

**THE EFFECTS OF PUBLIC SECTOR HIRING  
& COMPENSATION POLICIES ON THE  
EGYPTIAN LABOR MARKET**

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# **The Effects of Public Sector Hiring and Compensation Policies on the Egyptian Labor Market\***

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## Abstract

This paper examines the combined impact of the employment guarantee for graduates and public sector compensation policies on the Egyptian labor market. Besides contributing to an unsustainable rate of growth in the government labor force, these policies encouraged queuing for government jobs and contributed to high graduate unemployment rates, and reduced graduate employment in the private sector. Despite substantial wage erosion in the public sector in recent years, government wages, when appropriately corrected for observed and unobserved heterogeneity, are on par with private sector wages, especially for graduates. When combined with the more attractive non-wage aspects of government jobs, these compensation levels explain the attractiveness of public sector employment to graduates. Government pay scales are especially advantageous to female secondary school graduates who appear to face strong discriminatory barriers in the private sector.

## ملخص

تبحث هذه الورقة الأثر المشترك ل ضمانات تشغيل الخريجين وسياسات القطاع العام في التعويض في سوق العمل المصري. فإلى جانب المساهمة في خلق معدل للنمو لا يمكن الإبقاء عليه في قوى العمل الحكومية، شجعت هذه السياسات التزاحم على الوظائف الحكومية وساهمت في ارتفاع معدلات البطالة وانخفاض عدد العاملين في القطاع الخاص بين الخريجين. وبالرغم من التقلص الكبير في الأجور الحقيقية للقطاع العام خلال السنوات الأخيرة، فإن الأجور الحكومية - عند تصحيحها التصحيح الذي يراعى تباير الخواص الملموس وغير الملموس، تعد معادلة لأجور القطاع الخاص، خاصة بالنسبة للخريجين. فإذا ما ارتبطت مستويات التعويض هذه بالجوانب المغربية غير الأجرية في الوظائف الحكومية، تبين سبب إقبال الخريجين على وظائف القطاع العام. وتعتبر مستويات الأجور الحكومية في صالح الإناث خريجات المدارس الثانوية بشكل خاص، حيث أنهن يقابلن، فيما يبدو، عقبات كبيرة من التمييز في القطاع الخاص.

## 1. INTRODUCTION

While the topic of public-private wage differentials has been studied extensively in both developed and developing country contexts, the issue takes on special importance in Egypt because of the long-standing policy of guaranteeing employment in the public sector for all graduates of secondary and post-secondary institutions.<sup>1</sup> When the policy was first instituted in the early 1960's, its impact was relatively limited because of the small numbers of eligible graduates, but, over the long-term, it has had major consequences for the Egyptian labor market and economy.

The employment guarantee fueled the growth in the demand for secondary and university education, which the government has struggled to meet, often at the expense of the quality of education at all levels. The growth in the number of graduates has in turn translated into rapid growth in public sector employment and in the number of aspirants to such employment. When the growth of the public sector wage bill became unsustainable in the early 1980s, the government responded by eroding real public sector wages and extending the waiting period for government jobs. Long queues for government jobs indicate that despite wage erosion, rents received by public sector workers have not dissipated. These jobs offer lifetime job security and generous benefits; attributes that are difficult to obtain in the private sector because of lax enforcement of labor laws. Anecdotal evidence suggests that expectations of effort and performance and tolerance of moonlighting have adjusted to at least partially counteract the erosion of public sector wages. While comparisons of average wage trends indicate substantial reductions in the public-private wage ratio in Egypt (Zaytoun, 1991), this study shows that, once corrected for observed and unobserved worker heterogeneity, monetary wages in the government in 1988 were lower than in private sector for men but substantially higher for women. As the educational level of the worker increases, there is greater parity in wages between the two sectors. Since the non-pecuniary aspects of the job are substantially better in the government, however, even male government workers are likely to be receiving positive rents. Public enterprise workers are better paid than government workers and, since they receive similar non-wage benefits, their rents are even higher.

Since the public sector is a major employer of graduates, these compensation policies have a major impact on the employment and compensation of graduates in the rest of the economy. I present a Harris-Todaro-type model that predicts the major features of the market for educated labor in Egypt, namely queuing for public sector jobs, leading to unemployment rates that are three to five times higher among

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<sup>1</sup> For a review of the literature on public-private wage differentials in the U.S. and Canada see Ehrenberg and Schwartz (1986) and Gunderson (1978). Studies in a developing country context include Bennell (1981), Lindauer and Sabot (1983), Psacharopoulos (1983), Van der Gaag and Vijverberg (1988), Stlecner, Van der Gaag, and Vijverberg (1989), Al-Qudsi (1989), Terrell (1993).

graduates than non-graduates, and reduced employment of graduates in the private sector.

While graduates are over-remunerated in this economy in a static sense, the resulting excess demand for secondary and higher education, and the lowering of educational quality to meet such demand, results in comparatively low rates of return to education in Egypt by international standards. Moreover, in contrast to the findings of Psacharopoulos and others that rates of return to education are generally higher in the competitive sector than in the uncompetitive sector because of the presumed equalization of pay scales in the latter (Psacharopoulos, 1983), I find that rates of return to secondary education in Egypt are higher in the public sector than in the private sector. The secondary level is the lowest level for which a worker can qualify for the government employment guarantee and thus gain access to public sector rents. We would therefore expect that the greatest glut of graduates and the highest reductions in competitive returns to occur at that threshold level.

In section 1, I review the history and the mode of operation of the graduate employment guarantee scheme, highlighting changes in the size of the program and the resulting job queue that it engendered. In section 2, I examine the effects of the policy on the size and composition of the public sector labor force and its budgetary consequences. In Section 3, the implications of the policy for open unemployment are reviewed. Finally, in Section 4, I present the main findings of the paper on the effects public sector compensation policies on the wage structure and returns to education in the Egyptian labor market. I formulate a simple supply demand model of the labor market for graduates and estimate sector specific wage equations and returns to education. The wage equation estimates are corrected for non-random selection into wage work and into the public and private sectors. I end the section by attempting to quantify the non-wage benefits of a public sector job in order to obtain a more complete picture of relative compensation in each sector.

## **2. THE EMPLOYMENT GUARANTEE FOR GRADUATES**

### **2.1 Historical Background:**

As part of the extensive nationalization drive of 1961/62, the Egyptian government initiated a major public employment drive which included an employment guarantee to university graduates. In 1964, the guarantee was extended to vocational secondary school and technical institute graduates and the public employment drive was formalized in Law No. 14 of 1964 and was made permanent in Law No. 85 of 1973.<sup>2</sup> The expansion of the program to secondary school and

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<sup>2</sup> This law also extended the employment guarantee to demobilized military conscripts of all educational levels. This provision was abrogated in 1976 (Hansen and Radwan, 1982: 45). The role of the Ministry of Manpower and Training in administering the

technical institute graduates was very significant since, together, they constitute about two-thirds of eligible graduates.

The employment guarantee followed a period of rapid expansion in the number of graduates from all levels of education.<sup>3</sup> Primary education expanded from one million students in 1952 to nearly 3.5 million in 1965/66, a rate just under 9 percent per year (Richards, 1992: 8). Preparatory and secondary enrollments expanded even faster, multiplying six-fold and three-fold, respectively in the period from 1956 to 1961. While the expansion underscored the commitment of the Nasser regime to making educational opportunities more accessible to the mass of the population, it had devastating effects on educational quality. Despite rapid growth of enrollments, the education system was starved of resources due to major increases in military spending and the demands of the state-led import substitution drive (Ibid.).

In an attempt to substitute for the large number of expatriate technicians who left the country after the Suez Crisis in 1956, the government greatly expanded access to higher education, whose enrollment increased from 50,000 in 1952/53 to 97,000 in 1961/62. Combined with the abolition of fees for higher education institutions in 1963, the employment guarantee for graduates provided a major boost to the demand for education. The guaranteed employment greatly enhanced the private benefits of university education and the abolition of fees significantly lowered private costs (Richards, 1992: 8-9).

## **2.2 The Operation of the Employment Guarantee Scheme:**

With the exception of medical graduates and teachers, whose assignment is the responsibility of the relevant ministries, the law extends the right to graduates to apply to the Ministry of Manpower and Vocational Training for a public sector job.

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employment guarantee is spelled out in Circular Letter No. 43 of the Central Agency for Organization and Administration.

<sup>3</sup> The primary education system consists of five years of primary education (previously six) and three years of preparatory education. Diplomas from these two levels are classified as the “below intermediate” level of educational attainment in Egyptian statistical sources. Secondary education is divided into a three-year general track that leads into the higher education system and a three-year, and in a limited number of cases five-year, vocational track, whose graduates constitute the bulk of labor market entrants at the secondary level. Vocational secondary schools are further divided into industrial, commercial, and agricultural, and teacher-training tracks. Secondary school diplomas are classified as the “intermediate” level of educational attainment. The tertiary level of education consists of universities and other higher education institutions granting bachelors degrees and masters degrees (classified as “university degrees and above”) and two-year post-secondary technical institutes (classified as “above intermediate”). See Sanyal et al. (1982) and World Bank (1989) for a more detailed description of the Egyptian education system.

In addition to receiving the graduates' applications, the Ministry solicits requests for graduates from government agencies and state-owned enterprises. There was no incentive for these agencies to limit their requests since each appointee came with a budgetary allocation. Nonetheless, the requests consistently fell short of the number of applicants. The ratio of applicants to requests was 1.2 in 1977 and rose to 5.1 in 1981 (Fergany, 1991a). Excess supplies of applicants were usually allocated to local authorities to dispose of at their discretion (Hansen and Radwan, 1982: 44). Until 1978, with few exceptions, public agencies and enterprises were not allowed to hire permanent workers outside this centralized manpower allocation system. However, many agencies circumvented this restriction by hiring workers on temporary contracts. In 1978, public enterprises were allowed to opt out of the centralized manpower allocation scheme, to set their own hiring levels, and select their own workers. Thus, the brunt of the employment guarantee fell on the government sector, which includes the central government ministries, local government authorities, and the service and economic authorities. The term government will be used hereafter to refer to the civil service component of the public sector.

In the twenty-year period, from the time the graduate guarantee scheme was opened to secondary school graduates until the early 1980's when severe budgetary pressures resulting from a decline in oil revenues began to manifest themselves, the burden of the employment guarantee scheme on the public sector expanded significantly. The number of eligible secondary school and technical institute graduates increased from 26 thousand in 1966/67 to 213 thousand in 1983 and the number of eligible university graduates grew from 13 thousand in 1963/64 to 105 thousand in 1983.<sup>4</sup> This implies an annual growth rate of about 12 percent, compared to an overall rate of growth of the labor force during that period of 2.2 percent. When the guaranteed employment for graduates was fully implemented in 1963/64, graduates constituted about 17 percent of the annual increment to the labor force. By 1983, they made up 77 percent of that increment. This dramatic increase in the public sector's employment creation burden had clearly become unsustainable, but, for political reasons, the government felt it could not abolish the program outright. Two main courses of actions were pursued. The first was to gradually alter the rate of growth and composition of graduates through direct rationing of enrollments by the Ministry of Education, and the second was to gradually increase the waiting period for a government appointment in the hope that some graduates would drop out of the queue.

According to data from the Ministry of Manpower, the policy aiming at limiting enrollments has succeeded in significantly reducing the rate of growth in the number of graduates. As shown in Table 1, the number of university graduates peaked at about 130 thousand per year in 1986 and has been declining or stable since then. The decline has been across all specializations except for Law and teacher's training. While the total number of vocational secondary school graduates has

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<sup>4</sup> CAPMAS Statistical Yearbook for 1963/64 and 1966/67 data, and Ministry of Manpower and Vocational Training for 1989/90.

continued to grow, albeit at a slower rate than before, the mix has strongly shifted away from the commercial track toward the industrial track. This is the result of concerted efforts by the Ministry of Education to adjust the mix in favor of the industrial track by building more of the substantially more expensive industrial secondary schools.<sup>5</sup> Since post-secondary technical institutes are a relatively recent addition to the Egyptian education system, their enrollments were allowed to continue growing rapidly, at a rate of 12 percent per year until 1987, but then slowed to 3 percent per year from 1987 to 1991. The mix has also shifted significantly in favor of industrial specializations.

The second policy response of extending the waiting period for government appointments has created a queue for government jobs from which appointments are made primarily on the basis of time spent in the queue. By law, university graduates must wait two years after graduation and secondary school and technical institute graduates three years after graduation to apply to the Ministry of Manpower for a government job.<sup>6</sup> By the 1984, the period between graduation and appointment had been extended to three and a half years for university graduates and 4 years for vocational secondary and technical institute graduates and, by 1987, to 5 and 6 years, respectively (Handoussa, 1989). Hiring through the centralized manpower allocation system of Ministry of Manpower is currently on hold but has not been formally abolished. As of 1995, the last cohorts of graduates to have been offered appointments are the 1983 cohort of university graduates and the 1982 cohort of vocational secondary and technical institute graduates. As confirmed in the wage equation estimates below, this kind of a 'first-come-first-serve' hiring rule results in adverse selection into the government as more able graduates drop out of the queue to obtain private sector jobs.

A graduate is classified as unemployed by the Ministry of Manpower at a given date if his or her name remains on the registry of applicants at that date. While graduates are removed from the registry as a matter of course if they obtain a public sector job, many do not give up their position in the queue if they get a private job.<sup>7</sup> Thus graduates classified as unemployed by the Ministry may in fact be working in the private sector but remain in the queue to reserve their right to a public sector appointment when their turn comes up. Since the remainder of this section is based

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<sup>5</sup> A detailed account of the changes in policy toward technical education in Egypt can be found in World Bank (1989).

<sup>6</sup> The waiting period was designed to allow male graduates to complete their military service. With the exception of the period from 1967 to 1973, when conscripts could serve indefinitely, the duration of military service is normally one year longer for secondary and technical institute graduates than for university graduates.

<sup>7</sup> An attempt to implement this for some formal private sector firms, resulted in a mass resignation of graduates from these firms. This episode, which received a lot of attention in the Egyptian press, is a strong indication of the value graduates continue to attach to public employment. Details are provided in Assaad (1995) and *Al-Ahram*, September 9 and 10, 1992.



on Ministry of Manpower data, I will adopt the definition of 'unemployment' used by the Ministry. This is clearly at odds with the internationally-accepted definition of unemployment. The latter is the definition used in the Egyptian Labor Force Sample Survey, which is the basis of the discussion of unemployment in subsequent sections of this paper.

As of mid-1995, 36 percent of graduates eligible for the employment guarantee who graduated between 1983 and 1991 were classified by the Ministry as 'unemployed'. As shown in Table 2, 'unemployment' rates, defined as the number of 'unemployed' graduates divided by the total number of graduates, vary substantially by level of education, area of specialization, and year of graduation. Because appointments had already been made to virtually all 1983 university graduates, their 'unemployment' rate is only 0.9 percent, but increases steadily to 20 percent for 1991 graduates. Health professionals and teachers have the lowest 'unemployment' rates because their appointments are handled directly by the relevant ministries. The next lowest rates are among engineers who are in high demand in both the public and private sectors.<sup>8</sup>

While some specializations among university graduates, such as commerce, have rates of 'unemployment' in excess of 30 percent, they are still substantially lower than those of vocational secondary school graduates, which approach 50 percent. Unlike university graduates, however, 'unemployment' rates among vocational secondary graduates have been falling with year of graduation. This could mean that recent graduates perceive their chances of getting a job through the centralized manpower allocation system to be so low that they are no longer bothering to register with the Ministry of Manpower. The drop in 'unemployment' rates is especially noticeable for graduates from the industrial track who are likely to be more employable in the private sector.

