

DEPARTMENT OF ECONOMICS WORKING PAPERS

No.136

Compensating Differentials and the Queue For Public Sector Jobs: Evidence from
Egyptian Household Survey Data

Mona Said

March 2004

economics@soas.ac.uk

<http://www.soas.ac.uk/departments/departmentsinfo.cfm?navid=11>

**Compensating Differentials and the Queue For Public Sector Jobs:
Evidence from Egyptian Household Survey Data**

Mona Said

Lecturer in Economics

Department of Economics, SOAS

Thornhaugh Street, Russell Square,

London WC1H 0XG, UK.

Email: ms101@soas.ac.uk

Compensating Differentials and the Queue For Public Sector Jobs: Evidence from Egyptian Household Survey Data

Abstract

This Paper considers the determinants of male and female pay in the public and private sectors by estimating a joint model of sector allocation and wage determination using cross-sectional data from the Egyptian 1987 and 1997 labour force surveys. The results points to the profound impact of the graduate public sector employment guarantee on labour market segmentation in Egypt. In particular, the level of educational attainment became the most important factor in sorting workers between sectors. Comparison of the 1987 and 1997 results highlight that the strong impact of the public sector employment guarantee on the labour market in the 1980s was weakened in the 1990s for males but remains important for females. Moreover, risk-averse individuals (proxied by those who have greater financial responsibility in their households) have a greater probability of choosing public sector than private sector employment. These results are consistent with the effective operation of the guarantee for more highly educated workers and with time based queuing for guaranteed positions. A model of compensating wage differentials is then defined and estimated, in order to quantify the value of arguably the three most important non-pecuniary aspects of public sector employment: job security, fringe benefits (especially comprehensive retirement pensions) and lower effort and shorter hours which allow workers to supplement income through obtaining a second job. Estimates of the public-private differentials, correcting for differences in characteristics and selectivity, indicate a public sector disadvantage for males and a small advantage for females in 1987. Relative public sector wages improved for both males and females in 1997, and when adjustments for non-wage benefits are included, public sector premia are observed in all segments of the public sector for both males and females. It also emerged that the single most important adjustment factor leading to the change in the differential is the value of job stability, which drives up the differential in favour of the public sector, particularly in manufacturing. The results highlight the importance of job security as the major factor determining the persistence of queues for public sector jobs in Egypt.

Compensating Differentials and the Queue For Public Sector Jobs: Evidence from Egyptian Household Survey Data

Introduction

The public sector became the predominant employer in the Egyptian labour market following the wave of nationalisation in the early 1960s. This signalled the radical shift towards central planning and state-led industrialisation under the Nasser regime in Egypt. During that period, a public sector employment guarantee was enacted for all secondary school and university graduates, and public sector compensation and hiring practices constituted the main institutional force governing the operation of the formal labour market. The liberalisation of the Egyptian economy since the mid-1970s, and particularly the drive towards privatisation in the late 1980s and 1990s, have led to renewed interest in the issue of public sector employment and pay and the role of the government as an employer.¹

Despite the centrality of the issue to current debates concerning the civil service reform and privatisation, studies comparing public and private sector labour market outcomes in Egypt have been few. The first generation of studies was mostly institutional and descriptive in nature and mainly utilised aggregate data on wages for a few consecutive years (e.g. Institute of National Planning, 1979, Starr, 1983, Fathy, 1988, Handoussa, 1990 and Zaytoon 1991). A second generation of studies was motivated by the availability for the first time of micro data sets: the 1987 and 1988 Labour Force Sample Surveys. This allowed for the analysis of determinants of earnings in the public and private sectors (Shaban, Al-Qudsi and Assaad, 1993; Assaad, 1997a, 1997b). These studies provided a more detailed and empirically grounded discussion of public-private pay differentials. They all however concentrated on one year, and thus did not provide evidence on changes in pay differentials over time. They also ignored distributional issues within the public and private sectors themselves. For example, the issues of sectoral differences in wage dispersion, gender-based discrimination and occupational segregation were not tackled. Moreover although recognising the central role of non-pecuniary aspects (in particular job security) in determining the continued attractiveness of the public sector jobs, no attempt was made to incorporate the impact of job instability and other non-wage benefits in the empirical estimation of sector-pay gaps.²

¹ In this paper, the terms ‘pay’ and ‘wages’ are used interchangeably. They both refer to monetary remuneration to employees, as opposed to ‘non-wage’ or ‘non-pecuniary’ benefits.

² With the exception of Assaad (1997b), who provided a useful methodology to quantify such benefits. The method, however, was based on several restrictive assumptions and only provided a total figure of such benefits without distinguishing between their different components (such as job security, pension schemes, low effort etc.). See Section 3 for details.

This paper uses the December round of the 1987 Egyptian Labour Force Sample Survey (LFSS) and the 1997 Egyptian Integrated Household Survey (EIHS) to estimate public-private and public enterprise-private wage differentials that attempts to correct for differences in: a) *observable characteristics* of workers that may result in productivity or skill differences (such as experience, education etc.), b) any *unobservable characteristics* (such as talent, the work ethic or the quality of education received) that cannot be measured directly, but are assumed to sort workers between sectors, c) *compensating differences* for some important non-pecuniary job attributes in the public sector (job security, fringe benefits, whether work is of an intermittent nature), and finally, d) some job related characteristics, such the sector of economic activity it falls under.

The analysis in the paper extends previous work in this area in three directions. First, despite some differences in sample sizes and coverage of the 1987 and 1997 surveys, it was still possible to use results from them to compare wage differentials, sectoral allocation and wage setting mechanisms over a span of these ten years. This represents the first effort of its kind for Egypt that is based on the use of two micro-survey data sets. Secondly, an attempt is made to quantify the value of arguably the three most important non-pecuniary aspects of public sector employment: job security, fringe benefits (especially comprehensive retirement pensions) and lower effort and shorter hours which allow workers to supplement income through obtaining a second job. This is accomplished by defining and estimating a model of compensating wage differentials which utilises information on the variability of employment, second job holding and access to pensions and medical insurance in the 1997 EIHS survey. The methodology allows for calculating the difference between the public and private sectors in both the incidence and personal (or individual-specific) valuation of these non-wage benefits. Finally, a third extension of the paper is to incorporate risk aversion in the analysis, as it is arguably an important determinant of public sector employment in Egypt. An index based on household characteristics which measures the level of financial responsibility towards the family is constructed and used (to proxy the degree of risk aversion) as a determinant of sectoral selection for males.

Section 1 reviews empirical models of public-private wage differentials that underlie previous studies of wage comparisons between the public and private sector in Egypt and other developing countries. Section 2 then defines a model of sector allocation and wage determination that is used in estimating the probability of selection in the public and private sectors and in correcting wage equations for sector selection bias. A methodology based on a model of compensating wage differentials is then proposed for quantifying the value of non-wage benefits, which will be used in adjusting the mean public-private wage differentials in Section 3. The description of the data, variable definitions and the results of estimating these models are then presented in the last two sections (Section 4 and 5).

1. Models of Public-Private Wage Differentials and Previous Studies on Egypt

Studies of wage comparisons between the public and private sector in developing countries can generally be classified into two categories. The first focuses on averages between workers stratified by occupation, educational attainment or qualification (e.g. Bennell, 1981, Heller and Tait, 1984, case studies in Colclough, 1997 and several studies by the World Bank listed in Nunberg, 1985). These comparisons of average wages are subject to the criticism that, by concentrating on only one characteristic at a time, they do not systematically analyze the joint role of worker background characteristics in determining relative levels of wages. The second group of studies uses the Mincerian earnings function as a framework which assesses variation in wage outcomes based on individual characteristics. Most of these studies attempt to estimate wage differentials using one or more dummy variables to indicate the sector where the individual is employed, or by estimating separate equations for each sector using Ordinary Least Squares methods and then using these estimates to test the equality of wage structures across sectors.

The validity of this approach, however, depends on the implicit assumption that employees are randomly distributed (with respect to their unobservable wage-determining characteristics) between the two sectors. If the labour market is segmented into sectors that give different awards to human capital, then workers will queue for the higher paying sector and a selection process takes place which determines who finally enters that sector. In Egypt, the selection process is an explicit one for a large segment of employees, as secondary school and university graduates are guaranteed government jobs and are selected into the public sector on basis of year of graduation. In other countries, it usually depends on a combination of employer and employee decisions. Either way, the selection process will lead to two samples of workers (public, private) which are selected by design and not randomised and hence the implicit assumption of random samples is violated. Whether this will lead to a bias in the parameter estimates of the wage equations depends on whether the characteristics that have an impact

on both the wage level and the selection processes are in any way correlated. If they are, a bias exists and it will render the derived sectoral wage comparisons misleading.

Thus a second generation of studies appeared that explicitly test for the existence of such ‘sample selection’ or ‘selectivity’ bias and attempt to correct for it. The basic methodology is based on Heckman’s (1976, 1979) two step procedure which consists, in the first stage, of estimating selection equations that are used to predict the probability of selection in the alternative sectors. In the second stage, sector selection terms are calculated from these probabilities and used in the wage equations to remove sample selection bias.³

In the previous literature on public-private comparisons using Egyptian data, there are three other studies that used approaches based on selection models. Shaban et al. (1993) in an unpublished conference paper used the same data set used in this Paper (December round of the 1987 LFSS) to examine differences in sectoral selection and wage determination between the government, public enterprise and private sectors in Egypt. The study however did not attempt to calculate or decompose wage differentials based on these estimates, nor did it take account of differences in non-wage benefits and job security.⁴ Assaad (1997a and b) used a different data set (October round of the 1988 LFSS) to study wage differentials. In Assaad (1997a), a bivariate probit double selection model is estimated to account for two selection rules: participation into non-agricultural wage work and selection into the public and private sectors for non-agricultural wage work. Again there was no attempt made to correct for non-wage elements in the pay package, but an important result obtained in that study was that there was no significant selection in non-agricultural wage work. Based on this result (which was also found in other studies),⁵ the approach in this paper is to assume random selection in wage work and use the model defined below to correct only for selection into sector of employment.

³ Extensions to Heckman’s model proposed and used in the literature on public-private comparisons, include the switching-regression model, the bivariate probit double selection model and the multinomial logit choice model. The switching regression model consists of two sector specific wage equations (one for the public and one for the private sector) and a ‘switching equation’ that determines in which sector the employee is working.(see Van der Gaag and Vijverberg, 1988 and Hartog and Oosterbeck, 1993). The bivariate probit double selection model extends the standard single selection procedures developed by Heckman to account for two selection rules simultaneously, which allows one to test either selection into three separate sectors (see Terrell, 1993), or selection into wage work , as a first step, and selection into two sectors (the overall public sector as opposed to the private sector) as second step (see Assaad, 1997a). The multinomial logit model allows one to examine selection into n number of sectors, and as such has been used extensively in models of sectoral, occupational and union status choice (see for example Gyourko and Tracy, 1986 and Tansil, 1999).

⁴ The results were very preliminary and presented within a survey of labour issues in Arab Countries in general. The authors chose not to pursue that research further.

⁵ Shaban et al (1993), using the 1987 LFSS used in this paper, found the same result regarding no significant selectivity into wage work. This was explained as due to the fact that education (as opposed to unobservable factors) is the major determinant of labour force participation for both males and females in Egypt.

The most relevant work for the present analysis is Assaad (1997b) which uses a multinomial logit model to correct wage estimates for sector selection. An attempt is made in that work to take account of non-pecuniary aspects between public and private jobs. The methodology used consists of estimating a total figure of the non-wage aspects of the job (such as job security, retirement and health benefits and low expectation of effort) indirectly, by assuming that some marginal workers dissipate their lifetime rents by queuing for public sector jobs. The magnitude of non-wage benefits that set lifetime rents of this group to zero is then estimated and generalised to all workers in the public sector, subject to assumptions of how non-wage benefits relate to wages. Most importantly, the author had to assume that: (1) non-wage benefits in the public sector are proportional to monetary earnings, (2) that the constant of proportionality is invariant across workers and (3) that it is the same for government and public enterprise workers.⁶ Although the first assumption might be plausible, in published aggregate data the proportion of non-wage benefits to monetary wages varies significantly between the public enterprise sector and the government and across sectors of economic activity within each sector.⁷ The author thus arrived at a total estimate of the non-wage component equivalent to 86% of monetary wages, as the methodology used does not allow for decomposing this component into fringe benefits, effort, job security etc.⁸ One can also question the general conceptual assumption underlying this methodology, which is that there is free entry to all jobs in the private sector. So if the marginal worker finds that total compensation is lower in the public sector he can always quit and find a private sector job. This rationalisation ignores the fact workers might remain in low-wage-and-benefits public sector jobs precisely because they can combine them with private sector jobs (through second job holding).

Besides providing more recent evidence, the present analysis will divert from these studies in several directions. Unlike all of the three studies, the impact of risk aversion is incorporated in sectoral selection which serves to capture some of the missing unobservables in the male sectoral choice equation and affects the results on selectivity in the three sectors. Second, all studies discuss sector selection on basis of reduced form estimates that do not directly examine the impact of wage differential on the decision. We estimate a structural form of the equation that allows for directly

⁶ In calculating life-time rents, the author also had to make several other assumptions regarding the magnitude and constancy of the discount rate across workers, the length and cost of the queuing process for public sector jobs, the cutoff age to identify marginal workers and the level of disaggregation in the classification scheme. He performs sensitivity analysis to test the impact of varying these assumptions on the estimates obtained, and finds them generally robust.

⁷ For example figures on 1987/88 published by CAPMAS in “National Accounts Statistics: Economic and Functional Distribution of the Government Sector activities, 1987/88” indicate that on average pensions and fringe benefits are 25% of total compensation in the public enterprise sector as opposed to 15% only in the government. There are further differences across sectors of economic activity so the proportion ranges from 34% for public enterprises in the trade and tourism sector to 15% in social services in the government.

⁸ Arriving at a total figure was sufficient for the purpose of that research, which was to analyze alternative designs of severance programs to reduce labour redundancy in the Egyptian public enterprises selected for privatization.

ascertaining the role of wage differentials as opposed to non-wage factors in the persistence of the queue for public jobs among males and females. Third, a methodology is devised for estimating the value of non-wage benefits using information on variation in employment, second job holding and fringe benefits in the 1997 EIHS. Unlike previous attempts to quantify non-wage benefits, this method does not require strong assumptions about free entry to private sector jobs or the constancy of the proportion of non-wage benefits to monetary wages across workers.

