekly hours-of-work

	Probit	Probit	OLS
Variables	Employment	Formal Job	Weekly Hours
D_1988	0.144	0.454***	-6.068***
	(0.123)	(0.101)	(1.129)
D_2006	0.315***	-0.177*	3.398***
	(0.117)	(0.0980)	(1.093)
Age Group 15_29	-1.196***	-1.124***	2.102***
	(0.0551)	(0.0492)	(0.517)
Age Group 50_59	-0.540***	0.428***	-0.738
	(0.0716)	(0.0634)	(0.652)
Age 15_29*D1988	0.223***	0.0824	-3.238***
	(0.0851)	(0.0686)	(0.732)
Age 15_29*D2006	0.166**	0.167***	-1.093*
	(0.0730)	(0.0601)	(0.639)
Age 50_59*D1988	0.356***	-0.316***	0.873
	(0.120)	(0.0862)	(0.932)
Age 50_59*D2006	-0.0514	0.0646	-0.817
	(0.0949)	(0.0793)	(0.831)
Alex and Canal Cities	-0.116	0.0921	-2.548***
	(0.0770)	(0.0787)	(0.837)
Alex and Canal Cities*D1988	0.0470	-0.229**	1.188
	(0.117)	(0.111)	(1.211)
Alex and Canal Cities*D2006	0.103	-0.0673	0.461
	(0.104)	(0.101)	(1.097)
Urban Lower Egypt	0.0436	-0.0795	-4.571***
	(0.0723)	(0.0712)	(0.767)
Urban Lower Egypt*D1988	-0.0973	0.114	2.898***
	(0.109)	(0.102)	(1.118)
Urban Lower Egypt*D2006	0.0697	-0.0851	0.198
	(0.0993)	(0.0929)	(1.020)
Urban Upper Egypt	0.145*	-0.0529	-5.405***
	(0.0748)	(0.0718)	(0.767)
Urban Upper Egypt*D1988	0.0208	-0.0977	-0.0484
	(0.122)	(0.108)	(1.174)
Urban Upper Egypt*D2006	-0.0330	-0.0934	0.0856
	(0.0984)	(0.0913)	(0.992)
Rural Lower Egypt	0.0800	-0.187***	-5.757***
	(0.0703)	(0.0681)	(0.746)
Rural Lower Egypt*D1988	0.280***	-0.207**	4.595***
	(0.106)	(0.0918)	(1.021)
Rural Lower Egypt*D2006	0.188**	-0.0829	1.102
	(0.0935)	(0.0862)	(0.953)
Rural Upper Egypt	0.186**	-0.356***	-6.929***
	(0.0808)	(0.0771)	(0.842)
Rural Upper Egypt*D1988	0.210*	-0.00608	1.436
	(0.121)	(0.102)	(1.134)
Rural Upper Egypt*D2006	0.0930	-0.0436	-0.187
	(0.104)	(0.0959)	(1.054)
Less than Intermediate	0.0656	0.428***	0.371
	(0.0648)	(0.0579)	(0.658)
Less than Intermediate*D1988	-0.215**	0.0166	-0.202
	(0.101)	(0.0857)	(0.974)
Less than Intermediate*D2006	-0.114	-0.0204	-0.417
	(0.0873)	(0.0748)	(0.844)
Intermediate	-0.196***	0.876***	-2.737***
	(0.0578)	(0.0578)	(0.625)
Intermediate*D1988	-0.151*	-0.0398	0.0531
	(0.0893)	(0.0864)	(0.929)
Intermediate*D2006	0.0872	-0.127*	0.593
	(0.0766)	(0.0713)	(0.773)