This analysis of Ministry of Manpower data shows that secondary school graduates find it much harder than university graduates to get jobs either in the public or private sectors outside the employment guarantee scheme and therefore have a greater incentive to remain in the job queue. There may clearly be some substitution whereby jobs that require only a secondary education are filled by university graduates. However, the evidence is fairly convincing that the employment guarantee is contributing to the overproduction of low-quality vocational secondary school graduates and giving these graduates relatively high job expectations. The message that the government does not intend to maintain its commitment seems to be getting through, however, as indicated by the increasing number of drop outs among recent secondary school graduates.

While the Ministry of Manpower data on graduates are not disaggregated by gender, there is considerable indirect evidence to indicate that women are much less

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<sup>8</sup> This is confirmed by the large wage premia they receive in both sectors as shown below.

likely to drop out from the queue than men. Unemployment rates for female graduates are typically significantly higher than those of male graduates (Fergany, 1991b: 130-132; also see section 4 below). Moreover, as will be shown below, women's share of government employment has increased significantly. This is due in large part to the relatively egalitarian treatment of men and women in public sector wage setting compared to the large gender wage gap that exists in the private sector (see Section 5 below).

### **3. THE EFFECTS OF THE EMPLOYMENT GUARANTEE SCHEME ON THE PUBLIC SECTOR**

Having to absorb a large and growing number of workers every year has clearly had a devastating effect on public sector finances, performance, and on its size relative to the rest of the economy. Despite the abandonment of the socialist development path in 1973, public sector employment growth continued unabated in the 1970s, driven primarily by the guaranteed employment scheme. The extension of the employment guarantee to demobilized recruits from 1973 to 1976 further contributed to this growth, but it was also driven by the expansion of public coffers as a result of the oil windfall of the second half of the 1970s.

#### **3.1 Employment and Wages in the Government:**

While it is difficult to reconcile the various sources of data on the exact size of government employment, it appears to have mirrored the fluctuations in the Egyptian economy but generally growing at rates significantly higher than those for the overall labor force. According to Ministry of Finance data, government employment grew at a rate of 6.9 percent per year from 1960 to 1966/67, the height of the socialist phase. The growth rate then declined to 5.5 percent per year during the war period (1967-1973) as resources had to be diverted to the military buildup. It accelerated to 7.2 percent per year from 1973 to 1982 even though the government was committed to a more market-oriented path. While the growth of government employment was somewhat slower than the growth in the number of graduates, it was clearly driven by it and by the fact that, in the 1970s, the government had access to sufficient resources to hire them. When the oil windfall began to disappear around 1982, the government employment growth rate declined again to 5.1 percent per year from 1982/83 to 1986/7.<sup>9</sup>

Table 3 shows employment levels by sector from 1981 to 1992 as reported in the Labor Force Sample Survey (CAPMAS). Because of vastly different data collection methodologies, these data should not be compared directly to Ministry of Finance data. However, they can provide some indication about government

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<sup>9</sup> See Handoussa (1989) for a discussion of the discrepancy between Ministry of Finance data and other data sources. It appears that the Ministry of Finance data is exaggerating the growth of the government labor force in the latter part of the period.

employment trends since 1981.<sup>10</sup> The LFSS confirms that government employment was growing rapidly from 1981 to 1984 (8.4 percent per year), slowed down considerably between 1984 and 1992 (4 percent per year). The share of government in total employment appears to have stabilized somewhere between 23 and 24 percent.

Real government wages appear to have risen during the boom period of the 1970s and early 1980s, but then dropped precipitously thereafter, as the government attempted to bring its finances under control. According to Zaytoun (1991: 250), real government wages rose to a peak of 19 percent above their 1974 level in 1981, but by 1986 had fallen by nearly 40 percent of their 1981 level. While more recent data on government wages are not readily available, real wages have probably continued to decline since cost of living adjustments have been kept well below the inflation rate, by agreement with the IMF. Such a dramatic decline in real government wages has undoubtedly had a devastating effect on the quality of government services through reduced morale, increased moonlighting, and increased graft.

Despite the slowdown in government hiring and the erosion of real wages, the share of wages in the government budget has increased from 21 percent to 26 percent between 1983/84 and 1988/89, after a period where it was relatively stable at 22 percent from 1979 to 1983/84. While other expenditures, such as subsidies have been brought under control to comply with the IMF stabilization program, it has proven more difficult to cut the government wage bill.

### **3.2 Employment in Public Enterprise:**

No comprehensive series of public enterprise employment is available for the period 1960 to 1975, but Handoussa (1989) concludes that it grew at a rate of 8.7 percent per year from 1960 to 1966 and 2.9 percent from 1966 to 1976. Zaytoun (1991: 244) provides data on public enterprise employment from 1974 to 1986/87. That series suggests that employment has grown by about 5 percent per year from 1974 to 1979 and then slowed down to 1.4 percent per year from 1979 to 1986/87. The policy change to allow public enterprise to opt out of the centralized manpower allocation scheme would have become effective by 1979. The more recent data from the Labor Force Sample Survey shown in Table 2 does not reveal any upward trend in public enterprise employment.

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<sup>10</sup> Total employment in the October 1988 round of the survey is not comparable to total employment in other years because a special effort was made to detect female employment in agricultural and informal activities. See Fergany (1991b) for an explanation of the discrepancy.

### **3.3 The Composition of Public Sector Employment:**

In addition to its effect on overall government employment and wages, the guaranteed employment scheme has skewed the composition of public sector employment toward more graduates, most of whom are white collar workers. It has also contributed to an increasing feminization of the government labor force because of the higher likelihood that female graduates will remain in the job queue.

As shown in Table 4, nearly 70 percent of government employees are graduates. Among female employees, the proportion of graduates is nearly 95 percent. Graduates constitute 47 percent of the labor force in public enterprise. In contrast, they constitute less than 4.5 percent of employment in agriculture and less than 20 percent of employment in the private non-agricultural sector.

Even though the participation of public enterprise in the employment guarantee scheme ended in 1978, the legacy of the scheme remains with them. In discussions surrounding public enterprise restructuring and privatization, enterprise leaders stressed on a number of occasions that clerical and administrative workers constituted their most serious surplus labor problem.

The increasing feminization of the government labor force can be readily seen from Table 5, which is based on a comparison of census data from 1976 and 1986. Female employment in the government has grown at a rate of 8.7 percent per year. The government sector alone was responsible for 76 percent of female employment growth compared to about one third of male employment growth. Finally, women made up nearly one half of the increase in government employment over the period.

## **4. THE EFFECT OF THE EMPLOYMENT GUARANTEE ON UNEMPLOYMENT**

For a country where it is virtually impossible to get unemployment benefits, Egypt's open unemployment rate of 7 to 10 percent is relatively high. Most of this open unemployment involves graduates and can be attributed to the cumulative effect of the graduate guarantee scheme. While there is some seasonal unemployment among agricultural workers, most open unemployment is due to graduates waiting their turn in the government employment queue. As shown in Table 6, while unemployment rates among uneducated workers (the illiterate and read and write categories) fluctuate between 0.3 and 2.6 percent, unemployment rates among graduates are fairly stable and considerably higher. Consistent with the patterns detected from the records of the Ministry of Manpower, unemployment rates among graduates are highest among intermediate level (secondary school) graduates and lowest among university graduates. In most of the years shown, graduates make up over 90 percent of the unemployed.

Disaggregated by sex, unemployment data reveal that female graduates are disproportionately represented among the unemployed. In 1992, women made up 50

percent of unemployed graduates but only 25 percent of employed graduates. Among secondary school graduates, the female unemployment rate was 46 percent as compared to 22 percent for their male counterparts. The rate for female university graduates is lower (20 percent) but still considerably higher than that of males at that level (12 percent). These results confirm that female vocational secondary school graduates, most of whom pursue the commercial track, are the least able to find acceptable employment outside the government.

To conclude, unemployment data suggest that the sharp increase in open unemployment in Egypt since the early 1980s is primarily a manifestation of the adjustment needed as a result of the curtailment of the primary labor absorption mechanism for graduates in the Egyptian economy, namely government employment. The graduates themselves need to adjust their expectations to the kind of work available in the private sector, namely jobs with little job security, few benefits, and higher effort requirements. While it appears that the erosion of public sector wages and the length of the government job queue may finally be enticing male graduates to find alternative employment in the private sector, this is not yet the case for female graduates for whom the government is increasingly becoming the employer of last resort. The problem is particularly acute for vocational secondary school graduates who make up nearly two thirds of female applicants. Women with vocational secondary degrees seem to face substantial discrimination in the private labor market. While males with vocational secondary degrees earn about the same in public and private sectors, females face a public-private wage differential of 40 to 60 percent, not counting all the non-monetary benefits of a public sector job (see Table 10). It is therefore not surprising that they have a strong preference for public sector jobs.

## **5. THE EFFECTS OF PUBLIC WAGE SETTING POLICIES ON WAGE DETERMINATION AND RETURNS TO EDUCATION**

The combination of the employment guarantee for graduates and wage setting policies in the public sector have had a profound but complex effect on the structure of wages in the Egyptian economy. The non-market determination of public sector wages, combined with the substantial size of public sector employment, distorts wages in the private sector in two ways. First, by setting a floor for the wages and other benefits of those covered by the employment guarantee, the policy reduces the employment of graduates in the private sector by artificially raising the cost of their labor relative to that of others. Even if public sector jobs are not readily obtainable, the expected public sector wage (or anticipated discounted lifetime earnings and benefits) is still higher than in the private sector, thus encouraging graduates to queue for public sector jobs. Second, a public sector wage floor for graduates artificially inflates the demand for secondary and university education relative to other levels, leading to a shift of educational resources to these levels. The resulting increase in the supply of graduates pushes down the market clearing wage in the private sector below what it would have been without the wage floor.

## 5.1 A Simple Supply and Demand Model for Educated Labor:

The effect of the policy can be readily analyzed using a simplified Harris-Todaro type model as follows. Consider the model shown in Figure 1. Let SS be the supply curve of educated labor without the policy and DD the private sector demand for this labor. Government employment adds a fixed amount to labor demand shifting the demand curve to D'D'. If both the public and private sectors paid the market clearing wage, the wage would be  $w^*$ , private employment would be  $L_p^0$ , and total employment would be  $L_T^0$ . There would be no graduate unemployment. Assume instead that government wage setting practices are such that wages are set at  $\bar{w}$  above the market clearing wage  $w^*$ . Assume that each graduate has a probability  $p$  of receiving the government wage  $\bar{w}$ , the prevailing wage in the private sector will be the expected wage  $w_c = p\bar{w}$ . The probability of employment  $p$  is assumed to depend on the number of unemployed graduates  $L_u$  (or the length of the queue for government jobs) as follows:  $p = f(L_u)$ , where  $f(0) = 1$  and  $f'(L_u) < 0$ ;  $0 \leq p \leq 1$ .  $w_c$  will fall on the intersection of the curve EE and the supply curve. While  $w_c$  can be above or below  $w^*$ , the interesting case is when  $w_c > w^*$ . At that wage, private sector employment of graduates will decline to  $L_p^1$  and unemployment will be  $L_u^1$ . Public sector employment is assumed to be invariant to the wage.

If the increased demand for education at the secondary and university levels prompts the government to shift resources to these levels, the supply curve will shift outward. In that case the market clearing would be now be  $w'^* < w^*$  and the new prevailing wage will be  $w'_c$ . Since it is not clear whether  $w'_c$  will be above or below the original market clearing wage  $w^*$ , we cannot say whether the policy increases or reduces graduate wages and the private returns to education.

As indicated in earlier sections, the Egyptian labor market exhibits all the features predicted by this simple model: there is a queue of unemployed graduates waiting for government appointments and private sector employment of graduates is very limited. However, a direct comparison of public and private wages does not support the idea of a public sector wage floor. Average wages in the public sector appear to be substantially lower than in the private sector and have lagged further behind inflation in recent years. However, once wages are corrected for observed and unobserved heterogeneity, and the difference of non-pecuniary benefits is taken into account, the attraction of public sector jobs to graduates becomes readily apparent. This exercise is carried out below.

## 5.2 Wage Setting in the Government:

Wage setting in the Egyptian government has been driven by non-market considerations since well before the institution of the graduate employment guarantee. The "Law of the Price List of Educational Certificates" of 1951 stipulated a fixed initial salary for each educational certificate and a system of periodic increments

according to seniority and level of education, regardless of the position occupied. Basic wages in the government are still being set in this manner. Compensation levels are tied to job grades, with lower and upper bounds for each grade set according to a unified schedule. Each year the worker is entitled to a periodic increase so long as the resulting wage does not exceed the maximum for the grade. In addition to the basic wages, workers can receive allowances for hazardous work, accommodation, and various other aspects of the job. The employing agency can also pay incentives for good performance. The sum total of allowances and incentives is limited to 100 percent of the basic wage.<sup>11</sup>

In practice, the vast majority of employees are rated *Distinguished* or *Very Good* in their performance evaluation, irrespective of their performance. It appears that government managers and supervisors have little incentive to do otherwise and can suffer considerable grief from their subordinates and colleagues for "unduly" penalizing a worker. Incentive payments are usually made on a uniform basis throughout a particular agency, but important differences can be found among agencies (See Zaytoun, 1991).

### **5.3 Wage Equation Estimates:**

#### **5.3.1 Methodology**

I estimate wage equations for males and females using a standard Mincerian human capital model where variations in wages are assumed to be based on differences in educational attainment and on-the-job experience. Regional variables are included to control for differences in cost of living and labor market conditions. Since public sector wages are not necessarily set to equal marginal productivity as assumed in the Mincerian approach, I distinguish between the two sectors by allowing each to have its own wage-determination process.<sup>12</sup> A number of other studies have attempted to investigate public/private wage differentials in developing countries (Lindauer and Sabot, 1983, Corbo and Stlecner, 1983, Psacharopoulos, 1983, Al-Qudsi, 1989). These studies do not take into consideration the endogeneity of the sector allocation process as is done in some of the more recent studies (Van der Gaag and Vijverberg, 1988 and Stlecner, Van der Gaag and Vijverberg, 1989, Terrell, 1993). Since in this case data are only available for wage workers, I also need to take into account the endogeneity of participation in wage work in a context where self-employment is common.<sup>13</sup>

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<sup>11</sup> The system is laid out in articles 40 and 41 of the Civil Servants Law (Law 47 of 1978) and amended in Law 115 of 1983.

<sup>12</sup> The public sector is defined to include the government (or civil service) and the public enterprise sector. Everything else is included in the private sector.

<sup>13</sup> Tansel (1994) corrects for selectivity into wage work but does not disaggregate by sector.

