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EDUCATION-OCCUPATION MISMATCH AND THE EFFECT ON WAGES OF EGYPTIAN WORKERS

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Abstract

This study attempts to fill a void in the literature by examining education-occupation mismatches in Egypt. Using the Egypt Labor Market Panel Survey (ELMPS) 2006 and Egypt Labor Market Survey (ELMS) 1998, this paper investigates whether the empirical evidences of studies on over-education and under-education carry over to the private sector of the Egyptian labor market; evaluates the incidence and magnitude of the education-occupation mismatch by gender and by occupational categories; and determines whether the incidence of educational mismatches has increased over time. The main findings are as follows: there is evidence of an education-occupation mismatch in the Egyptian private sector. The incidence has declined from 51% to 42% during the eight year period, and males are more likely to be mismatched than females. The Egyptian labor market has witnessed a drop in the percentage of overeducated workers at the expense of an expansion in the share of under-educated workers. Empirical findings do not support the main stream literature. Returns to over-education for white collar and blue collar males are higher than those of adequately educated males and are greater in 2006 than in 1998. Females in white collar jobs, both over and undereducated, received higher returns than adequately educated females in 1998, but returns to over-education were higher and returns to under-education were lower than adequate education in 2006. Females in blue collar jobs are being penalized if they are inadequately matched, especially in 2006, and are rewarded less than males. These findings support the job competition model in a labor market with an imperfect information system whereby employers use education as an indicator of the cost of investing in job training. Workers, on the other hand, may accept these jobs while competing for a job.

ملخص

تحاول هذه الورقة أن تملأ ثمة الفراغ في الكتابات عن عدم التطابق بين نوعية التعليم ونوعية الوظيفة في مصر. فباستخدام لوحة مسح سوق العمل في مصر لعام 2006 ومسح سوق العمل المصري لعام 1998، تحاول هذه الورقة أن تتبين هل كانت الأدلة التجريبية للدراسات المنفذة على التعليم العالي والتعليم المتدني تنسحب على القطاع الخاص في سوق العمل المصري وهل تقوم بتقدير معدل حدوث ذلك التفاوت بين نوع التعليم ونوع الوظيفة حسب الجنس وكذلك حسب الفئات العاملة وتحدد هل زاد حدوث ذلك التفاوت مع مرور الزمن .وتمثلت أهم النتائج فيما يلي: ثمة دليلٍ على انعدام التناغم بين نوعية التعليم ونوعية الوظيفة في القطاع الخاص المصري. وقد انخفض معدل حدوث ذلك من 51% إلي 42% خلال الثمان سنوات التي غطتها الدراسة وكان الذكور أكثر تعرضاً لشغل وظائف لا تتسق وطبيعة تعليمهم بالمقارنة بالإناث . وشهد سوق العمل المصري انخفاضاً في نسبة العمال من ذوي التعليم العالي نظير التوسع في نصيب العمال منخفضي التعليم. ولا تعضد النتائج الخبروية الكتابات السائدة في هذا الخصوص .وكانت العوائد لذوي التعليم العالي من الذكور أصحاب الياقات البيضاء والياقات الزرقاء أعلى من عوائد الذكور الحاصلين على قدرٍ لا بأس به من التعليم وكانت هذه العوائد في العام 2006 أكبر منها في العام 1998 .أما الإناث اللائي يشغلن وظائف من طابع الياقات البيضاء سواء تمتعن بتعليمٍ عالٍ أو منخفضٍ فإنهن حصلن في العام 1998 على عائداتٍ أكبر من تلك التي حصلت عليها الإناث الحاصلات على قدرٍ لا بأس به من التعليم، ولكن العائدات لذوات التعليم العالي كانت أكبر من عائدات ذوات التعليم المتوسط وكانت عائدات ذوات التعليم المنخفض أقل من عائدات ذوات التعليم المتوسط في العام 2006 .وتعاقب الإناث في وظائف الياقات الزرقاء في حال وضعن في أماكن لا تناسبهن لا سيما في العام 2006، أما من حيث المكافأة فقد قل حظهن منها عن حظ الذكور . وتعتبر هذه النتائج مهمة لدعم نموذج المنافسة الوظيفية في سوق عملٍ لا يتمتع بنظامٍ معلوماتي كاملٍ حيث يعمد أرباب الأعمال فيه إلى استخدام نوع التعليم كمؤشرٍ على مقدار تكلفة الإستثمار في التدريب المهني .وعلى الجانب الآخر فإن العمال ربما يقبلون هذه الوظائف في معرض بحثهم عن وظيفة.

1. Introduction

It is sufficiently established that the distribution of income in an economy is strongly related to the amount of education people have accumulated. Generally speaking, more schooling means a higher lifetime income. Human capital theory assumes that individuals are paid the value of their marginal product which is determined by their human capital (education, training, experience, etc.), rather than the characteristics of their job (Becker, 1975). Firms on the other hand, are assumed to fully utilize their work force and to adapt their production technology in response to changes in the relative supply of skilled labor. This suggests that over-education or under-education are both primarily the result of an inefficiency in the labor market. However, some economists question whether firms can easily adapt their production techniques to changes in the relative input prices, including the price of labor (Duncan and Hoffman, 1981; Hartog and Oosterbeek, 1988; Rumberger, 1987). If firms cannot adapt quickly, then an individual's productivity, and hence their earnings, may depend on their job attributes. In which case, job characteristics (particularly educational requirements) need to be included as explanatory variables in any model of earnings, and it is quite possible the return to required education may exceed the return to any surplus education.

The recent literature on over-education and under-education provides a useful way of considering demand-side characteristics in the study of wage determination. The basic premise of this literature is that there is an assigned or required level of education for every occupation, representing the adequate level of education necessary to perform that occupation. Workers with education exceeding that level are considered overeducated, whereas those with lower levels are regarded as undereducated. (e.g., Cohn & Kahn, 1995; Duncan & Hoffman, 1981; Groot & Maassen van den Brink, 2000; Hartog, 2000; Hartog & Oosterbook, 1988; Hersch, 1991; Robst, 1995; and Sicherman, 1991). Empirical literature focusing mainly on industrialized economies and using the over and under- education approach has shown that returns to required education are significantly greater than returns to actual education.