Continued on Next page

	Probit	Probit	OLS
Above than Intermediate	-0.0108	1.196***	-4.409***
	(0.0972)	(0.0960)	(0.993)
Above than Intermediate*D1988	-0.310*	-0.133	-1.160
	(0.165)	(0.168)	(1.714)
Above than Intermediate*D2006	-0.127	-0.0473	1.332
	(0.135)	(0.123)	(1.301)
University	0.0965	1.504***	-5.335***
	(0.0749)	(0.0769)	(0.719)
University*D1988	-0.248**	-0.556***	1.918*
	(0.117)	(0.111)	(1.071)
University*D2006	-0.397***	-0.0813	-0.169
	(0.0953)	(0.0938)	(0.907)
Hhsize	-0.0121	-0.0391***	0.0212
	(0.0111)	(0.00798)	(0.0848)
Hhsize*D1988	0.000546	-0.00431	0.190*
	(0.0160)	(0.0100)	(0.106)
Hhsize*D2006	-0.0414***	-0.00714	-0.243**
	(0.0145)	(0.0104)	(0.109)
Nb of dependants 0_14	0.0264		
	(0.0227)		
Nb of dependants 0_14*D1988	0.00954		
	(0.0335)		
Nb of dependants 0_14*D2006	0.0812**		
	(0.0317)		
If any formal workers		0.280***	
		(0.0347)	
If any formal workers*D1988		-0.0208	
		(0.0483)	
If any formal workers*D2006		0.0357	
		(0.0447)	
Constant	1.691***	0.105	54.88***
	(0.0860)	(0.0756)	(0.845)
Observations	20,431	17,756	17,710
R-squared			0.045
Pseudo R2	0.139	0.233	

Notes: (i.)Standard errors in parentheses.
(ii.) ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

Table 11: Simultaneous Equations Results for Egyptian Men (15-59)

Excluding the Enrolled in School			
Variables	Working	Public Job	Weekly Hours
D_1988	-0.0147	0.400***	-5.678***
	(0.135)	(0.0969)	(1.181)
D_2006	0.286***	-0.212**	4.050***
	(0.108)	(0.0953)	(1.138)
Age Group 15_29	-1.054***	-0.486***	-2.977***
	(0.0537)	(0.0512)	(0.560)
Age Group 50_59	-0.516***	0.443***	-2.315***
	(0.0672)	(0.0542)	(0.683)
Age 15_29*D1988	0.726***	-0.379***	1.031
	(0.0976)	(0.0692)	(0.777)
Age 15_29*D2006	0.192***	-0.0688	0.441
	(0.0684)	(0.0572)	(0.661)
Age 50_59*D1988	0.661***	-0.410***	2.637***
	(0.149)	(0.0780)	(0.982)
Age 50_59*D2006	-0.00162	0.166**	-0.802
	(0.0886)	(0.0695)	(0.869)
Alex and Canal Cities	-0.115	0.187***	-3.030***
	(0.0725)	(0.0684)	(0.865)
Alex and Canal Cities*D1988	0.155	-0.0746	1.871
	(0.145)	(0.101)	(1.265)
Alex and Canal Cities*D2006	0.0576	-0.175*	0.951
	(0.0979)	(0.0909)	(1.136)
Urban Lower Egypt	-4.54e-05	0.123*	-4.351***
	(0.0681)	(0.0642)	(0.794)
Urban Lower Egypt*D1988	-0.0524	-0.145	2.652**
	(0.129)	(0.0951)	(1.169)
Urban Lower Egypt*D2006	0.0271	-0.158*	0.443
	(0.0932)	(0.0863)	(1.058)
Urban Upper Egypt	0.0942	0.309***	-4.818***
	(0.0698)	(0.0640)	(0.795)
Urban Upper Egypt*D1988	0.00223	-0.179*	-0.173
	(0.162)	(0.100)	(1.231)
Urban Upper Egypt*D2006	-0.0581	-0.223***	-0.00496
	(0.0917)	(0.0831)	(1.030)
Rural Lower Egypt	0.0346	0.251***	-5.393***
	(0.0658)	(0.0624)	(0.772)
Rural Lower Egypt*D1988	0.189	-0.364***	4.637***
	(0.121)	(0.0872)	(1.066)
Rural Lower Egypt*D2006	0.124	-0.180**	1.677*
	(0.0874)	(0.0804)	(0.988)
Rural Upper Egypt	0.0881	0.186***	-6.086***
	(0.0754)	(0.0719)	(0.872)
Rural Upper Egypt*D1988	0.0561	-0.351***	1.057