2. Estimation Model

The model underlying the estimation in this paper employs a variant of Heckman's two step procedure whereby the sector selection and wage equations are estimated simultaneously using maximum likelihood methods. According to the model, the labour market is seen to be divided into a public and private sector, each with distinct wage setting mechanisms. Wages in the two sectors are postulated to be determined by the following system of two equations:

$$\text{Ln } W_{si} = \beta_{si} X_i + \varepsilon_{si} \quad (s = p, r) \quad (1)$$

where $\text{Ln } W_{si}$ is log hourly wages in the public (p) or private sectors (r) for individual i, X is the vector of personal and job-related characteristics seen to be of relevance to wage determination and ε is the random error term. To simplify the presentation, the subscript i will be dropped in the rest of the model.

As mentioned above, each equation in this system is observed only for a sub population and not for a random sample. Sample selection bias is likely to result if ordinary least square methods of estimation are used.⁹ Consistent estimates can be obtained however if the process generating the observations of public and private sector workers (i.e. sector selection process) is incorporated in the model. So if the labour market is segmented into a public and private sector, there will be a queue for the preferred sector and non-price rationing will determine entry into it.

An individual will be observed in the public sector if

$$\text{Ln } W_p - \text{Ln } W_r > \alpha_1 V_1 + u_1 \quad (2)$$

Where V_1 is the vector of characteristics postulated to be associated with the probability of obtaining a public job and u_1 is the disturbance term. Equation (2) summarises a two step process. First based on expected benefits (or wages), a worker will determine whether or not to obtain a public job. Second an employer chooses workers from the queue of applicants based on expected costs and benefits, which in

⁹ The consequences of this bias are similar in effect to those produced by an omitted variable in normal regression analysis.

turn depend on characteristics of the employee.¹⁰ In its reduced form, the relationship can be expressed as follows:

$$P^* = \alpha V + u \quad (3)$$

Where P^* is a latent unobserved variable reflecting the person's choice into a sector of employment. V is the vector of individual, family and household characteristics that influence this choice and u is a random error term. The observed counterpart of P^* is a binary variable, P , which is equal to 1 if P^* is positive and the person chooses public sector employment and zero otherwise. It is assumed that ε and u have a bivariate normal distribution with respective variances of σ_ε^2 and σ_u^2 where the latter is normalised to one.¹¹ Heckman's selectivity correction procedure is implemented by performing a probit estimation as follows:¹²

$$\text{Prob}(P=1) = F(\alpha V) \quad (4)$$

Where F is the cumulative density function of u . u is potentially correlated with ε with correlation ρ . When ρ is not equal to zero, standard regression techniques applied to equation (1) yield biased results. A solution of the system of equations (1) and (4) can be found if one is able to identify variables that are postulated to influence chances of observation (sector choice) but not the outcome under study (wage determination),¹³ and its maximum likelihood estimation provides consistent and efficient parameter estimates. The system will be estimated separately for males and females in the public and private sector and results for 1987 and 1997 will be compared.

The estimated wage equations can then be used to create expected wages for each worker in both sectors. In order to get a direct estimate of the impact of public-private wage differentials on sector selection, the difference between the two expected wages is introduced as an instrumental variable to re-estimate the selection equation. This can be thought of as the structural version of the sector

¹⁰ For a similar representation see Van der Gaag & Vijveberg (1988) and Stelcner et al (1989). Ideally, if data on costs of workers to applying were available, the applicant and employer decision could be modeled by two separate equations. In absence of any such information, it is not possible to identify the two stages of the model and equation (2) should be interpreted as approximating the relationship implied by those two stages.

¹¹ Unless some convincing exclusion restriction is used, the violation of this multivariate normal distributional assumption will result in identification problems in the Heckman two-step or maximum likelihood selection model and would call for the use of alternative (more generalised) selectivity models (see Maddala, 1983, pp. 267-275 and Lee, 1982 for a detailed discussion).

¹² Lee (1982) noted that the three most popular binary choice models: probit, arctan and logit models are virtually indistinguishable except at arguments yielding probability extremely close to zero or one. Thus within the range of most data, the choice between any of these models is mainly done for computational reasons.

¹³ More precisely, identification in these models relies on distributional assumptions (about joint normality of error terms in the sector choice and wage equations), functional form (the fact that the function $F(\alpha v)$ in the probit model is a non-linear function of V) as well as specification (including presence of identifying variables that can be excluded from the wage equation). Thus, one theoretically does not need such identifying variables (i.e V can contain the same variables as X). But without them, one is relying on distributional and functional form assumptions which have no firm basis in economic theory to identify the model. Moreover, Maddala (1983, p.271) notes that even in the probit model, problems of identification would arise if X contains non-linear functions of variables used in V . Thus most

selection equation. Due to its sequence in the estimation, it is usually referred to in the literature as a second stage probit for sector choice (see Belman and Heywood, 1989).

3 Compensating Differentials and Non-Pecuniary Aspects of Public Sector Jobs

In calculating public-private total compensation (as opposed to just wage) differentials, it is important to correct for the higher degree of job security in the public sector and the presence of substantial non-wage benefits in some public and private jobs. There are limited attempts in the literature to correct public-private wage differentials for non-pecuniary aspects. This, in large part, may be due to the unavailability of such information in actual data sets. So either one has to rely on extraneous information,¹⁴ or alternatively devise a method of extracting it in an indirect fashion from the same data set, which usually entails making several stringent assumptions.¹⁵

In this section, a more direct method for evaluating these benefits is proposed which is based on the argument that although institutional public sector wage setting is unlikely to include pay compensating differentials for non-pecuniary aspects of jobs, the private sector (operating in a more competitive environment) is expected to so.¹⁶ In particular, it is likely to compensate workers in form of higher wages for lack of desirable work conditions and job characteristics. Using an extended earnings equation, it is possible to obtain estimates of such premia due to absence of aspects such as employment stability, access to pensions and medical insurance and long and intensive work day which prevents them from supplementing their income through second job holding. By subtracting these premiums from private sector wages in calculating the public-private differential, one is able to compare similar jobs in terms of non-pecuniary aspects of jobs.

In models of compensating wage differentials, theoretical support for the expected sign on the estimated wage differential associated with non-pecuniary job characteristics, is usually drawn from simple models of utility maximisation. In our case, workers are assumed to derive utility (U) from both wage and non-wage aspects of the job. Institutional aspects of public sector employment in the Egyptian case are likely to consist mainly of job security (or stability), fringe benefits and the

applications of models of selectivity-correction rely on exclusion restrictions (if such information is available) to ensure identification

¹⁴ See Bellante and Long (1981) for an example of a study using extraneous information on public-private differences in the rate of unemployment and fringe benefits to adjust pay differentials for differences in job security and fringe benefits.

¹⁵ As was done in the study by Assaad (1997b) mentioned above.

¹⁶ In the theory of compensating differentials (see Rosen, 1986 for a comprehensive survey), competitive behaviour of firms in the labour market is an important underlying assumption. But that term 'competitive labour market' does not have to refer to a 'perfectly competitive labour market.' It is only assumed that there are many firms who compete for workers and many workers who compete for jobs (Fehr et al., 1994, p. 325)

possibility of supplementing ones income through holding secondary jobs. This leads to the following representation of a worker's utility function.¹⁷

$$U = U(W, N) = U(W, I, B, S) \quad (4)$$

where W represents the worker's wages and N non wage aspects of jobs. These include: I , a measure of uncertainty or job instability; B , fringe benefits such as pensions and medical insurance and S , the probability of holding a second (secondary) job for a given first (or primary) job. The typical assumptions that utility is increasing in desirable attributes and decreasing in undesirable ones are made (i.e. $U_W > 0$, $U_I < 0$, $U_B > 0$ and $U_S > 0$).

Thus, workers in the private sector are assumed to receive wage premiums or compensating differentials for lack of desirable job characteristics such as employment stability, fringe benefits (pensions and medical insurance) and low effort requirement (or short effective working hours) which allows for second job holding. This leads to a representation of wage setting in the private sector in form of the following extended wage function

$$\ln W_i = a_0 + \sum_{j=1}^k a_j X_{ij} + b I_i + c B_i + d S_i + e_i \quad (5)$$

where $\ln W_i$ is the log of hourly wages for individual i ; a_0 is a constant term, X_{ij} are personal and job related characteristics and a_j are K parameters that capture their effects on wage setting; and b , c , and d are the compensating differentials for earnings instability, fringe benefits and probability of second job holding for a given job respectively.

From the first order conditions of the Lagrangian yielded by maximizing (4) subject to (5), it can be shown that:

$$\begin{aligned} b &= -U_I / U_W > 0 \\ c &= -U_B / U_W < 0 \\ d &= -U_S / U_W < 0 \end{aligned}$$

At the mean of the sample, the adjusted public-private total compensation premium (or disadvantage) in log terms can be calculated by subtracting private sector wage and non-wage compensating payments from public sector ones as follows:

$$AD1 = (\ln \bar{W}_p - \ln \bar{W}_r) - [b(\bar{I}_p - \bar{I}_r) + c(\bar{B}_p - \bar{B}_r) + d(\bar{S}_p - \bar{S}_r)] \quad (6)$$

¹⁷ The presentation of the utility and wage functions here are similar to McGoldrick (1995) and Bellante and Link (1982).

AD1 refers to adjusted public-private wage differential number 1 (to be distinguished from AD2 or adjusted public-private wage differential number 2, which will be discussed below). The bar above a variable refers to its mean. Thus $\overline{\ln W_p}$ is the mean log hourly wage of public sector employees in the public sector and $\overline{\ln W_r}$ is the mean log hourly wage of public sector employees if they were rewarded in same manner as comparable private sector employees.¹⁸ Thus the first term in the equation (6) measures the public-private wage premium for the average worker corrected for differences in personal and job characteristics. The second term adjusts the average premium for differences in the level of job instability between the two sectors. The third term adjusts for differences in fringe benefits and the fourth term adjusts for differences in probability of second job holding which allows for supplementing one's income.

To sum up, using the above methodology which assumes competitive behaviour in the private sector and hence payment of compensating wage differentials for the absence of desirable job attributes, it is possible to utilize information on the incidence (not value) of fringe benefits, second job holding, employment stability as well as the individual's household characteristics to obtain a direct estimate of the public-private differential in total rewards (as opposed to just a pay differential). The advantage of this methodology is that, unlike previous attempts in the literature, it does not have to rely on extraneous information and uses information commonly supplied in labour market surveys of this kind in getting an objective estimate of the value of non-wage rewards of jobs. It also does not rely on any strong assumptions regarding the constancy or proportionality of non-wage benefits to wages in the public or private sectors.

The validity of estimates obtained from this methodology, however, relies on the correct measurement of variables included in the compensating differential equation.¹⁹ There are also other factors that can arguably lead to an under-estimation of the magnitude of the required adjustment for non-wage benefits. For example, the possibility that there are other unmeasured non-pecuniary aspects, besides the ones considered here, cannot be excluded. Moreover, the fact that public sector employees tend to be more risk averse than their private sector counterparts may indicate that they value benefits such as job security more dearly than their private sector counterparts.²⁰ For those reasons, therefore, we

¹⁸ This is calculated by predicting log hourly wages for the sub-sample of public sector employees using the private sector parameter estimates.

¹⁹ Given the arbitrariness of the manner in which variables such as job stability are measured, the results obtained can best be interpreted as suggestive of the impact of adjusting public-private differentials for non-wage benefits, and not as providing precise estimates of the magnitude of such an adjustment.

²⁰ The rationale here is similar to the analysis of sorting equilibria in the occupational safety and health literature. The operation of a competitive labour market results in sorting workers, with danger-averse ones picking safer jobs and thereby lowering the implicit premium that employers must pay in wages in return for offering dangerous jobs (See Filer et. al, 2000, pp. 381-382). In the present analysis, more risk averse worker choose secure public sector jobs

interpret the adjustment yielded by AD1 as providing a lower bound on the magnitude of non-wage benefits. We also compute and report, for comparative purposes, an alternative adjustment AD2. This implements a simplified version of the Assaad (1997b) methodology that, subject to his assumptions discussed above, can be taken to provide a more comprehensive (and aggregate) estimate of non-wage benefits.

4 Data and Variable Specification

4.1 Comparison of 1987 LFSS and 1997 EIHS

This paper utilizes two separate micro survey data sets on Egypt. The first is the December round of the 1987 Egyptian Labour Force Sample Survey (henceforth, 1987 LFSS) conducted by CAPMAS. The Survey covers 12,000 households with questions directed to all members of the household. Given that there are on average five members per household, this amounts to about 61,000 observations. The question about wages inquires about net take home pay including all bonuses, overtime payments, incentives and allowances (but not non-wage benefits) in the most recent payment period. As the payment period is specified by the individual, one can use other questions asked (about the number of days worked per week and average number of hours worked per day) to calculate hourly wages.

The second data set used in this study is the 1997 Egypt Integrated Household Survey²¹ (henceforth 1997 EIHS) conducted along the same lines as the World Bank Living Standard Surveys. Besides wage employment, the survey covers a wide variety of topics such as subsidized and other food expenses, health and maternity history, farming and livestock ownership, non-farm family enterprises, credit and savings and sources of income of households. Despite such a wide variety of topics, it was administered in March-May 1997 to a smaller number of households than the 1987 LFSS (only 2,500) using a similar two stage stratification selection process by region. Separate questions about wages were directed to permanent and casual workers. permanent workers were asked to report their monthly wages, bonuses and incentives and allowances over the past 12 months and to state whether they also obtained pensions, subsidised medical care and insurance or contributed to employee provident funds. Casual workers, on the other hand, were asked about their daily wage over the past 12 months as well as the daily value of any non-cash benefits (such as meals) received. Both types of workers were also asked to report hours of work.

which lowers the compensating differential that the competitive private sector must pay to convince workers to accept less secure jobs.

²¹ The survey was undertaken by the International Food Policy Research Institute (IFPRI) in collaboration with the United States Agency for International Development (USAID), The Ministry of Agriculture and Land Reclamation of the Government of Egypt and the Ministry of Trade and Supply of the Government of Egypt.

Thus, the first major difference between the two surveys is in the way in which wages are inquired about. In order for them to be comparable, we use hourly wages in both cases and do not include fringe benefits or payment in kind. Other differences in the age, education, gender and sector distribution of the data sets can be seen from Table A1 and A2 in Appendix A. As the 1997 EIHS covered a smaller number of households (less than a quarter of sample size in 1987), it also registered a much smaller number of wage workers (2484 in 1997 as opposed to more than 9,000 in 1987). Before correcting for differences in productivity-related factors, the 1987 survey showed that on average male public sector employees earned about 10% less than the average private sector employee. In 1997, they earned 4% more. In the case of females, public sector employees had a 34% earnings advantage in 1987, compared to 50% in 1987.

