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Why Does the Productivity of Education Vary across Individuals in Egypt?

Firm Size, Gender, and Access to Technology as Sources of Heterogeneity in Returns to Education

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Abstract

The paper estimates the rates of return to investment in education in Egypt, allowing for multiple sources of heterogeneity across individuals. The paper finds that, in the period 1998–2006, returns to education increased for workers with higher education, but fell for workers with intermediate education levels; the relative wage of illiterate workers also fell in the period. This change can be explained by supply and demand factors. On the supply side, the number workers with intermediate education, as well as illiterate ones, outpaced the growth of other categories joining the labor force during the decade. From the labor demand side, the Egyptian economy experienced a structural transformation by which sectors demanding higher-skilled labor, such as financial intermediation and communications, gained importance to the detriment of agriculture and construction, which demand lower-skilled workers. In Egypt, individuals are sorted into different educational tracks, creating the first source of heterogeneity: those that are sorted into the general secondary-university track have higher returns than those sorted into vocational training. Second, the paper finds that large-firm workers earn higher returns than small-firm workers. Third, females have larger returns to education. Female government workers earn similar wages as private sector female workers, while male workers in the private sector earn a premium of about 20 percent on average. This could lead to higher female reservation wages, which could explain why female unemployment rates are significantly higher than male unemployment rates. Formal workers earn higher rates of return to education than those in the informal sector, which did not happen a decade earlier. And finally, those individuals with access to technology (as proxied by personal computer ownership) have higher returns.

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Why does the productivity of education vary across individuals in Egypt? Firm size, gender, and access to technology as sources of heterogeneity in returns to education[1]

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I. Introduction

Macroeconomists generally include proxies for human capital in their growth regressions or growth decomposition exercises. Initially they used years of schooling as a proxy, but given the limited success of this variable in explaining growth, economists began focusing on the quality of education. Hence, the returns to investment in education became a central element for growth analysis.

This paper measures the rate of return to investment in education in Egypt. Although most studies use an average rate of return for a country (Psacharopolus and Patrinos, 2004), it is possible that rates of return differ across groups of individuals. Although some studies estimate separate rates of return for males and females in Egypt, this one explores heterogeneity beyond the gender aspect in three dimensions. First, returns may vary depending on the specific educational path followed by the individual. In the Egyptian education system, individuals are sorted into different groups at different stages. Hence, returns to education may vary according to the specific educational path. Second, returns to education may differ according to the size of the firm where the individual works, given that large firms will have more capital, which in turn will imply different labor productivity and wage levels. And third, the paper explores the possibility that returns to education increase with the level of technology, as postulated by the Nelson-Phelps (1966) growth model. The productivity of schooling may be associated with the possibility of acquiring new technologies and new knowledge (Rosenzweig, 2010), and not all individuals have the same opportunities, creating unequal productivity of schooling outcomes.

The objective of this paper is to investigate why the productivity of education varies across individuals in Egypt, controlling for heterogeneity arising from several sources. Section II briefly describes the Egyptian education system and reviews previous studies on the topic. Section III describes the model; Section IV presents stylized facts of the data and discusses the methodology. Section V presents the econometric results, and Section VI discusses the policy implications and concludes.

II. Background and Literature Review for Egypt

The Egyptian education system is a maze through which students navigate toward the labor force. Along the way, students are sorted into groups at different stages. The first stage, basic education, is compulsory and takes 9 years to complete: 6 years of primary and 3 of preparatory level education. After finishing this stage, individuals who wish to pursue secondary education are sorted into three possible categories: general secondary education (3 years), 3-year vocational education (with specializing in agriculture, industry, or commerce), and 5-year vocational education. Those who graduate from general education and wish to continue into higher education are sorted again into university (4-year or 5-year programs) or into post-secondary technical institutes (with programs from 2 to 5 years). Graduates of 3-year vocational education can also pursue studies in post-secondary technical institutions. University graduates can further pursue post-graduate studies.

There are relatively few studies that examine the rate of return (RoR) to education in Egypt. Most studies calculate a rate of return for each level, allowing for gender heterogeneity. For instance, Tansel (1995) shows that the returns to education for males in Egypt were higher than for females, and

increased with the level of education, while they decreased for females: the RoR for primary education was 0.9 percent, it was 2.7 percent for general secondary education, 3.1 percent for vocational education, 7.5 percent for university graduates, and 11.8 percent for those with post-graduate studies. Returns to education for females decreased with higher education levels: the RoR for primary education was 9.9 percent; for general secondary, 8.2 percent; for vocational education, 6.1 percent; and for higher education, 7.4 percent. The study shows that returns to education are higher in the government and public sectors only for early education levels (primary and preparatory), while the RoRs for vocational, university, and higher education levels were superior in the private sector (El Arabi, 2010).

Wahba (1996) studies the determinants of earnings in the Egyptian labor market using the Egyptian Labor Force Sample Survey (LFSS) performed in October 1988. She uses the classical Mincerian model. Her study is consistent with earlier studies in showing an increase in returns to education with education level. She also reports variations among regions, and explains these discrepancies by differences in labor productivity characteristics.

Said (2007) uses the 1998 LFSS, 1998 ELMS, and 2006 ELMPS to study workers' earnings in Egypt. She ran 18 multivariate regressions of log hourly wage regressed on education levels for three rounds (1988, 1998, and 2006), males and females, sector of employment, and region. Said reports considerable improvement in female wages between 2006 and 1998, due to the concentration of female employment in the government sector, where wages increased by 40 percent between these two periods compared with a 17 percent increase in the private sector. Said reports a 4.7 percent return on vocational education, 7 percent for post-secondary education, and 8.5 percent for university education, without allowing for any heterogeneity.

El Arabi (2010) uses a sample of 862 observations of household heads between 15 and 64 years old who are wage employees distributed among five Egyptian governorates to study the economic and non-economic determinants of the demand for education. El Arabi also uses both the classical and extended Mincerian models. El Arabi finds that the return on education in Egypt is very low compared with other developing countries, which explains why school drop-out rates are high among the poor.

III. The Model

The starting point is the estimation of a human capital earnings function of the Mincer type, in which we control for experience, location, sector of employment, and other individual characteristics. The regression model is as follows:

$$\ln W = \alpha + \beta_1 ED_i + \beta_2 EXP_i + \beta_3 EXP_i^2 + \beta_4 Region_i + \beta_5 SEC_i + \beta_6 Activity_i + \beta_7 X_i + \varepsilon_i \quad \text{(eq.1)}$$

where

Ln W: ln hourly wage

ED_i: a vector of educational level dummies (illiterate, read & write, primary, preparatory general secondary, 3-year vocational education (agriculture), 3-year vocational education (industry), 3-year vocational education (commerce and others), 5-year vocational education, post-secondary,4-year university, 5-year university, and post-graduate)

EXP_i: Years of experience calculated as Age - years of education - 6

EXP^2_i: Years of experience squared

$Region_i$: Four regional dummies (Greater Cairo, Alexandria and Canal cities, Upper Egypt, and Lower Egypt)

SEC_i: Four sector of employment dummies (government, public enterprises, private, and others)

$Activity_i$: 16 economic activity dummies (agriculture / hunting / foresting / fishing, mining & quarrying, manufacturing, electricity, gas, and water supply, construction, wholesale and retail trade, hotels and restaurants, transportation, storage and communication, financial intermediaries, real estate, public administration and defense, education, health and social work, other communication, social, and personal activities, and private household)

X_i: Five personal characteristics and work environment dummies: covered by medical insurance, formal labor contract, member of a trade union, received training, and married

ε_i: Error term.

To estimate annual rates of return to education level, we follow Teal (2008) and calculate the RoR as follows:

$$ROR_i = e^{(\beta_i - \beta_j)/n_i} - 1 \quad \text{(eq.2)}$$

where

ROR_i: Annual rate of return on education level

β_i is the coefficient corresponding to a certain level of education

β_j is the coefficient corresponding to a level of education preceding β_i

n_i is the number of years spent to finish the level of education corresponding to β_i [4]

e is a mathematical constant = 2.718.

IV. Method and Data

This section describes the method and data used in the paper.

A. The Method

Simple OLS estimates of equation 1 may be biased due to two problems: endogeneity of education, and sample selection bias. Endogeneity may arise due to the fact that the individual's schooling choice may reflect unobserved characteristics (i.e., ability), while sample selection bias may arise if those who were employed (and reported wage income) have systematic differences with respect to those who did not participate in the labor market. The first problem is generally tackled through instrumental variables estimation, and the second through a Heckman two-step method of estimating a labor force participation equation, and then estimating the wage model.

To test for potential endogeneity bias, we instrumented the individual's education level with the parent's education level. The cost of this choice is that we lose almost 40 percent of the individuals who reported wages in the sample. Disregarding the cost momentarily, we ran the model estimating the probability that an individual is classified in a given education level given his/her parents' level of education. Table A1 in the Appendix shows that the inverse Mills ratio is insignificant, indicating that this source of bias is not important in this case; furthermore, the differences in the coefficients are negligible.

Next we examine sample selection bias using the same (limited) sample to ensure that there are no differences due to changes in the sample. First we estimate participation in the labor market equation,[5] and then we estimate the earnings equation. Estimation of the participation equation includes the individual's age, number of years of education, gender, marital status, a dummy if there is a family member living abroad, and regional dummies. The inverse Mills coefficient is negative and significant in the wage equation (Table A1). With the coefficients from both the OLS and the Heckman estimations, we calculated the returns to education (Table A1), showing that OLS leads to overestimating the returns to education by 8 to 16 percent, depending on the level of education.

[4] Primary education requires 6 years for completion; preparatory and general secondary each require 3 years; vocational education, 5 years; post-secondary, 3 years (on average); 4-year university education, 4 years; 5-year university education, 5 years; and post-graduate studies, 3 years (on average).

[5] We used extended labor force participation, which includes those who were working or actively seeking work in the past 3 months previous to the survey. The extended definition also includes those involved in the production of primary goods that might be used in household consumption.

Hence, in the remainder of the paper, we proceed with the Heckman method and the full sample.

B. Data and Stylized Facts

The Egyptian Labor Market Panel Survey (ELMPS) has 37,000 observations for 2006, while the 1998 (ELMS) surveyed 23,995 individuals. We start by showing stylized facts of the labor force to provide some context for the econometric results presented in the next section. Table 1 shows that female labor force participation is low, but increased from 31 percent in 1998 to 38 percent in 2006. Male participation rates increased from 47 to 65 percent between the two years. The labor force is mostly composed of males: 63 percent are males, up from 61 percent in 1998 (see Table 1).

Table 1 - Labor Force Participation and Gender

Labor Force Participation Rates, by Gender	1998	2006
Male	47%	65%
Female	31%	38%
Labor Force Composition, by Gender	**1998**	**2006**
Male	61%	63%
Female	39%	37%
Total	100%	100%

Source: Authors' calculations using ELMS 1998 and ELMPS 2006.

Regarding the composition of the labor force by level of education (Tables A2 and A3 in the Appendix), illiterates are the major category for both genders. However, while 19 percent of all participants were illiterate, females reached 36 percent (Table A3). Most of the illiterate population is composed of females (Table A2). At other education levels, the distribution between females and males is more balanced, except in vocational education for agriculture and industry, and 5-year university (mostly engineering), where males are the majority. Almost 15 percent of males had primary education, and 11 percent of females.[6]

Table 2 shows the median wage in each sector of employment in 1998 and 2006. Males received higher hourly wages than females in state-owned enterprises ("public") and the private sector ("private'), but the reverse happened in the government. These sample statistics show that the median wage of the private sector is lower than in the government or the public sector. This result will change in a multivariate setting that adequately controls for the level of education, experience, and other individual characteristics.