Continued on next page

Table 11 – *Continued from previous page*

Variables	Working	Public Job	Weekly Hours
	(0.137)	(0.0982)	(1.184)
Rural Upper Egypt*D2006	0.0876	-0.239***	0.0330
	(0.0974)	(0.0909)	(1.093)
Less than Intermediate	0.00703	0.364***	0.683
	(0.0612)	(0.0568)	(0.683)
Less than Intermediate*D1988	-0.222**	0.145*	-0.790
	(0.111)	(0.0842)	(1.020)
Less than Intermediate*D2006	-0.0724	0.0122	-0.788
	(0.0823)	(0.0755)	(0.879)
Intermediate	-0.295***	0.873***	-3.410***
	(0.0545)	(0.0546)	(0.646)
Intermediate*D1988	0.177	0.282***	0.806
	(0.111)	(0.0820)	(0.972)
Intermediate*D2006	0.129*	-0.138**	1.025
	(0.0718)	(0.0695)	(0.802)
Above than Intermediate	-0.0765	1.200***	-4.427***
	(0.0906)	(0.0842)	(1.030)
Above than Intermediate*D1988	0.0779	0.173	-0.911
	(0.229)	(0.148)	(1.800)
Above than Intermediate*D2006	-0.118	-0.0806	0.962
	(0.125)	(0.110)	(1.353)
University	0.00617	1.136***	-4.973***
	(0.0701)	(0.0630)	(0.748)
University*D1988	0.298*	0.00659	2.086*
	(0.176)	(0.0943)	(1.125)
University*D2006	-0.370***	0.119	-1.375
	(0.0885)	(0.0800)	(0.945)
Hhsize	-0.0120	-0.0179**	0.0152
	(0.0101)	(0.00744)	(0.0879)
Hhsize*D1988	0.0366**	-0.00231	0.212*
	(0.0183)	(0.00968)	(0.110)
Hhsize*D2006	-0.0462***	0.0109	-0.317***
	(0.0131)	(0.00995)	(0.114)
Nb of dependents 0_14	0.0122		
	(0.0197)		
Nb of dependents 0_14*D1988	-0.0387		
	(0.0376)		
Nb of dependents 0_14*D2006	0.105***		
	(0.0273)		
If any formal workers		0.165***	
		(0.0285)	
If any formal workers*D1988		-0.101**	
		(0.0416)	
If any formal workers*D2006		0.00500	
		(0.0374)	

Continued on next page

Table 11 – *Continued from previous page*

Variables	Working	Public Job	Weekly Hours
Constant	1.725***	-0.740***	53.57***
	(0.0795)	(0.0722)	(0.878)
Sigma	2.805***		
	(0.00677)		
Rho12	-1.030***		
	(0.0543)		
Rho13	0.856***		
	(0.0353)		
Rho23	-0.342***		
	(0.0124)		
Observations	19,933	19,933	19,933
ll	-88204	-88204	-88204

Notes: (i.)Standard errors in parentheses.

(ii.) ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

(iii.) the reference is a male aged 30 to 49 years in 1998 living in Greater Cairo, not educated or can read or write, not head of his household and who has no formal workers in his household