Although the two surveys were based on nationally representative stratified samples, there were some differences in the stratification process. The 1997 EIHS survey was conducted on a self-weighted sample in terms of the distribution between urban and rural areas. The design of the 1987 survey, however, samples urban households at twice the rate of rural households. This is a deliberate sampling bias to capture more diversity in urban areas. Thus as can be seen from tables A1 and A2, 71% of the 1987 sample in metropolitan or urban areas compared to only 47% in the 1997 EIHS. Also, as public sector activities tend to be more concentrated in urban areas, the majority of the 1987 sample work in the public sector (68.6%) as opposed to only 43% in 1997. For the same reasons, there is a higher concentration of females in public sector activities.

However, despite the difference in the urban bias, the gender, educational, age and industry distributions of workers are remarkably similar in the two surveys. About one fifth of wage workers covered in the two surveys are female. Also in both surveys, the public sector workforce is much more highly educated (56% of males and more than 90% of females have intermediate, university and above education in the two surveys) than the private sector (less than a quarter of males and half of the females in the private sector). Moreover, in both years, public sector employment is very highly concentrated in social services²² (more than 50% of males and 80% of females) whereas private sector employment is much more evenly distributed. This pattern highlights the importance of adjusting public-private wage comparisons for differences in age, education and sector of economic activity.

As the stratification was non-proportional across governorates in both surveys, it was necessary to weigh observations by geographical region. Sampling weights were supplied within the 1997 EIHS, but not the 1987 LFSS. In the latter case, therefore, they had to be constructed from actual population figures in different governorates in Egypt (as published in the 1986 census) reported in Table B.1 in

Appendix B. The weighing of observations in both samples should serve to make them much more comparable in the distributional patterns described above.

Finally, as the 1997 EIHS was a much more general type of survey, it did not include certain dimensions that can be of use in sectoral wage analysis such as the differences between public enterprises and government within the public sector and across occupations. Although this information is available for 1987, the level of aggregation used in 1997 in the definition of the public sector is maintained and occupational controls are not used in the two periods in order to maintain comparability.

These differences aside, both data sets contain similarly defined variables on the personal characteristics of workers such as age, level of education,²³ governorate and cities of residence (from which one can consolidate regions of residence), job related characteristics (such as its sector of economic activity and stability of the contract) and household characteristics (such as marital status, number of children, household headship and presence of other wage workers) . In addition, the 1997 data set contains information on background variables such as parents' education and type of employment.

4.2 Specification of Variables Used in Sector Selection Equations

It is postulated that sector choice is influenced by age, level of education and controls for residence in various geographical locations/ Level of education and geographical controls were entered as a series of dummy variables, with omitted categories in the regressions being illiterate level and residence in metropolitan areas, respectively. A squared age variable is also included to account for any possible non-linear effect. In addition, it is reasonable to expect choice of sector of employment to be affected by household characteristics and family background variables that capture individual's taste or ease of access to either the private or public sector. These household variables (which do not appear in the wage equation) are used in combination to identify the sector selection equation.²⁴

²² This includes both public administration and other social services such as health and education.

²³ The levels of education were defined slightly different in the two surveys. In the 1987 LFSS, 7 levels were defined : illiterate, read and write, below intermediate (includes holders of primary and secondary school certificates), intermediate (includes general and vocational secondary school certificates), above intermediate (two year colleges, four year higher institutes), university and above university. A more detailed and self explanatory classification was provided in the 1997 EIHS. Nine levels were defined: no schooling, less than primary, primary, preparatory, general secondary, vocational secondary, higher institute, university and other. Thus, the levels of eligibility to the guarantee in the 1987 data set are: intermediate, above intermediate and university. Whereas in 1997, they are vocational secondary, higher institute and university.

²⁴ In sector selection/ wage determination empirical models, household-related variables (and especially parents background ones) are used as ideal candidates for identifying the sector selection from the wage equation. Conceptually,

Using the 1987 LFSS data, such background variables included marital status (for both males and females), whether individual is a household head (for males only) and whether other members in the household work in public sector (for females only).²⁵ Marital status is a binary variable with individuals currently married coded 1 and those not currently married coded 0. Similarly, the presence of other workers in the public sector and household headship variables are coded 1 if they are and 0 if they are not. Due to the availability of such information in 1997 EIHS data, additional parents background variables were also included in the sector choice equations for both males and females. These included whether the worker's father was a salaried permanent employee; and whether his/her father had a secondary level of education or above.

4.3 Definition of Index of Financial Responsibility Towards the Household

It is also possible to utilize some of the household level data to construct an index of financial-responsibility towards the family, which can serve as a proxy for the degree of risk aversion of the individual.²⁶ The index has an ordering from 1 to 3 based on two attributes: household headship and number of children. The definition and gender and sectoral distribution of the index using the 1997 data set is described in Table C.1 in Appendix C. It is recognised that such a simple index is not likely to capture the full extent, or the variation in the degree, of risk aversion amongst individuals. The present index was however preferred to more complicated versions on basis of best empirical fit and due to its transparency. Appendix C reports results of experimentation with the ordering properties of this index and analyses the sensitivity of estimation results to varying the assumptions underlying its definition.

The use of the index here is based on the presumption that the degree of financial responsibility towards one's family in a patriarchal society, like the Egyptian one, could to some extent be indicative of the willingness of individuals (especially males) to take risk in choosing unstable jobs. Thus although the simplicity of definition of the index may lead it to miss a lot of individual variation, its inclusion in the sector choice equation is still likely to capture the pressure for choosing a stable career often

this is based on the presumption that these variables tend to affect reservation wages (opportunity cost) and not actual wages (See Dustmann and Van Soest, 1997).

²⁵ This variable is included to capture labour market information networking effects. It was not included in the male equation on suspicion of endogeneity, for it is more likely in countries like Egypt that the wife's sector choice is influenced by her husband's rather than the other way around.

²⁶ There are no surveys that directly measure degree of risk aversion in Egypt and they are rare in other countries. One example from the US is Bellante and Link (1981) who estimate a model of public sector choice in the US labour market that use a measure of risk aversion developed in the University of Michigan's panel study of income dynamics. The survey reports an index of innate risk aversion for each household which is formulated on basis of answers to questions involving the condition and insurance of automobiles owned, the use of seat belts, the head's extent of medical coverage and smoking and drinking habits. The authors acknowledge the shortcoming that the index has been derived on the basis of revealed consumer behaviour for insuring against unexpected changes in a person's material

attributed to those with family responsibilities. With this understanding in mind, in what follows we will refer to individuals with a higher value of the index as more risk averse individuals.

The gender/ sector distribution of the index shown in Table C.1 show that there is a far greater concentration of risk averse individuals amongst males than females. This is to be expected in light of the importance of the attribute of household headship in the definition of the index.²⁷ This implies that this index is probably more appropriate in describing degree of males' financial responsibility towards the family, whereas it is not likely to be a good measure of the degree of risk aversion of females.²⁸ Amongst males, the figures in the table show that risk averse workers tend to be more concentrated in the public sector than in the private sector. As mentioned in Appendix C various measures of risk aversion were empirically tested and reduced to the three case version. Using the 1987 data set, further tests on the male sector selection equations showed that it reduced to the attribute of household headship, which was used instead as a significant determinant of sector choice. On the 1997 data set, the risk aversion variable itself was used as it added explanatory power to the equation.

4.4 Specification of Variables used in Wage Equations

Log hourly wages are postulated to be a function of human capital variables and regional dummies used in the sectoral choice equations, except experience (calculated as age minus the number of years of schooling minus the age of entry into school) was used instead of age. Also instead of household related variables, wages are expected to be influenced by job-related characteristics such as whether work is of a casual nature and eight dummy variables for industry or sector of economic activity of the job (agriculture being the omitted category).²⁹ Each of these variables again entered as a binary variable that is coded 1 if the characteristic is present for the individual and 0 otherwise.

5. Estimation Results

5.1 First Stage Sector Selection

Table 1 and 2 present estimates of the sector choice probit model and earnings functions in the public and private sectors using the 1987 and 1997 data sets respectively. Two sectoral selection equations

possessions and physical health. For that fact, it may partially reflect an ability, rather than a propensity, to avert risk. The simpler index based on household characteristics defined here is not subject to such a criticism.

²⁷ In fact only 4.7 % of the sample of working women are household heads (20 observations in total).

²⁸ An additional important reason for not including this index in the female equation is that its definition is also based on the attribute of having children. As decisions on sector choice and motherhood are likely to be simultaneously taken by women, the inclusion of this variable in the sector choice equation is likely to introduce endogeneity bias.

²⁹ Although the relationship between wage and industrial structure is thought to be complex (see Ryan, 1986 and Gross, 1990), roughly speaking the inclusion of these variables can be thought of as capturing some employer-side influences on wages such as differences in organisational structure, volatility of product demand and differences in product market conditions (Rees and Shah, 1995).

were estimated separately for males and females.³⁰ The predicted probabilities of selection in the two sectors by level of educational attainment for both males and females are summarised in Chart 1. Based on goodness of fit and prediction criteria, the model fits the data very well. The results indicate that the level of educational attainment is the most important determinant of sectoral selection in the Egyptian labour market. This is in line with expectations, as the presence of the public sector employment guarantee means that selection of most of the workforce in the government is a non-random explicit process that is dependent on education and year of graduation. The probability of selection into the public sector increases significantly with education, particularly after the intermediate level (level of eligibility to the government employment guarantee).

From Chart 1, it is interesting to note that for the reference worker³¹ at lower levels of education (less than below intermediate in 1987 and less than general secondary in 1997), the probability of selection in the public sector is higher for males than females. From then onwards, the probability of selection in the public sector becomes significantly higher for females. In 1987, this probability peaks for both males and females at the level of eligibility of the guarantee (i.e. the intermediate or secondary level). Two main changes in 1997 can be observed from the chart. First, for more highly educated workers, the probability of selection in the public sector drops in comparison to 1987 for males but remains at the same high level for females. Second, the gap between males and females is larger in 1997 and the peak observed at the level of eligibility to the guarantee is still observed for females but not males. In other words, the impact of the guarantee and the public sector's significance as a major employer of the educated workforce appears to have declined in the 1990s for males, but still remains quite important for females.

Age and its quadratic term also turn out to be highly significant. The probability of being in the public sector increases with age. Again this result is consistent with the extension of the waiting period for eligibility for public sector employment under the guarantee scheme. In contrast, the probability of selection in the private sector is declining with education and age for both males and females. Similar to Shaban et al (1993) and Assaad (1997a), it is found that the relationship of age and the probability of joining the public sector has a concave shape signifying that very young and very old workers tend to work in the private sector.

³⁰ A likelihood ratio test of the null hypothesis of equality of parameters in the male and female reduced form probit produced a test statistic of $\chi^2(19) = 374.98$ for 1987 and $\chi^2(14) = 1283.6$ in 1997. These are highly significant and indicate that the male sector selection equation is statistically different from that estimated for females in both years.

³¹ The chart is drawn for the reference worker who is a 35 year old worker resident in metropolitan areas.

Residence outside metropolitan areas increases the probability of joining the public sector in both 1987 and 1997, which is consistent with the operation of a less developed labour market in these regions. As for household characteristics, male household heads were more likely to join the private sector than the public sector. Marital status was significant only for females and it decreases the probability of joining the private sector. This might be indicative of private sector employers' reluctance to hire married females due to perceived direct and indirect costs associated with pregnancy and child rearing.

As mentioned above, in 1997, a different set of household related variables were used. These included educational background of the father (namely whether he had an above secondary level of education) and whether he was a salaried worker (this in fact signified that the father was a permanent wage worker) . The results showed that males with a highly educated father were more likely to join the public sector and those whose father was a salaried worker were less likely to join the private sector. For females, having a salaried worker father increased the probability of them joining the public sector. Presence of both attributes about father also decreases their probability of joining the private sector. Risk aversion (proxied by the index of financial responsibility towards the household) is a very significant determinant of male sector selection and is positively associated with selection in the public sector.³² Presence of other members of the household in the public sector is also a quite important determinant of female sector selection.

5.2 Wage Equations and Public-Private Wage Differentials

Four wage functions were estimated for the two sectors and two sexes, first by OLS and then simultaneously with the sector selection equations by maximum likelihood methods. The results of the OLS estimation for 1987 and 1997 are shown in Appendix D. The results confirm that there are distinct wage setting mechanisms in the public and private sector. As can be seen in the bottom panel of Tables D.1 and Tables D.2, Chow tests reject the equality between coefficients of the two sectors at the 1% level of significance for males and females in the two years. Comparison with MLE estimates, shown in Tables 1 and 2, confirm the presence of sample selection bias.³³ Thus in what follows we focus comments on the selectivity corrected results but compare the public-private wage differentials yielded from both methods of estimation at the end of this sub-section.

³² In order to facilitate the interpretation of the results, and although the risk aversion variable was defined in an ordinal fashion, it was included in the estimation equation a continuous variable. A log-likelihood test of the validity of imposing this restriction instead of using a series of dummy variables for each state was conducted. The null hypothesis that the disaggregated version is a superior specification was rejected.

³³ As shown in Tables D.1 and D.2, Ramsey (1969) RESET specification tests rejected the null hypothesis of correct specification (no omitted variables) at the 1% level of significance for both the male and female equations in 1987 and for the female (but not the male) equation in 1997.

Parameter estimates of the sample selection terms show that in 1987 there was positive selection in the public sector for both males and females, implying that the unobserved characteristics that increase the probability of public sector employment also had a positive impact on wages. There was also positive selection in the private sector for females. In 1997, this was no longer the case as there was more of a random selection in the public sector. Both male and female workers with higher productivity than average are selected in the private sector. This is consistent with the weakening impact of the public sector employment guarantee on the labour market.

The results in Tables 1 and 2 also show that labour market experience is highly significant in both its linear and quadratic terms. The wage experience profile is steeper in the public sector, implying a higher impact for an additional year of experience in the public than in the private sector. There is however more (concave) curvature in the wage-experience profile in the private sector. This is clearly demonstrated in Charts 2 and 3, which show the predicted wage-experience profile for the reference worker³⁴ for the two years under study. Although it was not possible to distinguish between the two segments of the public sector (public enterprises and the government) in estimating the wage-experience profile, the results are presented for manufacturing and social services separately. This can give an indication of differences in wage setting between the two as the bulk of employment in the government is in social services and that in public enterprises is in manufacturing in Egypt.

The charts also show that in 1987, after correcting for the level of education, regional and job related characteristics, there was still a considerable wage gap in favour of the private sector for males in Egypt with less than 30 years of experience. Afterwards, wages were higher in the public sector. This pattern was the case in both manufacturing and social services, except the wage-experience profile is slightly higher in the former sector. For females, the wage gap in favour of the private sector existed but was much smaller for females in manufacturing. In social services, because of the significant returns to seniority, the gap turned into a positive differential in favour of the public sector for more experienced females (more than 20 years of experience). In 1997, the same results on the steepness and curvature of the wage-experience profiles in the two sectors were still held, but now public wages are higher in the public than private sectors for females at all experience levels in both manufacturing and social services. They were also higher for males with more than 10 years of experience in manufacturing (public enterprises) and with more than 30 years of experience in social services (government).