In this study, I limit the analysis to non-agricultural wage workers. I therefore take into account selection into non-agricultural wage work and selection into the public and private sectors for non-agricultural wage workers. For males, the relevant universe for the participation in non-agricultural wage work decision is all males 15 to 64 who were in the labor force at any time during the reference year. For females, the relevant universe for the participation decision is all females 15 to 64, whether or not they were in the labor force. I abstract from the issue of selection into the two components of the public sector. I assume that the wage determination process in public enterprise is identical to that in the government except for a shift parameter.<sup>14</sup>

To model the two simultaneous selection processes, I use a bivariate probit double selection framework that extends the single selection procedures developed by Heckman (1976, 1979) and Lee (1976) to account for two selection rules jointly determining inclusion in a particular subsample (Tunali, 1986). The distribution of the error terms of the two selection equations and the two wage equations are assumed to be quadrivariate normal. The model and the selection equation specification and estimates are presented in the Appendix.

### **5.3.2 The Data**

The data are obtained from the October 1988 round of the Egyptian Labor Force Sample Survey. This special round of the survey used a much more detailed set of questions to inquire about earnings than is usual in similar surveys in Egypt.<sup>15</sup> The earnings data are therefore likely to be of considerably higher quality than those obtained through other household surveys. While the survey attempted to get data on earnings in kind, the quality of that data is quite poor. I therefore use monetary net earnings and divide by the number of hours worked per year to compute the hourly wage. The most important exclusions from net earnings are the value of retirement and death benefits for workers who are covered by social insurance and the value of job security for those who possess legal employment contracts. While the vast majority of public sector workers have social insurance coverage and work under legal employment contracts, this is not the case in the private sector. Among private non-agricultural wage workers, only 12 percent have legal contracts and 26 percent have social insurance coverage.<sup>16</sup>

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<sup>14</sup> See Terrell (1993) for a study that takes into account non-random selection into the two components of the public sector. I also do not take into account endogenous selection into different levels of education. See Willis and Rosen (1979) for a discussion of the issues involved.

<sup>15</sup> The earnings module was designed by Professor Mohaya Zaytoun and is described in detail in Zaytoun (1990).

<sup>16</sup> See Assaad (1995) for a description of Egypt's job security and social insurance system.



Summary statistics for the variables used in the wage equations are shown in Table 7. The sample is limited to individuals between the ages of 15 and 64.<sup>17</sup> Nearly 38 percent of males in the overall sample are non-agricultural wage workers, and among those nearly 60 percent are in the public sector. The proportion of females in non-agricultural wage work is much lower at about 10 percent, but the share of the public sector among them is significantly higher than for males (77 percent).

The attractiveness of public sector work for females can be readily understood if one examines the wage data. While there is a large gap between the average male and female wage in the private sector, there is near parity in the public sector. As shown below, the relative gender gap between the two sectors does not disappear when worker characteristics are taken into account.

Female non-agricultural wage workers in both sectors are generally better educated than their male counterparts. Eighty one percent hold a secondary diploma or above and 26 percent hold a university diploma, compared to 43 and 16 percent for males, respectively. Holders of secondary and post-secondary degrees are also disproportionately represented in the public sector for both sexes. They constitute 54 percent and 91 percent of the public sector workforce for males and females respectively, compared to 27 percent and 49 percent of private non-agricultural wage workers. Finally, with the public sector, 34 percent of male workers and 16 percent of female workers work in public enterprise, with the remainder in the government.

### *5.3.3 Specification and Estimation*

Separate equations are estimated for males and females. Experience is calculated as the total number of years since entry into the labor force, thus neglecting any time spent outside the labor force since entry. Since the number of years of schooling is not available from the survey, education is specified as the attainment of particular educational credentials.<sup>18</sup>

I present wage equation estimates for all non-agricultural wage workers as well as disaggregated by sector.<sup>19</sup> The first set of estimates is corrected for selectivity into non-agricultural wage work, while the second is corrected for double selection into non-agricultural wage work and into the public or private sectors. Since several previous studies have shown that wage-experience profiles are steeper for educated

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<sup>17</sup> In addition, the male sample is limited to a randomly selected subsample of approximately half the households for which data on parents' employment status were collected.

<sup>18</sup> The "read and write" variable is clearly an exception to this rule. See van der Gaag and Vijverberg (1989) for a comparison of the credentials approach and the years of schooling approach.

<sup>19</sup> The specification and estimation of the selection equations are discussed in the Appendix.

workers (Knight and Sabot, 1981), I present two alternative specifications of the experience-education interaction. The first, referred to as Model (1) in the various tables, assumes no interaction exists between education and experience, and the second, referred to as Model (2), includes interaction terms between experience and dummy variables for the main educational levels --primary, secondary and tertiary.<sup>20</sup> I assume that the wage formation process in public enterprise is similar to the government's, except for a shift parameter, which is the parameter of the public enterprise dummy variable in the public sector equation.

The wage equation estimates are shown in Table 8 for males and Table 9 for females. Predicted wages by experience and education level are shown in Table 10.<sup>21</sup> A comparison of the results from models (1) and (2) in Tables 8 and 9 reveals that there is a significant education-experience interaction in the expected direction. I will therefore focus on the interpretation of estimates from model (2). Model (1) estimates are provided to allow for comparison with the majority of estimates provided in the literature.

The sector-specific equations reveal that there are distinct wage setting mechanisms in the public and private sectors.<sup>22</sup> For men, the main differences in wage setting between the two sectors appears to be in the returns to education for levels of educational attainment above the primary level, which are considerably higher in the public sector. Only engineers have similar returns to their education in the two sectors. For women, the primary difference besides differences in the constant appears to be in the return to university education, which are higher in the private sector, and in the regional dummies.

The sample selection terms confirm the hypothesis that the job queue results in adverse selection into the government, but show no evidence of non-random selection into non-agricultural wage work. The coefficient of the wage work sample selection term is either statistically insignificant or switches signs between specifications. The coefficient of the public-private selection term, however, is

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<sup>20</sup>In this context, "primary" includes both primary and preparatory certificates, "secondary" includes vocational secondary, general secondary, and technical institute diplomas, and "tertiary" includes baccalaureate and post-baccalaureate degrees. The reference category is "no certificate" which includes illiterates and those who can only read and write. The three education level dummy variables are interacted only with the linear experience term. The interactions with the quadratic term were jointly insignificant.

<sup>21</sup> The predicted wages are for a reference worker who lives in Greater Cairo, is not currently married and is not a head of household. The reference public sector worker is a government employee.

<sup>22</sup> A Chow test rejects equality between the coefficients [ $F(25,2877)=11.12$  for the male equation and  $F(25,1483)=4.99$  for the female equation]. Equality of the slopes is rejected even if the intercepts are allowed to differ [ $F(23,2877)=5.78$  for the male equation and  $F(23,1483)=4.73$  for the female equation].

always negative and is significant for both male and female public sector workers under the preferred model (2) specification, confirming the hypothesis of negative selection into the public sector.

To further examine the public-private wage differential I use an extension of Oaxaca's (1973) decomposition of the wage differential that includes differences due to selectivity bias (Idson and Feaster, 1990; Terrell, 1993). I decompose the total differential in mean wages between the government and the private sector and public enterprise and the private sector into four components: (i) a component that is explained by differences in observed worker characteristics, (ii) a component due to differences in the constant terms, which is sometimes interpreted as the premium or pure rent from being in a given sector, (iii) a component that captures differences in returns to worker characteristics in the two sectors, and (iv) selectivity bias.<sup>23</sup> Components (ii) and (iii) constitute the unexplained component of the mean wage differential. The decomposition is shown in Table 11. In all cases public sector workers have a positive and significant differential due to differences in observed characteristics because they are in general better educated than private sector workers. The unexplained differential between government and private sector male workers is negative and statistically significant and is due, for the most part, to a difference in the intercept rather than in returns to human capital and other characteristics. This differential in favor of the private sector is of the same order of magnitude as the lower-bound estimate of the difference in non-pecuniary benefits between the two sectors that is derived below (0.37 log points compared to 0.44 log points). Hence there is weak evidence, at best, that the average male worker in the government receives any rent. The unexplained differential between male public enterprise and private sector workers is smaller and statistically insignificant. Since non-pecuniary benefits and working conditions in public enterprise are similar to those of the government, we can conclude that public enterprise workers do receive rents.

The situation for females is quite different. Because of the large gender wage gap in the private sector and the more equitable wage setting rules in the public sector, there is a large positive unexplained differential in favor of both government and public enterprise workers. Most of it is due to differences in the constant term rather than in returns to the various characteristics. It is also worth noting the large negative selection differential, which captures the adverse selection of females into the public sector.

To investigate the variation in the wage differential by educational level and experience, I present, in Figure 2, wage-experience profiles for government and private sector workers for selected educational levels. For illiterate males (Panel a), measured wages are significantly higher in the private sector than in the government

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<sup>23</sup> I use a decomposition similar to Terrell's (1993):

$$\bar{y}_P - \bar{y}_R = 0.5(\beta_P + \beta_R)(\bar{X}_P - \bar{X}_R) + (\beta_{0P} - \beta_{0R}) + 0.5(\bar{X}_P + \bar{X}_R)(\beta_P - \beta_R) \\ + [\rho_{1P}\sigma_P\bar{\lambda}_{1P} + \rho_{2P}\sigma_P\bar{\lambda}_{2P} - \rho_{1R}\sigma_R\bar{\lambda}_{1R} - \rho_{2R}\sigma_R\bar{\lambda}_{2R}]$$

where a bar denotes sample means. The symbols are defined in the Appendix.

over most of the relevant range of experience, with the gap increasing at first and then declining at higher levels of experience. An illiterate male with 15 years of experience earns 70 percent more in the private sector than in the government (computed from Table 10). The pattern is reversed for illiterate females. Government wages, exclusive of benefits, are significantly higher than private sector wages over the entire range of experience. These results highlight once more the large gender wage gap that exists for illiterates in the private sector. Within the government, there is an apparent gender wage gap in favor of females for illiterate workers but the difference is well within the standard error of the constant term in the public sector equation for females.

Panel b shows the wage-experience profiles of white collar vocational secondary school graduates, who make up the bulk of graduates at the secondary level. For males, government and private sector wages are similar. A small gap in favor of the private sector develops for intermediate levels of experience, but narrows later as the effect of seniority-based wage setting rules in the government becomes more pronounced. For females there is a large and growing wage gap in favor of the government over most of the relevant experience range, underscoring the strong preference female vocational secondary school graduates have for public sector work.

For university graduates, differences between males and females and between the government and the private sector are much smaller (Panel c). Entry wages are similar in both sectors but a differential in favor of the private sector develops with experience.

Engineers receive a positive wage premium in both sectors, but the premium is significantly smaller in the government and is not significant for females. This suggests that the government has a limited ability to pay higher wages for professions that are in high demand in the private sector.

To conclude, the wage equation estimates indicate that while private sector wages are higher than government wages for males at all education levels, the premium received by private sector workers is probably insufficient to compensate them for the difference in non-wage benefits and working conditions. Since public enterprise workers are paid more than their government counterparts and receive similar benefits, they receive an even higher rent. For females, government wages exceed those in the private sector at all levels of education up to the university level. Faced with a large gender wage gap in the private sector and egalitarian wage-setting in the public sector, female with less than a university degree will clearly have a strong preference for the public sector. Those with a university education appear to face fewer discriminatory barriers in the private sector.

#### 5.4 Returns to Education:

Using the wage equation estimates discussed above, I compute private rates of return to schooling by sector and sex. Because of the large differences in benefits, job security, and work effort required in the public and private sectors, monetary compensation in the two sectors cannot be compared directly. Rates of return to schooling that do not disaggregate by sector are essentially comparing lifetime income streams for educated workers who are much more likely to be working in the public sector to those of workers with less schooling, who are much more likely to be found in the private sector. Since public sector jobs have significantly higher non-pecuniary benefits, this has the effect of reducing overall rates of return to schooling. To get around this problem, I calculate sector-specific rates of return to schooling, by comparing lifetime streams of income for workers in the same sector at different levels of schooling. Subject to the assumption that the non-pecuniary benefits of a public sector job do not vary by schooling level, this gets over the limitation of non-comparable compensation packages. However, because a given individual may be making a choice over a job in the private sector at the lower level of education and one in the public sector at the higher level, keeping the comparison within one sector may not accurately reflect the choice set.

In computing rates of return to schooling, I assume that the direct costs of schooling are insignificant compared to the income foregone while in school and that the duration for which income is forgone is equal to the duration of the additional schooling. While the first assumption is relatively unproblematic, the second one may not correspond to reality. Since graduates are much more likely to be unemployed at entry than non-graduates and, when unemployed, have longer unemployment duration, one would need to include such excess unemployment in the rate of return to schooling calculation. The likely effect of such an adjustment would be to reduce rates of return to secondary schooling and increase rates of return to university schooling because secondary school graduates face higher levels of unemployment than either university graduates or primary school graduates.

Private rates of return to schooling with and without disaggregation by sector are shown in Table 12. By international standards, rates of return to primary schooling are very low in Egypt. Psacharopoulos (1985) reports average private rates of return to primary schooling of 45 percent in Africa and 31 percent in Asia, compared to 1-5 percent for males and 4-10 percent for females in Egypt.<sup>24</sup> Psacharopoulos (1983) also reports that rates of return in the noncompetitive public sector tend to be lower than in the competitive private sector because compression of pay scales in the public sector flattens mean earnings differentials, and hence depresses returns to education. I find the opposite to be true in Egypt up to the

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<sup>24</sup>In this study, rates of return to primary schooling are computed assuming only two years of income foregone relative to who can just read and write.

university level.<sup>25</sup> Because of the oversupply of vocational secondary school graduates, rates of return to that level of education are either very low or negative in both sectors.

Private returns to schooling at the university level are significantly higher on average than at the secondary or primary level and appear to be higher in the private sector than in the public sector, lending some credence to Psacharopoulos' wage compression hypothesis. The gap between returns to schooling in the private and public sectors is largest for engineering graduates, who are highly prized in the private sector, but is also large for holders of post-graduate degrees. These patterns appear to hold for both males and females.

### **5.5 Quantifying the Non-Wage Benefits of a Public Sector Job:**

Besides better benefits and greater job security, there are many reasons why a public sector job may be preferred to a private job that pays the same wage. These include lower actual numbers of hours worked, access to rents, opportunities for moonlighting, access to subsidized commodities and housing, access to free transport, etc.. While women are less likely to participate in moonlighting than men, they prefer public sector jobs because the lower level of effort and time required makes a public sector job more compatible with their domestic responsibilities.<sup>26</sup> Quantifying the value placed on these non-wage benefits is not straightforward. My attempt at doing so provides a lower bound subject to some reasonable assumptions.

Assuming that there is free entry into the private sector, that public sector jobs are rationed, and that the non-wage benefits of a public sector job are invariant to, or at least do not decline with, increasing levels of education, a lower bound estimate of these benefits can be obtained as follows. Assume that illiterate male workers, for whom there is the largest wage gap in favor of the private sector receive no rent if they work in the public sector. Since there is free entry into the private sector, they receive no rent in the private sector either. Thus, the difference between their discounted lifetime earnings in the private and public sectors can serve as a lower bound for the non-pecuniary value of a government job.

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<sup>25</sup> This is clearly the case for males. The results for females are less reliable because of the imprecise estimates of the private sector wage equations.

<sup>26</sup> In an interview quoted in the *Ahram* newspaper, a woman who resigned her job in a large private firm when faced the possibility of losing her place in the queue for government jobs said: "I want to rest. I have back pain as a result of the many hours of work I spend at the sewing machine at the factory. I want a position in the government so that I can rest." [*Al Ahram*, September 10, 1992]. Another woman interviewed expressed the desire for the government because it would allow her to be closer to home so that she can marry and have children.