Table 12: Single Probit Estimations

VARIABLES	Probit Working	Probit Public Job	OLS Weekly Hours
D_1988	0.144	0.486***	-5.997***
	(0.123)	(0.103)	(1.127)
D_2006	0.315***	-0.177*	3.411***
	(0.117)	(0.103)	(1.094)
Age Group 15_29	-1.196***	-1.019***	2.102***
	(0.0551)	(0.0509)	(0.517)
Age Group 50_59	-0.540***	0.373***	-0.739
	(0.0716)	(0.0569)	(0.653)
Age 15_29*D1988	0.223***	0.0205	-3.168***
	(0.0851)	(0.0727)	(0.730)
Age 15_29*D2006	0.166**	0.0226	-1.100*
	(0.0730)	(0.0640)	(0.639)
Age 50_59*D1988	0.356***	-0.323***	0.912
	(0.120)	(0.0810)	(0.931)
Age 50_59*D2006	-0.0514	0.179**	-0.836
	(0.0949)	(0.0728)	(0.833)
Alex and Canal Cities	-0.116	0.172**	-2.548***
	(0.0770)	(0.0733)	(0.838)
Alex and Canal Cities*D1988	0.0470	-0.0585	1.136
	(0.117)	(0.106)	(1.210)
Alex and Canal Cities*D2006	0.103	-0.162*	0.461
	(0.104)	(0.0975)	(1.098)
Urban Lower Egypt	0.0436	0.154**	-4.572***
	(0.0723)	(0.0689)	(0.768)
Urban Lower Egypt*D1988	-0.0973	-0.189*	2.962***
	(0.109)	(0.100)	(1.118)
Urban Lower Egypt*D2006	0.0697	-0.158*	0.181
	(0.0993)	(0.0925)	(1.021)
Urban Upper Egypt	0.145*	0.389***	-5.405***
	(0.0748)	(0.0682)	(0.768)
Urban Upper Egypt*D1988	0.0208	-0.239**	-0.0696
	(0.122)	(0.105)	(1.169)
Urban Upper Egypt*D2006	-0.0330	-0.247***	0.0842
	(0.0984)	(0.0887)	(0.993)
Rural Lower Egypt	0.0800	0.306***	-5.758***
	(0.0703)	(0.0670)	(0.747)
Rural Lower Egypt*D1988	0.280***	-0.400***	4.632***
	(0.106)	(0.0920)	(1.020)
Rural Lower Egypt*D2006	0.188**	-0.146*	1.090
	(0.0935)	(0.0863)	(0.954)
Rural Upper Egypt	0.186**	0.277***	-6.929***
	(0.0808)	(0.0773)	(0.842)
Rural Upper Egypt*D1988	0.210*	-0.435***	1.225
	(0.121)	(0.104)	(1.132)
Rural Upper Egypt*D2006	0.0930	-0.247**	-0.189
	(0.104)	(0.0978)	(1.055)
Less than Intermediate	0.0656	0.431***	0.371
	(0.0648)	(0.0611)	(0.658)
Less than Intermediate*D1988	-0.215**	0.0875	-0.233
	(0.101)	(0.0890)	(0.973)
Less than Intermediate*D2006	-0.114	-0.0128	-0.430
	(0.0873)	(0.0813)	(0.845)
Intermediate	-0.196***	0.923***	-2.738***
	(0.0578)	(0.0588)	(0.626)
Intermediate*D1988	-0.151*	0.318***	0.0853
	(0.0893)	(0.0867)	(0.927)
Intermediate*D2006	0.0872	-0.112	0.591
	(0.0766)	(0.0750)	(0.774)

Continued on next page

VARIABLES	Probit Working	Probit Public Job	OLS Weekly Hours
Above than Intermediate	-0.0108	1.327***	-4.409***
	(0.0972)	(0.0890)	(0.994)
Above than Intermediate*D1988	-0.310*	0.148	-1.132
	(0.165)	(0.154)	(1.711)
Above than Intermediate*D2006	-0.127	-0.109	1.274
	(0.135)	(0.116)	(1.302)
University	0.0965	1.275***	-5.335***
	(0.0749)	(0.0665)	(0.719)
University*D1988	-0.248**	-0.0469	1.867*
	(0.117)	(0.0982)	(1.069)
University*D2006	-0.397***	0.0573	-0.173
	(0.0953)	(0.0855)	(0.907)
Hhsize	-0.0121	-0.0209***	0.0212
	(0.0111)	(0.00805)	(0.0848)
Hhsize*D1988	0.000546	0.000982	0.174*
	(0.0160)	(0.0103)	(0.105)
Hhsize*D2006	-0.0414***	0.00589	-0.243**
	(0.0145)	(0.0108)	(0.109)
Nb of dependents 0_14	0.0264		
	(0.0227)		
Nb of dependents 0_14*D1988	0.00954		
	(0.0335)		
Nb of dependents 0_14*D2006	0.0812**		
	(0.0317)		
If any formal workers		0.204***	
		(0.0330)	
If any formal workers*D1988		-0.120***	
		(0.0466)	
If any formal workers*D2006		-0.000975	
		(0.0433)	
Constant	1.691***	-0.900***	54.88***
	(0.0860)	(0.0775)	(0.846)
Observations	20,431	17,752	17,757
R-squared			0.045
Pseudo R2	0.139	0.207	