[6] These figures are significantly lower than those in China, where the numbers are 30 and 25 percent for males and females, respectively.

Table 2 - Median Hourly Wages by Gender and Sector of Employment

Hourly Wages	1998		2006	
	Male	Female	Male	Female
Government	1.25621	1.355311	2.458791	2.716758
Public	1.602564	1.572115	2.884617	2.509615
Private	1.153846	0.75	1.923077	1.098901
Others	1.141167	0.769231	2.183087	1.970567

Source: Authors' calculations using ELMS 1998 and ELMPS 2006.

Because we are interested in exploring the hypothesis of complementarily of education and technology, we report on whether the individual owns a computer. Table 3 shows that personal computer (PC) ownership increases with educational attainment. Only 12 percent of workers report owning a computer, but the ownership rates are very different across education levels: less than 2 percent of workers with primary education owned a computer, 6 percent of those with preparatory level education, 10 percent with general secondary education, 17 percent with post-secondary education, 29 percent with university-4 education, and 53 percent with university-5 level education. The average rate of computer ownership, 12.4 percent, is similar to Colombia's (13 percent), but significantly lower than in Chile (57 percent), Brazil (51 percent), and Mexico (32 percent) (World Bank, 2011).

Table 3 - PC Ownership

Does your family own a PC? (2006)	Yes	No
Illiterate	3.62%	96.38%
Read & Write	1.99%	98.01%
Primary	1.46%	98.54%
Preparatory	5.75%	94.25%
General Secondary	10.26%	89.74%
Voc. Sec. Agriculture (3-Yrs)	1.46%	98.54%
Voc. Sec. Industrial (3-Yrs)	7.02%	92.98%
Voc. Sec. Commerce & Other (3-Yrs)	11.98%	88.02%
Vocational Sec. (5-Yrs)	12.50%	87.50%
Post-secondary	17.32%	82.68%
University (4-Yrs)	29.06%	70.94%
University (5-Yrs)	53.28%	46.72%
Post Graduate	46.15%	53.85%
Total	12.44%	87.56%

Source: Authors' calculations using ELMS 1998 and ELMPS 2006.

C. Formal vs. Informal Workers

In 2006 the percentage of formal labor (i.e., have a work contract and contribute to social insurance) increased to almost 36 percent compared with only 11 percent in 1998 (Table 4). This trend toward

formality is associated with a higher wage premium and higher returns to education for formal labor in 2006.

Table 4 – Percentage of Formal vs. Informal Labor

	1998	2006
Informal	88.66	64.12
Formal	11.34	35.88

Source: Authors' calculations using ELMS 1998 and ELMPS 2006.

Table 5 - Formality and Firm Size - 2006

Firm Size	informal Labor	Formal Labor
1 to 4	90.8%	9.2%
5 to 49	85.6%	14.4%
50+	35.8%	64.2%
dont-know/miss	15.8%	84.2%

Firm Size	informal	Formal
1to4	69.9%	12.7%
5to49	19.9%	6.0%
50+	2.5%	8.1%
dont-know/miss	7.7%	73.2%

Source: Authors' calculations using ELMPS 2006.

Most of the informal labor (79.5 percent in 1998 and 70 percent in 2006) works in micro enterprises (1 to 4 employees), while most of the formal labor works in the government sector (Table 5). The majority of the informal workers are clustered in the private sector. Therefore, most of the informal labor is clustered in private micro enterprise, while most of the formal labor is in the government sector. The largest share of informal labor in 1998 and 2006 are illiterate, while the largest share of formal labor are 4-year university graduates.

Table 6 shows that: (a) informality decreases with education level; and (b) at each level of education, there was a shift toward formality between 1998 and 2006, with the exception of secondary and post-secondary education.

V. Results

A. General Regression with Full Sample, 1998-2006

Table 7 shows the results of the Heckman estimation for both periods. All the signs are the expected ones in both the participation equation and the earnings (wage) equation. The negative sign on the gender (female) variable in the participation equation is not surprising, given the observed differences in labor force participation rates (Table 1). The existence of a migrant member in the household negatively affects participation, capturing the effect of non-earned income and the corresponding substitution effect on labor force participation. This result is also reported by Assad and Binzel (2009). The other

variables in the participation equation have the expected signs: the likelihood of participating in the labor market increases with age, education level, and if the individual is married.[7] The negative sign of the lambda coefficient means that there is a negative correlation between unobserved characteristics that affect labor force participation and wage earnings. Individuals who are less likely to participate in the labor market, but that effectively work, will earn lower wages.

Table 6 - Percentage of Formal vs. Informal Labor by Level of Education

Education	1998		2006	
	Informal	**Formal**	**Informal**	**Formal**
Illiterate	94%	6%	90%	10%
Read & Write	82%	18%	79%	21%
Primary	90%	10%	80%	20%
Preparatory	91%	9%	74%	26%
General Secondary	68%	32%	69%	31%
Voc. Sec. Agriculture	63%	37%	68%	32%
Voc. Sec. Industrial	65%	35%	65%	35%
Voc. Sec. Commerce & Others	59%	41%	47%	53%
Vocational Sec. (5-Yr)	54%	46%	3%	97%
Post-secondary	27%	73%	32%	68%
University (4-Yrs)	31%	69%	27%	73%
University (5-Yrs)	22%	78%	18%	82%
Post-graduate	20%	80%	14%	86%

Source: Authors' calculations using ELMS 1998 and ELMPS 2006.

The estimated coefficients on education levels from the earnings equation (Table 7) allow computing the rates of return as described in equation 2. Figure 1 summarizes the results. There are two general trends that are remarkable: (a) the rate of return increases with the level of education; and (b) the rate of return increased for higher levels of education, but decreased for lower levels of education between 1998 and 2006. Although in 1998 the RoRs have a U-shaped form, given the very high rate of return to

[7] This result is driven by male characteristics and will change when gender heterogeneity is allowed for in the next section.

general secondary education, in 2006 RoRs are more or less increasing monotonically. The RoR is not computed for illiterate workers, because it is the omitted category in the regressions, but the constant in the wage equations can be interpreted as the wage of an individual with no schooling, or the "base wage" of the country as postulated by Rosenzweig (2010), and shows a significant decline between 1998 and 2006. These results will be confirmed throughout the paper, disaggregating the sample by gender, firm size, and formal/informal wage contracts.

The evolution of the RoR to investment in education in Egypt in the period 1998-2006, in particular the observed relative changes in the return to skilled and unskilled labor can be explained from both the supply and demand perspectives. From the supply side, the number of illiterate workers, as well as those with intermediate levels of education (Table 8) increased significantly during the period, precisely the workers whose RoRs experienced the largest declines. On the demand side, the Egyptian economy experienced a structural change during the decade, according to which activities that require skilled labor, such as financial intermediation and communications, increased their shares in GDP, while those intensive in the use of unskilled labor, such as construction and agriculture, decreased in importance (Figure 2).

Figure 1 – Rates of Return, 1998 and 2006

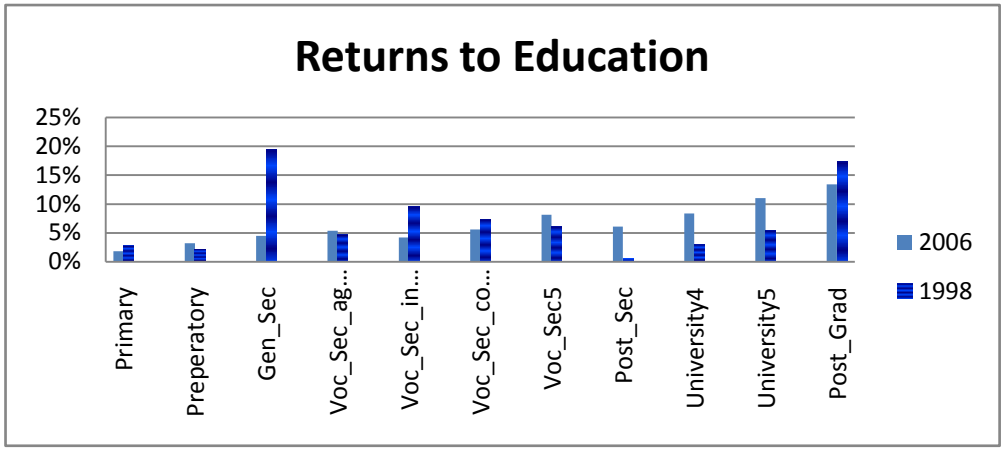
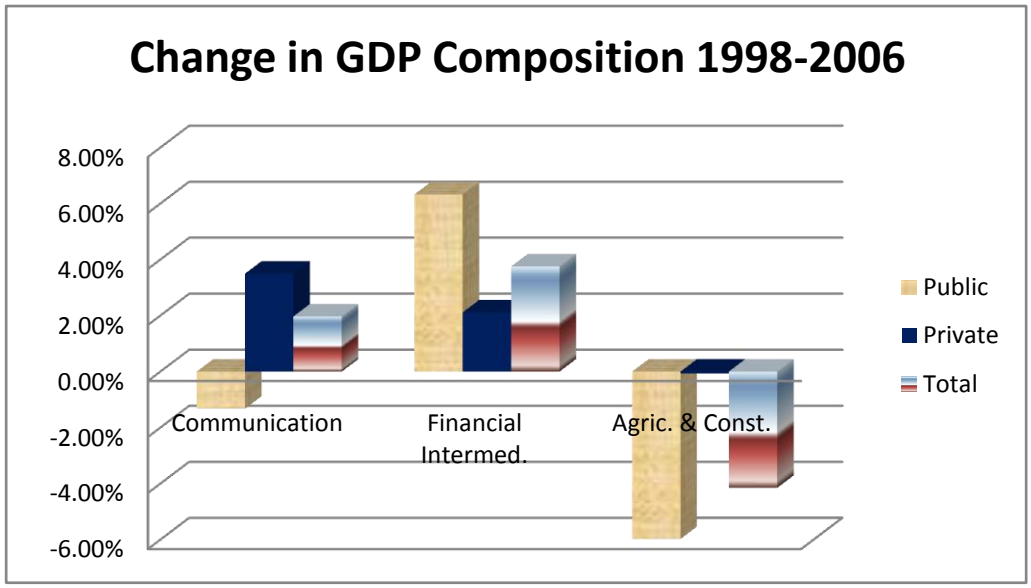


Table 8 - Flow of Participants to the Labor Market, 2001-2006

Illiterate	Read & Write	Less Than Intermediate	Intermediate	Above Intermediate	University & Above	Total
49%	-23%	16%	37%	3%	18%	100%

Source: Authors' calculations using the CAPMAS labor force survey.