Using the Model (2) estimates of the wage equations, I estimate the net present value of the difference in the stream of earnings from a private and a public sector job for an illiterate male at a discount rate of 5 percent to be 0.44 log points or about 56 percent. It ranges from 0.37 to 0.45 log points for discount rates of 4 to 8 percent.<sup>27</sup> Despite the preliminary nature of these estimates, an appropriate lower bound estimate for the non-wage value of a public sector job is approximately 50 percent of the observed public sector wage.

## 6. CONCLUSION

The employment guarantee for graduates and public sector compensation policies have indeed had a major effect on the Egyptian labor market. It contributed to an unsustainable rate of growth in the government labor force resulting in a bloated bureaucracy and severe overstaffing. By setting a floor for the wages and benefits that a graduate can achieve, it encouraged queuing for government jobs, contributing to high graduate unemployment rates, and reduced graduate employment in the private sector. Despite the *de facto* suspension of the program since 1990, the possibility of a government job continues to drive the labor market expectations of graduates.

The labor market for vocational secondary school and technical institute graduates is disproportionately affected by the public hiring and compensation policies. Because they have the highest ratio of public to private wages, they are more willing to queue for government jobs and therefore have the highest unemployment rates. When combined with the non-wage benefits of a public sector job, the relative wages for secondary and technical institute graduates in the public and private sectors translates into a significant rent for public sector workers. This public-private wage gap is particularly large for female vocational secondary school graduates, who appear to face severe discriminatory barriers in the private sector. Because of wage compression in the public sector, the wage differential between the two sectors is less pronounced for university graduates. Wage compression, in effect, mitigates the effect of the public sector wage floor for this category of graduates.

Rates of return to primary and secondary schooling in Egypt are well below those in comparable countries, especially in the private sector. At the primary level, this is probably due the fact that primary education was starved of resources to finance the demand for secondary and higher education generated by the employment guarantee scheme, with disastrous consequences for educational quality. While educational quality is also a factor at the secondary level, a compounding factor is the glut in the number of secondary school graduates that can be directly attributed to the employment guarantee scheme and the large public-private wage gap at that level. It is at this threshold level that the employment guarantee has its greatest distortionary impact on the labor market.

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<sup>27</sup> Under model (1), the estimate is even higher at around 0.64 log points.

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**Table 1 - Evolution of the Number of Graduates Eligible for the Employment Guarantee, 1983-91.**

|                                 | 1983           | 1985           | 1987           | 1989           | 1991           | 1983-91          | Structure (%) | Av. Ann. Gr. Rt. (%) |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|------------------|---------------|----------------------|
| Health Sciences                 | 9,998          | 8,754          | 8,062          | 6,546          | 7,230          | 74,185           | 2.1           | -4.1                 |
| Agriculture                     | 8,194          | 8,738          | 7,935          | 7,247          | 8,147          | 72,380           | 2.1           | -1.5                 |
| Commerce                        | 28,441         | 35,730         | 35,236         | 29,051         | 26,293         | 282,434          | 8.1           | -1.8                 |
| Engineering Sciences            | 8,575          | 10,198         | 9,209          | 8,163          | 7,614          | 78,386           | 2.3           | -2.6                 |
| Law                             | 4,370          | 4,486          | 4,456          | 3,864          | 3,625          | 37,792           | 1.1           | -2.2                 |
| Teacher's Training              | 9,562          | 13,551         | 13,394         | 14,879         | 17,848         | 124,308          | 3.6           | 6.9                  |
| Other Bachelor's Degrees        | 15,688         | 22,931         | 24,916         | 23,304         | 22,446         | 203,677          | 5.9           | 2.9                  |
| <b>All University</b>           | <b>105,272</b> | <b>130,490</b> | <b>129,311</b> | <b>116,738</b> | <b>120,479</b> | <b>1,100,048</b> | <b>31.7</b>   | <b>0.5</b>           |
| Commercial Technical Institute  | 17,709         | 23,512         | 26,007         | 26,356         | 25,993         | 218,902          | 6.3           | 4.7                  |
| Industrial Technical Institute  | 4,622          | 4,008          | 10,405         | 11,875         | 13,015         | 79,022           | 2.3           | 19.2                 |
| Other Technical Institute       | 2,115          | 2,752          | 3,120          | 3,587          | 5,241          | 29,202           | 0.8           | 10.3                 |
| <b>All Technical Institute</b>  | <b>24,446</b>  | <b>30,272</b>  | <b>39,532</b>  | <b>41,818</b>  | <b>44,249</b>  | <b>327,126</b>   | <b>9.4</b>    | <b>8.3</b>           |
| Agric. Vocational Secondary     | 22,267         | 23,563         | 29,228         | 30,486         | 35,103         | 251,107          | 7.2           | 5.0                  |
| Commercial Vocational Secondary | 107,672        | 102,696        | 111,996        | 126,303        | 112,898        | 1,015,129        | 29.2          | 0.9                  |
| Industrial Vocational Secondary | 58,412         | 65,108         | 75,210         | 108,169        | 131,472        | 779,987          | 22.5          | 11.4                 |
| <b>All Vocational Secondary</b> | <b>188,351</b> | <b>191,367</b> | <b>216,434</b> | <b>264,958</b> | <b>279,473</b> | <b>2,046,223</b> | <b>58.9</b>   | <b>5.4</b>           |
| <b>All Graduates</b>            | <b>318,069</b> | <b>352,129</b> | <b>385,277</b> | <b>423,514</b> | <b>444,201</b> | <b>3,473,397</b> | <b>100.0</b>  | <b>4.1</b>           |

Source: Ministry of Manpower and Vocational Training

**Table 2 - Proportion of Graduates Classified as Unemployed by the Ministry of Manpower and Vocational Training by Educational Level/Specialization and Year of Graduation (%)**

|                                 | 1983 | 1985 | 1987 | 1989 | 1991 | 1983-91 |
|---------------------------------|------|------|------|------|------|---------|
| Health Sciences                 | 0.2  | 0.5  | 0.7  | 1.0  | 0.8  | 0.6     |
| Agriculture                     | 1.3  | 33.9 | 38.2 | 41.7 | 48.5 | 33.3    |
| Commerce                        | 1.0  | 18.4 | 23.1 | 27.0 | 32.5 | 20.4    |
| Engineering                     | 1.1  | 6.6  | 8.4  | 10.1 | 14.1 | 7.8     |
| Sciences                        | 1.5  | 22.4 | 25.0 | 32.1 | 38.5 | 24.1    |
| Law                             | 1.4  | 15.3 | 19.3 | 23.8 | 26.7 | 18.7    |
| Teacher's Training              | 0.3  | 0.4  | 0.5  | 0.6  | 4.6  | 1.0     |
| Other Bachelor's Degrees        | 1.1  | 12.7 | 17.4 | 20.4 | 31.1 | 17.0    |
| All University                  | 0.9  | 12.8 | 15.8 | 18.5 | 24.3 | 14.6    |
| Commercial Technical Institute  | 18.4 | 26.0 | 34.0 | 43.5 | 46.3 | 35.5    |
| Industrial Technical Institute  | 23.5 | 62.3 | 36.6 | 40.9 | 38.7 | 41.1    |
| Other Technical Institute       | 3.9  | 8.4  | 12.1 | 15.7 | 10.8 | 11.6    |
| All Technical Institute         | 17.9 | 28.8 | 32.5 | 39.7 | 39.3 | 34.2    |
| Agric. Vocational Secondary     | 60.6 | 52.5 | 48.0 | 55.2 | 38.0 | 50.4    |
| Commercial Vocational Secondary | 42.0 | 48.7 | 49.9 | 52.1 | 48.0 | 48.9    |
| Industrial Vocational Secondary | 58.0 | 51.2 | 50.5 | 43.7 | 29.2 | 44.4    |
| All Vocational Secondary        | 49.2 | 50.1 | 49.9 | 49.0 | 37.9 | 47.4    |
| All Graduates                   | 30.8 | 34.4 | 36.6 | 39.7 | 34.4 | 35.8    |

Source: Ministry of Manpower and Vocational Training

**Table 3 - Distribution of Employment by Institutional Sector, Ages 12- 64.**

| Year               |                 | Government | Public Enterprise | Private | Other (incl. joint venture, foreign, ..) | All    |
|--------------------|-----------------|------------|-------------------|---------|--|--------|
| 1981<br>(May)      | '000s           | 1,980      | 1,337             | 6,604   | 25                                       | 9,946  |
|                    | row %           | 19.9       | 13.4              | 66.4    | 0.2                                      | 100.0  |
|                    | index, 1984=100 | 78.41      | 105.04            | 86.14   | 6.96                                     | 84.15  |
| 1984<br>(May)      | '000s           | 2,525      | 1,273             | 7,667   | 354                                      | 11,819 |
|                    | row %           | 21.4       | 10.8              | 64.9    | 3.0                                      | 100.0  |
|                    | index, 1984=100 | 100        | 100               | 100     | 100                                      | 100    |
| 1988<br>(October)  | '000s           | 2,930      | 1,314             | 11,833  | 188                                      | 16,263 |
|                    | row %           | 18.0       | 8.1               | 72.8    | 1.2                                      | 100.0  |
|                    | index, 1984=100 | 116        | 103               | 154     | 53                                       | 138    |
| 1990<br>(December) | '000s           | 3,285      | 1,515             | 9,421   | 140                                      | 14,361 |
|                    | row %           | 22.9       | 10.5              | 65.6    | 1.0                                      | 100.0  |
|                    | index, 1984=100 | 130        | 119               | 123     | 40                                       | 122    |
| 1991<br>(Annual)   | '000s           | 3,313      | 1,426             | 9,574   | 176                                      | 14,489 |
|                    | row %           | 22.9       | 9.8               | 66.1    | 1.2                                      | 100.0  |
|                    | index, 1984=100 | 131        | 112               | 125     | 50                                       | 123    |
| 1992<br>(Annual)   | '000s           | 3,479      | 1,410             | 9,347   | 163                                      | 14,399 |
|                    | row %           | 24.2       | 9.8               | 64.9    | 1.1                                      | 100.0  |
|                    | index, 1984=100 | 138        | 111               | 122     | 46                                       | 122    |

Source: CAPMAS, LFSS.

**Table 4 - Employment by Institutional Sector and Sex (1976-86)**

| Sector                  |          | Employment<br>'000s |        |        | Employment Structure<br>% |       |        | Annual<br>Growth Rate (%) |
|-------------------------|----------|---------------------|--------|--------|---------------------------|-------|--------|---------------------------|
|                         |          | 1976                | 1986   | change | 1976                      | 1986  | change | 1976-86                   |
| Government              | Male     | 1,511               | 1,920  | 409    | 16.0                      | 18.2  | 35.9   | 2.4                       |
|                         | Female   | 275                 | 657    | 382    | 40.7                      | 55.9  | 76.5   | 8.7                       |
|                         | Total    | 1,786               | 2,577  | 791    | 17.7                      | 21.9  | 48.3   | 3.7                       |
|                         | % female | 15.4                | 25.5   | 48.3   |                           |       |        |                           |
| Public Enterprises      | Male     | 891                 | 1,085  | 194    | 9.4                       | 10.3  | 17.0   | 2.0                       |
|                         | Female   | 74                  | 120    | 46     | 10.9                      | 10.2  | 9.3    | 4.9                       |
|                         | Total    | 965                 | 1,205  | 240    | 9.5                       | 10.3  | 14.7   | 2.2                       |
|                         | % female | 7.6                 | 10.0   | 19.4   |                           |       |        |                           |
| Agriculture             | Male     | 4,725               | 4,408  | -317   | 50.1                      | 41.7  | -27.9  | -0.7                      |
|                         | Female   | 156                 | 125    | -31    | 23.0                      | 10.6  | -6.2   | -2.2                      |
|                         | Total    | 4,881               | 4,533  | -348   | 48.3                      | 38.6  | -21.3  | -0.7                      |
|                         | % female | 3.2                 | 2.7    | 8.9    |                           |       |        |                           |
| Private Non-Agriculture | Male     | 2,303               | 3,156  | 853    | 24.4                      | 29.9  | 74.9   | 3.1                       |
|                         | Female   | 172                 | 274    | 102    | 25.4                      | 23.3  | 20.5   | 4.7                       |
|                         | Total    | 2,475               | 3,430  | 955    | 24.5                      | 29.2  | 58.3   | 3.3                       |
|                         | % female | 6.9                 | 8.0    | 10.7   |                           |       |        |                           |
| Total                   | Male     | 9,430               | 10,568 | 1,138  | 100.0                     | 100.0 | 100.0  | 1.1                       |
|                         | Female   | 676                 | 1,176  | 499    | 100.0                     | 100.0 | 100.0  | 5.5                       |
|                         | Total    | 10,106              | 11,744 | 1,637  | 100.0                     | 100.0 | 100.0  | 1.5                       |
|                         | % female | 6.7                 | 10.0   | 30.5   |                           |       |        |                           |

Source: CAPMAS, Population Censuses.

**Table 5 - Distribution of Employment by Sector and Educational Attainment, 1988**

| Sector                   |   | Educational Attainment (Age 10 and above) |                            |                         |       |
|--------------------------|---|---|----------------------------|-------------------------|-------|
|                          |   | below<br>intermediat<br>e                 | intermediat<br>e and above | university<br>and above | Total |
|                          |   | Row Percentages                           |                            |                         |       |
| Government               | M | 42.6                                      | 31.3                       | 26.1                    | 100.0 |
|                          | F | 5.3                                       | 63.1                       | 31.6                    | 100.0 |
|                          | T | 31.6                                      | 40.7                       | 27.7                    | 100.0 |
| Public Enterprise        | M | 58.1                                      | 26.6                       | 15.3                    | 100.0 |
|                          | F | 21.3                                      | 55.4                       | 23.3                    | 100.0 |
|                          | T | 53.3                                      | 30.4                       | 16.3                    | 100.0 |
| Private Agriculture      | M | 94.0                                      | 5.0                        | 1.0                     | 100.0 |
|                          | F | 98.8                                      | 1.2                        | 0.0                     | 100.0 |
|                          | T | 96.5                                      | 3.0                        | 0.5                     | 100.0 |
| Private Non- Agriculture | M | 80.0                                      | 13.0                       | 7.0                     | 100.0 |
|                          | F | 82.7                                      | 11.1                       | 6.2                     | 100.0 |
|                          | T | 80.5                                      | 12.6                       | 6.9                     | 100.0 |
| All Sectors              | M | 75.0                                      | 15.4                       | 9.6                     | 100.0 |
|                          | F | 80.5                                      | 13.1                       | 6.4                     | 100.0 |
|                          | T | 76.9                                      | 14.6                       | 8.5                     | 100.0 |
|                          |   | Column Percentages                        |                            |                         |       |
| Government               | M | 10.5                                      | 37.6                       | 50.3                    | 18.5  |
|                          | F | 0.9                                       | 67.8                       | 69.9                    | 14.1  |
|                          | T | 7.0                                       | 47.2                       | 55.6                    | 16.9  |
| Public Enterprise        | M | 7.9                                       | 17.7                       | 16.3                    | 10.2  |
|                          | F | 0.7                                       | 11.8                       | 10.2                    | 2.8   |
|                          | T | 5.3                                       | 15.8                       | 14.7                    | 7.6   |
| Private Agriculture      | M | 43.3                                      | 11.2                       | 3.5                     | 34.5  |
|                          | F | 81.8                                      | 6.1                        | 0.2                     | 66.7  |
|                          | T | 57.6                                      | 9.6                        | 2.6                     | 45.9  |
| Private Non- Agriculture | M | 37.5                                      | 29.7                       | 25.7                    | 35.2  |
|                          | F | 16.4                                      | 13.4                       | 15.5                    | 15.9  |
|                          | T | 29.7                                      | 24.5                       | 23.0                    | 28.4  |
| All Sectors              | M | 100.0                                     | 100.0                      | 100.0                   | 100.0 |
|                          | F | 100.0                                     | 100.0                      | 100.0                   | 100.0 |
|                          | T | 100.0                                     | 100.0                      | 100.0                   | 100.0 |

Source: Calculated from CAPMAS October 1988 LFSS.