This paper is the first to examine the impact of the education-occupation mismatch on wages in Egypt. Quinn and Rubb (2006) initiated such studies for developing countries (namely Mexico). Given the differences between developed and developing countries, it is likely that the findings of the over/under-education literature may not hold true in less advanced economies. This paper provides original evidence into the current status and historical trend of the education-occupation mismatch and its effect on wages, and suggests policy implications consistent with the results.

The research presented in this paper is not intended to justify the existence, or to discuss causes of, over/under- education in Egypt. Rather, this paper explores whether the empirical evidence of studies on over-education and under-education carry over to the Egyptian labor market. In particular, the purpose of this paper is to:

1. Evaluate the incidence and magnitude of the education-occupation mismatch, and test evidence against competing models of education surplus.
2. Determine whether the incidence of educational mismatches has increased over time (by comparing two points in time: 1998 and 2006).
3. Evaluate gender differences in education-occupation mismatch and the effect on wages

The rest of this paper is organized as follows: Section II provides a brief overview of the education-occupation mismatch literature. Section III details the data and methodology used in this study, as well as presents descriptive summaries on the extent of over-education and under-education in the Egyptian labor market. Results from the estimation of the modified

earnings functions, and gender differences are presented in Section IV, and Section V concludes with a summary and policy implications.

2. A Brief Review of the Literature

Tinbergen (1956) is credited for the early introduction of the over-education concept in labor markets literature, within the context of income inequality. Tinbergen believes that differences in wages are due to a race between supply and demand involving educated labor. In this framework, Tinbergen argues that advances in technology are normally accompanied by increased demand on high skilled, highly educated labor. If such demand persists, changes in technology shifts the demand in favor of high educated workers, and if there is low elasticity of substitution among workers of different education levels, wages of highly educated workers will increase relative to those less educated, and income inequality will widen.

There are several — not necessarily mutually exclusive — theories in the literature explaining over-education, accommodated by the human capital theory. To begin with, the human capital of a worker may be obtained by forms other than formal schooling (i.e. experience or on the job training). Workers, especially the young, may compensate for lack of required human capital by settling for a low-level job as a step towards investing in training or gaining experience. Several studies have confirmed this phenomenon (Alba-Ramirez, 1993; Groot & Maasen van den Brink, 2000; and Cohn and Ng 2000). Groot (1996) and Sicherman (1991) found that over-education is considered a part of career mobility where overeducated, young workers try different jobs until they find the matching one.

One interpretation of over-education upholds a job competition model in a labor market dominated by imperfect information (Thurow, 1975), whereby employers use education as an indicator of the cost of investing in job training. According to this view, employers prefer to hire people with more education, or from reputable schools, at the prevailing wage rate. Either because they are (or are believed to be) more productive, thus employers save on training costs, or simply because employers prefer to associate with the better educated. Additional schooling beyond that required for the job, as explained by Rumberger (1987), is not always rewarded. While additional schooling is not completely unproductive, jobs constrain the ability of workers to fully utilize the skills and capabilities they acquired in school. Workers, on the other hand, may accept these jobs while competing for another job. Lindahl & Regnér (2005) show that the wage premium for tertiary education in Sweden depends on the university at which the degree was obtained.

A variant of this group is advanced by Spence (1973) with the screening hypothesis, whereby in a labor market with imperfect information, employers use education as a mean of job screening. In the context of the screening hypothesis, it is worth pointing out the bumping model, promoted by Fields (1972). The model rests on the assumption that both rigid wages and educational screening are salient features of the labor market, particularly in developing countries. The screening feature of this argument implies that the rate of return to education below a certain number of years of education is low, whereas above that critical level, the rate of return in quite high. Therefore, there is a strong incentive among potential workers to invest in education to surpass that critical level. This incentive persists as long as the rate of return to education at the higher level does not fall[1]. Over time, employers respond to the excess supply by raising the minimum educational requirements for these jobs. So, the more highly educated job seekers are able to secure employment more easily than the less educated. Because there is no waiting, the expected returns to education do not fall, even if

[1] An explanation that is consistent with the persistent high levels of unemployment among educated workers in Egypt.

the actual wage rate in the new job is lower. Eventually, educated workers push less educated ones out of these jobs. The signaling or screening theorists claim that any increase in human capital is always absorbed by demand. In other words, over-education can exist in this imperfect labor market, and ultimately workers compete for jobs not for wages.

Another interpretation is provided by the search theory, in which over-education is a result of the cost of search by either employee or employer. With imperfect information, a poor mismatch occurs where an over qualified worker is matched with a lower level job. In this scenario, the worker is expected to leave the job shortly after, and so over-education is a temporary state. Conversely, an undereducated worker in a higher level job may have an incentive to stay longer. Proponents of this view argue that the firm may not replace the worker to save on labor recruitment or on the job training costs. Empirical studies documented that the probability of over-education is lower with experience, whereas the probability of under-education increases with experience (Hartog, 2000; Sloane et al., 1999).

A further explanation of over-education is shown in the assignment literature, where in a dynamic world, with imperfect information, workers and jobs mismatches are possible, and may persist for a long time (Sattinger, 1993, and Sloane et al., 1999). In this framework, i.e. the assignment of heterogeneous workers to heterogeneous jobs, if the education system graduates an excess supply of a certain level of education in comparison to demand, employers may employ overeducated workers. Conversely, when demand for a certain level of education exceeds supply, qualifications other than formal education must make up for the difference, and hence undereducated workers are employed.

Finally, the neo-classical model of household specialization has been used to explain gender differences in over-education. Frank (1978) argues that because men are assumed to earn more than women (women have shorter and interrupted employment), couples, when choosing where to live, will maximize their utilities (income) by giving priority to finding the best job for the husband, though empirical evidences are mixed in this regard. Whereas McGoldrick & Robst (1996), Battu et al. (2000) fail to support it, Büchel et al. (2000) confirmed a significant evidence. Other studies found that workers who have experienced a career interruption (such as women), are more likely to be in jobs for which they are overeducated.