Notes: (i.)Standard errors in parentheses.
(ii.) ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels.

Table 13: Variables Definition

Year dummies	
D1988	1 = if the year is 1988
	0 = otherwise
D1988	1 = if the year is 1988
	0 = otherwise
D2006	1 = if the year is 2006
	0 = otherwise
Age dummies	
Age 15-29	1 = if the individual is between 15 and 29 years old
	0 = otherwise
Age 50-59	1 = if the individual is between 50 and 57 years old
	0 = otherwise
Educational Levels	
Less than Intermediate	1 = if the individual has a less than intermediate education level
	0 = otherwise
Intermediate	1 = if the individual has an intermediate education level
	0 = otherwise
Above than Intermediate	1 = if the individual has an above than intermediate education level
	0 = otherwise
Marital Status	
Married	1 = if the individual is married
	0 = otherwise
Household Characteristics	
Number of persons of age 0_14	Number of present individuals in the household and aged of 0 to 14 years old
Region dummies	
Region 1	Greater Cairo
Region 2	Alexandria and Canal Cities
Region 3	Urban Lower Egypt
Region 4	Urban Upper Egypt
Region 5	Rural Lower Egypt
Region 6	Rural Upper Egypt

Appendix 1: The Multivariate Probit Model There are three main variables :

1. Participation Equation:

$$P_i^* = X_i'\beta + \epsilon_{pi} \tag{8}$$

2. Formal/Informal Equation :

$$F_i^* = Z_i'\gamma + \epsilon_{fi} \tag{9}$$

3. Hours-of work Equation :

$$H_i = K_i'\theta + \epsilon_{hi} \tag{10}$$

where $(\epsilon_p, \epsilon_f, \epsilon_h)$ are jointly normally distributed;

$$\begin{pmatrix} \epsilon_p \\ \epsilon_f \\ \epsilon_h \end{pmatrix} \sim \mathrm{N} \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \ \Sigma$$

Three probabilities are being estimated in the log likelihood function :

1. The probability of being inactive or not working:

$$\begin{aligned} l_{notworking} &= \prod_{P=0} Pr(P_i^* \prec 0) \\ &= \Phi(-X_i'\beta_i) \end{aligned} \tag{11}$$

2. The probability of having a formal job, hours being observed:

$$l_{formalworking} = \prod_{P=1,F=1} Pr(Z_i'\gamma_i + \epsilon_{fi} \geq 0, X_i'\beta_i + \epsilon_{pi} \geq 0, H_i = K_i'\theta_i + \epsilon_{hi})$$

According to Bayes' rule:

$$\begin{aligned} l_{formalworking} &= \prod_{P=1,F=1} Pr(H = K_i'\theta_i + \epsilon_{hi}) \times \\ & \quad Pr(Z_i'\gamma_i + \epsilon_{fi} \geq 0, X_i'\beta_i + \epsilon_{pi} \geq 0 | K_i'\theta_i + \epsilon_{hi} = H) \quad (12) \end{aligned}$$

3. The probability of having an informal job, hours being observed:

$$\begin{aligned} l_{informalworking} &= \prod_{P=1,F=1} Pr(K_i'\theta_i + \epsilon_{hi} = H) \times \\ & \quad Pr(Z_i'\gamma_i + \epsilon_{fi} \prec 0, X_i'\beta_i + \epsilon_{p} \geq 0 | K_i'\theta_i + \epsilon_{hi} = H) \quad (13) \end{aligned}$$