**Table 6 - Distribution of the Unemployed and Unemployment Rates by Educational Attainment, Ages 12- 64**

| Year               |           | Illiterate | Reads<br>and Writes | Below<br>Intermediate | Intermediate | Above<br>Intermediate | University | All   |
|--------------------|-----------|------------|---------------------|-----------------------|--------------|-----------------------|------------|-------|
| 1987<br>(December) | '000s     | 36         | 37                  | 30                    | 819          | 107                   | 306        | 1,354 |
|                    | row %     | 2.7        | 2.8                 | 2.2                   | 60.5         | 7.9                   | 22.6       | 100.0 |
|                    | un. rt. % | 0.4        | 1.5                 | 1.5                   | 31.8         | 19.8                  | 18.8       | 7.4   |
| 1990<br>(December) | '000s     | 174        | 55                  | 113                   | 716          | 91                    | 197        | 1,345 |
|                    | row %     | 12.9       | 4.1                 | 8.4                   | 53.3         | 6.8                   | 14.6       | 100.0 |
|                    | un. rt. % | 2.6        | 1.8                 | 12.7                  | 23.2         | 15.4                  | 12.3       | 8.5   |
| 1991<br>(Annual)   | '000s     | 52         | 24                  | 49                    | 933          | 115                   | 224        | 1,397 |
|                    | row %     | 3.7        | 1.7                 | 3.5                   | 66.8         | 8.2                   | 16.0       | 100.0 |
|                    | un. rt. % | 0.8        | 0.8                 | 5.6                   | 30.2         | 19.3                  | 14.0       | 8.8   |
| 1992<br>(Annual)   | '000s     | 17         | 15                  | 17                    | 997          | 129                   | 241        | 1,416 |
|                    | row %     | 1.2        | 1.0                 | 1.2                   | 70.4         | 9.1                   | 17.0       | 100.0 |
|                    | un. rt. % | 0.3        | 0.5                 | 2.1                   | 30.2         | 20.1                  | 14.6       | 9.0   |

Source: CAPMAS, LFSS.

Note: Below intermediate refers to primary and preparatory school graduates, intermediate refers to secondary school graduates, and above intermediate refers to technical institute graduates.

**Table 7 - Means and Standard Deviations of Variables Used in the Wage Equations**  
(Standard Deviations are in parentheses)

| Variable                       | Males             |                   |                   | Females           |                   |                   |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                | Private           | Public            | All               | Private           | Public            | All               |
| log-hourly wage                | -0.586<br>(0.703) | -0.477<br>(0.630) | -0.523<br>(0.664) | -0.955<br>(0.707) | -0.551<br>(0.591) | -0.644<br>(0.642) |
| age                            | 28.2<br>(10.9)    | 39.3<br>(10.3)    | 34.6<br>(11.9)    | 27.7<br>(10.3)    | 32.6<br>(8.6)     | 31.5<br>(9.2)     |
| experience                     | 12.8<br>(10.9)    | 19.7<br>(11.7)    | 16.8<br>(11.9)    | 6.8<br>(9.0)      | 10.5<br>(8.7)     | 9.7<br>(8.9)      |
| <b>Educational Attainment:</b> |                   |                   |                   |                   |                   |                   |
| illiterate (reference)         | 0.307<br>(0.461)  | 0.146<br>(0.353)  | 0.213<br>(0.410)  | 0.304<br>(0.460)  | 0.033<br>(0.179)  | 0.094<br>(0.292)  |
| read and write                 | 0.183<br>(0.387)  | 0.182<br>(0.386)  | 0.182<br>(0.386)  | 0.060<br>(0.237)  | 0.014<br>(0.116)  | 0.024<br>(0.154)  |
| primary                        | 0.106<br>(0.307)  | 0.076<br>(0.265)  | 0.089<br>(0.284)  | 0.054<br>(0.226)  | 0.018<br>(0.132)  | 0.026<br>(0.160)  |
| preparatory                    | 0.137<br>(0.344)  | 0.054<br>(0.226)  | 0.089<br>(0.285)  | 0.088<br>(0.283)  | 0.025<br>(0.157)  | 0.040<br>(0.196)  |
| general secondary              | 0.039<br>(0.194)  | 0.032<br>(0.176)  | 0.035<br>(0.183)  | 0.028<br>(0.166)  | 0.025<br>(0.155)  | 0.025<br>(0.158)  |
| voc. sec., blue collar         | 0.097<br>(0.296)  | 0.031<br>(0.172)  | 0.058<br>(0.235)  | 0.071<br>(0.257)  | 0.014<br>(0.116)  | 0.027<br>(0.161)  |
| voc. sec., white collar        | 0.048<br>(0.214)  | 0.185<br>(0.388)  | 0.127<br>(0.333)  | 0.196<br>(0.398)  | 0.436<br>(0.496)  | 0.381<br>(0.486)  |
| technical institute            | 0.020<br>(0.141)  | 0.060<br>(0.237)  | 0.043<br>(0.203)  | 0.037<br>(0.189)  | 0.143<br>(0.350)  | 0.119<br>(0.324)  |
| all bachelor's degrees         | 0.060<br>(0.238)  | 0.201<br>(0.401)  | 0.142<br>(0.349)  | 0.159<br>(0.366)  | 0.275<br>(0.447)  | 0.249<br>(0.432)  |
| bachelor of engineering        | 0.015<br>(0.123)  | 0.025<br>(0.157)  | 0.021<br>(0.144)  | 0.003<br>(0.053)  | 0.013<br>(0.112)  | 0.010<br>(0.107)  |
| postgraduate                   | 0.004<br>(0.064)  | 0.035<br>(0.183)  | 0.022<br>(0.146)  | 0.003<br>(0.053)  | 0.019<br>(0.135)  | 0.015<br>(0.122)  |
| <b>Region of Residence:</b>    |                   |                   |                   |                   |                   |                   |
| Greater Cairo (reference)      | 0.368<br>(0.482)  | 0.288<br>(0.453)  | 0.322<br>(0.467)  | 0.520<br>(0.500)  | 0.353<br>(0.478)  | 0.393<br>(0.488)  |
| Alexandria and Suez Canal      | 0.123<br>(0.328)  | 0.123<br>(0.328)  | 0.123<br>(0.328)  | 0.145<br>(0.352)  | 0.157<br>(0.364)  | 0.154<br>(0.361)  |
| Urban Lower Egypt              | 0.160<br>(0.367)  | 0.141<br>(0.348)  | 0.149<br>(0.356)  | 0.105<br>(0.307)  | 0.195<br>(0.396)  | 0.174<br>(0.379)  |
| Urban Upper Egypt              | 0.085<br>(0.279)  | 0.130<br>(0.367)  | 0.111<br>(0.315)  | 0.068<br>(0.252)  | 0.129<br>(0.335)  | 0.115<br>(0.319)  |
| Rural Lower Egypt              | 0.175<br>(0.380)  | 0.198<br>(0.398)  | 0.188<br>(0.391)  | 0.125<br>(0.331)  | 0.125<br>(0.331)  | 0.125<br>(0.330)  |
| Rural Upper Egypt              | 0.089<br>(0.285)  | 0.120<br>(0.326)  | 0.107<br>(0.310)  | 0.037<br>(0.189)  | 0.041<br>(0.197)  | 0.039<br>(0.194)  |
| Currently Married              | 0.429<br>(0.495)  | 0.820<br>(0.384)  | 0.662<br>(0.473)  | 0.281<br>(0.450)  | 0.673<br>(0.469)  | 0.583<br>(0.493)  |
| Household Head                 | 0.377<br>(0.485)  | 0.749<br>(0.434)  |                   | 0.094<br>(0.292)  | 0.095<br>(0.293)  | 0.095<br>(0.293)  |
| Public enterprise              |                   | 0.343<br>(0.475)  |                   |                   | 0.157<br>(0.364)  |                   |
| Number of Observations         | 1,232             | 1,694             | 2,926             | 352               | 1,180             | 1,532             |

<sup>1</sup> Refers to non-participation in non-agricultural wage work.



**Table 8 - Selectivity-Corrected Wage Equation Estimates, Males**  
 Dependent Variable: log Hourly Wage (t-ratios in parentheses)

| Variable                                   | Single Selection Model |                       | Double Selection Model |                        |                       |                       |
|--|------------------------|-----------------------|------------------------|------------------------|-----------------------|-----------------------|
|  | (1)                    | (2)                   | (1)                    |                        | (2)                   |                       |
|  | All Sectors            | All Sectors           | Private                | Public                 | Private               | Public                |
| constant                                   | -1.287 ***<br>(-17.23) | -0.833 ***<br>(-9.25) | -0.903 ***<br>(-6.68)  | -1.630 ***<br>(-13.86) | -0.687 ***<br>(-4.39) | -0.933 ***<br>(-5.86) |
| experience                                 | 0.051 ***<br>(15.25)   | 0.024 ***<br>(5.25)   | 0.050 ***<br>(7.10)    | 0.042 ***<br>(9.86)    | 0.037 ***<br>(4.31)   | 0.008<br>(1.12)       |
| experience*primary education               |                        | 0.011 ***<br>(3.94)   |                        |                        | 0.009<br>(1.60)       | 0.009 **<br>(2.53)    |
| experience*secondary education             |                        | 0.023 ***<br>(7.72)   |                        |                        | 0.019 **<br>(2.52)    | 0.020 ***<br>(5.53)   |
| experience*tertiary education              |                        | 0.024 **<br>(6.98)    |                        |                        | 0.026 ***<br>(2.56)   | 0.024 ***<br>(5.95)   |
| experience <sup>2</sup> /100               | -0.080 ***<br>(-10.26) | -0.037 ***<br>(-4.04) | -0.097 ***<br>(-6.55)  | -0.045 ***<br>(-5.07)  | -0.071 ***<br>(-4.03) | 0.003<br>(0.25)       |
| <b>Educational Attainment:<sup>1</sup></b> |                        |                       |                        |                        |                       |                       |
| read and write                             | 0.079 **<br>(1.99)     | 0.046<br>(1.18)       | -0.064<br>(-0.93)      | 0.194 ***<br>(3.93)    | -0.081<br>(-1.15)     | 0.150 ***<br>(2.98)   |
| primary                                    | 0.162 ***<br>(3.52)    | -0.117 *<br>(-1.64)   | -0.002<br>(-0.02)      | 0.290 ***<br>(4.86)    | -0.155<br>(-1.42)     | -0.022<br>(-0.19)     |
| preparatory                                | 0.226 ***<br>(4.68)    | -0.059<br>(-0.92)     | -0.006<br>(-0.07)      | 0.436 ***<br>(6.58)    | -0.154<br>(-1.50)     | 0.117<br>(1.07)       |
| general secondary                          | 0.421 ***<br>(6.66)    | -0.034<br>(-0.40)     | 0.070<br>(0.63)        | 0.769 ***<br>(9.62)    | -0.137<br>(-1.01)     | 0.197<br>(1.57)       |
| vocational sec., blue collar               | 0.572 ***<br>(9.07)    | 0.155 **<br>(1.97)    | 0.187 *<br>(1.72)      | 0.785 ***<br>(8.81)    | -0.027<br>(-0.20)     | 0.262 **<br>(2.16)    |
| vocational sec., white collar              | 0.407 ***<br>(7.56)    | -0.057<br>(-0.74)     | 0.057<br>(0.47)        | 0.723 ***<br>(10.83)   | -0.191<br>(-1.25)     | 0.187 *<br>(1.73)     |
| technical institute                        | 0.536 ***<br>(7.88)    | 0.074<br>(0.86)       | 0.145<br>(0.88)        | 0.863 ***<br>(10.69)   | -0.069<br>(-0.38)     | 0.312 ***<br>(2.62)   |
| university                                 | 0.741 ***<br>(14.12)   | 0.268 ***<br>(3.37)   | 0.401 ***<br>(2.93)    | 1.056 ***<br>(14.71)   | 0.143<br>(0.87)       | 0.436 ***<br>(3.58)   |
| increment for engineering                  | 0.342 ***<br>(4.34)    | 0.354 ***<br>(4.60)   | 0.607 ***<br>(3.66)    | 0.182 **<br>(2.27)     | 0.522 ***<br>(3.02)   | 0.226 ***<br>(2.74)   |
| post graduate                              | 1.064 ***<br>(12.68)   | 0.524 ***<br>(4.77)   | 0.811 ***<br>(2.86)    | 1.391 ***<br>(15.01)   | 0.184<br>(0.47)       | 0.742 ***<br>(5.30)   |
| <b>Region of Residence:<sup>2</sup></b>    |                        |                       |                        |                        |                       |                       |
| Alexandria and Suez Canal                  | -0.072 **<br>(-2.00)   | -0.072 **<br>(-2.04)  | 0.031<br>(0.49)        | -0.143 ***<br>(-3.43)  | 0.034<br>(0.52)       | -0.166 ***<br>(-3.86) |
| Urban Lower Egypt                          | -0.168 ***<br>(-4.70)  | -0.156 ***<br>(-4.46) | -0.083<br>(-1.29)      | -0.183 ***<br>(-4.34)  | -0.069<br>(-1.03)     | -0.195 ***<br>(-4.54) |
| Urban Upper Egypt                          | -0.221 ***<br>(-5.66)  | -0.198 ***<br>(-5.17) | -0.162 **<br>(-1.99)   | -0.163 ***<br>(-3.52)  | -0.135<br>(-1.59)     | -0.183 ***<br>(-3.92) |
| Rural Lower Egypt                          | -0.320 ***<br>(-7.76)  | -0.258 ***<br>(-6.27) | -0.048<br>(-0.55)      | -0.360 ***<br>(-7.05)  | 0.002<br>(0.02)       | -0.377 ***<br>(-7.43) |
| Rural Upper Egypt                          | -0.313 ***<br>(-6.41)  | -0.244 ***<br>(-4.99) | -0.011<br>(-0.10)      | -0.323 ***<br>(-5.27)  | 0.041<br>(0.37)       | -0.351 ***<br>(-5.78) |
| Public Enterprise                          |                        |                       |                        | 0.245 ***<br>(9.30)    |                       | 0.251 ***<br>(9.63)   |
| Wage Work Selection - $\lambda_1$          | 0.132 **<br>(2.03)     | -0.023<br>(-0.34)     | -0.188<br>(-1.57)      | 0.162 *<br>(1.89)      | -0.275 **<br>(-2.14)  | 0.124<br>(1.47)       |
| Public-Private Selection - $\lambda_2$     |                        |                       | -0.129 *<br>(-1.65)    | -0.065<br>(-1.17)      | -0.094<br>(-1.17)     | -0.205 ***<br>(-3.01) |
| $\rho_{E1}$                                | 0.231                  | -0.048                | -0.274                 | 0.354                  | -0.417                | 0.317                 |
| $\rho_{E2}$                                |                        |                       | -0.162                 | -0.186                 | -0.0819               | -0.456                |
| R <sup>2</sup>                             | 0.278                  | 0.297                 | 0.218                  | 0.446                  | 0.226                 | 0.459                 |
| N  | 2926                   | 2926                  | 1232                   | 1694                   | 1232                  | 1694                  |

<sup>1</sup> Illiterate is the reference category.