Rubb (2003), surveying studies from different countries, found three uniform findings: The returns to required education are higher than the returns to actual schooling. Years of over-education are less rewarded than years of required education. Years of under-education are rewarded less than years of required education in similar jobs, but more than required education in jobs with lower level of required education.

3. Data Source and Methodology

The empirical analysis is based on the recent Egypt Labor Market Panel Survey 2006 (ELMPS 06), which is a follow-up survey to the Egypt Labor Market Survey 1998 (ELMS 98), that was carried out by the Economic Research Forum (ERF) in cooperation with CAPMAS (Central Agency for Public Mobilization and Statistics). ELMS 98 was administered on a nationally-representative sample of 4,816 households. ELMPS 06 is the second round of a periodic longitudinal survey that tracks the labor market and demographic characteristics of the households interviewed in 1998, in addition to a refresher sample of households. The ELMPS 06 sample consists of a total of 8,349 households. Empirical analysis is carried out on non-agriculture, private sector, out of school, currently in the labor force, wage workers ages 15 to 64.

In the literature of over-education, the number of years of over-education is inserted as a separate variable into a human capital earnings function. It is expected to see different rates

of return to over, under and adequate education. A straightforward way is to estimate an earnings function in which an individual's actual educational attainment is decomposed into the number of years of education required for the job and any years of surplus or deficit education. By comparing the current schooling level of a worker with the level of education required for the job at which the worker performs, a measure of "mismatch" or "over-education" vs. "under-education" is created. The primary interest is in differences between the estimated coefficients on required education and those for years of surplus or deficit education. If productivity levels and wages on jobs are inflexible, then the estimated coefficients for both surplus and deficit education should be zero. If, however, productivity levels on the job are more irregular, and if worker productivity is positively related to education level without regard for minimal requirements, then we would expect a positive coefficient on years of surplus education and a negative one on years of deficit education.

Using the modified model of human capital earnings function introduced by Mincer (1974), pay differences can be explained by differences in workers' endowments of human capital in addition to other explanatory variables, as follows:

$$\text{Ln}W = \beta_0 + \beta_1 E + \beta_2 EXP + \beta_3 EXP^2 + \beta_4 X + u \quad (1)$$

Where LnW is the log of real hourly wages, E is a measure of education, EXP is experience in years, EXP^2 is experience squared, X is a vector of variables reflecting worker and job characteristics that may influence the wage level, such as region of residence, marital status and firm size, and *u* is a random disturbance term. The specification is shown logarithmically in order for the regressors to be interpreted in terms of marginal effects, in which case the index β is interpreted as the rate of returns to schooling. The education variable is a categorical variable taking the values 6, 9, 12, 16 and 18 for primary, preparatory, high school, university, and above university degrees respectively.

To examine the effects of over and under-education on earnings, following Duncan and Hoffman (1981)[2], Hartog (2000), Bauer (2000), and Voon and Miller (2005), the education variable (E) is decomposed into three parts: E_r , E_o, and E_u, where E_r is years of schooling required by the job, E_o is number of years of over-education — a positive variable if attained education minus required education is positive, and zero otherwise — and E_u is number of years of under-education — a positive variable if required education minus attained education is positive, and zero otherwise.

In other words:

$$E = E_r + E_o - E_u \quad (2)$$

Where:

$$E_o = \begin{cases} E - E_r & \text{if } E > E_r, \\ 0 & \text{otherwise;} \end{cases}$$

$$E_u = \begin{cases} E_r - E & \text{if } E_r > E, \\ 0 & \text{otherwise.} \end{cases}$$

Following from (1) and (2), according to Hartog (2000), the modified earnings function in (1) incorporate these additional measures as follows:

$$\text{Ln}W = \beta_0 + \beta_1 E_r + \beta_2 E_o + \beta_3 E_u + \beta_4 EXP + \beta_5 EXP^2 + \beta_6 X + u \quad (3)$$

2 Duncan and Hoffman's model was replicated for the Dutch labor market by Hartog and Oosterbeek (1988) and for the Spanish labor market by Alba-Ramerez (1993).

In the case where wages are determined by the required level of education, β_2 and β_3 will be zero will be zero; i.e. rewards to years in excess of or below the required level of education for a particular job would be zero. If, however productivity is positively related to education level, then we would expect a positive coefficient on years of surplus education and a negative one on years of deficit education.

Hartog (2000) offered a review on a number of methods used to determine educational requirements. As the choice among these procedures3 is determined by data availability, the realized match method is used. A measurement of job requirements is derived from the actual educational attainments of all workers. Required years of terminated certification (rather than the highest year of school attendance), is employed as a proxy for educational attainment. For each occupation, the mean and standard deviation of all workers are computed and rounded up to the nearest certification level. Workers with educational attainment greater than the mean plus one standard deviation are labeled "overeducated". Likewise, workers with educational attainment below the occupational mean minus one standard deviation are classified as "undereducated". Workers whose educational attainment is within the mean plus or minus one standard deviation are considered "adequately matched". Kiker et al. (1997) have modified this measure by using the mode instead of the mean as the mode is more sensitive to outliers. The latter modification is used in this study. This methodology was applied to Hong Kong (Ng, 2001), and both the US and Hong Kong (Cohn, Johnson and Ng, 2000).

Descriptive Summary

Descriptive statistics of the sample reveal that by 2006, approximately 60% of all private sector workers worked in "craft and trade related work" and "services and shop related work". "Plant and machine operations and assembly workers" comprised 15% of the distribution. The studied period has witnessed some drastic changes in occupational distribution; workers in the "technicians and associates" category increased by 95% (from 3.6% to 6.9%). In contrast, the category of "legislators, senior officials, and managers" has lost 44% of its employment (from 2.2% to 1.2%). Plant machines operators and assembly workers, and elementary occupations have gained employment by 38% and 28% respectively.