³⁴ The reference worker is a permanent one holding an intermediate or vocational secondary school certificate and residing in a metropolitan area.

As for the impact of the educational variables on wage determination, it can be seen from the results in the tables that in both years returns to education were higher in the public than in the private sector. In 1987, returns to education were also higher for females than males in both sectors. The situation was reversed in 1997, with returns to education higher for males than females. Only some of the coefficients on the regional dummies were significant and they generally showed that public sector employees resident outside metropolitan areas had a wage premium. In contrast, private sector employees resident out of cities had an earnings disadvantage. The coefficients on industry dummies were mostly insignificant for females due to small sample size in some industries. For males, industry variables turn out to be more relevant in the public sector, implying that that within public sector pay differences do not necessarily reflect human capital factors as they do in the private sector.

Based on the wage equation estimates, predicted mean public-private wage differentials (corrected for differences in characteristics) are presented in Table 3 across levels of educational attainment for 1987 and 1997. The figures show that after correcting for differences in characteristics and selectivity, in 1987 there was an average earnings disadvantage for male public sector employees in Egypt when compared to their private sector counterparts (amounting to around 44% of public sector wages). Females on the other hand, had a small earnings advantage or public sector wage premium (around 10%), mainly due to their advantage in social services.

In 1997, the males disadvantage in manufacturing turned to an advantage of 9% and it was reduced in social services to -10%. On average, Males had a 10% pay disadvantage in the public sector. Females, on the other hand, had clear and large wage premiums (on average 93%) at all educational levels in the public sector. Unlike males, premiums were higher in social services than in manufacturing. In other words, the comparison of the results from the two years indicate that relative earnings in the public sector have improved for both males and females when compared to 1987. Males still face a small disadvantage in social services (government), but now earn pay premiums in manufacturing (public enterprises). Females have pay advantages in both segments of the public sector, but these are much larger in social services (government).

Given the small size of the female wage worker sample in 1997 (only 124 observations in the public sector and 299 in the private sector), the results on the size of the pay differential for females in that year should be interpreted with care. Comparison of the magnitude of the public-private pay differentials based on selectivity corrected equations (reported in Table 3) and those based on OLS estimates (reported in the second panel of Tables D.1 and D.2), show that the latter over-estimated male disadvantages and under-estimated the female advantage in the public sector. The magnitude of the difference is particularly large in case of the female 1997 equations (the OLS estimates showed

only a 0.23 log wage points or 26% public sector advantage compared to the 93% advantage obtained from maximum likelihood estimation). This calls for additional caution in interpreting the maximum likelihood estimates for females.³⁵

5.3 Second Stage Sector Selection

In order to gain more insights into the impact of the guarantee scheme on sector selection, predicted wage differentials can be used to re-estimate the probit equations for sector choice. Using the estimated wage equations, wages are predicted for every individual in both sectors. From this, a new variable is constructed which estimates the individuals' relative earnings in the public sector and it is included in the extended version of the sector selection. Note that as wage differentials are included separately, the coefficients of the variables can be interpreted as the impact of the variable on the worker valuation of non-pecuniary aspects of public sector jobs which influences their choice, as well as the impact of the variables themselves (not related to wage or non-pecuniary benefits) in influencing sector choice. The latter effects can then capture how certain worker characteristics relate to the institutional selection mechanism at work (i.e the public sector employment guarantee).

Tables 4 and 5 detail the specification and results of the second stage probit equation for both males and females. Like in the first stage estimates, the probability of joining the public sector still increases with age (with a concave shape) and education. In 1997, risk aversion and higher education of fathers still creases the probability of males joining the public sector. And presence of other male members of the household in the public sector also increases this probability for females. It is interesting to note that the magnitude of parameter estimates attached to

There are some important changes between the first stage and second stage in 1987 and 1997, however. Regional dummies become mostly insignificant which point to the importance of inter-regional wage differentials for sector choice. Moreover, in 1987, the inclusion of the wage differential variable reduces the impact of age and education on sector selection (except for higher levels of education for females). Whereas in 1997, the opposite is true as the effect of age becomes stronger for females and the impact of education is accentuated at all levels for both males and females. Thus in 1997, although highly educated males and females are still likely to choose public instead of private employment, the second stage estimates show a stronger tendency for this as the level of education increases. These results can be taken to indicate that non-wage factors and institutional arrangements

³⁵ In fact, recent Monte-Carlo studies, such as Nawata (1993), found that based on mean square error criterion, the Heckman is not to be recommended when the sample size is small. In such cases, OLS estimates can in fact be more efficient and robust to deviation of underlying model assumptions.

(specifically the length of the waiting period before entry after graduation), as opposed to wage incentives play a predominant role in selection in public sector employment.

5.4 The Probability of Second Job Holding

To examine the determinants of second job holding, a probit equation is estimated in which the dependent variable equals one if the person has a second job and equals zero otherwise. Second job holding is postulated to be dependent on age, years of schooling, region of residence, industry and gender. A dummy variable is also included to indicate whether a person is a public sector employee or not. The marginal coefficient to that variable captures the difference in the probability of second job holding between the public and private sectors and thus can be used directly in the adjustment for non-wage benefits in equation (6).

The estimation results presented in Table 6 generally confirm the expectation that the probability of holding a second job increases with age and has a concave shape (i.e. the phenomenon is concentrated in middle age groups who tend to have high levels of family responsibility). It decreases with years of schooling and is less likely for females. Residents of lower Egypt (compared to metropolitan areas) and those working in agriculture, social services and the electricity sector are the most likely to hold second jobs. Finally, being a public sector employee is a very significant determinant and it increases the probability of second job holding by 7.2% when compared to the private sector employee.

5.5 Compensating Differentials and the Adjusted Public-Private Wage Differentials

Finally, in order to implement the adjustment in equation (6), a compensating differential equation for the private sector (similar to equation 5 above) is estimated. Due to the lack of information on the more important and specific benefits for females (maternity leave, unpaid leave to join husband abroad, etc.), the estimation of the equation and hence the adjustment to the differential is limited to males. Since females appear in practice to have an even higher preference for the public sector, one can safely assume that the adjustment for males also represents a lower bound for females. Results are also presented in Table 5 (left hand side panel).

As the impact of age and level of educational attainment is similar to the previous estimates in Table 2, comments will be limited to the three additional variables introduced to capture non-pecuniary aspects of the job. Job instability was measured as the coefficient of variation of number of days worked per year.³⁶ Fringe benefits were denoted by a dummy that was equal to one if the individual had access to pensions, medical insurance and employee provident funds on the job. And probability of

³⁶ This is in line with the empirical literature on employment stability (see for example, Feinberg, 1981).

second job holding is predicted from the equation estimates above at the mean individual characteristics but for given job characteristics (industry, sector and region).³⁷

Note that there is an element of arbitrariness in the measurement of all of those non-pecuniary aspects. Second job holding is widely believed to be under-reported in surveys like this, due to its illegality in some cases in the public sector or the general reluctance of respondents to report sources of supplementary income. Also the list of fringe benefits reported above is not exhaustive. Subsidised clothing, housing, food and enforcement of maternity leave policy etc. are additional benefits widely offered in the public sector but not measured in the 1997 survey. Finally, the variation in number of days worked per year by industry/region is only one amongst many possible measures of job security and may reflect differences in the requirements of jobs rather than their instability.³⁸ This survey, however, does a better job than others in the Egyptian case in inquiring about the information needed to construct these three variables that can at least give an indication of the extent of coverage of non-pecuniary benefits in the public and private sectors.

As can be seen from Table A.2, the mean of all three of these variables indicate that their incidence is higher in the public sector. In particular, there is a near universal coverage of fringe benefits (pensions, medical insurance, employee provident fund) in the public sector, compared to only 10% of males and 7% of females in the private sector. This highlights the importance of correcting wage differentials for these aspects. The parameter estimates presented in Table .5 for the three variables were all highly significant and had the expected signs. They indicate that for every unit increase in the variation of employment, hourly wages in the private sector increase by 0.5 log points. If probability of second job holding increases by 1%, log wages decrease by 0.01. And presence of fringe benefits decreases wages in the private sector by 0.12 log points.

These estimates can be used to present an adjustment of the wage differential, which corresponds to AD1 presented in Section 4 above. A second adjustment AD2 is presented which is comparable to Assaad (1997b) and is based on identifying the marginal workers in the public sector and assuming their rents (including non-wage benefits) are at least equal to zero. This yields a lower bound on the

³⁷ This is because second job holding as a non-pecuniary advantage is a job-related aspect for a given primary job.

³⁸ Layoff rates are the usual measures used in the US and UK literature. Unemployment figures supplied in this survey as well as other labour force sample surveys in Egypt are mostly of the new-entrant type (i.e. the unemployed have no previous experience) and cannot be interpreted as layoff rates.

proportion of non-wage benefits to public sector wages that is used to adjust the mean wage differential.³⁹

The results of those two adjustments are presented in Table 7 for males at the mean of experience and other attributes in the sample, but at different levels of educational attainment. The figures show that the adjustment for fringe benefits and the probability of second job holding increases the wage differentials by 18% in manufacturing and by 19% in social services. The adjustment for instability is higher for lower educated groups, and also higher in manufacturing than in social services. This is indicative of the high turnover in manufacturing in the private sector. For all sectors of economic activity, the adjustment increases the premium from -10% to 42%. Somewhat higher estimates were obtained using Assaad's methodology (AD2). The marginal workers were identified as primary school leavers located in trade who have a disadvantage of 67% in the public sector. Assuming these workers are making at least zero rents in order for them to still wish to remain in the public sector, then the figure represents the proportion of non-wage benefits to wage benefits for this group of workers. Under the assumption that this proportion is constant for employees this can be used to adjust the mean public-private wage differential so it is equal to 57% of public wages.⁴⁰

To sum up, the adjustment for non-pecuniary benefits enhances the manufacturing (public enterprise) wage more than it does to social services (government). For all sectors of economic activity, the adjustment employing different methodologies yields an estimate of the public-private differential for males in the range of 42%-57% in 1997. Due to the lack of information on female specific benefits, the adjustment to the differential was limited to males. But since females appear in practice to have an even higher preference for the public sector, the above adjustment for males may be taken to represent also a lower bound estimate for females. In general, due to the reasons cited in Section 3 above, the present adjustments may still underestimate the magnitude of the actual public sector advantage in non-wage benefits. But this, arguably, can be the case with all measures of non-wage benefits, including ones that directly ask each individual to evaluate them in monetary terms. It is argued here that given the importance of non-pecuniary aspects in the overall public-sector compensation package, it is still important to incorporate whatever information is available about them in analyses of public-private wage differentials but perhaps interpret them only as partial adjustments.

Conclusion

³⁹ The marginal worker is defined as one with the largest negative public-private wage differential. Like Assaad (1997b), we limit this to workers in the beginning of their career (i.e. less than 35 years in age) as it is likely to be much more difficult for workers with a long tenure to change sectors.

⁴⁰ In calculating rents, Assaad (1997b) also integrated over the life time of workers. We use only the observed differential in 1997, as the author himself noted, the rank between this differential and the difference between the lifetime earnings for public and private employees is likely to be very similar.

This Paper considers the determinants of male and female pay in the public and private sectors in Egypt employing cross-sectional household data in 1987 and 1997. The computation of sector-based wage differentials, that took account of differences in personal and job characteristics, was based on the estimation of a joint model of sector allocation and wage determination. The results are highly consistent with the institutional attributes of the system of public sector employment and suggest that there are indeed significant differences between public and private choice decisions and earnings structures in Egypt.

The level of educational attainment emerged as a very important determinant of sectoral selection in the Egyptian labour market. In both 1987 and 1997, the probability of selection into the public sector increases significantly with both age and education, particularly after level of eligibility to the government employment guarantee, and is higher for females than for males. These results are consistent with the effective operation of the guarantee for more highly educated workers and with time based queuing for guaranteed positions. Comparison of the 1987 and 1997 results highlight that the strong impact of the public sector employment guarantee on the labour market in the 1980s was weakened in the 1990s for males but remains important for females. Moreover, risk averse individuals (proxied by those who have greater financial responsibility in their households) have a greater probability of choosing public sector than private sector employment. Again this is in line with the importance of job security for public sector employees and highlights the importance of adjusting public-private wage comparisons for the high degree of job instability in the private sector.

The estimates of wage equations themselves show that returns to age and education are higher in the public than in the private sector and residence outside metropolitan areas is associated with a premium in the public sector. Moreover, for males, industry variables turn out to be more relevant in the public sector, implying that that within-sector pay differences do not necessarily reflect human capital factors as they do in the private sector. All these results are in line with institutional wage setting in the public sector, the reliance of basic wages setting on the level of educational attainment and increments on seniority as well as the payment of allowances for work outside the city. Estimates of the public-private differentials, correcting for differences in characteristics and selectivity, indicate a public sector disadvantage for males and a small advantage for females in 1987.⁴¹ Relative public sector wages improved for both males and females in 1997, and when adjustments for non-wage benefits are included, public sector premia are observed in all segments of the public sector for both males and females. It also emerged that the single most important adjustment factor leading to the change in the

⁴¹ The result on the coexistence of male disadvantages with female advantages in the public sector are consistent with those obtained in previous studies on Egypt, Jordan, UK and Germany. The magnitude of the male disadvantage

differential is the value of job stability, which drives up the differential in favour of the public sector, particularly in manufacturing.

REFERENCES

- Assaad, R. 1997a. "The Effects of Public Sector Hiring and Compensation Policies on the Egyptian Labour Market" *The World Bank Economic Review*, Vol. 11
- Assaad, R. 1997b. "An Analysis of Compensation Programs For Redundant Workers In Egyptian Public Enterprise" Economic Research Forum Working Paper no. 9701, Cairo.
- Bellante, D. and J. Long . 1981. "The Political Economy of Rent-Seeking Society: the Case of Public Sector Employees and their Unions." *Journal of Labour Research*, Vol. II: 1-13.