<sup>2</sup> Greater Cairo is the reference category.

Significance levels at the 1 percent level (\*\*\*), 5 percent level (\*\*) and 10 percent level (\*) are indicated.

**Table 9 - Selectivity-Corrected Wage Equation Estimates, Females**  
 Dependent Variable: log Hourly Wage (t-ratios in parentheses).

| Variable                                   | Single Selection Model |                       | Double Selection Model |                       |                       |                       |
|--|------------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|
|  | (1)                    | (2)                   | (1)                    |                       | (2)                   |                       |
|  | All Sectors            | All Sectors           | Private                | Public                | Private               | Public                |
| constant                                   | -1.535 ***<br>(-10.13) | -1.169 ***<br>(-7.34) | -1.702 ***<br>(-4.16)  | -1.164 ***<br>(-4.83) | -1.444 ***<br>(-3.85) | -0.761 ***<br>(-2.94) |
| experience                                 | 0.060 ***<br>(14.83)   | 0.030 ***<br>(5.13)   | 0.025 **<br>(2.09)     | 0.047 ***<br>(8.00)   | 0.012<br>(0.93)       | 0.020 **<br>(2.46)    |
| experience*primary education               |                        | 0.017 ***<br>(2.74)   |                        |                       | 0.010<br>(0.82)       | 0.016 *<br>(1.88)     |
| experience*secondary education             |                        | 0.030 ***<br>(8.04)   |                        |                       | 0.029 ***<br>(2.64)   | 0.029 ***<br>(4.48)   |
| experience*tertiary education              |                        | 0.020 ***<br>(4.26)   |                        |                       | 0.040 **<br>(2.08)    | 0.021 ***<br>(3.07)   |
| experience <sup>2</sup> /100               | -0.083 ***<br>(-6.78)  | -0.054 ***<br>(-4.22) | -0.035<br>(-1.13)      | -0.044 **<br>(-2.54)  | -0.012<br>(-0.39)     | -0.036 **<br>(-2.04)  |
| <b>Educational Attainment:<sup>1</sup></b> |                        |                       |                        |                       |                       |                       |
| read and write                             | 0.045<br>(0.51)        | 0.003<br>(0.03)       | -0.022<br>(-0.10)      | -0.088<br>(-0.52)     | -0.040<br>(-0.22)     | -0.046<br>(-0.25)     |
| primary                                    | 0.237 ***<br>(2.65)    | -0.007<br>(-0.06)     | 0.063<br>(0.27)        | 0.039<br>(0.25)       | -0.014<br>(-0.07)     | -0.242<br>(-1.12)     |
| preparatory                                | 0.274 ***<br>(3.34)    | 0.033<br>(0.33)       | 0.059<br>(0.29)        | 0.195<br>(1.25)       | -0.020<br>(-0.10)     | -0.063<br>(-0.28)     |
| general secondary                          | 0.672 ***<br>(7.07)    | 0.274 ***<br>(2.60)   | 0.424<br>(1.56)        | 0.470 ***<br>(3.02)   | 0.298<br>(1.20)       | 0.007<br>(0.04)       |
| vocational sec., blue collar               | 0.448 ***<br>(3.62)    | 0.091<br>(0.70)       | 0.270<br>(0.92)        | 0.155<br>(0.80)       | 0.123<br>(0.46)       | -0.245<br>(-1.08)     |
| vocational sec., white collar              | 0.491 ***<br>(4.65)    | 0.099<br>(0.86)       | 0.090<br>(0.31)        | 0.288 *<br>(1.70)     | -0.058<br>(-0.22)     | -0.132<br>(-0.64)     |
| technical institute                        | 0.598 ***<br>(4.93)    | 0.170<br>(1.29)       | 0.047<br>(0.12)        | 0.360 *<br>(1.94)     | -0.057<br>(-0.17)     | -0.073<br>(-0.34)     |
| university                                 | 0.882 ***<br>(7.94)    | 0.583 ***<br>(4.62)   | 0.875 ***<br>(2.71)    | 0.628 ***<br>(3.63)   | 0.657 **<br>(2.20)    | 0.291<br>(1.38)       |
| increment for engineering                  | 0.136<br>(1.13)        | 0.152<br>(1.29)       | 0.202<br>(0.57)        | 0.084<br>(0.73)       | 0.303<br>(0.59)       | 0.075<br>(0.65)       |
| postgraduate                               | 1.185 ***<br>(7.89)    | 0.906 ***<br>(5.40)   | 1.278 ***<br>(2.72)    | 0.942 ***<br>(4.66)   | 0.826<br>(1.31)       | 0.628 ***<br>(2.65)   |
| <b>Region of Residence:<sup>2</sup></b>    |                        |                       |                        |                       |                       |                       |
| Alexandria and Suez Canal                  | -0.124 ***<br>(-3.40)  | -0.125 ***<br>(-3.49) | -0.173<br>(-1.36)      | -0.153 ***<br>(-3.63) | -0.131<br>(-1.15)     | -0.171 ***<br>(-3.97) |
| Urban Lower Egypt                          | -0.129 ***<br>(-3.64)  | -0.113 ***<br>(-3.26) | -0.429 ***<br>(-3.08)  | -0.098 **<br>(-2.39)  | -0.360 ***<br>(-2.77) | -0.114 ***<br>(-2.72) |
| Urban Upper Egypt                          | -0.184 ***<br>(-4.51)  | -0.177 ***<br>(-4.39) | -0.539 ***<br>(-2.91)  | -0.150 ***<br>(-3.13) | -0.469 ***<br>(-2.81) | -0.176 ***<br>(-3.59) |
| Rural Lower Egypt                          | -0.194 ***<br>(-4.60)  | -0.176 ***<br>(-4.25) | -0.355 **<br>(-2.21)   | -0.180 ***<br>(-3.72) | -0.308 **<br>(-2.20)  | -0.200 ***<br>(-4.08) |
| Rural Upper Egypt                          | -0.252 ***<br>(-3.67)  | -0.240 ***<br>(-3.57) | -0.510 *<br>(-1.88)    | -0.238 ***<br>(-3.05) | -0.455 *<br>(-1.92)   | -0.280 ***<br>(-3.54) |
| Public Enterprise                          |                        |                       |                        | 0.188 ***<br>(5.17)   |                       | 0.196 ***<br>(5.49)   |
| Wage Work Selection - $\lambda_1$          | 0.008<br>(0.14)        | -0.023<br>(-0.41)     | 0.206<br>(1.24)        | -0.075<br>(-0.88)     | 0.145<br>(1.01)       | -0.039<br>(-0.43)     |
| Public-Private Selection - $\lambda_2$     |                        |                       | -0.170<br>(-1.59)      | -0.252 **<br>(-2.41)  | -0.094<br>(-0.90)     | -0.323 ***<br>(-2.82) |
| $\rho_{\epsilon 1}$                        | 0.017                  | -0.051                | 0.394                  | 0.192                 | 0.302                 | 0.367                 |
| $\rho_{\epsilon 2}$                        |                        |                       | -0.377                 | -0.475                | -0.274                | -0.67                 |
| R <sup>2</sup>                             | 0.461                  | 0.483                 | 0.306                  | 0.530                 | 0.319                 | 0.542                 |
| Number of Observations                     | 1,532                  | 1,532                 | 352                    | 1,180                 | 352                   | 1,180                 |

<sup>1</sup> Illiterate is the reference category.

<sup>2</sup> Greater Cairo is the reference category.

Significance levels at the 1 percent level (\*\*\*), 5 percent level (\*\*) and 10 percent level (\*) are indicated.

**Table 10 - Predicted Wages by Institutional Sector and Sex, in LE/hr.**

|                                     | Government <sup>1</sup> |                  |        |      | Private Sector |      |                     |      | All Sectors |      |        |      |
|-------------------------------------|-------------------------|------------------|--------|------|----------------|------|---------------------|------|-------------|------|--------|------|
|                                     | Male                    |                  | Female |      | Male           |      | Female <sup>5</sup> |      | Male        |      | Female |      |
|                                     | (1) <sup>2</sup>        | (2) <sup>2</sup> | (1)    | (2)  | (1)            | (2)  | (1)                 | (2)  | (1)         | (2)  | (1)    | (2)  |
| Experience <sup>3</sup>             |                         |                  |        |      |                |      |                     |      |             |      |        |      |
| 5 years                             | 0.49                    | 0.54             | 0.52   | 0.52 | 0.54           | 0.54 | 0.22                | 0.27 | 0.53        | 0.51 | 0.47   | 0.46 |
| 15 years                            | 0.69                    | 0.72             | 0.77   | 0.78 | 0.74           | 0.82 | 0.27                | 0.40 | 0.75        | 0.76 | 0.72   | 0.75 |
| 25 years                            | 0.88                    | 0.96             | 1.04   | 1.10 | 0.83           | 1.08 | 0.30                | 0.57 | 0.91        | 1.05 | 0.94   | 1.10 |
| 35 years                            | 1.03                    | 1.28             | 1.28   | 1.45 | 0.76           | 1.24 | 0.31                | 0.80 | 0.94        | 1.34 | 1.04   | 1.45 |
| Educational Attainment <sup>4</sup> |                         |                  |        |      |                |      |                     |      |             |      |        |      |
| Illiterate                          | 0.34                    | 0.44             | 0.58   | 0.58 | 0.69           | 0.75 | 0.24                | 0.28 | 0.50        | 0.57 | 0.53   | 0.43 |
| Read and Write                      | 0.41                    | 0.52             | 0.53   | 0.55 | 0.65           | 0.69 | 0.24                | 0.26 | 0.54        | 0.60 | 0.46   | 0.43 |
| Primary                             | 0.45                    | 0.50             | 0.60   | 0.58 | 0.69           | 0.73 | 0.26                | 0.32 | 0.58        | 0.60 | 0.56   | 0.55 |
| Preparatory                         | 0.50                    | 0.58             | 0.70   | 0.69 | 0.69           | 0.74 | 0.26                | 0.31 | 0.62        | 0.64 | 0.58   | 0.57 |
| General Secondary                   | 0.72                    | 0.73             | 0.92   | 0.90 | 0.74           | 0.87 | 0.37                | 0.57 | 0.76        | 0.78 | 0.86   | 0.89 |
| Voc. Sec. Blue Collar               | 0.73                    | 0.78             | 0.67   | 0.70 | 0.84           | 0.97 | 0.32                | 0.48 | 0.88        | 0.94 | 0.69   | 0.74 |
| Voc. Sec. White Collar              | 0.69                    | 0.72             | 0.77   | 0.78 | 0.74           | 0.82 | 0.27                | 0.40 | 0.75        | 0.76 | 0.72   | 0.75 |
| Technical Institute <sup>4</sup>    | 0.79                    | 0.82             | 0.83   | 0.83 | 0.80           | 0.93 | 0.26                | 0.40 | 0.85        | 0.87 | 0.80   | 0.80 |
| Engineering Bacc.                   | 1.16                    | 1.23             | 1.18   | 1.14 | 1.90           | 2.13 | 0.72                | 1.31 | 1.47        | 1.53 | 1.22   | 1.21 |
| Other Bacc.                         | 0.96                    | 0.98             | 1.08   | 1.06 | 1.04           | 1.27 | 0.59                | 0.97 | 1.04        | 1.07 | 1.06   | 1.04 |
| Post Graduate                       | 1.35                    | 1.33             | 1.48   | 1.48 | 1.56           | 1.32 | 0.88                | 1.14 | 1.44        | 1.39 | 1.44   | 1.43 |

Notes:

<sup>1</sup>On average, public enterprise wages are 25 percent higher than in government for males, and 19 percent higher for females.

<sup>2</sup>(1) and (2) refer to wage equation estimates without and with experience-education interactions, respectively, as indicated in Tables 8 and 9.

<sup>3</sup>Using white collar vocational secondary graduates residing in Greater Cairo as the reference.

<sup>4</sup>Using individuals with 15 years of experience and residing in Greater Cairo as the reference.

<sup>5</sup>The wage equation coefficients for private sector females have large standard errors due to small sample size.

**Table 11 - Decomposition of Public-Private Wage Differentials**

| Log-Wage Comparison        |         | Total Mean Differential | Differential due to difference in |                    |                                  |                   | Selection (iv)    |
|----------------------------|---------|-------------------------|-----------------------------------|--------------------|----------------------------------|-------------------|-------------------|
|                            |         |                         | Observed Characteristics (i)      | Constant Term (ii) | Returns to Characteristics (iii) | (ii)+(iii)        |                   |
| $\bar{Y}_G - \bar{Y}_R$    | males   | 0.058                   | 0.271<br>(0.062)                  | -0.246<br>(0.223)  | -0.123<br>(0.175)                | -0.369<br>(0.153) | 0.156<br>(0.135)  |
|                            | females | 0.382                   | 0.256<br>(0.138)                  | 0.683<br>(0.456)   | -0.058<br>(0.297)                | 0.626<br>(0.294)  | -0.500<br>(0.293) |
| $\bar{Y}_{PE} - \bar{Y}_R$ | males   | 0.208                   | 0.226<br>(0.041)                  | 0.004<br>(0.224)   | -0.134<br>(0.167)                | -0.129<br>(0.147) | 0.111<br>(0.137)  |
|                            | females | 0.523                   | 0.326<br>(0.099)                  | 0.879<br>(0.459)   | -0.100<br>(0.277)                | 0.779<br>(0.307)  | -0.582<br>(0.305) |

Note: G stands for government, PE for public enterprise and R for private.

Standard errors are in parentheses.

Based on Model (2) in Tables 8 and 9.