Figures (1-A) and (1-B) display the distribution of workers by their levels of education across occupations in the private sector for years 1998 and 2006, as well as their total distribution; and table (1) presents the incidence of mismatch in both years. The figures reveal that, in general, only secondary and university education graduates have increased between 1998 and 2006 (by 26% and 20% respectively). While above secondary and beyond dominates high level occupations such as legislators, senior officials and professionals, by the nature of its requirements, secondary education and below lead to occupations such as clerks, service, plant and elementary occupations. These general characteristics mask inner differences. For example, in 1998, some 17% of all workers of occupational category "legislator, senior officials and managers" were secondary school graduates.

In 2006, their size more than doubled to 37% (an increase of 111%). This may explain the increase in the percentage of the "undereducated" group in that category from 30% in 1998 to 37% in 2006, as indicated in Table (1). Another substantial variation appears in the category of "technicians and associate professionals", whereby university educated workers

3 Hartog (2000) provided a review of measures of over, under and required education according to data availability: 1- Job Analysis (JA): evaluation by job analysts who determine the required level of education for a typical job or occupation; 2- Worker Self Assessment (WA): where the workers specify the required level of education for a typical job; 3- Realized Match (RM), where required education is obtained from the mean or the mode of education of all workers.

representing a mere 5% in 1998, escalated by over 300% to reach 22% of total workers in that category. This is also reflected by the rise in percentage of the "overeducated" from 8% to 22%. University graduates, as well, advanced their share in the category "craft and related trade workers" by over 200% (from 1% in 1998 to 3% in 2006). A puzzling outcome surfaces in this category. While in 1998 about 43% of its workers were classified as overeducated (and 57% as adequately educated), it registered 30% of undereducated workers in 2006 (3% overeducated, 67% adequately educated). It is a puzzling conclusion because that occupational category witnessed a drop in primary, preparatory, as well as above secondary workers (by 27%, 32% and 50% respectively) at the expense of an increase in both secondary and university educated workers (by 46% and 200% respectively). An explanation for this is attempted later on.

Turning to overall gender differences, descriptive statistics reveal that, in both years, females made up 12% of the workforce and males approximately 87%. About 73% of females in 1998 worked in three main occupations: professionals (27%), services (25%) and crafts (21%). While these same categories accommodated 62% of females in 2006, the technicians and associate professionals category attracted 13%, compared to only 2% in 1998. As for males, 76% were employed at three occupational categories with mild variations between 1998 and 2006 —services (19%), crafts and related trade jobs (45%) and plant and machine operations (12%) in 1998 as compared to 24%, 36% and 16% respectively in 2006.

Table (2) presents the incidence of mismatch by gender, for 1998 and 2006. On average, the table shows that the percentage of overeducated workers has dropped from 42% to 12% between 1998 and 2006, which is lower than the 40% reported for Mexican men by Quinn (2006). On the other hand, the economy witnessed an increase in the share of adequately educated workers from 49% to 58%, and an expansion in the share of undereducated from 9% to 30%, which is comparable to that of Mexican men at 31% (Ibid). It appears that males are more likely to have educational mismatches, which is consistent with the findings of Groot (1996) for the UK, McGoldrick and Robst (1996) for the USA, and Voon (2005) for Australia.

It is important, when it comes to studying the relation between earnings and education to consider years of experience. The literature on human capital has documented the role of years of experience in workers' earnings. Workers with more years of experience earn higher wages than workers with lower levels of experience. Interesting observations are revealed in Table 3, where the mismatch is reported by cohorts of years of experience.

With a few exceptions, the table shows a negative relationship between over-education and years of experience, which also confirms the previous theoretical explanation that overeducated workers are compensated for lack of experience and on the job training. Conversely, undereducated workers have more years of experience. For example, in 1998, approximately 53% of male workers who had between one and five years of experience were overeducated (39% for females), and only 4% were undereducated (7% for females). In 2006, some 16% of male workers with one to five years of experience were overeducated (19% for women), and 17% were undereducated (11% for women). Comparing 1998 and 2006, the incidence of the correct match for early entrants into the labor market (those with one to five years of experience) is noticeably higher in 2006 than in 1998 for both males and females (67% for males and 71% for females in 2006 vs. 43% and 54% respectively in 1998).

These preliminary findings are consistent with the literature on the fact that labor market experience may substitute for formal education, especially for 1998. In fact, as Voon (2005) verified in the case of Australia, higher educated workers may voluntarily choose jobs that require lower levels of education in order to gain work experience. Meanwhile, undereducated workers are likely to swap low levels of education with more years of

experience. Since the definition of required education might have changed in the eight year span as well as the demographics of the workers, and concurring with Quinn (2006), caution is advised while interpreting the changes in the incidence of mismatch from 1998 to 2006. For example, the recent literature on credentials or "sheep skin effect" may serve as a valid explanation for the drop in the percentage of overeducated vis a vis the increased percentage of undereducated in 2006. Firms may have increased hiring credentials while workers were seeking more education. In other words, younger workers may have obtained more education than the older generation in the hope of getting promoted, while older workers were left behind, showing up in the statistics as undereducated. This conclusion may explain the previous puzzle regarding workers in crafts and trade related occupations.

Having provided a general portrayal of the sample, and in order to evaluate the development of the education-occupation mismatch in Egypt, it is useful to distinguish between traditionally higher paid, higher educated workers and lower paid, lower educated groups. One way is to group employment by occupation and economic activity into three broad categories: professional workers (i.e., legislators, managers, health professionals and educators); white-collar workers (i.e., technical assistance, clerks, sales and services) and blue-collar workers (i.e., vocational, production workers and others). The following analysis is run for males and females separately and for the three occupational categories: professionals, white collars, blue collars and others.

Table (4) reports the incidence of mismatch by gender and occupational group. Care is advised when interpreting the numbers related to professional occupations. In general, professional occupations require advanced degrees that may top 18 years of education, thus creating a "ceiling", where it is unexpected to find considerable number of mismatched workers. Recognizing that, educational mismatch is more applicable to occupations that require less than the pre-defined maximum level, such as white or blue collar workers. Furthermore, the distributional results of Table (4) show minimal incidences of overeducated professional workers (males or females). Hence, while the rest of the analysis reports results of professional occupations, discussions will be limited to white and blue collars only.