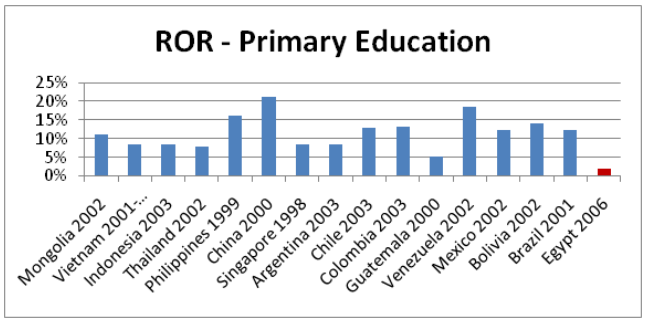
Figure 2 - Structural Changes in the Economy

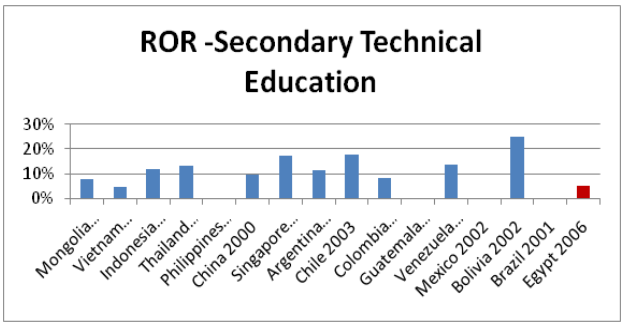


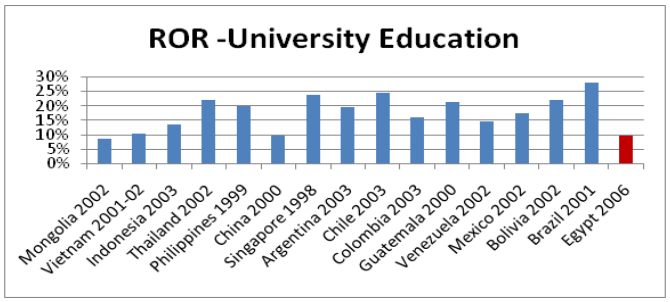
Source: Authors' calculations.

In the international context, the estimated RoRs are low (see Figures 3, 4, and 5). Comparing the estimated RoR withother countries' (Patrinos et.al., 2006), explains the low contribution of human capital to growth in Egypt.

Figures 3, 4, and 5 - International Comparisons



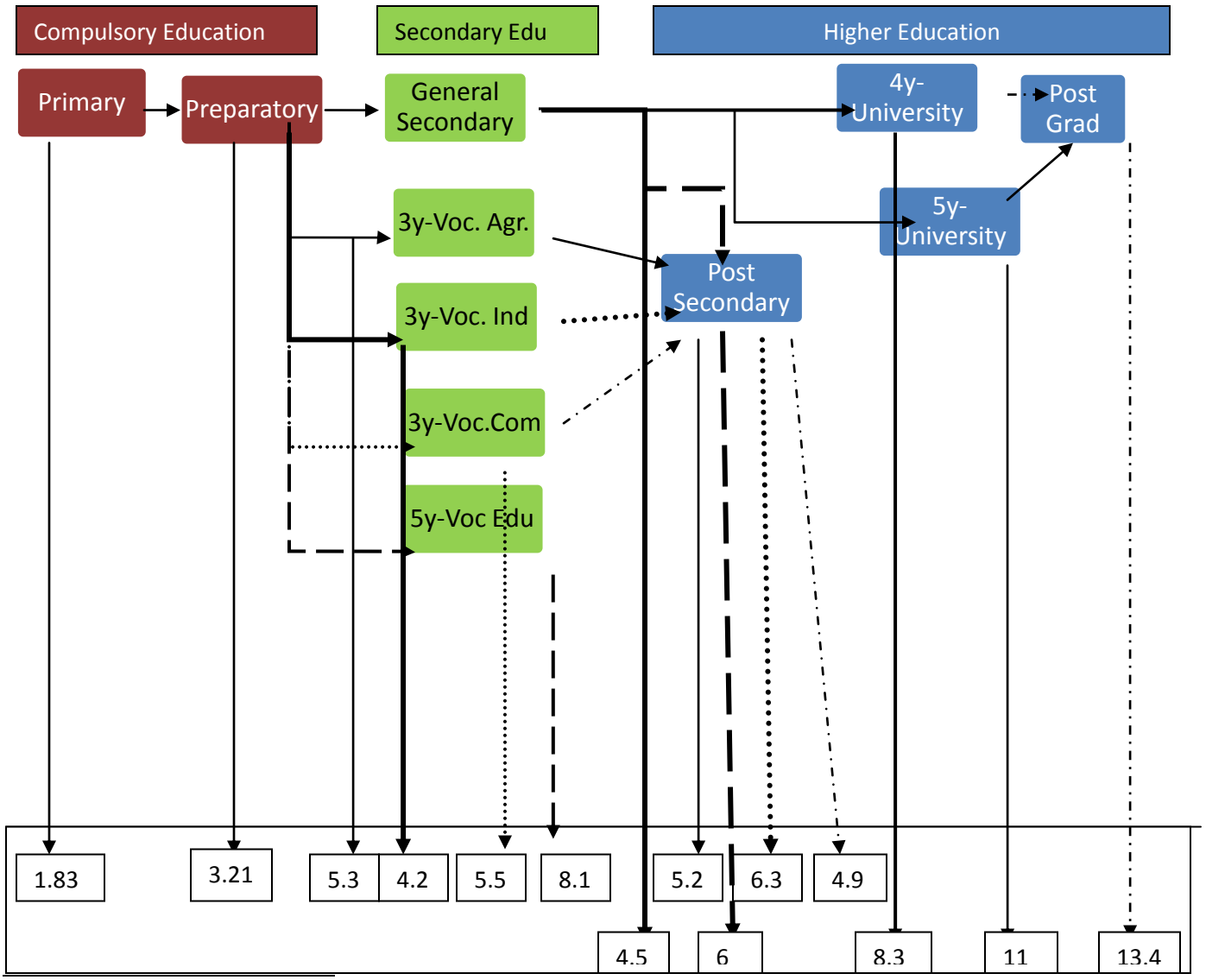




B. Different Paths Imply Different Rates of Return

The U-shaped form of returns to education in 1998 is due to the unusually high returns to general secondary education, 19 percent. The high value of the general secondary coefficient in Table 7 leads to the calculated high rate of return for general secondary education, and affects the returns to university education as well as to post-secondary.[8] However, some post-secondary students graduate from vocational institutions. Hence the RoR for post-secondary education varies depending on the educational path followed by each student. Returns to post-secondary education increased significantly between 1998 and 2006 (where general secondary is the preceding level), but were still low, compared with university level education. Figure 6 summarizes the RoRs for different educational paths; Appendix Table A4 presents the information for 1998 and 2006.

Figure 6 – Educational Paths



[8] This is given that returns to these levels are calculated as indicated in equation 2, and involve the difference between the coefficients of these variables and the coefficient of general secondary education.

Summing up, the main results regarding the heterogeneity of RoRs arising from the sorting of individuals show that: (a) Vocational education has a higher return than general secondary education in the most recent period, while in 1998 the reverse was true. However, most individuals sorted into the general secondary category continue into the university level, which has significantly higher rates of return. (b) The rate of return to post-secondary education oscillates from 5 to 6.4 percent per year, depending on the specific path of the individual. (c) The rate of return to university education is higher than that of post-secondary technical institutes, and the post-graduate rate of return is the highest of all.

Other remarkable results from the general regression (Table 7):

a) On-the-job training has a premium of 11 percent, slightly lower than the 14 percent registered in the previous decade. Disaggregation by firm size will yield interesting results in the next section.

b) The wage differences between the private sector and the government did not change between 1998 and 2006. In 2006, workers in the private sector earned 20 percent more than government employees, while in 1998 it was exactly the same premium. Similarly, workers in publicly owned companies earned 13 percent more than government workers, on average.

c) Regional premiums have reduced significantly or disappeared. In 1998, workers in Cairo earned more than workers in the rest of the country: 10 percent more than workers in Alexandria, and 17 percent more than workers in Upper or Lower Egypt. By 2006, the Cairo premium with respect to Alexandria was not significant, while the (negative) premium for workers in Upper and Lower Egypt had decreased to one-half its 1998 size.

d) Finally, it is remarkable that while workers with formal wage contacts in 1998 earned less than workers with informal contracts, in 2006 the situation was reversed: workers with formal work contracts earned 13 percent more.

C. Do Returns to Education Vary by Firm Size?

Yes. Tables 9, 10, and 11 report estimations for three types of firms: micro firms (up to 4 employees), small firms (between 5 and 50 employees), and large firms (more than 50 employees). The returns to education increase with firm size, as shown in Tables 9, 10, and 11. This is the same result obtained by Teal (2008) for workers in Tanzania.

In general, all firms reward advanced levels of education more (with the exception of firms with 50 or more employees or in vocational education.

Returns to on-the-job training vary inversely with firm size: workers who take training in micro firms receive an 18 percent premium, 11 percent in small firms, and 2 percent (not statistically different from zero) in large firms.

The other result that is worth highlighting when considering differences by firm size is the premium for workers' experience: in large firms, it is almost twice the size of the premium in small firms. In 2006 (see

Tables 9, 10, and 11), larger firms compensated experience more than small firms did, as micro firm employees earned a 2.6 percent premium for each additional year of experience, while workers in large firms earned a premium of 4.1 percent.

Our results for returns to education increasing with firm size coincide with results from numerous other studies, finding that the wage premium increases with firm size (Lallmand et al,2005). This might be explained by higher productivity in large firms, which has been documented for Egypt (World Bank, 2010).

D. Informality

Formal vs. informal labor

The regression results in Table 7 show that formal labor (i.e., have a contract and contribute to social insurance) enjoyed a higher wage premium (13.2 percent) in 2006 compared with their informal counterparts. In 1998, informal labor had a higher wage premium than formal labor. The increase in the wage premium of informal labor coincided with a similar shift toward formality between 1998 and 2006, as shown in Table 4. The table shows the increasing trend of labor to shift from informality to formality; in 2006, formal labor enjoyed higher wages.

Formality and returns to education

We ran additional, separate OLS regressions for formal and informal labor for 1998 and 2006 (see Tables 12 and 13).

In 1998, informal labor experienced higher returns to education for preparatory, 4-year university, and 5-year university degrees compared with their formal counterparts.

In 2006, formal labor witnessed higher RoRs for all education levels except post-graduate studies. The gap in rates of return between formal and informal labor narrowed as education levels advanced. One possible explanation would be that the professions that graduates with higher education pursue might not entail signing a contract or contributing to social insurance (such as consultants, physicians, etc.). This is further confirmed by the higher wage premium received by informal workers (30 percent) who are trade union (or syndicate) members, compared with their formal counterparts (18 percent).

Although an additional year of experience yielded a very close premium for formal and informal labor in 1998, it rewarded 1 percent more for formal workers compared with their informal counterparts in 2006.

In both 1998 and 2006, there was no wage premium among informal labor working in different sectors of employment; their formal counterparts working in the private sector received the highest wage premium, followed by those working in the public sector.

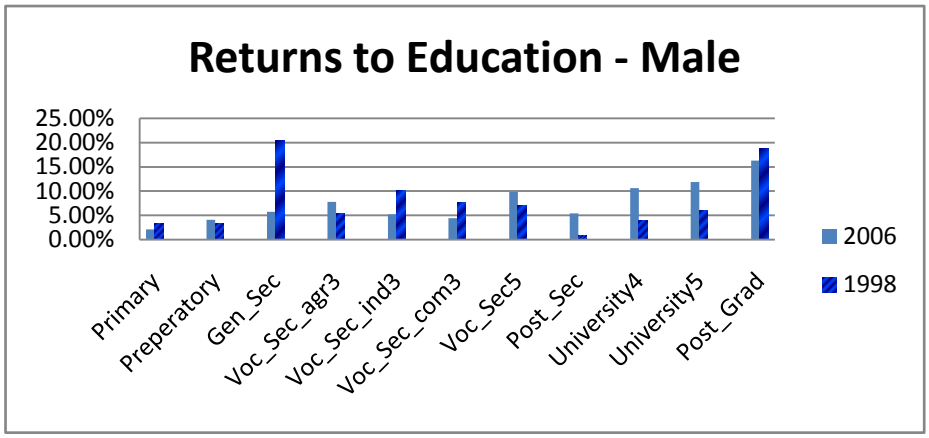
E. Are There Gender Differences in the Returns to Education?