**Table 12- Rate of Return to Schooling by Institutional Sector and Sex (Percentage)**

|                                    | Males            |                  |               |      |                |      | Females     |      |               |      |                |      |
|------------------------------------|------------------|------------------|---------------|------|----------------|------|-------------|------|---------------|------|----------------|------|
|                                    | All Sectors      |                  | Public Sector |      | Private Sector |      | All Sectors |      | Public Sector |      | Private Sector |      |
|                                    | (1) <sup>1</sup> | (2) <sup>1</sup> | (1)           | (2)  | (1)            | (2)  | (1)         | (2)  | (1)           | (2)  | (1)            | (2)  |
| Primary <sup>2</sup>               | 3.3              | 2.5              | 3.7           | 1.05 | 2.3            | 4.45 | 9.9         | 10.1 | 5.7           | 4.3  | 3.4            | 8.1  |
| Secondary                          |                  |                  |               |      |                |      |             |      |               |      |                |      |
| Vocational Secondary (Blue Collar) | 6.6              | 7.4              | 8.2           | 7.07 | 2.1            | 4.6  | 1.8         | 5.2  | -             | 3.3  | 2.0            | 7.0  |
| Vocational Secondary(White Collar) | 3.0              | 3.9              | 6.9           | 5.77 | -              | 1.6  | 2.9         | 5.3  | 2.0           | 5.2  | -              | 4.4  |
| General Secondary                  | 3.4              | 4.3              | 7.8           | 6.0  | -              | 2.55 | 7.0         | 8.1  | 6.7           | 7.4  | 6.8            | 9.5  |
| Tertiary                           |                  |                  |               |      |                |      |             |      |               |      |                |      |
| Technical Institute                | 6.1              | 5.6              | 8.4           | 7.0  | 4.8            | 7.56 | 4.4         | -    | 3.2           | 1.7  | -              | -    |
| Engineering                        | 14.4             | 14.7             | 10.6          | 10.8 | 20.9           | 19.8 | 11.0        | 10.0 | 8.4           | 6.3  | 21.8           | 24.3 |
| All other baccaloretate            | 8.4              | 8.4              | 8.2           | 7.35 | 8.8            | 10.8 | 10.0        | 7.2  | 8.4           | 6.1  | 21.7           | 21.9 |
| Post graduate <sup>3</sup>         | 11.2             | 8.3              | 11.6          | 10.3 | 14.6           | -    | 10.4        | 11.1 | 10.8          | 11.7 | 14.4           | 1.89 |

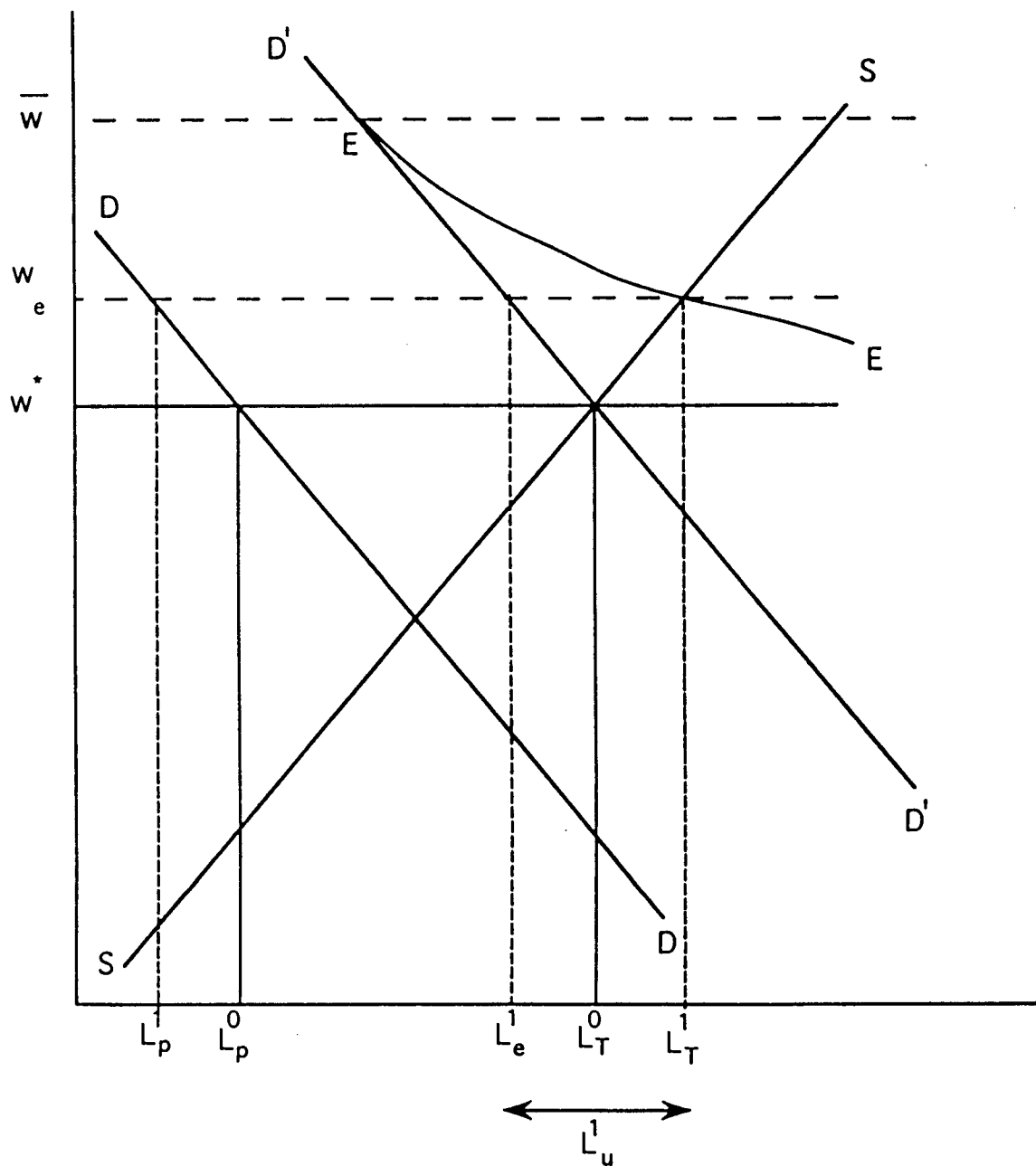
Notes:

<sup>1</sup>(1) and (2) refer to wage equation estimates without and with experience-education interactions, respectively, as indicated in Tables 8 and 9. Model (1) results are provided to allow for comparison with other studies on rates of return to schooling. (-) means negative rate of return.

<sup>2</sup>Assumes two-years labor income foregone compared to read and write.

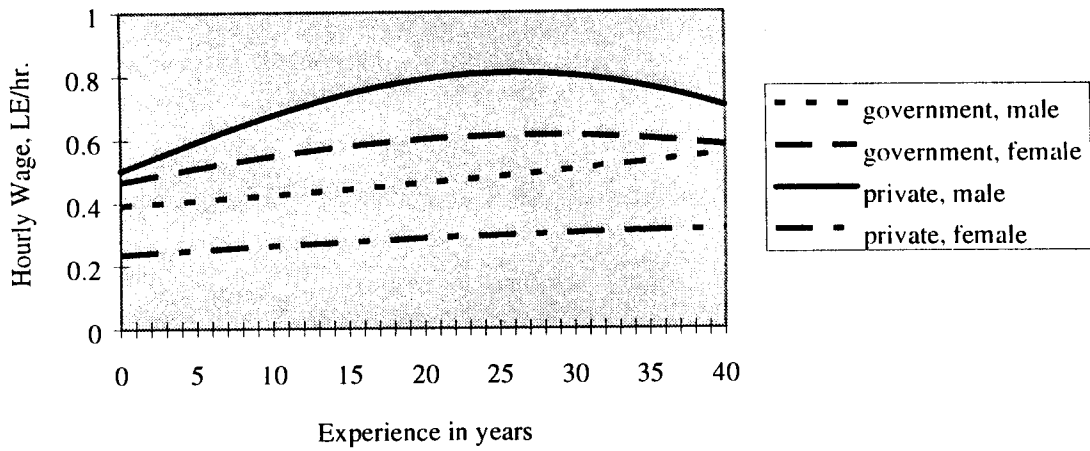
<sup>3</sup>Using "all other baccaloretate" as a base.

Figure 1: Supply and Demand for Graduate Labor in the Presence of a Public Sector Wage Floor.

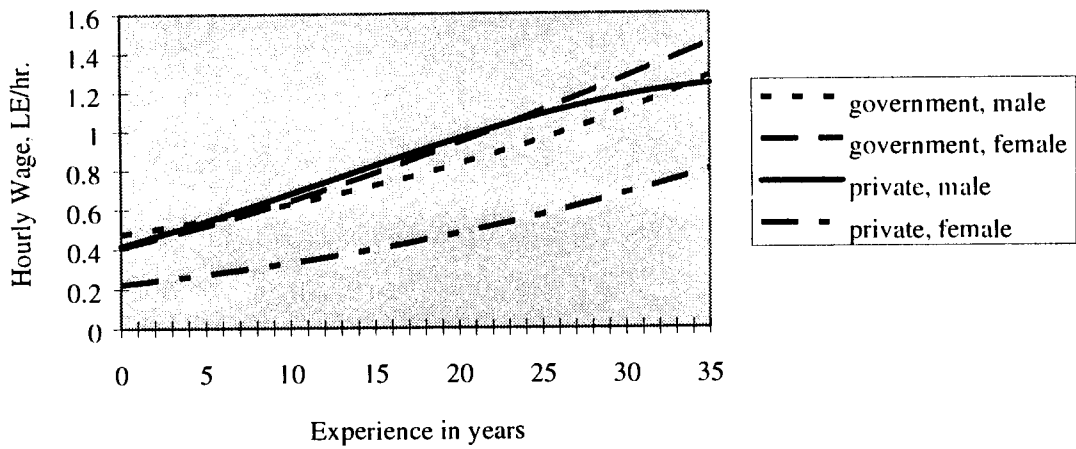


**Figure 2 - Estimated Wage-Experience Profiles by Selected Educational Levels, Institutional Sector, and Sex**

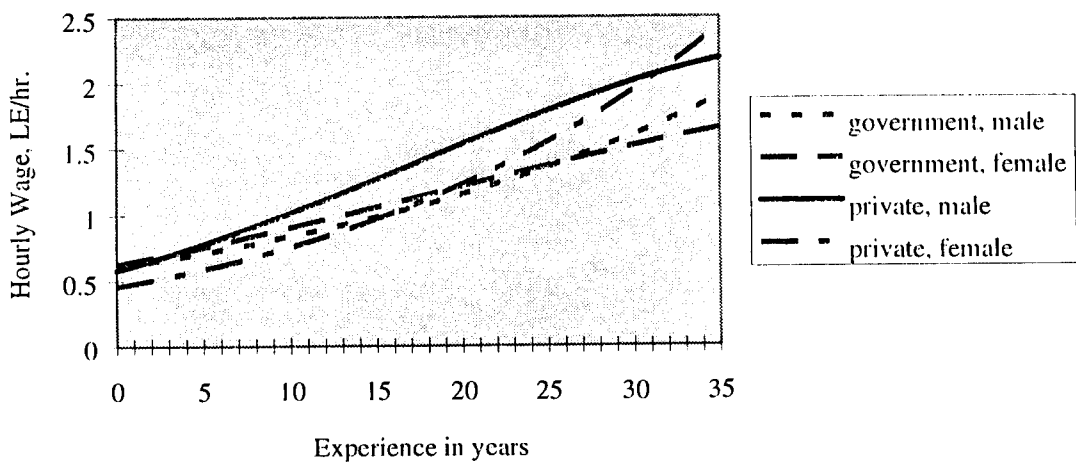
**a- Illiterates**



**b- Vocational Secondary, White Collar**



**c- Bachelor Degrees Other than Engineering**



## APPENDIX

### Specification and Estimation of The Selection Equation

#### A.1 The Model

Using the dichotomous variables  $D_1$  and  $D_2$ , the two selection rules for participation in non-agricultural wage work and sectoral selection can be expressed as:

$$D_1 = \begin{cases} 1 & \text{non-agricultural wage worker if } I_1^* > 0 \\ 0 & \text{otherwise if } I_1^* \leq 0 \end{cases}$$

$$D_2 = \begin{cases} 1 & \text{non-agricultural wage worker in public sector if } I_2^* > 0 \\ 0 & \text{non-agricultural wage worker in private sector if } I_2^* \leq 0 \end{cases}$$

where  $I_1^*$  and  $I_2^*$  are latent variables indicating the difference in the worker's utility between non-agricultural wage work and other labor market states, and between public and private non-agricultural wage work, respectively.<sup>1</sup> The worker's utility in each sector takes into account both pecuniary and non-pecuniary aspects of participation in each sector as well as non-competitive barriers to entry, which can take the form of waiting queues or other costs of entry.

Omitting subscripts indicating a particular individual, the latent variables can be written as a linear function of observable characteristics and an error term as follows:

$$I_1^* = \gamma_1 \mathbf{Z} + \varepsilon_1 \tag{1}$$

$$I_2^* = \gamma_2 \mathbf{Z} + \varepsilon_2 \tag{2}$$

where  $\mathbf{Z}$  is a vector of individual characteristics,  $\gamma_1$  and  $\gamma_2$  are vectors of unknown parameters,  $\varepsilon_1$  and  $\varepsilon_2$  are zero-mean, constant variance disturbance terms. Since  $I_1^*$  and  $I_2^*$  are not observed, but sector selection is, this can be estimated as a system of two dichotomous dependent variable equations, with allowance for the two disturbances to be correlated. Variables included in  $\mathbf{Z}$  include the usual human capital

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<sup>1</sup> The decisions are not necessarily sequential. The methodology used allows for the two decisions to be carried out simultaneously.



variables, locational characteristics, variables related to household structure and family background, such as marital and headship status and father's employment status, and for women, the number of children of different age groups in the household, other family members' income and employment status, and the presence of other female caretakers in the household.

The wage equations in the public and private sectors are specified according to the standard Mincerian human capital model, where log wages are assumed to be depend on human capital characteristics and regional labor market and cost of living differences as follows:

$$y_p = \beta_{0p} + \beta_p \mathbf{X}_p + v_p \quad (3)$$

$$y_R = \beta_{0R} + \beta_R \mathbf{X}_R + v_R \quad (4)$$

where  $\mathbf{X}_p$  and  $\mathbf{X}_R$  are vectors of characteristics for workers in the public and private sectors, respectively,  $\beta_{0p}$  and  $\beta_{0R}$  are the two intercepts, and  $\beta_p$  and  $\beta_R$  are vectors of unknown parameters other than the intercept. The vector of disturbances  $\mathbf{U} = (\varepsilon_1, \varepsilon_2, v_p, v_R)$  is assumed to have a multivariate normal distribution with zero means and covariance matrix  $\Sigma$ . With the usual standardization of the unidentifiable variances of the dichotomous dependent variable models,  $\Sigma$  is given by:

$$\Sigma = \begin{bmatrix} 1 & \rho_{12} & \rho_{1p}\sigma_p & \rho_{1R}\sigma_R \\ \rho_{12} & 1 & \rho_{2p}\sigma_p & \rho_{2R}\sigma_R \\ \rho_{1p}\sigma_p & \rho_{2p}\sigma_p & \sigma_p^2 & \rho_{pR}\sigma_p\sigma_R \\ \rho_{1R}\sigma_R & \rho_{2R}\sigma_R & \rho_{pR}\sigma_p\sigma_R & \sigma_R^2 \end{bmatrix}$$

The system of equations (1)-(4) and the covariance matrix can be estimated by Heckman-Lee type two-stage methods, keeping in mind that  $\sigma_{pR}$  cannot be identified because only one regime is observed for each person.<sup>2</sup>

Because workers in the protected and unprotected sectors are not randomly selected from the population, the expected values of the wage equations' disturbances do not in general equal zero. The expected value of log wages in the public and private sectors are given by:

$$\begin{aligned} E(y_p) &= \beta_{0p} + \beta_p \mathbf{X}_p + E(v_p | D_1 = 1, D_2 = 1) \\ &= \beta_{0p} + \beta_p \mathbf{X}_p + \rho_{1p}\sigma_p\lambda_{1p} + \rho_{2p}\sigma_p\lambda_{2p} \end{aligned} \quad (5)$$