Table (4) reveals blue collar jobs have adjusted quickly to changes in the market. Between 1998 and 2006, adequately educated workers represented 53% and 63% for males and females respectively. The incidence of over-education in blue collar jobs has rapidly dropped for males and females alike (a drop by 91% and 94% respectively). In fact, since careers are limited at lower levels of occupations, over-education is less likely to be visible. Surprisingly, these jobs have attracted undereducated workers by greater numbers in 2006 compared to 1998. The incidence of undereducated workers has gone up to represent 41% of males, and 34% of females in blue collar jobs. Here, the credential argument may explain this change; employers raise their educational requirements, and while young workers come with higher levels of education, older workers, with lower levels of education, appear as undereducated. For white collars, aside from minimal fluctuation in the incidence of adequately educated workers, over-educated workers represented 27% of all white collar males in 2006 (and 30% for females), and while the incidence of undereducated white collar male workers has dropped by 30% from 1998 to 2006, female undereducated white collar workers have experienced a 52% increase during the same period. It seems that overeducated males in white collar jobs are forced to accept jobs below their qualifications, while undereducated women are given increased opportunities, probably because they may accept lower wages than undereducated men. The same destiny is faced by undereducated workers in blue collar jobs for males and females alike.

4. Empirical Findings[4]

Table (5) shows estimated coefficients from running equation (3) for males and females using 1998 and 2006 household surveys data. For brevity and because of the previously mentioned "ceiling" effect facing professionals, results on professionals are reported but not discussed. The adequately educated variable represents workers with matched certificates of education for their job, and the corresponding coefficient documents the returns to required certificate of education if adequately matched by the worker. The overeducated variable equals the difference between the worker's actual certificate of education and the required certificate of education for that job. A positive coefficient for an overeducated worker with, say 12 years of education, in a job that requires 9 years of education indicates that he/she will earn more than a worker with the required level of education. Conversely, the undereducated variable represents the difference between the educational certificate required for the job and actual certificate of education. A negative sign for undereducated coefficients means that if a worker working in a job that requires, for example, secondary education (i.e. 12 years of education), a worker with 9 years of education will earn less than a worker with the required level of education.

The table displays few significant coefficients for the education mismatch variables. However, when tested statistically, the coefficients on adequate, over and under-education differ significantly in all cases, for both genders and in both years. F-tests for the hypothesis that the years of adequate education, over-education and under-education should be rewarded equally, i.e. $\beta_1=\beta_2=\_\beta_3$, are all significant at least at the 5% level, implying that the assumption of equal rate of returns to adequate-, over and under-schooling, is rejected. Hence, it is somewhat safe to say that years of required education, years of over-education and years of under-education are not equally rewarded in the private employment economy.

The table also shows that overeducated males in white collar jobs receive higher returns than adequately educated males in the same occupation, whereas undereducated males in the same occupation receive less. Moreover, returns to white collar jobs for males are better in 2006 than in 1998 (i.e. overeducated workers earn more in 2006 than in 1998 — returns increased by 6 percentage points). For the undereducated, while still earning less than the adequately educated, the gap is lower in 2006 than in 1998 — i.e. returns decreased by 30 percentage points. A result that supports the argument that when employers are faced with an increased supply of overeducated candidates, they may be tempted to take advantage of them (in other words, employers favor overeducated workers to lower training costs). For white collar females, surprisingly, both over and under-education coefficients are positive and higher than the adequately educated group in 1998. A result that may reflect two competing arguments: first, an increased demand for women in low paying, white collar jobs — since they normally accept lower wages than males, and second, the labor market may have rewarded females' years of experience at the expense of certification. This is supported by previous results (El-Hamidi and Said, 2008), where certification and years of experience were treated differently by occupation and gender. Nevertheless, 2006 results matched those of males. Returns to over education were higher and returns to under-education were lower than adequately matched, though at a lower magnitude than those of men. Thus, there is evidence of a correction in the labor market regarding rewards for white collar females in 2006.

Blue collar males experienced the same effect of white collar males — higher returns to over-education and lower returns to under-education. Blue collar women, on the other hand, were

[4] The author acknowledges that the analysis ignores the potential bias that may be due to self-selection. One source of selectivity bias might be that persons with "over-education" might select themselves into specific occupations. Alternatively, people expecting low rent on inherited ability might invest more in education to increase the rental payment on acquired human capital.

penalized if they were inadequately matched, especially in 2006. Previous research (El-Hamidi and Said, 2008) has documented that increased wage gaps between men and women in blue collar jobs has been attributed to pure discrimination in earnings due to concentration of women in low pay blue collar jobs, while men worked in high pay blue collar jobs, where their productivity related characteristics were treated according to market forces. The decline in returns to matched education for both gender and occupations seems to suggest that the demand for labor in these jobs has grown at a slower pace than the supply.

As a result, the assumption that years of required, over and under-education are equally rewarded in the labor market is likely. Meanwhile, the assumption that productivity levels and wages are inflexible may now be rejected in the face of different returns to matched, over and under-education, for white and blue collar males and females. In fact, these findings support both the bumping model and job competition model in a labor market with an imperfect information system (Fields, 1972 and Thurow, 1975 respectively), whereby in the first model, the educated worker moves to the front of the queue of unskilled jobs and is hired first at the unskilled wage rate, "bumping" a less educated person from a job. In the second model, employers use education as a screening tool and an indicator of the cost of investing in job training by hiring overeducated workers in order to save on training costs. Meanwhile they may be unable or unwilling to utilize the extra education of the overeducated workers (Rumberger, 1987), when workers may accept these jobs while competing for a job.

For the remainder of the coefficients, in general, residing in an urban area, as well as being married, affects wages positively (though coefficients are insignificant). Experience and experience squared both have the expected concave shape of increasing then diminishing returns. Finally, a large firm size (larger than 20 workers) has a positive influence on wages for white collar but not for blue collar workers.

V. Policy Implications

This study attempts to fill a void in the literature by examining education-occupation mismatches in Egypt. Using two surveys — ELMS 98 and ELMPS 06 — this paper explores whether the empirical evidence of studies on over and under-education carry over to the Egyptian labor market in order to evaluate the incidence and magnitude of the education-occupation mismatch by gender and by occupational categories and to determine whether the incidence of educational mismatches has increased over time.