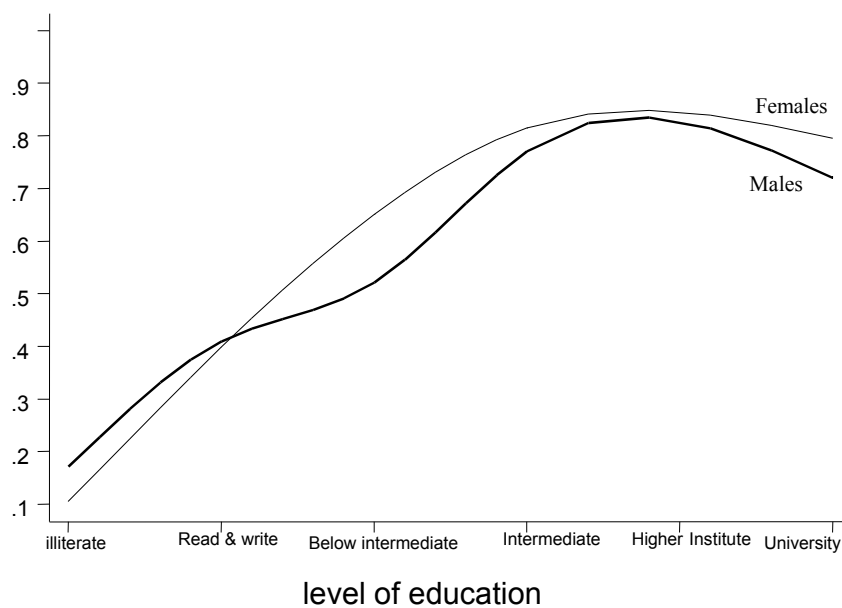
obtained here for 1987 is also close to the results obtained by Assaad (1997a) for 1988. Our estimate of the female advantage (0.1) are much lower than his.(0.79-0.9).

- Bellante, D. and Link, A. 1982. "Worker Responses to a menu of Implicit Contracts." *Industrial and Labour Relations Review*, Vol. 35: 590-599.
- Bellante, N and A Link. 1981. "Are Public Sector Workers More Risk Averse than Private Sector Workers?" *Industrial and Labour Relations Review*, Vol. 34: 408-412.
- Belman, D. and J.S. Heywood .1989. " Government Wage Differentials: a Sample Selection Approach" *Applied Economics*, Vol. 21: 427-438.
- Bennell, P. 1981. "Earnings Differential Between Public and Private Sectors in Africa: The Cases of Ghana, Kenya and Nigeria" *Labour and Society*, Vol. 6(3): 221-241
- Central Agency for Public Mobilisation and Statistics. 1990. "Results of the Labour Force Sample Survey, Fourth Quarter 1988: Detailed Employment Characteristics." Labour Information System Project, CAPMAS, Cairo.
- Colclough, C. 1997. *Public Sector Pay and Adjustment: Lessons from Five Countries*. London and New York: Routledge.
- Dustmann, C. and A. Van Soest. 1997. "Wage Structure in the Private and Public Sector in West Germany," *Fiscal Studies*, Vol. 18: 225-248
- Fathy, S. 1988. "The Economics of Government Employment in Egypt" in A. Ghanem (ed.), *Government Employment in Egypt*. Cairo : Centre for Political Research and Studies, , Cairo University. [in Arabic]
- Fehr, G., E. Kirchler, A. Weichbold and S. Gächter. 1998. "When Social Norms Overpower Competition: Gift Exchange in Experimental Labour Markets." *Journal of Labour Economics*, Vol. 16: 324-351.
- Feinberg, R. 1981. "Earnings-Risk as a Compensating Differential" *Southern Economic Journal*, Vol.48.
- Filer, R., D. Hamermesh and A. Rees. 2000. *The Economics of Work and Pay*. London: Harper Collins and College Publishers.
- Gross, M. 1990. "Labour Market Segmentation : The Role of Product Market and Industry Structure in Determining Labour Market Outcomes. A Test for the United Kingdom" PhD Dissertation, Faculty of Economics and Politics, University of Cambridge, Cambridge, U.K.
- Gyouroko, J. and J. Tracey. 1988. "An Analysis of Public and Private-Sector Wages Allowing for Endogenous Choice of Both Government and Union Status" *Journal of Labour Economics*, Vol. 6: 229-253.
- Handoussa, H. 1990. "The Burden of Public Sector Employment and Remuneration: The Case of Egypt in W. Van Ginneken, (ed.), *Government and its Employees*. Aldershot, U.K: Avebury.
- Hartoog, J. and H. Oosterbeek. 1993."Public and Private Sector Wages in the Netherlands." *European Economic Review*, Vol. 37: 97-114.
- Heckman, J. 1976. "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited dependent Variables and a Simpler Estimator for Such Models, *Annals of Social Measurement* 5 (September): 475-492.
- Heckman, J. 1979. "Sample Selection as Specification Error" *Econometrica*, Vol. 47:153-161.
- Heller, P.S. and A. Tait, 1983. *Government Employment and Pay: Some International Comparisons*, IMF Occasional paper no. 24. Washington D.C.: IMF.
- Institute of National Planning. 1979. "Factors affecting Public Sector salaries Policy in Egypt." Cairo: Institute of National Planning [Arabic]
- Lee, L. 1982. "Some approaches to the Correction of Selectivity Bias" *Review of Economic Studies* 49 (July):355-72.
- Machlup, F. 1974. "Proxies and Dummies." *Journal of Political Economy*: Vol. 82: 892.
- Maddala, G. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press
- McGoldrick, K. 1995. "Do Women Receive Compensating Wages for Earning Uncertainty?" *Southern Economic Journal*, Vol. 62
- Nawata, K. 1993. "A Note on the Estimation of Models with Sample Selection Bias." *Economic Letters*, Vol. 42: 15-24.

- Nunberg, B. 1985. "Public Sector Pay and Employment Reform." World Bank Working Paper no. 113. Washington D.C: World Bank.
- Ramsey, J. 1969. "Tests of Specification Errors in Classical Linear Least Square Regression Analysis." *Journal of the Royal Statistical Society, Serie B.*, Vol. 31: 350-371
- Rees, H and A, Shah. 1995. " Public-Private Sector Wage Diffierentials in the U.K." *The Manchester School*, Vol. LX111: 52-68.
- Rosen, S. 1986. "The Theory of Equalising Differences" in O. Ashenfelter and R. Layard (eds.) *Handbook of Labour Economics*. Amsterdam: North-Holland.
- Ryan, P. 1986. "Primary and Secondary Labour Markets" in J. Eatwell, M.Milgate and P. Newman (eds.), *The New Palgrave: A Dictionary of Economic Theory and Doctrine*. London: Macmillan.
- Shaban, R., R. Assaad and S. Al-Qudsi, 1993. "Labour Markets in Arab Countries: A Survey," paper presented to the First Annual Conference on Development Economics, Initiative to Encourage Economic Research in the Middle East and North Africa, Cairo, June 4-6.
- Starr, G. 1983. "Wages in the Egyptian Formal Sector" Geneva Technical Paper no.5 of the ILO/UNDP comprehensive employment mission to Egypt, ILO, Geneva.
- Stelcner, M. And J. Van Der Gaag, 1989."A Switching Regression Model of Public -Private Sector Wage Differentials in Peru:1985-1986." *Journal of Human Resources*, Vol. XXIV: 545-559.
- Tansil, A. 1999. " Public-Private Employment Choice, Wage Differentials and Gender in Turkey", ERF working paper number 9913 (Cairo: The Economic Research Forum For Arab Countries, Turkey and Iran)
- Terrell, K. 1993. "Public-Private Wage Differentials in Haiti: Do Public Servants Earn a Rent?" *Journal of Development Economics*. Vol. 42, 293-304
- Van der Gaag, J. and Wim Vijerberg, 1988. "A Switching -Regression Model for Wage Determinants in the Public and private sectors of a Developing Country, *Review of Economics and Statistics*, Vol. 70: 244-252.
- Zaytoon, M. 1991. "Earnings and the Cost of Living: An Analysis of Recent Developments in the Egyptian Economy." in Handoussa, H. and G. Potter (eds). *Employment and Structural Adjustment: Egypt in the 1990s*. Cairo: The American University in Cairo Press.

Chart 1. Estimated Probability of Selection in the Public Sector by level of Educational Attainment (1987&1997)

A. 1987 LFSS



B. 1997 EIHS

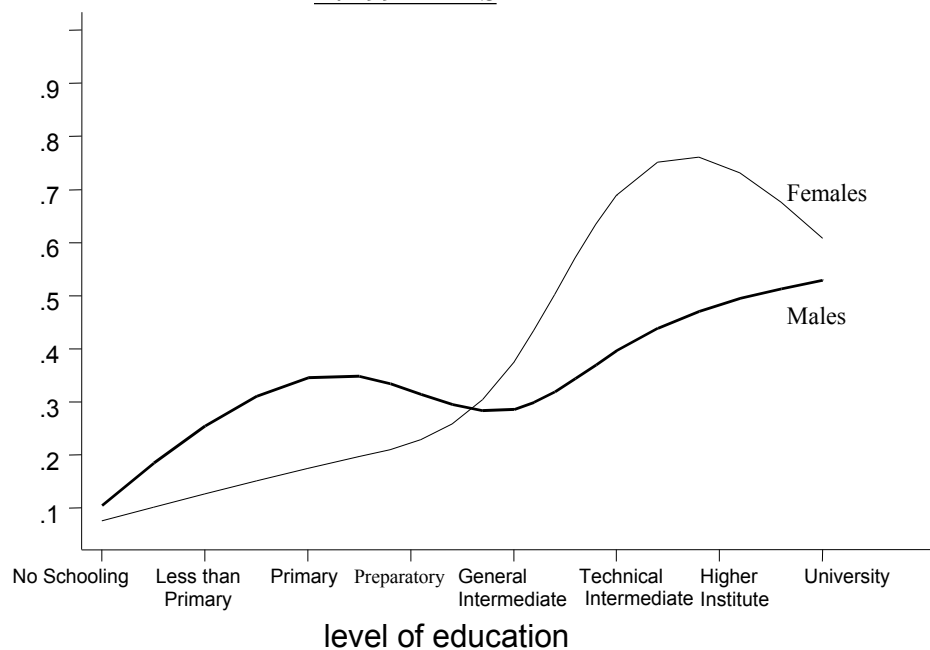
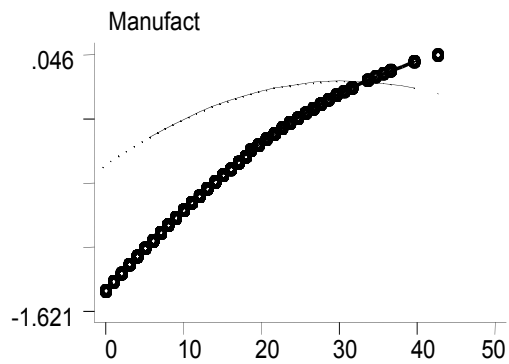


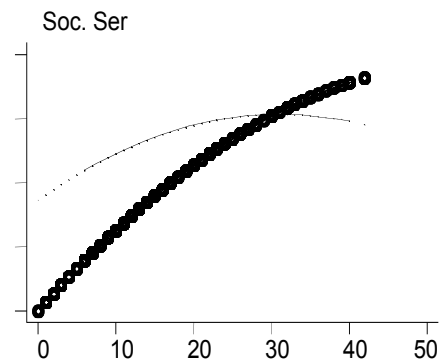
Chart 2. Estimated Wage-Experience Profiles, 1987

A. Males

• Public

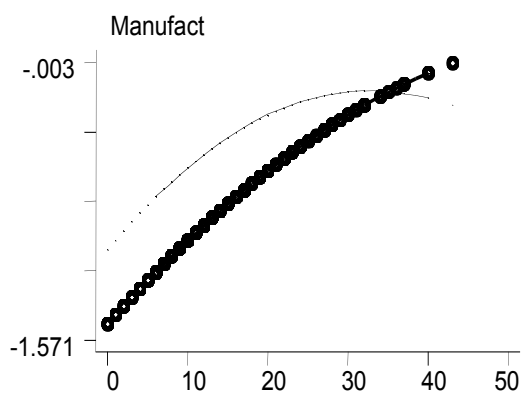


• Private



B. Females

• Public



• Private

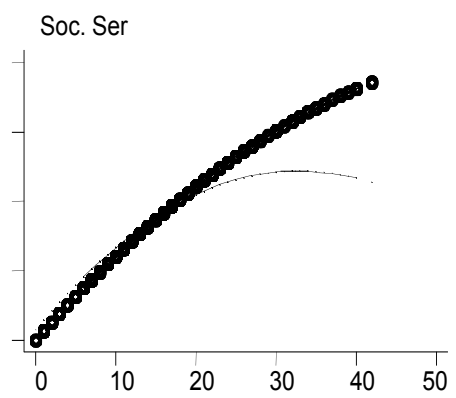
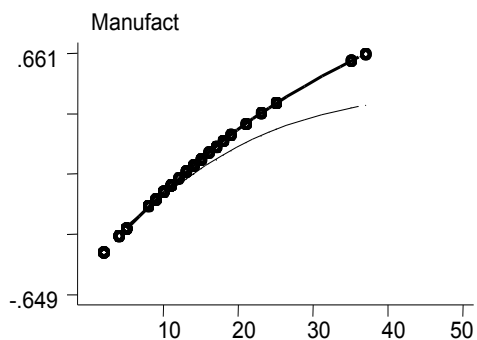


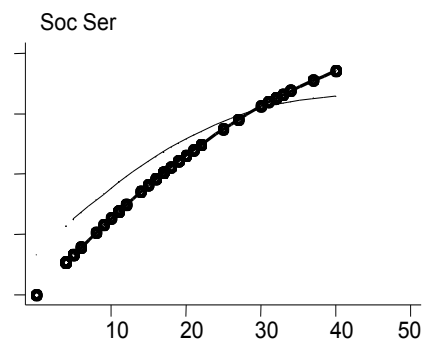
Chart 3. Estimated Wage-Experience Profiles, 1997

A. Males

• Public

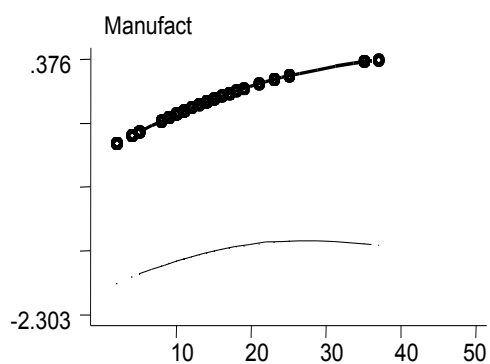


. Private



B. Females

• Public



. Private

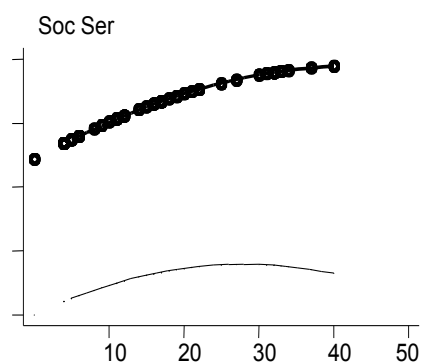


Table 1: Maximum Likelihood (Probit) Estimates of the Selection and Wage Equations 1987