- With $\epsilon_p = \frac{\rho_{ph}}{\sigma_h}\epsilon_h + \xi$; $\xi \perp \epsilon_h$ and $var(\xi) = 1 - \rho_{ph}^2$

$$\begin{aligned} l_{formalworking} &= \prod_{P=1,F=1} Pr(K_i'\theta_i + \epsilon_{hi} = H_i) \times \\ & \quad Pr(\xi \geq -\frac{Z_i'\gamma_i + \mu_f^*}{\sigma_f^*}, \xi \geq -\frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}) \\ &= \frac{1}{\sigma_h}\phi\left(\frac{H_i' - K_i\theta_i}{\sigma_h}\right) \times \Phi_2(\frac{Z_i'\gamma_i + \mu_f^*}{\sigma_f^*}, \frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}, \rho_{pf}^*) \end{aligned} \quad (14)$$

- With $\epsilon_f = \frac{\rho_{fh}}{\sigma_h}\epsilon_h + \xi$; $\xi \perp \epsilon_h$ and $var(\xi) = 1 - \rho_{fh}^2$

$$\begin{aligned} l_{informalworking} &= \prod_{P=1,F=1} Pr(K_i'\theta_i + \epsilon_{hi} = H_i) \times \\ & \quad Pr(\xi \prec -\frac{Z_i\gamma_i + \mu_f^*}{\sigma_f^*}, \xi \geq -\frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}) \\ &= \frac{1}{\sigma_h}\phi\left(\frac{H_i - K_i'\theta_i}{\sigma_h}\right) \times \Phi_2(-\frac{Z_i'\gamma_i + \mu_f^*}{\sigma_f^*}, \frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}, -\rho_{pf}^*) \end{aligned} \quad (15)$$

- Where conditional means and variances are : (Greene, 1997)

$$\mu_p^* = \mu_{p|\epsilon_h - K_i'\theta_i = H_i} = \frac{\rho_{ph}}{\sigma_h}(\epsilon_h) = \frac{\rho_{ph}}{\sigma_h}(H - K_i'\theta)$$

$$\sigma_p^* = \sigma_{p|\epsilon_h - K_i'\theta_i = H_i} = \sqrt{1 - {\rho_{ph}}^2}$$

$$\begin{aligned}
\mu_f^* &= \mu_{f|\epsilon_h - K_i'\theta_i = H_i} = \frac{\rho_{fh}}{\sigma_h}(\epsilon_h) = \frac{\rho_{fh}}{\sigma_h}(H - K_i'\theta) \\
\sigma_f^* &= \sigma_{f|\epsilon_h - K_i'\theta_i = H_i} = \sqrt{1 - {\rho_{fh}}^2} \\
\rho_{pf}^* &= \rho_{pf|\epsilon_h - K_i'\theta_i = H_i} = \frac{\rho_{pf} - \rho_{ph}\rho_{fh}}{\sigma_p^* \sigma_f^*}
\end{aligned} \tag{16}$$

Thus, one could write the Log likelihood function as written above in the Model section:

$$LL = \begin{cases} \sum_{P=0}[ln\Phi(-X_i'\beta_i)] \\ + \sum_{P=1,F=0} ln(\frac{1}{\sigma_h}\phi\left(\frac{H_i - K_i'\theta_i}{\sigma_h}\right)) + ln(\Phi_2\left(-\frac{Z_i'\gamma_i + \mu_f^*}{\sigma_f^*}, \frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}, -\rho_{pf}^*\right)) \\ + \sum_{P=1,F=1} ln(\frac{1}{\sigma_h}\phi\left(\frac{H_i - K_i'\theta_i}{\sigma_h}\right)) + ln(\Phi_2\left(\frac{Z_i'\gamma_i + \mu_f^*}{\sigma_f^*}, \frac{X_i'\beta_i + \mu_p^*}{\sigma_p^*}, \rho_{pf}^*\right)) \end{cases} \tag{17}$$