The main findings of this paper are as follows. The incidence of education-occupation mismatch has declined from 51% to 42% during the eight year period, and males are more likely to be mismatched than females. The Egyptian labor market has witnessed a drop in the percentage of overeducated workers at the expense of an expansion in the share of undereducated workers.

Empirical results of this study do not support the mainstream literature that overeducated workers receive lower returns than equally matched workers. In fact, empirical findings have indicated that returns to over-education for white collar and blue collar males are higher than those of adequately educated males and greater in 2006 than in 1998. This supports the argument that when employers are faced with an increased supply of overeducated candidates they may be tempted to take advantage of the more skilled having not yet raised the requirements of jobs that have been traditionally held by the less skilled. Females in white collar jobs, surprisingly, and for both over and undereducated workers, received higher returns than the adequately educated group in the first period. A result that my reflect two competing arguments: first, an increased demand for women in low paying, white collar jobs — since they normally accept lower wages than males, and second, and this is more applicable to undereducated women, the labor market may have rewarded years of experience

at the expense of certification. But evidence shows a reverse in this trend in 2006, where results mirrored that of males — i.e. returns to over-education were higher and returns to lower education were lower than the adequately matched, though at a lower magnitude. Females in blue collar jobs are penalized if they are inadequately matched, especially in 2006, and are less rewarded than males, suggesting increased wage gaps between men and women in blue collar jobs. This has been attributed to the concentration of women in low pay blue collar jobs, while men work in high pay blue collar jobs, where their productivity related characteristics are rewarded according to market forces.

To an extent, these results suggest that wages are not linked to required education. In other terms, in a given occupation, the returns to an additional year of required education is less than the returns from additional schooling of an overeducated worker (i.e. job requirements do not determine wages). This result also indicates that in order to raise the average wages, it is more efficient for optimizing current resources to increase educational attainments side by side with occupational levels and requirements. In fact, the greater the proportion of mismatched labor forces in the economy the greater the wage dispersion. Conventional wisdom suggests that increasing levels of education are expected to minimize earnings inequality (i.e. higher education reaps higher wages). Nevertheless, recent research Martins and Pereira (2004), Hartog, Pereira and Vieira (2001) for Portugal, and Gosling, Machin and Meghir (2000) for the UK, has shown that wage dispersion is wider between the more educated.

The findings of this paper supports the job competition model in a labor market with an imperfect information system whereby employers use education as an indicator of the cost of investing in job training. Employers may hire overeducated workers in order to save on training costs, and they may be unable or unwilling to utilize the extra education of the overeducated workers. Workers, on the other hand, may accept these jobs while competing for another job. This is a significant finding suggesting that firms may not immediately react to changes in the supply side, as implied by the neoclassical theory. Several adverse effects may arise from education-occupation mismatch: firms may change their technology to adjust to current productivity levels, productivity may deteriorate and profits may decline in addition to lowering workers' morals.

The evidence of mismatched education found in this study reflects a structural mismatch between the job market and educational institutions. Policy makers should consider the source of over-education in the educational system not in the labor market. In many countries, graduates with marginal qualifications are voluntarily being forced to stay in the education system longer than they need to for limited job opportunities, and where surplus education is voluntarily, it is more often than not a result of society wide preference for education, and not a result of an investment decision based on rational expectations and potential future earnings. For policy makers, it is key to promote a mechanism for education screening that replaces the current system of personal contacts or connections in hiring workers, to foster proper labor market assignments and advance a transparent and effective labor market information system and to coordinate the rise in educational attainment with the higher occupational levels in order to efficiently maximize the use of economic resources. Policy makers may limit the supply of educated graduates by raising the private cost of a certain type of education, or impact the demand on a certain type of workers by offering tax credits for employing certain skill types, along with spreading career advice centers.

A further investigation into the returns to actual level of schooling is needed for comparison and to concur with the literature. Studies have found that mismatched workers earn substantially lower rates of return to their education than their peers who found a job

matching their education. If this is the case, then educational expansion may augment wage inequality by increasing wage differences within equally educated workers.

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Figure (1-A): Distribution of Occupations by Educational Levels, 1998