Yes. To examine heterogeneity in returns to education by due to gender differences, we ran separate models for males and females (Tables 14 and 15).[9] The estimations show interesting results. In the labor force participation equation, being married enters with opposite signs: while married males are more likely to participate in the labor market, females are less likely. The education coefficient is three times as large for females as males, pointing to the importance of female education to increase the likelihood of labor force participation.

Rates of return for both males and females increase with level of education, and exhibit the same trend between 1998 and 2006: the returns increase for higher levels of education and decrease for lower levels. Returns to education are higher for females, consistent with previous studies of Egypt.

Three–year vocational education and post-secondary education exhibit low RoRs in 2006 for males, and lower than in 1998. But for females, the RoR is slightly increasing in vocational education and strongly increasing in post-secondary education.[10]

Figure 7 – Returns to Education for Males, 1998 and 2006



[9] We ran four regressions: one for each year by gender. The constant term captures the regression's specific gender, i.e., if it is a regression for males, the constant term (the comparison group) measures the returns on illiterate males, not covered by medical insurance, workers in the informal market, not a trade union member, single, without training, living in Cairo, working for the government, and in the agriculture/hunting or forestry sector.

[10] The RoRs for post-secondary education are calculated assuming general secondary education is the previous stage. Appendix Table A4 presents the RoRs for different paths in the education system.

Figure 8 – Returns to Education for Females, 1998 and 2006

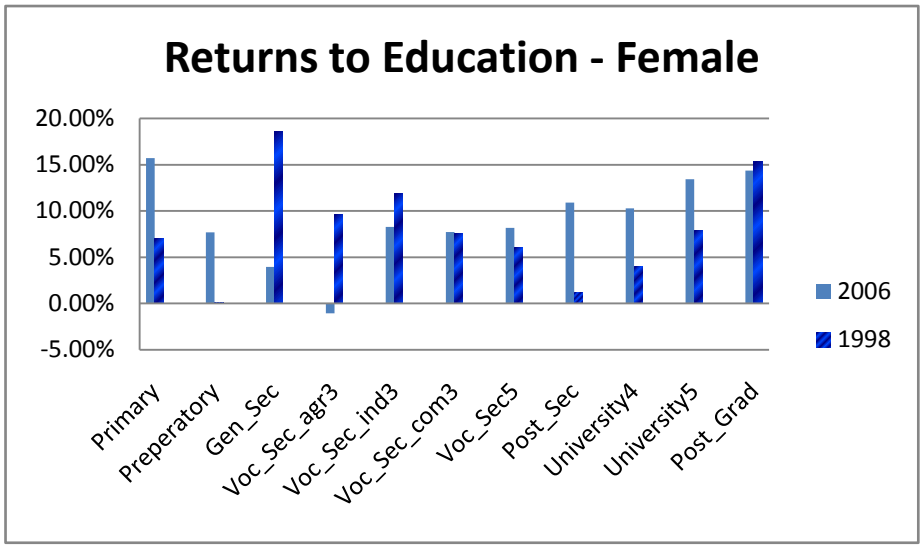
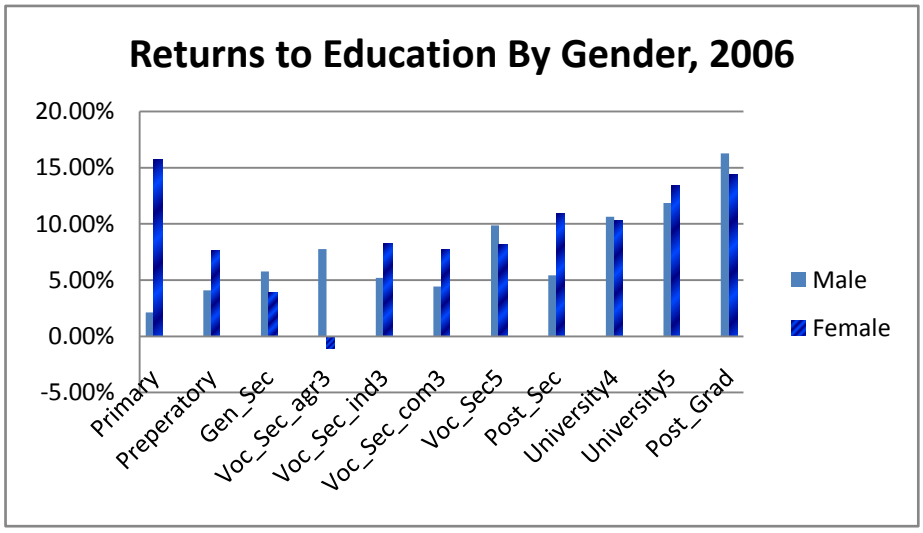


Figure 9 – Returns to Education by Gender, 2006



In 1998 and 2006, males and females earned similar wage premiums on each additional year of experience: while in 1998 females were rewarded 4.2 percent and males 4.7 percent for each year of experience, in 2006 the compensation increased for females to 4.6 percent and decreased for males to 3 percent (see Tables 14 and 15).

One of the more striking contrasts in the wage equation is the premium paid by the private sector with respect to what an individual with identical characteristics would earn in the government: while the private sector pays a premium of about 25 percent for males, the premium is insignificant for females. This is true for both 1998 and 2006. This means that females working in the government earn wages similar to market determined levels, but males working in the government earn less than market rates.

The male premium is also significant for public enterprise workers: they earn 20 percent more than government workers, while females in public enterprises receive no premium.

Formality of the wage contract implied higher wages for both males and females in 2006 and had the same rising pattern: while formality was not rewarded for females in 1998, in 2006 it was rewarded with a 25 percent premium. Male workers with a formal contract earned 10 percent less in 1998, and a 12 percent premium in 2006.

The premium for training has different levels and trends for males and females. While the premium declined from 13 to 9 percent for males, it increased from 6 to 17 percent for females.

In 1998, women residing in Greater Cairo received a wage premium, followed by Lower and Upper Egypt, while women living in Alexandria and Canal cities received the lowest wages. In 2006, wages for women living in Lower or Upper Egypt were not statistically different from those in Greater Cairo; however, women living in Alexandria received lower wages (see Tables 14 and 15).

The trend is reversed for men in both years, as wages received by men living in Alexandria and Canal cities were not statistically different from men residing in Greater Cairo, while wages in Upper Egypt were the lowest followed by Lower Egypt. In 2006, men residing in Alexandria and Canal cities continued to earn wages that were not statistically different from those living in Greater Cairo, while those living in Lower and Upper Egypt received lower wages.

F. Access to Technology

Up to this point, we have described how returns to education increase with education level. However, we have also seen that access to technology varied positively with education level. The Nelson-Phelps growth model postulates that returns to education depend on the degree of technological advancement. Hence, initially we introduce a dummy for PC ownership to control for access to technology. Table 16 shows that the coefficient is positive, significant, and implies that PC owners earn a 20 percent wage premium. But, more interestingly, the coefficients for all the education levels fell significantly, although the largest falls were for the higher education levels. This suggests that technology does not homogeneously affect all returns to education.

To allow a heterogeneous response, we interacted the PC ownership dummy variable with each level of education. Table 17 summarizes the results, and shows that the interacted term is mostly significant for higher levels of education. The activities of those with higher education will be less routinized and are more likely to use technology more intensively. In this fashion, the rate of return to education for those without access to a PC will be calculated without the interacted term, while for those with a computer it will be calculated as the sum of the coefficients of the interacted variable with the original one. This is for those coefficients that are statistically significant in Table 17. Table 18 summarizes the RoRs, depicting the wide variance in the RoR, depending on access to technology. On average, those with access to technology earn 3.3 times more than those without access.

Table 18 – Access to Technology and Rates of Return

ROR (2006)	With PC	Without PC
Voc. Sec. Industrial(3-Yrs)	10%	3.18%
Voc. Sec. Commerce & Other(3-Yrs)	14%	4.12%
Vocational Sec. (5-Yrs)	26%	5.40%
University (4-Yrs)	13%	7.44%
Post Graduate	26%	7.32%

These results point to the importance of technology in education. In principle, they suggest the relevance of building school computer labs, supplying computers, and connectivity in schools. This will necessarily imply developing and disseminating new curricula in electronic format. Distance learning programs wil also become essential elements.

However, providing computers and technology is no guarantee that the quality of education will improve. Evaluations of these programs show mixed results, especially in developing economies. For instance, an impact evaluation of the use of computers in education in Colombia showed that teachers used the computers for class preparation and to teach students computer skills in the presentation and dissemination of information, rather than for the intended purpose of developing new knowledge in language and mathematics (Barrera and Linden, 2009). Hence, the introduction of technology will not affect education unless teachers are trained and develop new skills in the use of the new technology. Incorporating technology in the learning process requires more than computers in the classroom.

VI. Conclusions and Directions for Future Research

The rate of return to investment in education in Egypt varies depending on the specific path into which the individual is sorted. Individuals who are sorted into the general secondary-university path earn higher rates of return to education. This fact perpetuates inequality.

Other factors are sources of heterogeneity: returns to education increase with firm size, female returns to education tend to be larger, and the factors affecting their participation in the labor market are different than for males. Finally, access to technology produces the largest discrepancy in RoR across individuals, with the RoR being two to four times larger for individuals with access to computers. This result highlights the importance of modifying the curriculum to include more computer access in schools, with corresponding monitoring and evaluation of the use of computers in the classroom.

Other interesting results of this paper: (a) Workers in the formal market earn more than informal workers, but in the past this was the opposite. (b) Regarding the relationship between government and private sector workers, there are major differences depending on gender. While males in the private sector earn a 25 percent premium with respect to government employees, females in the government sector earn the same as in the private sector. This is a clear incentive for females to wait in queue for a government job, as it sets a reservation wage. This might explain why female unemployment is higher than that for males. (c) Regional wage premiums have reduced significantly or disappeared. At the end

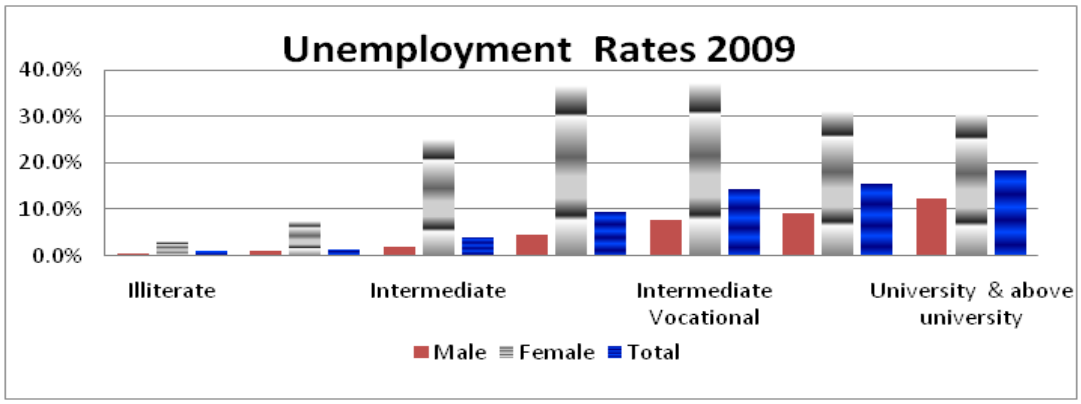
of the 1990s, workers in Cairo earned a premium of 10 percent with respect to Alexandria and Canal cities, and 17 percent with respect to Upper and Lower Egypt. The most recent survey shows the first one has been eliminated and the second one reduced by half.

The rates of return to education estimated here are gross rates of return. Further research on this topic could contemplate the cost of education, and two key elements of uncertainty: the probability of becoming unemployed and the wage risk associated with the level of education. In Egypt, unemployment increases with the level of educational attainment (Figure 10) , while in many other countries the reverse occurs: unemployment decreases with education.