Variable	MALES								FEMALES							
	Public				Private				Public				Private			
	selection		wage		selection		wage		selection		wage		selection		wage	
Constant	-4.304	***	-2.585	***	4.155	***	-0.927	***	-5.051	***	-2.803	***	4.531	***	1.499	***
	(.198)		(.061)		(.211)		(.054)		(.523)		(.119)		(.488)		(.193)	
Age	0.164	***			-0.154	***			0.186	***			-0.164	***		
	(.0111)				(.012)				(.030)				(.027)			
Age2	-0.002	***			0.001	***			-0.002	***			0.002	***		
	(.0001)				(.0001)				(.0004)				(.0003)			
Experience			0.057	***			0.035	***			0.051	***			0.046	***
			(.002)				(.004)				(.003)				(.008)	
Experience2			-0.001	***			-0.001	***			-0.0004	***			-0.0007	***
			(.00004)				(.00006)				(.0001)				(.0001)	
Educational level																
Read and Write	0.719	***	0.249	***	-0.726	***	0.022		0.994	***	0.284	***	-0.700	***	-0.142	
	(.043)		(.027)		(.044)		(.033)		(.213)		(.092)		(.210)		(.138)	
Below intermediate	1.003	***	0.653	***	-1.022	***	0.137	***	1.621	***	0.976	***	-1.273	***	0.305	*
	-0.072		(.0400)		(.074)		(.059)		(.261)		(.101)		(.261)		(.183)	
Intermediate	1.673	***	1.030	***	-1.825	***	0.286	***	2.134	***	1.182	***	1.970	***	0.369	***
	(.054)		(.036)		(.055)		(.091)		(.146)		(.074)		(.139)		(.122)	
Higher Institute	1.908	***	1.271	***	-2.154	***	0.240		2.672	***	1.348	***	-2.562	***	0.747	***
	(.105)		(.046)		(.113)		(.146)		(.0229)		(.079)		(.250)		(.301)	
University	1.418	***	1.337	***	-1.570	***	0.535	***	2.059	***	1.555	***	-1.884	***	0.917	***
	(.061)		(.038)		(.063)		(.095)		(.150)		(.076)		(.143)		(.134)	
Above University	1.817	***	1.899	***	-2.174	***	0.678	*	2.176	***	2.058	***				
	(.216)		(.072)		(.288)		(.353)		(.4033)		(.108)					

Region																
Urban Lower Egypt	0.156	**	0.038		-0.152	**	-0.115	***	0.541	***	0.040		-0.612	***	-0.038	
	(.066)		(.028)		(.070)		(.042)		(.135)		(.029)		(.150)		(.126)	
Rural Lower Egypt	0.239	***	-0.040	*	-0.201	***	-0.103	***	0.406	***	0.093	***	-0.133		0.003	
	(.048)		(.023)		(.050)		(.031)		(.122)		(.033)		(.124)		(.127)	
Urban Upper Egypt	0.296	***	0.082	***	-0.292	***	-0.134	***	0.679	***	0.142	***	-0.779	***	-0.260	
	(.073)		(.029)		(.076)		(.046)		(.153)		(.031)		(180)		(.189)	
Rural Upper Egypt	-0.010		-0.082	***	0.085	*	-0.123	***	0.690	***	0.170	***	-0.687	***	0.331	*
	(.042)		(.022)		(.044)		(.030)		(.191)		(.042)		(.217)		(.178)	
Job Characteristics																
Mining			0.448	***			0.512	***			0.342					
			(.081)				(.143)				(.251)					
Manufacturing			0.065	***			-0.053				0.139				-0.052	
			(.035)				(.034)				(.094)				(.147)	
Electricity, Gas & Water			-0.062				0.167				0.004					
			(.051)				(.138)				(.116)					
Construction			0.169	***			0.288	***			0.227				0.258	
			(.044)				(.029)				(.159)				(.165)	
Trade			0.102	***			-0.146	***			0.057				-0.302	*
			(.050)				(.045)				(.112)				(.175)	
Transport			0.031				0.115	***			0.084				-0.092	
			(.039)				(.041)				(.105)				(.295)	
Finance			0.135	**			-0.042				0.145				-0.254	
			(.057)				(.093)				(.109)				(.247)	
Social Services			-0.068	**			-0.269	***			0.048				-0.512	***
			(.031)				(.042)				(.085)				(.147)	
Casual Work			0.369	*			0.034				-0.310				0.026	
			(.195)				(.027)				(.268)				(.107)	

Household Characteristics									
Household Head	-0.041 (.051)			0.116 (.057)	*				
Male Public Employee in the Household						0.329 (.073)	***	-0.495 (.083)	***
Married	-0.086 (.057)			-0.093 (.065)		0.010 (.107)		-0.315 (.120)	***
Sector Selection Term		0.372 (.0173)	***		-0.021 (.0604)		0.253 (.0268)	***	0.018 (0.0007)
Sample Size	7309					1796			
Log Likelihood	- 1113.428			- 1508.252		- 359.812		- 230.918	
Goodness of Fit - - c 2 (36) (Prob > c 2)	324.410 (0.000)			2219.36 (0.000)		760.010 (0.000)		650.520 (0.000)	

Source: CAPMAS, 1987 LFSS.

Notes: The dependent variable in the sector selection equation is a binary, which is equal to 1 if individual, is located in the public sector and equal to 0 if located in the private sector. In the wage equation it is log hourly wages in 1987 Egyptian Pounds. Standard errors (robust against heteroscedasticity using the White (1990) procedure) are in parenthesis. Reported standard errors for the wage equation are also based on the asymptotically corrected variance matrix for using generated selection terms as regressors. * denotes significance at the 10 percent level, ** denotes significance at the five percent level and *** denotes significance at the 1 percent level. The goodness of fit is a log-likelihood ratio test of the null hypothesis that the parameters of the model are jointly equal to zero (see Greene, 2000, pp. 152-153 for a full description).

Table 2: Maximum Likelihood (Probit) Estimates of the Selection and Wage Equations 1997

Variable	MALES								FEMALES							
	Public				Private				Public				Private			
	selection		wage		selection		wage		selection		wage		selection		wage	
Constant	-6.001	***	-1.508	***	2.800	***	-0.900	***	-4.470	***	-0.864	***	1.550	***	-1.390	***
	(.416)		(.266)		(.288)		(.117)		(.787)		(.281)		(.786)		(.394)	
Age	0.201	***			-0.069	***			0.156	***			-0.015	***		
	(.020)				(.0139)				(.040)				(.044)			
Age2	-0.002	***			0.001	***			-0.001	***			-0.0001	***		
	(.0002)				(.00016)				(.0005)				(.0006)			
Experience			0.045	***			0.041	***			0.044	***			0.037	**
			(.008)				(.004)				(.009)				(.016)	
Experience2			-0.037	***			-0.049	***			-0.049	***			-0.066	**
			(.013)				(.007)				(.022)				(.031)	
Educational level																
less than Primary	0.392	***	0.246	**	-0.319	***	0.117	*	(.356)		-0.387	*	-0.603	***	-0.573	**
	(.149)		(.104)		(.123)		(.066)				(.211)		(.280)		(.250)	
Primary	0.859	***	0.257	**	-0.635	***	0.250	***	0.867	**	-0.203	***	-0.728	***	-0.266	
	(.144)		(.107)		(.122)		(.037)		(.347)		(.205)		(.302)		(.267)	
Preparatory	0.860	***	0.538	***	-0.958	***	0.311	***	0.117		-0.233		-0.893	***	-0.105	
	(.167)		(.121)		(.147)		(.098)		(.593)		(.346)		(.441)		(.380)	
General Secondary	0.786	***	1.098	***	-1.260	***	-0.089		0.883		0.203		-0.111	***	0.792	*
	(.250)		(.161)		(.245)		(.189)		(.591)		(.271)		(.518)		(.429)	
Vocational Secondary	0.984	***	0.705	***	-0.791	***	0.256	***	1.510	***	0.105		-1.620	***	-0.833	***
	(.134)		(.122)		(.114)		(.076)		(.258)		(.175)		(.252)		(.280)	
Higher Institute	1.600	***	0.751	***	-1.500	***	0.500	***	1.270	***	0.273		-1.028	***	-0.040	
	(.205)		(.155)		(.212)		(.180)		(.348)		(.193)		(.329)		(.334)	
University	1.270	***	1.060	***	-1.039	***	0.834	***	1.510	***	0.504	***	-1.709	***	-0.340	

Other	(.154) 1.770 (.303)	***	(.147) 1.260 (.181)	***	(.142) -1.210 (.283)	***	(.106) 0.112 (.220)	(.277) 1.140 (.417)	***	(.184) 0.238 (.209)	(.291) -1.855 (.558)	***	(.314) -0.391 (.529)
Region													
Urban Lower Egypt	0.177 (.126)		-0.074 (.067)		-0.123 (.117)		-0.035 (.072)	0.627 (.229)	***	0.039 (.085)	-0.780 (.285)	***	-0.903 (.249)
Rural Lower Egypt	0.268 (.106)	**	-0.009 (.060)		-0.198 (.097)	**	0.766 (.062)	0.362 (.208)	*	-0.100 (.085)	-0.389 (.214)	***	0.054 (.196)
Urban Upper Egypt	0.345 (.114)	***	0.167 (.060)	***	-0.193 (.108)	*	0.149 (.070)	0.588 (.183)	***	-0.069 (.078)	-0.288 (.209)	***	-0.611 (.200)
Rural Upper Egypt	-0.038 (.123)		-0.075 (.074)	***	-0.184 (.107)	*	0.062 (.067)	0.353 (.291)		0.056 (.117)	-0.651 (.321)	***	-0.169 (.281)
Job Characteristics													
Minining			0.620 (.224)	***									
Manufacturing			0.295 (.090)	***			-0.100 (.065)			0.171 (.154)			0.183 (.155)
Electricity, Gas & Water			0.197 (.132)				0.922 (.122)			0.144 (.226)			
Construction			0.289 (.116)	***			0.113 (.067)	*		0.082 (.326)			0.328 (.328)
Trade			0.224 (.198)				-0.117 (.089)			0.398 (.291)			-0.022 (.241)
Transport			0.226 (.105)	**			0.291 (.092)			0.034 (.238)			0.680 (.397)
Finance			0.312 (.153)	**			-0.427 (.205)	**		0.354 (.178)	*		1.120 (.234)
Social Services			0.152 (.080)	*			-0.060 (.082)			0.877 (.111)	***		-0.070 (.112)

Casual Work		0.152 **		-0.185 ***		0.015		0.228 **
		(.071)		(.055)		(.197)		(.112)
Background Characteristics								
Risk Aversion Index	0.227 ***		-0.212 *				***	
	(0.0655)		(.062)					
Male Public Emp. in the Household					0.298 **		-0.332 ***	
					(.116)		(.127)	
Father Highly Educated	0.315 ***		-0.262		-0.151		-0.023 ***	
	(.100)		(.088)		(.162)		(.144)	
Father Salaried	0.087		-0.140 *		0.308 **		-0.127 ***	
	(0.084)		(.078)		(.142)		(.136)	
Sector Selection Term		0.002		0.063 ***		-0.083		0.803 ***
		(.098)		(.0016)		(.104)		(.062)
Sample Size	7286		7279		1797		1796	
Log Likelihood	-6332.14		-5674.60		-1184.24		-742.90	
Goodness of Fit -- c 2 (36)	543.110		368.97		192.810		183.840	
(Prob > c 2)	(0.000)		(0.000)		(0.000)		(0.000)	

Source: IFPRI, 1997 EIHS

Notes: Same as Table 1, except that the independent variable in the wage equation is log hourly wages in 1997 Egyptian Pounds.

Table 3: Estimated Mean Public-Private Wage Differentials by educational level, 1987 and 1997

1987							1997						
Educational level	MALES			FEMALES			Educational level	MALES			FEMALES		
	<i>manufact</i>	<i>Social</i>	<i>mean for</i>	<i>manufact</i>	<i>Social</i>	<i>mean for</i>		<i>manufact</i>	<i>Social</i>	<i>mean for</i>	<i>manufact</i>	<i>Social</i>	<i>mean for</i>
	<i>uring</i>	<i>Services</i>	<i>all</i>	<i>uring</i>	<i>Services</i>	<i>all</i>		<i>uring</i>	<i>Services</i>	<i>all</i>	<i>uring</i>	<i>Services</i>	<i>all</i>
			<i>activities</i>			<i>activities</i>				<i>activities</i>			<i>activities</i>
Illiterate	-0.84	-0.54	-0.77	-0.71	-0.18	-0.32	No schooling	0.05	-0.16	-0.10	0.75	1.16	1.05
Read and Write	-0.56	-0.39	-0.57	-0.38	0.11	-0.07	less than Primary	0.08	-0.13	-0.10	0.67	1.00	0.83
Below	-0.53	-0.16	-0.47	-0.20	0.14	-0.01	Primary	0.03	-0.41	-0.27	0.48	0.83	0.71
intermediate							Preparatory	0.14	-0.03	-0.01		0.53	0.53
Intermediate	-0.40	-0.25	-0.40	-0.16	0.26	0.18	Vocational	0.09	-0.19	-0.17	0.96	0.94	0.98
Higher Institute	-0.05	0.05	-0.03	-0.62	0.04	0.01	Secondary						
University	-0.29	-0.22	-0.30	-0.32	0.10	0.03	Higher Institute	0.12	-0.08	-0.06		0.91	0.58
Above University	0.26	0.24	0.22	0.63	0.80	0.78	University	0.09	-0.12	-0.12	1.11	0.95	0.93
							Other	1.48	0.67	0.69		0.93	0.93
Mean for all Public Sector Employees													
Public Sector Employees	-0.53	-0.24	-0.44	-0.30	0.17	0.10		0.09	-0.10	-0.10	0.80	0.93	0.93

Source: CAPMAS, 1987 LFSS and IFPRI 1997 EIHS.

Notes: All differentials are expressed as a proportion of predicted public sector hourly wages and are corrected for characteristics and selectivity differences (based on the selection models' estimates presented in tables 1 and 2). The public-private wage differential is defined as the difference between what public sector employees with mean characteristics are predicted to obtain in the public sector (using the coefficients of the public sector equation) and what they are predicted to obtain had they been located in the private sector (using the coefficients of the private sector equation). Due to the smallness of their sample size, General Secondary graduates were not included in the above calculations.