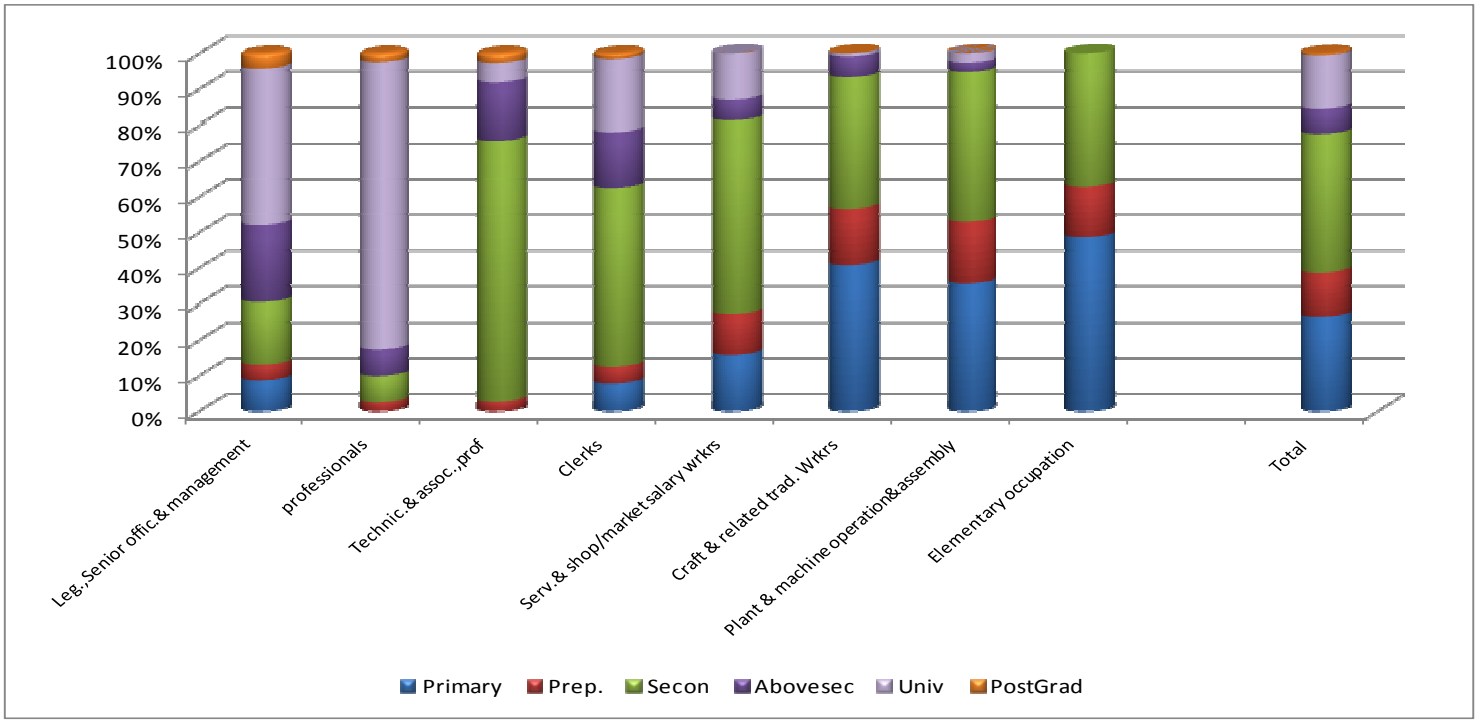

Figure (1-B): Distribution of Occupations by Educational Levels, 2006

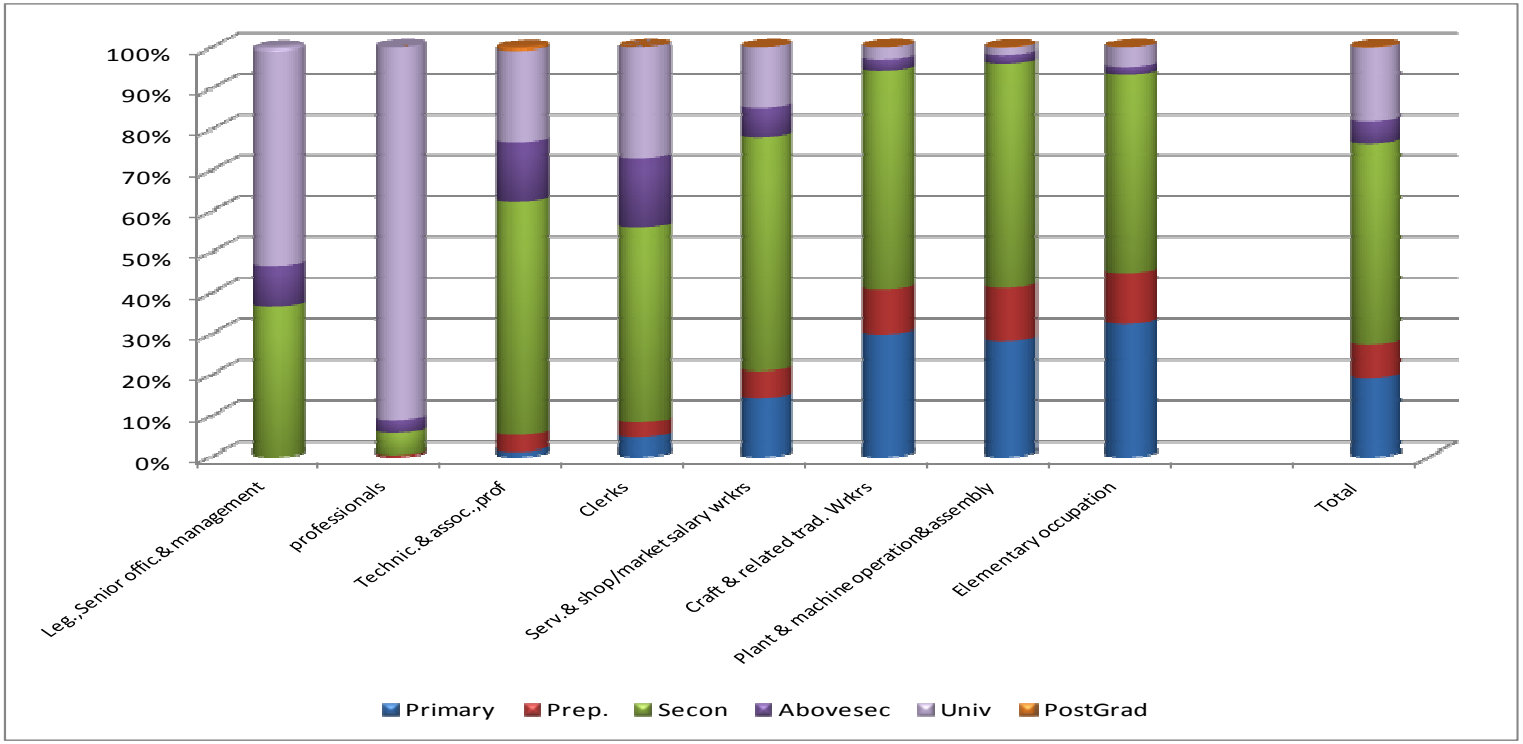

Table 1: The Incidence of Education-Occupation Mismatch

Occupation	1998			2006		
	Adequate	Over	Under	Adequate	Over	Under
Leg, Senior Offic, manag.	70	-	30	63	-	37
Professionals	90	-	10	90	1	9
Technic.& assoc., Prof.	89	8	3	72	22	5
Clerks	70	22	8	64	27	8
Serv.& shop/market sal. wrkrs	71	13	16	71	15	14
Craft & related trad. wrkrs	57	43	-	67	3	30
Plant & machine operat. & assemb.	62	3	36	70	2	28
Elementary occupations	63	37	-	63	5	32

Source: Author's Estimates, ELMS 1998, and ELMPS 2006.