Wage dispersion, as measured by the coefficient of variation of wages for each level of education, decreases with the level of education (Table 19). This is a counterintuitive result, since higher returns should be associated with higher risk. In other countries, the wage risk increases with the level of education (Martins and Pereira, 2000).

Exploring these two puzzling facts is essential for the research agenda on returns to education and the working of labor markets in Egypt.

Figure 10 - Unemployment Rate by Level of Education and Gender



Source: CAPMAS.

Table 19- Wage Variability by Level of Education

Log Hourly Wages 2006	Mean	Range	S.D.	C.V
Illiterate	0.574356	7.363491	0.698594	1.216308
Read & Write	0.605313	7.087198	0.700891	1.157898
Primary	0.600967	7.815974	0.717499	1.193908
Preparatory	0.68016	5.49931	0.674432	0.991578
General Secondary	0.719294	3.534729	0.726791	1.010423
Voc. Sec. Agr.	0.762449	7.060184	0.914658	1.199632
Voc. Sec. Ind.	0.713535	7.020302	0.707029	0.990882
Voc. Sec. Comm.	0.816916	8.064637	0.908271	1.111829
Vocational Sec. (5 Yr)	1.061099	4.237093	0.947272	0.892727
Post-Secondary	1.03215	6.560169	0.850148	0.823667
University (4-Yr)	1.110068	7.536291	0.818655	0.737482
University (5-Yr)	1.504037	6.340902	0.820116	0.545276
Post Graduate	1.536158	3.444239	0.909388	0.591989
Total	0.813368	9.3174	0.815371	1.002462

Table 7 - General Regression

2006				1998			
VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR ǂ	VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR ǂ
Read & Write	-0.0276			Read & Write	0.0740*		
	(0.0393)				(0.0396)		
Primary	0.0812**		1.83%	Primary	0.235***		2.72%
	(0.0361)				(0.0407)		
Preparatory	0.176***		3.21%	Preparatory	0.300***		2.19%
	(0.0464)				(0.0530)		
General Secondary	0.308***		4.50%	General Secondary	0.832***		19.40%
	(0.0851)				(0.104)		
3-year Vocational - Agriculture	0.333***		5.37%	3-year Vocational - Agriculture	0.436***		4.64%
	(0.0530)				(0.0678)		
3-year Vocational - Industry	0.300***		4.22%	3-year Vocational - Industry	0.572***		9.49%
	(0.0391)				(0.0510)		
3-year Vocational - Commerce & Oth.	0.339***		5.58%	3-year Vocational - Commerce & Oth.	0.512***		7.32%
	(0.0368)				(0.0463)		
5-year Vocational Education	0.568***		8.16%	5-year Vocational Education	0.595***		6.08%
	(0.132)				(0.0638)		
Post Secondary	0.485***		6.08%	Post Secondary	0.849***		0.57%
	(0.0477)				(0.0643)		
4-year University	0.629***		8.36%	4-year University	0.950***		2.99%
	(0.0431)				(0.0540)		
5-year University	0.831***		11.03%	5-year University	1.095***		5.40%
	(0.0751)				(0.0791)		
Post Graduate	1.007***		13.43%	Post Graduate	1.428***		17.27%
	(0.0970)				(0.109)		
Experience	0.0376***			Experience	0.0486***		
	(0.00238)				(0.00283)		
$Experience^2$	-0.000465***			$Experience^2$	-0.000509***		
	(4.28e-05)				(4.88e-05)		
Medical Insurance	0.170***			Medical Insurance	0.0471		
	(0.0382)				(0.0461)		
Formal Labor	0.132***			Formal Labor	-0.0848**		
	(0.0350)				(0.0422)		
Member of Trade Union	0.232***			Member of Trade Union	0.137***		
	(0.0226)				(0.0253)		
Married	0.0517**	0.637***		Married	-0.0708**	0.923***	
	(0.0249)	(0.0279)			(0.0332)	(0.0432)	
Training	0.108***			Training	0.140***		
	(0.0207)				(0.0277)		
Alex & Canal Cities	-0.0466	0.00803		Alex & Canal Cities	-0.105***	-0.0196	
	(0.0305)	(0.0411)			(0.0332)	(0.0554)	
Upper Egypt	-0.0800***	0.106***		Upper Egypt	-0.178***	0.162***	
	(0.0254)	(0.0339)			(0.0289)	(0.0464)	
Lower Egypt	-0.0745***	0.129***		Lower Egypt	-0.162***	0.198***	
	(0.0251)	(0.0334)			(0.0285)	(0.0459)	
Public Sector	0.134***			Public Sector	0.137***		
	(0.0409)				(0.0441)		
Private Sector	0.209***			Private Sector	0.208***		
	(0.0378)				(0.0464)		
Other Sec. of Employment	-0.00851			Other Sec. of Employment	-0.310*		
	(0.134)				(0.159)		
Fishing	0.199			Fishing	0.261**		
	(0.126)				(0.130)		
Mining & Quarrying	0.458***			Mining & Quarrying	0.141		
	(0.132)				(0.138)		
Manufacturing	0.0145			Manufacturing	0.131***		
	(0.0371)				(0.0434)		
Electricity Gas & Water	0.180**			Electricity Gas & Water	0.222***		
	(0.0724)				(0.0834)		
Construction	0.308***			Construction	0.270***		
	(0.0393)				(0.0470)		
Wholesale & Retail Trade	-0.101**			Wholesale & Retail Trade	-0.0823*		
	(0.0394)				(0.0500)		
Hotels & Restaurants	0.0796			Hotels & Restaurants	0.0805		
	(0.0546)				(0.0770)		
Transp. Storage & Comm.	0.185***			Transp. Storage & Comm.	0.202***		
	(0.0409)				(0.0520)		
Financial Intermediaries	0.562***			Financial Intermediaries	0.381***		
	(0.0716)				(0.0786)		
Real Estate	0.0550			Real Estate	-0.125		
	(0.0692)				(0.118)		
Public Admin. & Defense	-0.0456			Public Admin. & Defense	-0.00864		
	(0.0453)				(0.0518)		
Education	0.00767			Education	0.0689		
	(0.0455)				(0.0531)		
Health & Soc. Work	-0.0153			Health & Soc. Work	-0.0760		
	(0.0542)				(0.0645)		
Other Communication	-0.281***			Other Communication	0.0339		
	(0.0569)				(0.0529)		
Private HH	-0.255**			Private HH	0.578**		
	(0.101)				(0.241)		
Age		0.0270***		Age		0.00989***	
		(0.000968)				(0.00127)	
Years of Education		0.0743***		Years of Education		0.0936***	
		(0.00200)				(0.00287)	
Female		-1.549***		Female		-1.302***	
		(0.0238)				(0.0339)	
Family Member Living Abroad		-0.346***					
		(0.0616)					
lambda		-0.0532**		lambda		-0.0948***	
		(0.0247)				(0.0330)	
Constant	-0.349***	-1.419***		Constant	3.663***	-1.340***	
	(0.0771)	(0.0443)			(0.0963)	(0.0580)	
Observations	19,444	19,444		Observations	9,624	9,624	

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
ǂ Rates of return are calculated using equation 2.

Table 9 - Firm Size 1-4 2006

VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR [1]
Read & Write	-0.0196		
	(0.0547)		
Primary	-0.0235		
	(0.0504)		
Preparatory	0.0972		
	(0.0672)		
General Secondary	0.173		
	(0.129)		
3-year Vocational - Agriculture	0.130		
	(0.0829)		
3-year Vocational - Industry	0.114**		0.56%
	(0.0578)		
3-year Vocational - Commerce & Oth	0.119**		0.73%
	(0.0581)		
5-year Vocational Education	0.355		
	(0.284)		
Post Secondary	0.155*		-0.60%
	(0.0829)		
4-year University	0.331***		4.03%
	(0.0748)		
5-year University	0.295		
	(0.208)		
Post Graduate	0.700***		13.09%
	(0.191)		
Experience	0.0268***		
	(0.00413)		
Experience^2	-0.000401***		
	(6.97e-05)		
Medical Insurance	0.236***		
	(0.0831)		
Formal Labor	0.161**		
	(0.0798)		
Member of Trade Union	0.253***		
	(0.0475)		
Married	0.105***	0.310***	
	(0.0372)	(0.0555)	
Training	0.175***		
	(0.0324)		
Alex & Canal Cities	-0.0428	-0.0378	
	(0.0548)	(0.0843)	
Upper Egypt	-0.0666	-0.0363	
	(0.0454)	(0.0693)	
Lower Egypt	-0.0183	-0.0194	
	(0.0440)	(0.0676)	
Public Sector	0.105		
	(0.116)		
Private Sector	0.145		
	(0.0899)		
Other Sec. of Employment	-0.0727		
	(0.335)		
Fishing	0.390**		
	(0.182)		
Mining & Quarrying	0.789**		
	(0.391)		
Manufacturing	0.0737		
	(0.0574)		
Electricity Gas & Water	0.293		
	(0.180)		
Construction	0.307***		
	(0.0577)		
Wholesale & Retail Trade	-0.120**		
	(0.0532)		
Hotels & Restaurants	0.0184		
	(0.0797)		
Transp. Storage & Comm.	0.149***		
	(0.0567)		
Financial Intermediaries	0.152		
	(0.213)		
Real Estate	0.153		
	(0.101)		
Public Admin. & Defense	-0.121		
	(0.0994)		
Education	0.0606		
	(0.0942)		
Health & Soc. Work	-0.00779		
	(0.0988)		
Other Communication	-0.366***		
	(0.0916)		
Private HH	-0.0483		
	(0.119)		
Age		0.0395***	
		(0.00216)	
Years of Education		0.0581***	
		(0.00392)	
Female		-1.936***	
		(0.0484)	
Family Member Living Abroad		-0.0711	
		(0.131)	
lambda		-0.178***	
		(0.0379)	
Constant	-0.0684	-0.895***	
	(0.131)	(0.0861)	
Observations	5,234	5,234	

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

[1] Rates of return are calculated using equation 2 .

Table 10 -Firm Size 5-49 2006

	Wage Equation	Labor Participation	ROR ǂ
VARIABLES	lnwage_hr	in_laborf	
Read & Write	-0.0699		
	(0.0712)		ROR
Primary	0.149**		3.72%
	(0.0624)		
Preparatory	0.209**		2.02%
	(0.0849)		
General Secondary	0.0808		
	(0.164)		
3-year Vocational - Agriculture	0.144		
	(0.0957)		
3-year Vocational - Industry	0.232***		0.77%
	(0.0705)		
3-year Vocational - Commerce & Oth.	0.149**		-1.98%
	(0.0735)		
5-year Vocational Education	-0.0193		-4.46%
	(0.595)		
Post Secondary	0.194**		3.85%
	(0.0986)		
4-year University	0.531***		11.91%
	(0.0873)		
5-year University	0.717***		13.57%
	(0.188)		
Post Graduate	0.570*		1.31%
	(0.293)		
Experience	0.0274***		
	(0.00503)		
Experience^2	-0.000354***		
	(8.40e-05)		
Medical Insurance	0.214***		
	(0.0712)		
Formal Labor	0.0888		
	(0.0612)		
Member of Trade Union	0.181**		
	(0.0714)		
Married	0.0568	0.150	
	(0.0442)	(0.127)	
Training	0.112***		
	(0.0369)		
Alex & Canal Cities	-0.0436	0.317	
	(0.0619)	(0.205)	
Upper Egypt	-0.0292	-0.153	
	(0.0519)	(0.145)	
Lower Egypt	-0.0427	-0.0122	
	(0.0531)	(0.145)	
Public Sector	0.139		
	(0.345)		
Private Sector	-0.0471		
	(0.132)		
Fishing	-0.0671		
	(0.148)		
Mining & Quarrying	-0.481*		
	(0.279)		
Manufacturing	-0.168***		
	(0.0554)		
Construction	0.185***		
	(0.0553)		
Wholesale & Retail Trade	-0.0802		
	(0.0666)		
Hotels & Restaurants	-0.0320		
	(0.0772)		
Transp. Storage & Comm.	0.412***		
	(0.0986)		
Financial Intermediaries	0.688***		
	(0.193)		
Real Estate	-0.0418		
	(0.120)		
Public Admin. & Defense	-0.214		
	(0.189)		
Education	-0.281**		
	(0.109)		
Health & Soc. Work	-0.0721		
	(0.159)		
Other Communication	0.372***		
	(0.133)		
Private HH	-0.451		
	(0.276)		
Age		0.0359***	
		(0.00580)	
Years of Education		0.0320***	
		(0.00903)	
Female		-1.779***	
		(0.110)	
Family Member Living Abroad		6.725	
		(0)	
lambda		-0.302***	
		(0.0734)	
Constant	0.180	0.398**	
	(0.174)	(0.197)	
Observations	1,402	1,402	

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
ǂ Rates of return are calculated using equation 2 .