Table 4: Second Stage Selection Equation Estimates, 1987

Variable	Males						Females					
	Probit estimates			Marginal estimates			Probit estimates			Marginal estimates		
	Coef		S.E	Coef		S.E.	Coef		S.E	Coef		S.E.
Constant	-3.541	***	0.178				-3.232	***	0.439			
Age	0.153	***	0.009	0.058	***	0.003	0.143	***	0.025	0.056	***	0.010
Age2	-0.002	***	0.000	-0.001	***	0.000	-0.002	***	0.000	-0.001	***	0.000
Educational level												
Read and Write	0.574	***	0.035	0.221	***	0.013	0.572	***	0.161	0.225	***	0.061
Below intermediate	0.851	***	0.058	0.329	***	0.021	0.990	***	0.207	0.369	***	0.063
Intermediate	1.518	***	0.045	0.544	***	0.012	1.965	***	0.144	0.659	***	0.032
Higher Institute	1.535	***	0.087	0.525	***	0.018	3.228	***	0.229	0.660	***	0.018
University	1.240	***	0.048	0.462	***	0.015	2.381	***	0.135	0.705	***	0.022
Above University	1.472	***	0.139	0.507	***	0.030	4.544	***	0.395	0.606	***	0.019
Region												
Urban Lower Egypt	-0.199	***	0.041	-0.073	***	0.015	0.361	***	0.111	0.143	***	0.044
Rural Lower Egypt	-0.184	***	0.037	-0.068	***	0.013	-0.215	*	0.126	-0.082	*	0.047
Urban Upper Egypt	-0.118	***	0.050	-0.044	***	0.018	-0.694	***	0.160	-0.242	***	0.046
Rural Upper Egypt	-0.262	***	0.043	-0.095	***	0.015	0.279		0.172	0.110		0.068
Background Characteristics												
Married	0.011		0.047	0.004		0.018	0.079		0.122	0.031		0.048
Household Head	0.029		0.052	0.011		0.020						
Male Public Employee in the Household							0.317	**	0.115	0.120	**	0.042
Public-Private Wage Differential	0.779	***	0.108	0.293	***	0.041	2.534	***	0.203	0.986	***	0.077

Sample Size	11758	3061
Log Likelihood	-6013.12	-622.489
Goodness of Fit -- c	3879.2	2998.3
2 (15)		
(Prob > c 2)	(0.000)	(0.000)

Source: CAPMAS, 1987 LFSS

Notes: Same as Table 1.

Table 5: Second Stage Selection Equation Estimates, 1997

Variable	Males						Females					
	Probit estimates			Marginal estimates			Probit estimates			Marginal estimates		
	Coef		S.E	Coef		S.E.	Coef		S.E	Coef		S.E.
Constant	-5.444	***	0.428				-6.136	***	1.075			
Age	0.175	***	0.019	0.064	***	0.007	0.168	***	0.052	0.047	***	0.015
Age2	-0.002	***	0.000	-0.001	***	0.000	-0.002	***	0.001	-0.001	***	0.000
Educational level												
Less than Primary	0.392	***	0.151	0.150	***	0.059	0.632		0.422	0.135		0.065
Primary	0.902	***	0.150	0.347	***	0.055	1.202	***	0.403	0.197	***	0.037
Preparatory	0.934	***	0.185	0.359	***	0.066	0.910		0.703	0.163		0.066
General Secondary	0.244		0.436	0.093		0.172	1.845	**	0.749	0.203	**	0.029
Vocational	1.030	***	0.140	0.390	***	0.050	1.287	***	0.443	0.315	***	0.094
Secondary												
Higher Institute	1.694	***	0.236	0.570	***	0.047	1.490	***	0.422	0.221	***	0.035
University	1.379	***	0.165	0.505	***	0.048	1.225	***	0.414	0.250	***	0.062
Other	1.099	**	0.439	0.414	**	0.139	0.936		0.591	0.167		0.057
Region												
Urban Lower Egypt	0.359	**	0.142	0.137	**	0.056	-0.712		0.490	-0.233		0.179
Rural Lower Egypt	0.456	***	0.128	0.173	***	0.049	0.465	*	0.270	0.116	*	0.059
Urban Upper Egypt	0.340	**	0.132	0.130	**	0.052	-0.135		0.314	-0.039		0.093
Rural Upper Egypt	0.267	*	0.147	0.101	*	0.056	0.255		0.388	0.065		0.089
Background Characteristics												
Risk Aversion Index	0.238	***	0.070	0.088	***	0.026						
Male Public Emp. in Household							0.431	**	0.167	0.121	**	0.046
Father Highly Educated	0.425	***	0.106	0.155	***	0.038	-0.286		0.220	-0.082		0.065
Father Salaried	0.119		0.091	0.044		0.034	0.355		0.197	0.098		0.054

Public-Private Wage Differential	0.859	***	0.277	0.317	***	0.102	1.432	***	0.385	0.401	***	0.111
Sample Size	1420						411					
Log Likelihood	-672.116						-126.334					
Goodness of Fit -- c 2 (19)	567.001						226.06					
(Prob > c 2)	(0.000)						(0.000)					

Source: IFPRI, 1997 EIHS

Notes: Same as Table 1, except that the independent variable in the wage equation is log hourly wages in 1997 Egyptian Pounds.

Table 6: Estimates of Determinants of Second Job Holding and Males in the Private Sector Compensating Differentials Equation, 1997

	Determinants of Second Job Holding Equation							Private Sector Males Compensating Differentials Equation		
Variable	Probit estimates			Marginal estimates			Variable			
	Coefficient		Standard error	Coefficient		Standard error		Coefficient		Standard error
Age	0.048	***	0.016	0.007	***	0.003	Experience	0.039	***	0.004
Age2	-0.001	***	0.000	-0.000	***	0.000	Experience2	-0.048	***	0.006
Years of Schooling	-0.026	***	0.007	-0.004	***	0.001	Less than Primary	0.093	*	0.048
							Primary	0.197	***	0.056
Female	-0.754	***	0.131	-0.083	***	0.010	Preparatory	0.277	***	0.082
							General Secondary	0.153		0.153
Urban Lower Egypt	0.291	**	0.146	0.052	**	0.029	Vocational Secondary	0.441	***	0.061
Rural Lower Egypt	0.453	***	0.131	0.081	***	0.026	Higher Institute	0.376	**	0.174
Urban Upper Egypt	0.000		0.153	0.000		0.024	University	0.799	***	0.094
Rural Upper Egypt	0.154		0.138	0.025		0.024	Other	0.038		0.242
Manufacturing	-0.949	***	0.125	-0.099	***	0.009	Job Instability	0.509	***	0.188
Electricity, Gas & Water	-0.570	***	0.207	-0.061	***	0.014	Probability of Second Job Holding	-1.360	**	0.583
Construction	-0.886	***	0.146	-0.085	***	0.009	Fringe Benefits	-0.119	**	0.058
Trade	-0.809	***	0.221	-0.075	***	0.011				
Transport	-1.118	***	0.197	-0.089	***	0.008	Constant	-0.758	***	0.097
Finance	-0.781	***	0.337	-0.071	***	0.015				

Social Services	-0.583	***	0.108	-0.083	***	0.014		
Public Sector Employee	0.454	***	0.099	0.072	***	0.016		
Constant	-1.722	***	0.318					
Sample Size	2563						Sample Size	1057
Log Likelihood	-803.990						R2	0.150
Goodness of Fit -- c 2 (19) (Prob > c 2)	567.000 (0.000)							

Source: IFPRI, 1997 EIHS.

Notes: The dependent variable in the second job holding equation is the dummy variable set to one if individual holds a second job and zero otherwise. In the private sector male compensating differential wage equation it is log hourly wages in 1997 Egyptian Pounds. * denotes significance at the 10 percent level, ** denotes significance at the five percent level and *** denotes significance at the 1 percent level.

Table 7: Male Public-Private Wage Differentials Adjusted for Non-pecuniary Aspects, 1997

Educational level	Manufacturing					Social Services					Mean For All Activities					
	<i>UAD</i>	<i>FB</i>	<i>PSJ</i>	<i>INS</i>	<i>AD1</i>	<i>UAD</i>	<i>FB</i>	<i>PSJ</i>	<i>INS</i>	<i>AD1</i>	<i>UAD</i>	<i>FB</i>	<i>PSJ</i>	<i>INS</i>	<i>AD1</i>	<i>AD2</i>
	<i>(in log hourly wages)</i>					<i>(in log hourly wages)</i>					<i>(in log hourly wages)</i>					
No schooling	0.08	0.09	0.10	0.18	0.45	-0.13	0.09	0.10	0.15	0.22	-0.07	0.11	0.10	0.24	0.37	
less than Primary	0.07	0.09	0.10	0.17	0.43	-0.05	0.11	0.10	0.12	0.28	-0.06	0.10	0.10	0.21	0.35	
Primary	0.01	0.11	0.10	0.17	0.39	-0.24	0.07	0.10	0.14	0.07	-0.18	0.10	0.10	0.20	0.22	
Preparatory	0.12	0.08	0.10	0.17	0.46	-0.03	0.12	0.10	0.12	0.31	-0.01	0.10	0.10	0.18	0.37	
Vocational Secondary	0.08	0.06	0.10	0.15	0.39	-0.16	0.08	0.10	0.12	0.14	-0.14	0.09	0.10	0.19	0.24	
Higher Institute	0.11	0.12	0.10	0.16	0.49	-0.05	0.12	0.10	0.11	0.27	-0.03	0.10	0.10	0.18	0.35	
University	0.11	0.03	0.10	0.14	0.39	-0.10	0.05	0.10	0.10	0.15	-0.09	0.06	0.10	0.15	0.22	
Other	1.04	0.12	0.10	0.12	1.37	0.79	0.00	0.10	0.09	0.98	0.82	0.10	0.10	0.17	1.18	

Mean Differential for all Male Public Sector Employees																
<i>in log hourly wages</i>	0.10	0.08	0.10	0.16	0.44	-0.06	0.09	0.10	0.13	0.25	-0.05	0.10	0.10	0.21	0.35	
<i>as % of public wage</i>	10%	10%	13%	22%	45%	-10%	8%	8%	11%	27%	-10%	14%	14%	31%	42%	57%

Source: IFPRI, 1997 EIHS.

Notes: UAD is the unadjusted public-private wage differential, in log hourly wages based on wage estimates presented in Table2.

FB: is the adjustment for presence of fringe benefits in form of pensions, employee provident funds and medical insurance.

PSJ: is the adjustment for the higher probability being able to supplement one's income through obtaining a second job.

INS: is the adjustment for greater job instability in the private sector.

AD1: is the differential after incorporating the above three adjustments.

AD2: is the adjusted differential using the methodology of identifying the marginal workers in the public sector and assuming that their rents (including nonwage benefits) are at least equal to zero. This yields produces an estimate the proportion of nonwage benefits to public sector wages that is used in adjusting the mean differential (see text for details).

APPENDIX A: Descriptive Statistics on Variables used in Estimation

Table A1: Means and Standard Deviations of Variables by Sector and Gender, 1987

Variable	Male				Female				Total	
	Public mean	S.D.	Private mean	S.D.	Public mean	S.D.	Private mean	S.D.	mean	S.D.
Log Hourly Wage	-0.614	0.577	-0.512	0.665	-0.766	0.492	-1.060	0.692	-0.625	0.605
Experience	23.33	12.34	20.31	13.18	13.19	8.38	15.34	13.31	20.53	12.63
Experience2	696.40	645.02	586.01	694.37	244.20	304.98	411.87	673.27	580.91	639.56
illiterate	0.13	0.34	0.46	0.50	0.03	0.16	0.46	0.50	0.22	0.41
Read and Write	0.23	0.42	0.28	0.45	0.02	0.14	0.08	0.28	0.21	0.40
Below intermediate	0.07	0.25	0.07	0.25	0.02	0.13	0.05	0.21	0.06	0.23
Intermediate	0.26	0.44	0.09	0.29	0.46	0.50	0.24	0.43	0.25	0.43
Higher Institute	0.05	0.23	0.01	0.12	0.12	0.32	0.01	0.12	0.05	0.22
University	0.23	0.42	0.08	0.27	0.34	0.47	0.15	0.36	0.20	0.40
Above University	0.02	0.15	0.00	0.04	0.02	0.14	0.01	0.08	0.02	0.12
Metropolitan areas	0.40	0.49	0.46	0.50	0.42	0.49	0.59	0.49	0.42	0.49
Urban Lower Egypt	0.17	0.38	0.13	0.33	0.27	0.44	0.12	0.32	0.17	0.38
Rural Lower Egypt	0.15	0.36	0.17	0.38	0.08	0.27	0.22	0.42	0.15	0.36
Urban Upper Egypt	0.13	0.33	0.09	0.28	0.17	0.38	0.04	0.19	0.12	0.32
Rural Upper Egypt	0.09	0.29	0.15	0.35	0.03	0.17	0.03	0.16	0.09	0.29
Agriculture	0.04	0.20	0.21	0.41	0.02	0.13	0.19	0.39	0.09	0.29
Mining	0.03	0.16	0.01	0.09	0.00	0.04	0.00	0.00	0.02	0.13
Manufacturing	0.21	0.40	0.24	0.43	0.07	0.25	0.20	0.40	0.19	0.39
Electricity, Gas & Water	0.03	0.18	0.00	0.04	0.02	0.12	0.00	0.00	0.02	0.14
Construction	0.05	0.21	0.18	0.39	0.01	0.08	0.04	0.20	0.08	0.27
Trade	0.04	0.19	0.12	0.32	0.02	0.13	0.12	0.33	0.06	0.24
Transport	0.09	0.28	0.09	0.29	0.03	0.16	0.02	0.15	0.08	0.26
Finance	0.03	0.16	0.02	0.14	0.02	0.15	0.03	0.18	0.03	0.16
Social Services	0.50	0.50	0.12	0.33	0.83	0.38	0.38	0.49	0.44	0.50

Casual Work	0.00	0.04	0.29	0.45	0.00	0.04	0.14	0.35	0.09	0.28
Age	39.47	10.32	32.34	12.35	32.48	7.73	29.03	11.54	35.95	11.24
Age2	1664.28	845.58	1198.15	918.96	1114.66	550.80	975.56	902.25	1418.42	868.00
Household Head	0.80	0.40	0.58	0.49	0.09	0.29	0.16	0.36	0.60	0.49
Married	0.84	0.37	0.63	0.48	0.80	0.40	0.55	0.50	0.76	0.43
Male Public Emp. in the Household	1.16	0.43	0.15	0.41	0.73	0.57	0.28	0.53	0.77	0.63
Sample Size	4744	2565			1507	289			9106	

Source: Calculated from CAPMAS, 1987 LFSS.

Notes: With the exception of log hourly wages, age and experience all variables in the above table are dummies, therefore the mean refers to the percentage of the relevant variable in the sample.