Table 2: The Incidence of Educational Mismatch by Gender, 1998 and 2006

	1998			2006		
	Male	Female	Total	Male	Female	Total
Adequately Educated	48.16	55.07	48.96	57.12	65.41	58.12
Over Educated	43.44	28.99	41.77	11.46	16.98	12.12
Under Educated	8.40	15.94	9.27	31,42	17.61	29.76

Source: Author's Estimates, ELMS 1998, and ELMPS 2006

Table 3: The Incidence of Educational Mismatch by Years of Experience and Gender, 1998 and 2006

Years of Experience	1998			2006		
	Adeq. Educated	Over Educated	Under Educated	Adeq. Educated	Over Educated	Under Educated
Males						
1-5	43.20	52.80	4.00	66.91	16.25	16.82
6-10	44.75	47.86	7.39	66.28	12.60	21.11
11-20	50.60	38.86	10.54	51.72	8.86	39.42
20-30	57.52	33.63	8.85	38.39	5.69	55.92
30+	56.32	27.59	16.09	30.37	6.67	62.96
Females						
1-5	53.70	38.89	7.41	70.54	18.75	10.71
6-10	68.75	25.00	6.25	60.23	21.59	18.18
11-20	36.00	24.00	40.00	68.52	9.26	22.22
20-30	75.00	0.00	25.00	52.17	4.35	43.48
30+	44.44	22.22	33.33	63.64	13.64	22.73

Source: Author's estimates, ELMS 1998, and ELMPS 2006

Table 4: The Incidence of Mismatch by Occupational Groups and Gender, 1998 and 2006

	1998			2006		
Males	Professionals	White Collars	Blue Collars	Professionals	White Collars	Blue Collars
Adequately Educated	77.36	54.58	40.28	86.6	56.01	53.32
Over-Educated	3.77	21.12	59.72	0.48	26.87	5.37
Under-Educated	18.87	24.3	0	12.92	17.11	41.3
Females						
Adequately Educated	65.79	58.62	45.45	86.08	56.55	63.38
Over-Educated	0	32.76	54.55	1.27	30.36	2.82
Under-Educated	34.21	8.62	0	12.66	13.1	33.8

Soruce: Author's estimates, and ELMS 1998. ELMPS 2006

Table 5: Estimates of Regression Coefficients of Log Real Hourly Wages by Occupational Categories and Gender, 1998 and 2006

Variables	1998			2006		
Males	**Professionals**	**White Collars**	**Blue Collars**	**Professionals**	**White Collars**	**Blue Collars**
Adequately educated	0.0004	0.007	0.020	0.059*	0.001	0.002
	(0.018)	(0.016)	(0.016)	(0.030)	(0.010)	(0.007)
Over Educated	0.470***	0.067	0.010	0.462*	0.073*	0.053
	(0.172)	(0.050)	(0.016)	(0.246)	(0.038)	(0.032)
Under educated	0.003	-0.057	0.000	0.196	-0.026	-0.019
	(0.0055)	(0.044)	(0.000)	(0.168)	(0.023)	(0.014)
Experience	0.030	0.036***	0.051***	0.033	0.035***	0.017***
	(0.024)	(0.013)	(0.007)	(0.020)	(0.009)	(0.006)
Experience-Sq.	-0.056	-0.042	-0.067***	-0.074*	-0.045**	-0.012
	(0.062)	(0.032)	(0.016)	(0.045)	(0.021)	(0.011)
Married (0= not married)	0.044	0.166	0.019	0.218	0.191***	0.109***
	(0.181)	(0.109)	(0.056)	(0.164)	(0.069)	(0.038)
Urban (0=rural)	-0.217	-0.102	-0.067	-0.004	-0.099*	-0.055*
	(0.199)	(0.101)	(0.046)	(0.200)	(0.051)	(0.030)
Firm Size (0=LT 20)	0.441* **	0.214***	-0.094**	0.299**	0.246***	-0.065*
	(0.154)	(0.076)	(0.043)	(0.140)	(0.052)	(0.035)
Constant	0.383	0.018	0.150	-0.239	0.044	0.488***
	(0.323)	(0.204)	(0.104)	(0.488)	(0.127)	(0.087)
Observations	135	269	644	208	699	1398
R-squared	0.207	0.263	0.169	0.106	0.210	0.073

Table 5 (continued)

Variables		1998			2006	
Females	**Professionals**	**White Collars**	**Blue Collars**	**Professionals**	**White Collars**	**Blue Collars**
Adequately educated	0.009	0.117***	0.098	0.018	0.007	0.073
	(0.027)	(0.030)	(0.106)	(0.027)	(0.028)	(0.049)
Over Educated	0.000	0.585***	0.181**	0.095	0.048	-0.196
	(0.000)	(0.106)	(0.080)	(0.278)	(0.098)	(0.199)
Under educated	-0.034	0.280***	0.000	-0.106	-0.043	-0.162
	(0.158)	(0.084)	(0.000)	(0.095)	(0.092)	(0.121)
Experience	0.018	-0.006	0.062	0.047	0.049	0.031
	(0.034)	(0.034)	(0.058)	(0.043)	(0.033)	(0.057)
Experience-Sq.	-0.070	0.109	-0.106	-0.059	-0.005	-0.018
	(0.091)	(0.091)	(0.124)	(0.123)	(0.149)	(0.171)
Married (0= not married)	0.140	0.933***	0.161	0.005	0.221	0.896*
	(0.317)	(0.324)	(0.671)	(0.191)	(0.211)	(0.518)
Urban (0=rural)	-0.897**	-0.097	-0.116	-0.296	0.034	0.247
	(0.341)	(0.217)	(0.283)	(0.311)	(0.201)	(0.306)
Firm Size (0=LT 20)	0.897**	0.521***	-0.008	0.157	0.442**	-0.017
	(0.403)	(0.151)	(0.472)	(0.258)	(0.171)	(0.250)
Constant	-0.010	-1.839***	-1.204*	0.167	-0.505	0.625
	(0.495)	(0.382)	(0.702)	(0.684)	(0.356)	(0.628)
Observations	41	63	31	77	160	68
R-squared	0.254	0.766	0.300	0.185	0.226	0.225

Notes: *** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses
Source: Author's Estimates, ELMS 1998, and ELMPS 2006