Table 11 - Firm Size 50+ 2006			
	Wage Equation	Labor Participation	ROR ǂ
VARIABLES	lnwage_hr	in_laborf	
Read & Write	0.0972		
	(0.199)		
Primary	0.285*		3.18%
	(0.171)		
Preparatory	0.232		
	(0.189)		
General Secondary	0.466		
	(0.310)		
3-year Vocational - Agriculture	0.813***		21.37%
	(0.236)		
3-year Vocational - Industry	0.456***		7.75%
	(0.157)		
3-year Vocational - Commerce & Oth.	0.384**		5.20%
	(0.165)		
Post Secondary	0.595***		4.39%
	(0.181)		
4-year University	0.975***		13.57%
	(0.166)		
5-year University	1.471***		22.26%
	(0.219)		
Post Graduate	3.212***		110.78%
	(0.525)		
Experience	0.0416***		
	(0.0104)		
Experience^2	-0.000654***		
	(0.000230)		
Medical Insurance	0.0755		
	(0.0821)		
Formal Labor	0.0379		
	(0.0832)		
Member of Trade Union	0.310***		
	(0.0821)		
Married	0.178**	-5.797	
	(0.0823)	(7.222)	
Training	0.0230		
	(0.0708)		
Alex & Canal Cities	0.114	4.943	
	(0.0891)	(0)	
Upper Egypt	-0.0500	-1.107	
	(0.0973)	(1.136)	
Lower Egypt	-0.168*	4.695	
	(0.0857)	(0)	
Mining & Quarrying	0.314		
	(0.297)		
Manufacturing	0.0550		
	(0.175)		
Electricity Gas & Water	0.316		
	(0.301)		
Construction	0.350*		
	(0.211)		
Wholesale & Retail Trade	-0.0732		
	(0.196)		
Hotels & Restaurants	0.148		
	(0.210)		
Transp. Storage & Comm.	0.257		
	(0.206)		
Financial Intermediaries	0.826***		
	(0.266)		
Real Estate	-0.243		
	(0.254)		
Public Admin. & Defense	0.0119		
	(0.513)		
Education	-0.361		
	(0.249)		
Health & Soc. Work	-0.313		
	(0.307)		
Other Communication	0.184		
	(0.254)		
Private HH	-0.319		
	(0.383)		
Age		-0.0152	
		(0.0811)	
Years of Education		-0.436	
		(0.409)	
Female		-6.474	
		(0)	
Family Member Living Abroad		-0.263	
		(0)	
lambda		-0.108	
		(0.697)	
Constant	-0.406*	20.94	
	(0.224)	(0)	
Observations	506	506	

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
ǂ Rates of return are calculated using equation 2 .

Table 12 - Formal vs Informal - 1998 VARIABLES	Informal			Formal	
Read & Write	0.183***			0.0160	
	(0.0650)	ROR		(0.0533)	ROR
Primary	0.248***	1%		0.281***	5%
	(0.0591)			(0.0549)	
Preparatory	0.393***	5%		0.340***	2%
	(0.0843)			(0.0652)	
General Secondary	0.378			0.996***	24%
	(0.309)			(0.104)	
3-year Vocational - Agriculture	0.401***	0%		0.606***	9%
	(0.130)			(0.0757)	
3-year Vocational - Industry	0.560***	6%		0.730***	14%
	(0.0792)			(0.0575)	
3-year Vocational - Commerce & Oth.	0.323***	-2%		0.679***	12%
	(0.0974)			(0.0544)	
5-year Vocational Education	0.491***	2%		0.779***	9%
	(0.141)			(0.0673)	
Post Secondary	0.419			1.020***	1%
	(0.319)			(0.0655)	
4-year University	0.765***	10%		1.123***	3%
	(0.147)			(0.0561)	
5-year University	0.910***	11%		1.291***	6%
	(0.301)			(0.0770)	
Post Graduate				1.605***	17%
				(0.101)	
Experience	0.0412***			0.0477***	
	(0.00591)			(0.00335)	
$Experience^2$	-0.000424***			-0.000414***	
	(9.32e-05)			(6.22e-05)	
Medical Insurance	0.452			0.0177	
	(0.358)			(0.0440)	
Member of Trade Union	-0.0463			0.145***	
	(0.126)			(0.0240)	
Married	0.0192			-0.00651	
	(0.0566)			(0.0308)	
Training	0.0807*			0.171***	
	(0.0488)			(0.0348)	
Alex & Canal Cities	0.0200			-0.163***	
	(0.0795)			(0.0346)	
Upper Egypt	-0.168**			-0.168***	
	(0.0665)			(0.0302)	
Lower Egypt	0.0181			-0.240***	
	(0.0634)			(0.0301)	
Public Sector	-0.129			0.171***	
	(0.325)			(0.0442)	
Private Sector	0.0642			0.219***	
	(0.248)			(0.0465)	
Other Sec. of Employment	-0.0436			-0.301*	
	(0.503)			(0.159)	
Fishing	0.322*			0.0940	
	(0.170)			(0.260)	
Mining & Quarrying	-0.00252			0.328**	
	(0.279)			(0.165)	
Manufacturing	0.174***			0.0928	
	(0.0655)			(0.0811)	
Electricity Gas & Water	0			0.197**	
	(0)			(0.0989)	
Construction	0.354***			0.109	
	(0.0641)			(0.101)	
Wholesale & Retail Trade	-0.0865			0.0138	
	(0.0740)			(0.0934)	
Hotels & Restaurants	0.0662			0.168	
	(0.109)			(0.131)	
Transp. Storage & Comm.	0.257**			0.198**	
	(0.103)			(0.0820)	
Financial Intermediaries	0			0.343***	
	(0)			(0.0945)	
Real Estate	-0.00126			0.0679	
	(0.215)			(0.163)	
Public Admin. & Defense	-0.201			-0.0198	
	(0.399)			(0.0770)	
Education	0.256			0.0452	
	(0.250)			(0.0775)	
Health & Soc. Work	-0.922***			-0.0706	
	(0.240)			(0.0853)	
Other Communication	0.0669			0.000264	
	(0.0782)			(0.0921)	
Private HH	0.521*			0	
	(0.282)			(0)	
Constant	3.677***			3.365***	
	(0.270)			(0.108)	
Observations	1,105			2,333	
R-squared	0.239			0.450	
Standard errors in parentheses.					
*** p<0.01, ** p<0.05, * p<0.1					

Table 13 - Formal vs Informal - 2006 VARIABLES	Informal			Formal	
Read & Write	0.0184			-0.103	
	(0.0435)	ROR		(0.0743)	ROR
Primary	0.0779**	1.0%		0.148**	4.3%
	(0.0388)			(0.0684)	
Preparatory	0.185***	3.6%		0.270***	4.2%
	(0.0528)			(0.0788)	
General Secondary	0.215**	1.0%		0.500***	8.0%
	(0.106)			(0.131)	
3-year Vocational - Agriculture	0.268***	2.8%		0.541***	9.5%
	(0.0622)			(0.0862)	
3-year Vocational - Industry	0.225***	1.3%		0.500***	8.0%
	(0.0430)			(0.0635)	
3-year Vocational - Commerce & Oth.	0.143***	-1.4%		0.581***	10.9%
	(0.0469)			(0.0599)	
5-year Vocational Education	0.0621			0.755***	10.2%
	(0.642)			(0.145)	
Post Secondary	0.224***	0.3%		0.743***	8.4%
	(0.0720)			(0.0680)	
4-year University	0.455***	6.2%		0.890***	10.2%
	(0.0576)			(0.0621)	
5-year University	0.734***	10.9%		1.091***	12.5%
	(0.188)			(0.0923)	
Post Graduate	1.387***	36.4%		1.209***	11.2%
	(0.327)			(0.111)	
Experience	0.0259***			0.0343***	
	(0.00333)			(0.00375)	
$Experience^2$	-0.000343***			-0.000278***	
	(5.47e-05)			(7.49e-05)	
Medical Insurance	0.0676			0.204***	
	(0.0688)			(0.0478)	
Member of Trade Union	0.304***			0.188***	
	(0.0533)			(0.0263)	
Married	0.148***			0.0627*	
	(0.0284)			(0.0342)	
Training	0.166***			0.00758	
	(0.0241)			(0.0353)	
Alex & Canal Cities	-0.0636			-0.0670	
	(0.0446)			(0.0415)	
Upper Egypt	-0.0996***			-0.0887**	
	(0.0359)			(0.0352)	
Lower Egypt	-0.0531			-0.118***	
	(0.0352)			(0.0350)	
Public Sector	-0.115			0.170***	
	(0.124)			(0.0487)	
Private Sector	0.115			0.181***	
	(0.0772)			(0.0498)	
Other Sec. of Employment	0.160			-0.0599	
	(0.273)			(0.160)	
Fishing	0.207*			-0.0884	
	(0.119)			(0.528)	
Mining & Quarrying	-0.242			0.801***	
	(0.260)			(0.175)	
Manufacturing	-0.000574			0.160*	
	(0.0393)			(0.0917)	
Electricity Gas & Water	0.293			0.285***	
	(0.334)			(0.107)	
Construction	0.335***			0.175	
	(0.0388)			(0.114)	
Wholesale & Retail Trade	-0.117***			0.120	
	(0.0401)			(0.106)	
Hotels & Restaurants	0.0348			0.458***	
	(0.0571)			(0.128)	
Transp. Storage & Comm.	0.154***			0.340***	
	(0.0455)			(0.0940)	
Financial Intermediaries	0.889***			0.635***	
	(0.217)			(0.105)	
Real Estate	0.0213			0.299**	
	(0.0815)			(0.131)	
Public Admin. & Defense	-0.0280			0.0567	
	(0.110)			(0.0839)	
Education	-0.274***			0.127	
	(0.0876)			(0.0842)	
Health & Soc. Work	-0.261***			0.150	
	(0.0989)			(0.0925)	
Other Communication	-0.0655			-0.263**	
	(0.0752)			(0.102)	
Private HH	-0.213**			-0.0906	
	(0.0981)			(0.312)	
Constant	-0.171*			-0.583***	
	(0.102)			(0.118)	
Observations	3,470			4,075	
R-squared	0.187			0.221	
Standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
ǂ Rates of return are calculated using equation 2 .					