Table A 2: Means and Standard Deviations of Variables by Sector and Gender, 1997

Variable	Male				Female				Total	
	Public		Private		Public		Private			
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.
Log Hourly Wage	0.098	0.570	0.057	0.575	-0.058	0.508	-0.460	0.705	0.031	0.586
Experience	23.91	12.78	20.71	15.48	17.25	10.31	17.48	13.98	20.75	14.31
Experience2	734.88	688.56	668.05	905.96	403.51	437.25	499.38	681.09	634.95	782.07
No Schooling	0.10	0.30	0.32	0.47	0.04	0.19	0.37	0.48	0.21	0.40
less than Primary	0.10	0.30	0.23	0.42	0.02	0.15	0.14	0.35	0.15	0.36
Primary	0.13	0.34	0.15	0.36	0.03	0.18	0.13	0.34	0.13	0.34
Preparatory	0.08	0.26	0.05	0.22	0.01	0.08	0.04	0.20	0.06	0.24
General Secondary	0.02	0.14	0.01	0.11	0.01	0.10	0.02	0.13	0.02	0.14
Vocational Secondary	0.28	0.45	0.18	0.38	0.48	0.50	0.16	0.37	0.25	0.43
Higher Institute	0.07	0.26	0.01	0.10	0.09	0.29	0.05	0.21	0.04	0.20
University	0.19	0.39	0.04	0.20	0.29	0.45	0.08	0.27	0.12	0.33
Other	0.03	0.18	0.00	0.06	0.03	0.17	0.02	0.13	0.02	0.13
Metropolitan areas	0.16	0.37	0.15	0.36	0.22	0.41	0.28	0.45	0.17	0.37
Urban Lower Egypt	0.16	0.36	0.12	0.33	0.22	0.41	0.09	0.28	0.14	0.35
Rural Lower Egypt	0.28	0.45	0.28	0.45	0.19	0.39	0.34	0.48	0.27	0.45
Urban Upper Egypt	0.20	0.40	0.11	0.31	0.29	0.45	0.14	0.35	0.16	0.37
Rural Upper Egypt	0.20	0.40	0.33	0.47	0.09	0.28	0.14	0.35	0.25	0.44
Agriculture	0.08	0.27	0.33	0.47	0.05	0.22	0.28	0.45	0.20	0.40
Minining	0.01	0.09	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.06
Manufacturing	0.16	0.36	0.22	0.41	0.06	0.23	0.24	0.43	0.18	0.38
Electricity, Gas & Water	0.04	0.19	0.03	0.16	0.02	0.13	0.00	0.00	0.03	0.16
Construction	0.06	0.24	0.16	0.37	0.01	0.08	0.04	0.20	0.10	0.30
Trade	0.01	0.10	0.07	0.25	0.01	0.08	0.14	0.35	0.04	0.20
Transport	0.06	0.25	0.08	0.27	0.01	0.10	0.01	0.09	0.06	0.24
Finance	0.02	0.14	0.01	0.09	0.03	0.17	0.02	0.13	0.02	0.12
Social Services	0.56	0.50	0.10	0.31	0.82	0.38	0.28	0.45	0.37	0.48
Casual Work	0.10	0.30	0.79	0.41	0.02	0.13	0.66	0.47	0.46	0.50

Age	40.10	10.59	32.28	13.31	36.02	9.27	29.40	11.49	34.92	12.63
Age2	1720.13	876.78	1218.80	1046.15	1383.27	707.32	995.37	801.37	1379.19	977.49
Risk Aversion Index	1.80	0.84	1.32	0.65	1.06	0.31	1.12	0.44	1.41	0.71
Male Public Emp. in the Household	1.15	0.60	0.18	0.45	0.72	0.63	0.23	0.48	0.58	0.70
Father Highly Educated	0.31	0.46	0.42	0.49	0.35	0.48	0.42	0.50	0.38	0.49
Father Salaried	0.33	0.47	0.21	0.41	0.55	0.50	0.24	0.43	0.29	0.46
Second job Holder	0.16	0.36	0.11	0.31	0.02	0.13	0.08	0.27	0.12	0.32
Female	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.17	0.37
Years of Schooling	10.19	5.29	5.61	5.12	12.73	3.64	6.02	6.02	8.17	5.71
Public Sector Employee	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.46	0.50
Employment Instability	0.26	0.15	0.44	0.15	0.24	0.14	0.42	0.19	0.36	0.18
Fringe benefits	0.95	0.22	0.10	0.31	0.95	0.21	0.07	0.26	0.49	0.50
Sample Size	939	1226			124	299			2548	

Source: Calculated from IFPRI, 1997 EIHS

Note: With the exception of log hourly wages, age and experience all variables in the above table are dummies, therefore the mean refers to the percentage of the relevant variable in the sample.

APPENDIX B: Governorate Weights Used in the 1987 Wage Regressions

Table B.1 Weights Allocated to Observations by Governorate and Rural/Urban Location, 198

Governorate	Number of Observations			Weights	
	Urban	Rural	Total	Urban	Rural
Urban Governorates					
Cairo	0	10612	10612	0.000	0.045
Alex	0	3892	3892	0.000	0.060
Port Said	0	407	407	0.000	0.078
Suez	0	662	662	0.000	0.039
Lower Egypt Governorates					
Damietta	453	590	1043	0.060	0.025
Dakahlia	2569	1506	4075	0.049	0.048
Sharkia	2291	1517	3808	0.058	0.038
Kalyoubia	1399	1733	3132	0.050	0.050
Kafr-El_Sheikh	1376	1140	2516	0.050	0.029
Gharbia	1686	1965	3651	0.057	0.038
Menoufia	1503	923	2426	0.058	0.038
Behera	2540	1348	3888	0.048	0.045
Ismailia	309	464	773	0.044	0.045
Upper Egypt Governorates					
Giza	1015	3207	4222	0.077	0.053
Beni-suef	1130	489	1619	0.047	0.059
Fayoum	590	409	999	0.099	0.070
Menia	1604	1073	2677	0.064	0.041
Assyout	1453	1013	2466	0.054	0.048
Shohag	1837	1000	2837	0.051	0.043
Qena	1283	1052	2335	0.066	0.040
Aswan	362	443	805	0.066	0.057
Frontier Governorates					
Redsea	0	701	701	0.000	0.009
El-Wadi El-Gidid	0	1124	1124	0.000	0.004
				1.000	1.000
All Egypt	23400	37270	60670		

Source: Author's calculations based on CAPMAS, Results of 1986 Population Census and 1987 Labour Force Sample Survey.

Notes: Weights are calculated as the ratio of population to the number of sampled observations in each governorate. These ratios are then normalised (by dividing by the total) to add up to one.

APPENDIX C Definition and Sensitivity Analysis on Index of Financial Responsibility Towards the Household, 1997

The index of financial responsibility towards the household used in the sector selection equation is constructed such that it has an ordering from 1 to 3 based on two attributes: household headship and number of children in household. The ordering in the index is based on the implicit assumption that the attribute of household headship leads to greater financial responsibility than having children. The gender and sectoral distribution of the index, using the 1997 data set is presented in Table C1 below:

Table C1: Definition of Financial Responsibility Towards The Household (Risk Aversion) Index, 1997.

Value of Index	Definition <i>Household Head</i> <i>Presence of Children</i>		Distribution Across Sample (%)			
			Male		Female	
			<i>Public</i>	<i>Private</i>	<i>Public</i>	<i>Private</i>
1	No	No	7.0	77.5	95.3	92.2
2	Yes	No	5.5	12.7	3.0	3.5
3	Yes	Yes	7.5	9.8	1.7	4.3
			Average Value of Index			
			1.80	1.32	1.06	1.12

Source: Calculated from IFPRI, 1997 EIHS.

One might reasonably question four aspects of this index. First, its definition relied on only 2 household attributes and excluded other potentially important factors such as the presence of other incomes in the household. Second, and related to the above, the fact that it is only limited to 3 states and hence is likely to miss a large degree of variability in risk-related factors amongst individuals. Third, that it is used as a single ordered dichotomous variable in the sector selection equation (which means that it has an ordinal interpretation) when it might have been more appropriate to include it in form of separate dummy variables for each state. And, fourth, that its ordering implies that household headship results in greater aversion to income loss than parenthood.

To test the sensitivity of the results to altering the first two assumptions, I started with a longer specification which also used the attribute of presence of other wage earners in the household to define ten different states for the index and estimated the sector selection equation. I then re-estimated the equation with more simplified versions of the index (by combining different states). Based on goodness of fit and prediction criteria in the selection equation, the parsimonious 3-state index presented above performed best. The results on the estimated public-private wage differential for males in 1997 (which is the only case when this index was used in the sector selection equation) were robust to different specifications of the index. They ranged from -0.12 when the longer 10-states version of the index was used to -0.10 when the 3-states version was used.

To test the third assumption (of whether it is appropriate to include the index as single variable) I estimated an unrestricted version of the equation with two dummy variables for two states (and one state excluded as a reference category) and conducted a log-likelihood ratio test where the null hypothesis was that the restricted model (with the aggregated index) is true. The test indicated that this hypothesis indeed cannot be rejected ($\chi^2(1) = 1.1$; $\text{prob} > \chi^2 = 0.39$). Finally, the assumption that household headship can lead to greater financial responsibility towards the household than parenthood seems reasonably plausible and when that ordering was reversed a negative and insignificant estimate in the sector selection equation emerged.

APPENDIX D: Ordinary Least Square Estimates and Diagnostic Tests of Wage Equations

Table D.1: OLS Estimates of Wage Equations, 1987

Variable	Male				Female			
	Public		Private		Public		Private	
Constant	-1.937	***	-1.156	***	-2.352	***	-1.597	***
Experience	0.054	***	0.047	***	0.045	***	0.050	***
Experience2	-0.001	***	-0.001	***	-0.000	***	-0.001	***
Educational level								
Read and Write	0.122	***	0.125	***	0.154	*	0.017	
Below intermediate	0.355	***	0.186	***	0.747	***	0.432	***
Intermediate	0.562	***	0.363	***	0.878	***	0.506	***
Higher Institute	0.724	***	0.387	***	1.026	***	0.953	***
University	0.917	***	0.610	***	1.229	***	1.035	***
Above University	1.424	***	1.003	***	1.745	***	2.366	***
Region								
Urban Lower Egypt	-0.019		-0.112	***	-0.013		-0.014	
Rural Lower Egypt	-0.122	***	-0.091	***	0.036		-0.027	
Urban Upper Egypt	0.028		-0.124	***	0.085		-0.320	
Rural Upper Egypt	-0.116	***	-0.077	***	0.097	*	0.273	
Job Characteristics								
Mining	0.580	***	0.495	***	0.323			
Manufacturing	0.064	*	-0.055		0.132		-0.096	
Electricity, Gas & Water	-0.078		0.162		0.033			
Construction	0.159	***	0.315	***	0.195		0.245	
Trade	0.085	*	-0.147	***	0.030		-0.324	
Transport	0.020		0.103	***	0.154		-0.150	
Finance	0.164	***	-0.051		0.126		-0.295	
Social Services	-0.055		-0.229	***	0.044		-0.497	***
Casual Work	0.148		0.094	***	-0.397		0.187	
Implied Public-Private Pay Differential	-0.16				0.23			
Sample Size	4744		2565		1507		289	
Adjusted R-Squared	0.379		0.190		0.44		0.257	
Chow Tests of Equality of Coefficients								
H0: public sector coefficients= private sector coefficients	29.3				4.3			
H0:male coefficients= female coefficients	3.12		5.66					
Ramsey RESET Test	6.69		6.32		10.58		0.29	
Cook-Weisburg Heteroscedasticity Test	0.94		38.42		0.54		10.39	

Source: Calculated from CAPMAS, 1987 LFSS

Notes: The dependent variable is log hourly wages in 1987 Egyptian Pounds. Standard errors are suppressed to save space, and only levels of significance are reported. * denotes significance at the 10 percent level, ** denotes significance at the five percent level and *** denotes significance at the 1 percent level.

The Chow (1960) test is an F test of the null hypothesis of equal coefficients between two equations (see Kennedy, 1998, p. 56 for the generic form of all Chow type tests). The relevant critical value $F_{0.01}(20, \infty) = 1.9$

The Ramsey (1969) Regression Specification Error Test RESET is an F test of the null hypothesis of no omitted variables which amounts to estimating: (1) $y = b_0 + b_1 x + b_2 z + u$ and then testing that $t=0$. It is also a test of non-linearity since powers of fitted values of Y are used for Z.

The Cook-Weisberg (1983) Heteroscedasticity test: is a Chi2 test of the null hypothesis of constant error variance. It amounts to testing $t=0$ in $\text{var}(e) = s^2 \exp(tz)$, where fitted values for Y in (1) are used for Z.

Table D.2: OLS Estimates of Wage Equations, 1997

Variable	Male				Female			
	Public		Private		Public		Private	
Constant	-1.161	***	-0.754	***	-1.070	***	-1.526	***
Experience	0.033	***	0.041	***	0.050	***	0.053	***
Experience2	-0.016	*	-0.051	***	-0.065	***	-0.066	***
Educational level								
Less than Primary	0.114		0.060		-0.391	*	-0.183	
Primary	0.227	***	0.205	***	-0.152		0.099	
Preparatory	0.503	***	0.260	***	-0.017		0.407	
General Secondary	0.944	***	0.194	***	0.257		1.253	***
Vocational Secondary	0.651	***	0.450	***	0.129		0.402	
Higher Institute	0.706	***	0.483		0.304	*	0.730	***
University	1.005	***	0.811	***	0.551	***	1.044	***
Other	1.102	***	0.031	***	0.276		0.546	
Region								
Urban Lower Egypt	-0.146	***	-0.116	*	0.071		-0.252	
Rural Lower Egypt	-0.113	**	-0.078		-0.088		0.305	
Urban Upper Egypt	0.049		0.076		-0.038		-0.296	
Rural Upper Egypt	-0.130	**	-0.055		0.087		0.443	
Job Characteristics								
Mining	0.490		-0.255					
Manufacturing	0.147	**	-0.057		0.273		0.142	
Electricity, Gas & Water	0.101		0.192		0.244			
Construction	0.175	**	0.124	**	0.178		-0.135	
Trade	0.077		-0.117		0.403		0.231	
Transport	0.110		0.069		0.091		0.469	
Finance	0.411	***	-0.162		0.425	***	0.499	
Social Services	0.052		-0.015		0.176		-0.049	
Casual Work	0.056		0.201	***	0.019		0.157	
Implied Public-Private Pay Differential	-0.81				-0.51			
Sample Size	939		1226		124		299	
Adjusted R-Squared	0.352		0.174		0.326		0.259	
Chow Test of Equality of Coefficients	5.5				2.0			
H0: Public sector coefficients= private sector coefficients								
H0:male coefficients= female coefficients								
Ramsey RESET Test	1.88		5.97		1.98		7.98	
Cook-Weisburg Heteroscedasticity Test	12.13		8.49		5.35		2.50	

Source: Calculated from IFPRY, 1997 EIHS

Notes: Same as Table D. 1, except that the dependent variable is log hourly wages in 1997 Egyptian Pounds.