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<sup>2</sup> Two stage methods provide estimates for  $\lambda_j = \rho_i\sigma_j$  (where  $i=1,2, j=P, R$ ) rather than for  $\rho_{ij}$  and  $\sigma_{ij}$  separately. OLS estimation of the second stage results in incorrect estimates of the standard errors. The expression for an asymptotic covariance matrix is provided in Tunali (1986). The sample selection package in LIMDEP, which I use to estimate these models adjusts the standard errors accordingly.

$$\begin{aligned}
E(y_R) &= \beta_{0R} + \beta_R X_R + E(v_R | D_1 = 1, D_2 = 0) \\
&= \beta_{0R} + \beta_R X_R + \rho_{1R} \sigma_R \lambda_{1R} + \rho_{2R} \sigma_R \lambda_{2R}
\end{aligned} \tag{6}$$

where:

$$\begin{aligned}
\lambda_{1P} &= \frac{f(\theta_1)F(\theta_2^*)}{G(\theta_1, \theta_2; \rho_{12})} \quad , \quad \lambda_{2P} = \frac{f(\theta_{21})F(\theta_1^*)}{G(\theta_1, \theta_2; \rho_{12})} \\
\lambda_{1R} &= \frac{f(\theta_1)F(\theta_2^*)}{G(\theta_1, -\theta_2; -\rho_{12})} \quad , \quad \lambda_{2R} = -\frac{f(\theta_2)F(\theta_1^*)}{G(\theta_1, -\theta_2; -\rho_{12})}
\end{aligned} \tag{7}$$

where  $f(\cdot)$  and  $F(\cdot)$  denote the standard univariate normal density and distribution functions, respectively,  $G(\cdot, \cdot; \rho)$  denotes the standard bivariate normal distribution function, with correlation  $\rho$ ,

$$\begin{aligned}
\theta_1 &= \gamma_1 Z \quad , \quad \theta_2 = \gamma_2 Z \\
\theta_1^* &= \frac{\theta_1 - \rho_{12} \theta_2}{(1 - \rho_{12}^2)^{1/2}} \quad , \quad \theta_2^* = \frac{\theta_2 - \rho_{12} \theta_1}{(1 - \rho_{12}^2)^{1/2}}
\end{aligned}$$

## A.2 Specification

For males, the determinants of participation in non-agricultural wage work are assumed to be age, education, headship status, region of residence, and father's employment status. Since educational specialization at the bachelor's level is linked to the likelihood of being in the liberal professions and therefore determine participation in wage work versus self-employment, I include a more detailed breakdown of educational specializations than is typical in the standard human capital models. I also distinguish between vocational and general secondary education. Despite its important role in the theory of labor supply, unearned income is omitted because of the absence of any information about it in the data set. Since participation in the labor force is virtually universal for males in the relevant age group, I consider males who have participated in the labor force during the reference year as the relevant universe from which selection occurs. Moreover, because information on the father's employment status is only available for a randomly selected subsample of about half the overall sample, the male equations are limited to that subsample.

Since female labor supply is strongly dependent on domestic responsibilities, there are a number of additional variables that can be used as regressors in the participation in wage work equation for females, which is essentially a reduced-form labor supply equation. These include variables related to household structure, such as the number of children in various age groups in the household, the incidence of alternative care givers, and the presence of elderly household members. Whereas for males it is not reasonable to assume that the labor force status of other household members is exogenous, such an assumption is more easily defensible for females. In

the Egyptian context, it is unlikely that husbands, brothers, or fathers decide their labor force status in function of that of their wives, sisters, or daughters. It is therefore possible to include variables describing the employment status of other household members and their earnings in the female participation decision without worrying about simultaneity bias. Such variables include: “other household earnings from wages”, which would be expected to be negatively associated with participation in wage work; “other private or public wage workers in the household”, which should be positively associated because of the labor market information made available by other household members; “other self-employed workers in the household”, which would be positively associated with employment in a family enterprise and therefore negatively associated with wage work. Since no data are available for earnings other than wage earnings, the effect of earnings from self-employment is captured by the variable “other self-employed workers.”

The specification of the sector selection equation is very similar for males and females. Because of the employment guarantee for graduates, education is expected to be strongly associated with participation in the public sector. Some educational specializations are also more likely to be employed in the public sector than others. Married individuals are also more likely to prefer the public sector, other things equal, because of their greater desire for income security. Identification of the male equations is done in a fairly *ad hoc* manner by omitting the dummy variables “father self-employed” and “head of household” from the sector selection equation, and omitting the variable “currently married” from the participation in non-agricultural wage work equation. These omitted variables were insignificant in the respective univariate probit models. The female equations are well identified.

The parameter estimates for the selection equations are shown in Table A1. A single selection model of participation in wage work for males and females is estimated first using a univariate probit specification (columns 1 and 4 in the table). These estimates are used to correct for selectivity the wage equation estimates that do not distinguish workers by sector. I also present the parameter estimates from the double selection model where participation in wage work and sectoral selection are estimated jointly using a bivariate probit framework (columns 2, 3 for males and 5, 6 for females). These estimates are used to correct for selectivity the wage equations that distinguish between the public and the private sector.

**Table A1 - Selection Equation Estimate**

| Variable                                   | Males                                       |   |                                    |   | Females                                     |                                    |   |                                    |
|--|---|---|------------------------------------|---|---|------------------------------------|---|------------------------------------|
|  | Univariate Probit                           |   | Bivariate Probit                   |   | Univariate Probit                           |                                    | Bivariate Probit                            |                                    |
|  | Participation in Non Agricultural Wage Work | Participation in Non Agricultural Wage Work | Public /Private Selection Decision | Participation in Non Agricultural Wage Work | Participation in Non Agricultural Wage Work | Public /Private Selection Decision | Participation in Non Agricultural Wage Work | Public /Private Selection Decision |
| constant                                   | -1.467 ***<br>(-9.05)                       | -1.467 ***<br>(-9.26)                       | -5.763 ***<br>(-13.30)             | -5.110 ***<br>(-22.88)                      | -5.135 ***<br>(-24.40)                      | -7.736 ***<br>(-11.08)             | 0.198 ***<br>(15.61)                        | 0.280 ***<br>(8.02)                |
| age  | 0.107 ***<br>(10.99)                        | 0.100 ***<br>(11.00)                        | 0.212 ***<br>(10.45)               | 0.197 ***<br>(15.44)                        | 0.198 ***<br>(15.61)                        | 0.280 ***<br>(8.02)                | -0.251 ***<br>(-14.91)                      | -0.335 ***<br>(-6.71)              |
| age2/100                                   | -0.140 ***<br>(-12.56)                      | -0.140 ***<br>(-12.51)                      | -0.203 ***<br>(-7.56)              | -0.250 ***<br>(-14.56)                      | -0.251 ***<br>(-14.91)                      | -0.335 ***<br>(-6.71)              |   |                                    |
| <b>Educational Attainment:<sup>1</sup></b> |   |   |                                    |   |   |                                    |   |                                    |
| read and write                             | 0.477 ***<br>(9.29)                         | 0.476<br>(9.25) ***                         | 0.489 ***<br>(4.81)                | 0.140 *<br>(1.67)                           | 0.141 *<br>(1.70)                           | 0.514 **<br>(2.39)                 |   |                                    |
| primary                                    | 0.446 ***<br>(6.68)                         | 0.446<br>(6.69) ***                         | 0.772 ***<br>(6.17)                | 0.597 ***<br>(6.69)                         | 0.597 ***<br>(6.89)                         | 1.297 ***<br>(6.11)                |   |                                    |
| preparatory                                | 0.514 ***<br>(7.46)                         | 0.515<br>(7.39) ***                         | 0.791 ***<br>(6.03)                | 0.709 ***<br>(8.60)                         | 0.710 ***<br>(8.71)                         | 1.207 ***<br>(6.39)                |   |                                    |
| general secondary                          | 0.373 ***<br>(3.87)                         | 0.372<br>(3.89) ***                         | 0.801 ***<br>(3.82)                | 0.682 ***<br>(6.88)                         | 0.683 ***<br>(6.52)                         | 1.321 ***<br>(5.18)                |   |                                    |
| vocational secondary                       | 0.896 ***<br>(14.86)                        | 0.896<br>(14.81) ***                        | 1.349 ***<br>(10.52)               | 2.021 ***<br>(35.32)                        | 2.028 ***<br>(35.91)                        | 2.653 ***<br>(14.22)               |   |                                    |
| technical institute                        | 0.881 ***<br>(7.65)                         | 0.877<br>(7.82) ***                         | 1.631 ***<br>(9.16)                | 2.430 ***<br>(27.04)                        | 2.431 ***<br>(26.69)                        | 3.142 ***<br>(12.56)               |   |                                    |
| bachelor of medicine                       | 0.679 ***<br>(2.83)                         | 0.676<br>(3.00) ***                         | 2.613 ***<br>(4.73)                | 2.379 ***<br>(11.11)                        | 2.400 ***<br>(11.63)                        | 2.412 ***<br>(6.23)                |   |                                    |
| bachelor of agriculture                    | 0.740 ***<br>(4.27)                         | 0.740<br>(4.27) ***                         | 2.056 ***<br>(4.70)                | 2.076 ***<br>(9.79)                         | 2.072 ***<br>(9.54)                         | 2.372 ***<br>(5.99)                |   |                                    |
| bachelor of engineering                    | 0.770 ***<br>(4.59)                         | 0.770<br>(4.50) ***                         | 1.060 ***<br>(5.60)                | 1.891 ***<br>(8.13)                         | 1.894 ***<br>(7.85)                         | 2.704 ***<br>(5.64)                |   |                                    |
| bachelor of science                        | 0.728 ***<br>(2.67)                         | 0.726<br>(2.86) ***                         | 1.735 ***<br>(4.16)                | 2.054 ***<br>(8.65)                         | 2.059 ***<br>(8.37)                         | 2.185 ***<br>(4.80)                |   |                                    |
| bachelor of commerce                       | 0.715 ***<br>(6.24)                         | 0.714<br>(6.33) ***                         | 1.215 ***<br>(7.11)                | 1.953 ***<br>(18.21)                        | 1.954 ***<br>(17.68)                        | 2.353 ***<br>(8.81)                |   |                                    |

Table A1 - Selection Equation Estimates(cont.)

| Variable                                | Males                  |                        | Females             |                       |
|---|------------------------|------------------------|---------------------|-----------------------|
|   | Univariate Probit      | Bivariate Probit       | Univariate Probit   | Bivariate Probit      |
| bachelor of law                         | 0.446 **<br>(2.47)     | 0.447<br>(2.57) **     | 1.463 ***<br>(3.71) | 1.561 ***<br>(7.85)   |
| other bachelor                          | 1.028 ***<br>(8.27)    | 1.023<br>(8.15) ***    | 1.982 ***<br>(9.48) | 2.156 ***<br>(24.81)  |
| postgraduate                            | 0.994 ***<br>(5.63)    | 0.995<br>(5.91) ***    | 1.699 ***<br>(6.96) | 2.362 ***<br>(9.49)   |
| <b>Region of Residence:<sup>2</sup></b> |                        |                        |                     |                       |
| Alexandria and Suez Canal               | -0.166 **<br>(-2.44)   | -0.168<br>(-2.47)      | 0.222 **<br>(2.47)  | 0.006<br>(0.10)       |
| Urban Lower Egypt                       | 0.328 ***<br>(-5.46)   | -0.327 **<br>(-5.53)   | 0.226 **<br>(2.13)  | -0.089<br>(-1.51)     |
| Urban Upper Egypt                       | -0.310 ***<br>(-4.66)  | -0.308 ***<br>(-4.72)  | 0.473 ***<br>(3.78) | -0.058<br>(-0.88)     |
| Rural Lower Egypt                       | -0.681 ***<br>(-12.85) | -0.680 ***<br>(-12.79) | 0.441 ***<br>(3.04) | -0.152 **<br>(-2.50)  |
| Rural Upper Egypt                       | -0.814 ***<br>(-13.74) | -0.813 ***<br>(-13.59) | 0.571 ***<br>(3.29) | -0.333 ***<br>(-4.01) |
| <b>Father's Employment Status:</b>      |                        |                        |                     |                       |
| father self-employed/employer           | -0.383 ***<br>(-10.51) | -0.384 ***<br>(-10.51) |                     |                       |
| <b>Household-level Variables:</b>       |                        |                        |                     |                       |
| head of household                       | 0.250 ***<br>(4.64)    | 0.249 ***<br>(4.59)    |                     |                       |
| currently married                       |                        |                        | 0.266 ***<br>(3.03) | 0.078<br>(1.10)       |
| No. of children under 2                 |                        |                        |                     | -0.497 ***<br>(-8.77) |
| No. of children 3 to 6                  |                        |                        |                     | -0.122 ***<br>(-3.82) |
| No. of children 7 to 11                 |                        |                        |                     | 0.015<br>(0.60)       |
|   |                        |                        |                     | -0.014<br>(-0.03)     |
|   |                        |                        |                     | -0.014<br>(-0.55)     |
|   |                        |                        |                     | 0.069<br>(0.96)       |
|   |                        |                        |                     | -0.496 ***<br>(-9.17) |
|   |                        |                        |                     | -0.107 ***<br>(-3.35) |
|   |                        |                        |                     | 0.020<br>(0.78)       |
|   |                        |                        |                     | -0.014<br>(-0.03)     |
|   |                        |                        |                     | -0.014<br>(-0.55)     |
|   |                        |                        |                     | 0.420 **<br>(2.50)    |
|   |                        |                        |                     | 0.093 *<br>(0.50)     |

Table A1 - Selection Equation Estimates(cont.)

| Variable                         | Males             |                  | Females               |                       |
|----------------------------------|-------------------|------------------|-----------------------|-----------------------|
|                                  | Univariate Probit | Bivariate Probit | Univariate Probit     | Bivariate Probit      |
| Other females 12 to 64           |                   |                  | -0.107 **<br>(-2.35)  | -0.114 **<br>(-2.35)  |
| Females 65 and over              |                   |                  | -0.024<br>(-0.32)     | -0.010<br>(-0.14)     |
| Males 65 and over                |                   |                  | 0.004<br>(0.06)       | -0.019<br>(-0.29)     |
| Other household earnings         |                   |                  | -0.021<br>(-0.98)     | -0.013<br>(-0.56)     |
| Other household earnings squared |                   |                  | 0.017<br>(1.14)       | 0.013<br>(0.77)       |
| Other self-employed              |                   |                  | -0.232 ***<br>(-4.76) | -0.206 ***<br>(-4.43) |
| Other private wage workers       |                   |                  | 0.117 **<br>(2.04)    | 0.129 **<br>(2.41)    |
| Other public wage workers        |                   |                  | 0.227 ***<br>(4.14)   | 0.232 ***<br>(4.08)   |
| P1,2                             |                   | 0.157<br>(0.67)  |                       | 0.626<br>(2.43)       |
| Log-likelihood                   | -3,394.7          | -4,726.3         | -2,837.9              | -3,373.0              |
| Number of Observations           | 5,917             | 5,917            | 15,789                | 15,789                |

<sup>1</sup> Illiterate is the reference category.

<sup>2</sup> Greater Cairo is the reference category.

Significance levels at the 1 percent level (\*\*\*), 5 percent level (\*\*) and 10 percent level (\*) are indicated.

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