Table 14 - Males

2006				1998			
	Wage Equation	Labor Participation	ROR ǂ		Wage Equation	Labor Participation	ROR ǂ
VARIABLES	lnwage_hr	in_laborf		VARIABLES	lnwage_hr	in_laborf	
Read & Write	0.0222			Read & Write	0.0773*		
	(0.0372)		ROR		(0.0412)		ROR
Primary	0.148***		0.0212	Primary	0.274***		0.0333
	(0.0395)				(0.0506)		
Preparatory	0.268***		0.0408	Preparatory	0.369***		0.0322
	(0.0532)				(0.0690)		
General Secondary	0.436***		0.0576	General Secondary	0.926***		0.204
	(0.0928)				(0.129)		
3-year Vocational - Agriculture	0.492***		0.0775	3-year Vocational - Agriculture	0.526***		0.0537
	(0.0648)				(0.0883)		
3-year Vocational - Industry	0.420***		0.052	3-year Vocational - Industry	0.660***		0.1019
	(0.0549)				(0.0754)		
3-year Vocational - Commerce & Oth.	0.398***		0.0443	3-year Vocational - Commerce & Oth.	0.592***		0.0772
	(0.0564)				(0.0774)		
5-year Vocational Education	0.738***		0.0986	5-year Vocational Education	0.711***		0.0708
	(0.174)				(0.0942)		
Post Secondary	0.594***		0.0541	Post Secondary	0.954***		0.0094
	(0.0672)				(0.0986)		
4-year University	0.840***		0.1063	4-year University	1.079***		0.039
	(0.0668)				(0.0893)		
5-year University	0.996***		0.1185	5-year University	1.213***		0.0591
	(0.0930)				(0.110)		
Post Graduate	1.292***		0.1626	Post Graduate	1.596***		0.1881
	(0.121)				(0.140)		
Experience	0.0330***			Experience	0.0474***		
	(0.00258)				(0.00358)		
$Experience^2$	-0.000352***			$Experience^2$	-0.000476***		
	(4.46e-05)				(5.76e-05)		
Medical Insurance	0.104***			Medical Insurance	0.0317		
	(0.0404)				(0.0530)		
Formal Labor	0.122***			Formal Labor	-0.101**		
	(0.0362)				(0.0459)		
Member of Trade Union	0.236***			Member of Trade Union	0.143***		
	(0.0245)				(0.0298)		
Married	0.354***	1.494***		Married	0.0698	1.710***	
	(0.107)	(0.0491)			(0.176)	(0.0711)	
Training	0.0895***			Training	0.130***		
	(0.0200)				(0.0291)		
Alex & Canal Cities	-0.00978	0.0116		Alex & Canal Cities	-0.0351	0.0355	
	(0.0339)	(0.0596)			(0.0391)	(0.0753)	
Upper Egypt	-0.0950***	0.0945**		Upper Egypt	-0.143***	0.0840	
	(0.0280)	(0.0477)			(0.0342)	(0.0615)	
Lower Egypt	-0.101***	0.0521		Lower Egypt	-0.117***	0.151**	
	(0.0275)	(0.0474)			(0.0348)	(0.0611)	
Public Sector	0.205***			Public Sector	0.202***		
	(0.0427)				(0.0490)		
Private Sector	0.248***			Private Sector	0.259***		
	(0.0415)				(0.0541)		
Other Sec. of Employment	0.0409			Other Sec. of Employment	-0.291		
	(0.149)				(0.186)		
Fishing	0.161			Fishing	0.233*		
	(0.114)				(0.131)		
Mining & Quarrying	0.435***			Mining & Quarrying	0.151		
	(0.122)				(0.140)		
Manufacturing	0.0304			Manufacturing	0.146***		
	(0.0358)				(0.0465)		
Electricity Gas & Water	0.168**			Electricity Gas & Water	0.214**		
	(0.0721)				(0.0923)		
Construction	0.285***			Construction	0.266***		
	(0.0367)				(0.0489)		
Wholesale & Retail Trade	-0.0813**			Wholesale & Retail Trade	-0.0293		
	(0.0380)				(0.0541)		
Hotels & Restaurants	0.0519			Hotels & Restaurants	0.118		
	(0.0509)				(0.0799)		
Transp. Storage & Comm.	0.193***			Transp. Storage & Comm.	0.238***		
	(0.0392)				(0.0553)		
Financial Intermediaries	0.674***			Financial Intermediaries	0.439***		
	(0.0786)				(0.0964)		
Real Estate	0.0639			Real Estate	-0.164		
	(0.0712)				(0.141)		
Public Admin. & Defense	-0.0129			Public Admin. & Defense	0.0371		
	(0.0471)				(0.0579)		
Education	0.0427			Education	0.101		
	(0.0496)				(0.0619)		
Health & Soc. Work	-0.0264			Health & Soc. Work	-0.0296		
	(0.0665)				(0.0849)		
Other Communication	-0.303***			Other Communication	0.0267		
	(0.0554)				(0.0557)		
Private HH	-0.494***			Private HH			
	(0.112)						
Age		0.0121***		Age		-0.00463**	
		(0.00162)				(0.00192)	
Years of Education		0.0466***		Years of Education		0.0562***	
		(0.00280)				(0.00384)	
Family Member Living Abroad		-0.342***					
		(0.0817)					
lambda		0.397***		lambda		0.124	
		(0.136)				(0.189)	
Constant	-0.816***	-1.065***		Constant	3.318***	-0.911***	
	(0.187)	(0.0591)			(0.266)	(0.0738)	
Observations	9,891	9,891		Observations	4,970	4,970	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ǂ Rates of return are calculated using equation 2

Table 15 Females

2006				1998			
VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR ł	VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR ł
Read & Write	-0.492***			Read & Write	-0.0737		
	(0.171)				(0.166)		
Primary	0.384*		15.72%	Primary	0.332**		7.00%
	(0.206)				(0.143)		
Preparatory	0.606**		7.68%	Preparatory	0.336**		0.13%
	(0.273)				(0.158)		
General Secondary	0.722*		3.94%	General Secondary	0.848***		18.61%
	(0.374)				(0.214)		
3-year Vocational - Agriculture	0.574*		-1.06%	3-year Vocational - Agriculture	0.612***		9.64%
	(0.319)				(0.193)		
3-year Vocational - Industry	0.845***		8.29%	3-year Vocational - Industry	0.672***		11.85%
	(0.288)				(0.141)		
3-year Vocational - Commerce & Oth.	0.829***		7.72%	-year Vocational - Commerce & Otl	0.554***		7.54%
	(0.278)				(0.112)		
5-year Vocational Education	0.999***		8.18%	5-year Vocational Education	0.631***		6.08%
	(0.372)				(0.139)		
Post Secondary	1.033***		10.92%	Post Secondary	0.883***		1.17%
	(0.318)				(0.133)		
4-year University	1.113***		10.27%	4-year University	1.003***		3.95%
	(0.347)				(0.126)		
5-year University	1.352***		13.43%	5-year University	1.227***		7.87%
	(0.405)				(0.179)		
Post Graduate	1.516***		14.38%	Post Graduate	1.430***		15.30%
	(0.436)				(0.217)		
Experience	0.0465***			Experience	0.0416***		
	(0.00850)				(0.00664)		
$Experience^2$	-0.000364**			$Experience^2$	-0.000314**		
	(0.000153)				(0.000152)		
Medical Insurance	0.335***			Medical Insurance	0.131		
	(0.0962)				(0.0939)		
Formal Labor	0.251***			Formal Labor	0.131		
	(0.0923)				(0.111)		
Member of Trade Union	0.161***			Member of Trade Union	0.0980**		
	(0.0541)				(0.0464)		
Married	0.165***	-0.268***		Married	0.0507	-0.393***	
	(0.0587)	(0.0496)			(0.0507)	(0.0703)	
Training	0.168**			Training	0.0576		
	(0.0798)				(0.100)		
Alex & Canal Cities	-0.162**	0.0322		Alex & Canal Cities	-0.340***	-0.0958	
	(0.0732)	(0.0608)			(0.0606)	(0.0973)	
Upper Egypt	0.0242	0.0967*		Upper Egypt	-0.244***	0.156*	
	(0.0652)	(0.0526)			(0.0531)	(0.0853)	
Lower Egypt	0.0608	0.228***		Lower Egypt	-0.237***	0.173**	
	(0.0675)	(0.0508)			(0.0533)	(0.0831)	
Public Sector	-0.0599			Public Sector	-0.166		
	(0.121)				(0.107)		
Private Sector	0.0807			Private Sector	-0.00622		
	(0.0870)				(0.0892)		
Other Sec. of Employment	-0.364			Other Sec. of Employment	-0.215		
	(0.297)				(0.291)		
Manufacturing	0.0245			Manufacturing	0.157		
	(0.140)				(0.124)		
Electricity Gas & Water	0.563**			Electricity Gas & Water	0.286		
	(0.260)				(0.194)		
Construction	0.613**			Construction	-0.00333		
	(0.299)				(0.213)		
Wholesale & Retail Trade	-0.204			Wholesale & Retail Trade	-0.252*		
	(0.146)				(0.137)		
Hotels & Restaurants	0.213			Hotels & Restaurants	-0.691**		
	(0.337)				(0.301)		
Transp. Storage & Comm.	0.267			Transp. Storage & Comm.	-0.0399		
	(0.177)				(0.162)		
Financial Intermediaries	0.269			Financial Intermediaries	0.228		
	(0.184)				(0.150)		
Real Estate	0.0666			Real Estate	0.0913		
	(0.192)				(0.216)		
Public Admin. & Defense	-0.0592			Public Admin. & Defense	-0.201		
	(0.141)				(0.125)		
Education	-0.0453			Education	-0.134		
	(0.136)				(0.122)		
Health & Soc. Work	-0.0898			Health & Soc. Work	-0.313**		
	(0.138)				(0.128)		
Other Communication	0.239			Other Communication	0.193		
	(0.220)				(0.183)		
Private HH	0.254			Private HH	0.758***		
	(0.229)				(0.248)		
Age		0.0304***		Age		0.0239***	
		(0.00153)				(0.00204)	
Years of Education		0.129***		Years of Education		0.170***	
		(0.00365)				(0.00639)	
Family Member Living Abroad		-0.204**					
		(0.0972)					
Children 5 Years or Less		-0.164***		Children 6 Years or Less		8.978	
		(0.0497)				(0)	
Children between 6 & 14 Years		0.399***					
		(0.0445)					
lambda		0.253		lambda		0.0163	
		(0.164)				(0.0351)	
Constant	-1.551***	-3.151***		Constant	3.536***	-3.185***	
	(0.542)	(0.0805)			(0.176)	(0.117)	
Observations	9,553	9,553		Observations	4,654	4,654	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
ł Rates of return are calculated using equation 2 .

Table 16 Access to Technology - PC Ownership

	2006		
	Wage Equation	Labor Participation	ROR [1]
VARIABLES	lnwage_hr	in_laborf	
Read & Write	-0.0238		
	(0.0392)		
Primary	0.0768**		1.69%
	(0.0360)		
Preparatory	0.163***		2.92%
	(0.0463)		
General Secondary	0.284***		4.12%
	(0.0849)		
3-year Vocational - Agriculture	0.320***		5.37%
	(0.0528)		
3-year Vocational - Industry	0.277***		3.87%
	(0.0391)		
3-year Vocational - Commerce & Oth.	0.315***		5.20%
	(0.0368)		
5-year Vocational Education	0.546***		7.96%
	(0.131)		
Post Secondary	0.449***		5.65%
	(0.0478)		
4-year University	0.567***		7.33%
	(0.0437)		
5-year University	0.728***		9.29%
	(0.0760)		
Post Graduate	0.912***		12.19%
	(0.0975)		
Experience	0.0360***		
	(0.00238)		
$Experience^2$	-0.000450***		
	(4.27e-05)		
Medical Insurance	0.177***		
	(0.0381)		
Formal Labor	0.123***		
	(0.0349)		
Member of Trade Union	0.216***		
	(0.0226)		
PC Ownership	0.205***		
	(0.0268)		
Married	0.0539**	0.637***	
	(0.0249)	(0.0279)	
Training	0.109***		
	(0.0206)		
Alex & Canal Cities	-0.0481	0.00803	
	(0.0304)	(0.0411)	
Upper Egypt	-0.0690***	0.106***	
	(0.0254)	(0.0339)	
Lower Egypt	-0.0553**	0.129***	
	(0.0251)	(0.0334)	
Public Sector	0.123***		
	(0.0408)		
Private Sector	0.202***		
	(0.0377)		
Other Sec. of Employment	-0.0316		
	(0.133)		
Fishing	0.206*		
	(0.125)		
Mining & Quarrying	0.445***		
	(0.132)		
Manufacturing	0.0106		
	(0.0369)		
Electricity Gas & Water	0.186**		
	(0.0722)		
Construction	0.306***		
	(0.0391)		
Wholesale & Retail Trade	-0.104***		
	(0.0393)		
Hotels & Restaurants	0.0825		
	(0.0544)		
Transp. Storage & Comm.	0.182***		
	(0.0408)		
Financial Intermediaries	0.529***		
	(0.0715)		
Real Estate	0.0362		
	(0.0690)		
Public Admin. & Defense	-0.0524		
	(0.0452)		
Education	0.0123		
	(0.0453)		
Health & Soc. Work	-0.0245		
	(0.0540)		
Other Communication	-0.277***		
	(0.0566)		
Private HH	-0.248**		
	(0.100)		
Age		0.0270***	
		(0.000968)	
Years of Education		0.0743***	
		(0.00200)	
Female		-1.549***	
		(0.0238)	
Family Member Living Abroad		-0.346***	
		(0.0616)	
lambda		-0.0673***	
		(0.0247)	
Constant	-0.316***	-1.419***	
	(0.0769)	(0.0443)	
Observations	19,444	19,444	

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
[1] Rates of return are calculated using equation 2 .

Table 17 - Access to Technology - PC Interactive Dummies

2006

VARIABLES	Wage Equation lnwage_hr	Labor Participation in_laborf	ROR †
Read & Write	-0.0275		
	(0.0394)		
Primary	0.0724**		1.68%
	(0.0361)		
Preparatory	0.176***		3.51%
	(0.0471)		
General Secondary	0.273***		3.29%
	(0.0889)		
3-year Vocational - Agriculture	0.314***		4.71%
	(0.0531)		
3-year Vocational - Industry	0.270***		3.18%
	(0.0395)		
3-year Vocational - Commerce & Oth.	0.297***		4.12%
	(0.0376)		
5-year Vocational Education	0.439***		5.40%
	(0.139)		
Post Secondary	0.482***		7.22%
	(0.0502)		
4-year University	0.560***		7.44%
	(0.0447)		
5-year University	0.736***		9.70%
	(0.101)		
Post Graduate	0.772***		7.32%
	(0.126)		
Read & Write - PC	0.00665		
	(0.234)		
Primary - PC	0.0206		
	(0.211)		
Preparatory - PC	-0.151		
	(0.156)		
General Secondary - PC	0.232		
	(0.259)		
3-year Vocational - Agriculture - PC	0.164		
	(0.349)		
3-year Vocational - Industry - PC	0.204**		10.44%
	(0.0806)		
3-year Vocational - Commerce & Oth. - PC	0.275***		14.11%
	(0.0639)		
5-year Vocational Education - PC	0.905**		26.31%
	(0.370)		
Post Secondary - PC	-0.0339		
	(0.0856)		
4-year University - PC	0.200***		12.95%
	(0.0395)		
5-year University - PC	0.168		
	(0.126)		
Post Graduate - PC	0.479***		25.90%
	(0.174)		
Experience	0.0361***		
	(0.00239)		
Experience^2	-0.000450***		
	(4.27e-05)		
Medical Insurance	0.174***		
	(0.0381)		
Formal Labor	0.128***		
	(0.0349)		
Member of Trade Union	0.219***		
	(0.0226)		
Married	0.0515**	0.637***	
	(0.0249)	(0.0279)	
Training	0.109***		
	(0.0206)		
Alex & Canal Cities	-0.0503*	0.00803	
	(0.0304)	(0.0411)	
Upper Egypt	-0.0733***	0.106***	
	(0.0254)	(0.0339)	
Lower Egypt	-0.0598**	0.129***	
	(0.0252)	(0.0334)	
Public Sector	0.118***		
	(0.0408)		
Private Sector	0.196***		
	(0.0377)		
Other Sec. of Employment	-0.0467		
	(0.134)		
Fishing	0.205		
	(0.125)		
Mining & Quarrying	0.453***		
	(0.132)		
Manufacturing	0.0157		
	(0.0369)		
Electricity Gas & Water	0.187***		
	(0.0722)		
Construction	0.308***		
	(0.0391)		
Wholesale & Retail Trade	-0.101**		
	(0.0393)		
Hotels & Restaurants	0.0844		
	(0.0544)		
Transp. Storage & Comm.	0.183***		
	(0.0408)		
Financial Intermediaries	0.523***		
	(0.0716)		
Real Estate	0.0377		
	(0.0690)		
Public Admin. & Defense	-0.0547		
	(0.0452)		
Education	0.00718		
	(0.0453)		
Health & Soc. Work	-0.0159		
	(0.0540)		
Other Communication	-0.279***		
	(0.0566)		
Private HH	-0.249**		
	(0.100)		
Age		0.0270***	
		(0.000968)	
Years of Education		0.0743***	
		(0.00200)	
Female		-1.549***	
		(0.0238)	
Family Member Living Abroad		-0.346***	
		(0.0616)	
lambda		-0.0669***	
		(0.0247)	
Constant	-0.304***	-1.419***	
	(0.0770)	(0.0443)	
Observations	19,444	19,444	

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

† Rates of return are calculated using equation 2 .

Appendix

Table A1 - Limited Sample 2006				Rates of Returns ł		
	OLS	Corrected for Endogeneity	Corrected for Selection Bias	OLS	Corrected for Endogeneity	Corrected for Selection Bias
Read_Write	-0.021	-0.007	-0.024			
	(0.42)	(0.11)	(0.47)			
Primary	0.123	0.137	0.066	2.43%	2.43%	
	(2.61)**	(2.32)*	(1.21)			
Preperatory	0.165	0.18	0.082	1.41%	1.44%	
	(2.78)**	(2.51)*	(1.15)			
Gen_Sec	0.401	0.418	0.286	8.18%	8.26%	7.04%
	(3.49)**	(3.39)**	(2.25)*			
Voc_Sec_agr3	0.486	0.502	0.374	11.29%	11.33%	10.22%
	(6.83)**	(6.04)**	(4.23)**			
Voc_Sec_ind3	0.399	0.413	0.286	8.11%	8.08%	7.04%
	(8.28)**	(6.81)**	(3.99)**			
Voc_Sec_com3	0.439	0.451	0.323	9.56%	9.45%	8.37%
	(9.35)**	(7.95)**	(4.49)**			
Post_Sec	0.603	0.619	0.471	10.63%	10.57%	9.69%
	(10.72)**	(8.93)**	(5.62)**			
University4	0.755	0.763	0.608	9.25%	9.01%	8.38%
	(14.98)**	(13.99)**	(7.14)**			
University5	0.941	0.957	0.791	11.41%	11.38%	10.63%
	(10.60)**	(9.72)**	(7.01)**			
Post_Grad	1.063	1.078	0.892	10.81%	11.07%	9.93%
	(9.55)**	(9.07)**	(6.51)**			
exp	0.036	0.036	0.031			
	(11.22)**	(11.19)**	(7.93)**			
exp2	0	0	0			
	(7.11)**	(7.11)**	(6.78)**			
med_ins_dum1	0.137	0.137	0.136			
	(2.73)**	(2.73)**	(2.70)**			
formal	0.144	0.143	0.143			
	(3.00)**	(2.98)**	(2.99)**			
trade_uni1	0.202	0.202	0.203			
	(7.45)**	(7.46)**	(7.47)**			
married	0.097	0.096	-0.034			
	(2.13)*	(2.12)*	(0.45)			
training	0.107	0.107	0.104			
	(3.75)**	(3.76)**	(3.64)**			
alex_canal	-0.022	-0.022	-0.02			
	(0.57)	(0.56)	(0.53)			
upper_egy	-0.065	-0.065	-0.064			
	(2.01)*	(2.00)*	(1.97)*			
lower_egy	-0.031	-0.03	-0.029			
	(0.96)	(0.93)	(0.91)			
male	-0.088	-0.087	-0.264			
	(2.99)**	(2.93)**	(3.02)**			
emp_sec_pub	0.125	0.124	0.124			
	(2.57)*	(2.54)*	(2.56)*			
emp_sec_priv	0.197	0.195	0.193			
	(4.11)**	(4.06)**	(4.03)**			
emp_sec_others	-0.047	-0.047	-0.042			
	(0.29)	(0.30)	(0.26)			
Fishing	0.369	0.369	0.366			
	(2.28)*	(2.28)*	(2.26)*			
Mining_qu	0.403	0.405	0.411			
	(2.30)*	(2.31)*	(2.35)*			
Manufacturing	0.142	0.143	0.143			
	(2.75)**	(2.76)**	(2.77)**			
Elec_Gaz_wat	0.248	0.248	0.248			
	(2.87)**	(2.87)**	(2.86)**			
Construction	0.318	0.319	0.315			
	(5.63)**	(5.64)**	(5.58)**			
Whole_retail	0.063	0.064	0.063			
	(1.10)	(1.12)	(1.11)			
Hot_Rest	0.185	0.186	0.182			
	(2.33)*	(2.34)*	(2.29)*			
Trns_strg_com	0.271	0.271	0.271			
	(4.92)**	(4.92)**	(4.92)**			
Fina_int	0.567	0.567	0.567			
	(6.61)**	(6.60)**	(6.61)**			
Real_est	0.183	0.183	0.184			
	(1.66)	(1.66)	(1.67)			
Pub_ad_def	0.007	0.007	0.007			
	(0.13)	(0.12)	(0.13)			
Education	0.038	0.039	0.037			
	(0.66)	(0.68)	(0.63)			
Hlt_socwrk	0.049	0.051	0.058			
	(0.70)	(0.73)	(0.84)			
Oth_commun	-0.222	-0.222	-0.225			
	(2.99)**	(3.00)**	(3.04)**			
Priv_hh	-0.256	-0.256	-0.246			
	(2.18)*	(2.18)*	(2.10)*			
invmills		-0.063				
		(0.38)				
imr_lf_st			-0.459			
			(2.13)*			
Constant	-0.48	-0.449	0.13			
	(4.96)**	(3.55)**	(0.43)			
Observations	4705	4705	4705			
R-squared	0.22	0.22	0.22			
Absolute value of t statistics in parentheses						
* significant at 5%; ** significant at 1%						
ł Rates of returns are calculated by euation 2						

Table A2

Level of Education by Gender	2006		1998	
	Male	Female	Male	Female
Illiterate	35%	65%	32%	68%
Read & Write	58%	42%	57%	43%
Primary	58%	42%	55%	45%
Preparatory	54%	46%	56%	44%
General Secondary	49%	51%	55%	45%
Voc. Sec. Agriculture	75%	25%	74%	26%
Voc. Sec. Industrial	71%	29%	78%	22%
Voc. Sec. Commerce & Others	34%	66%	34%	66%
Vocational Sec. (5-Yr)	51%	49%	59%	41%
Post Secondary	54%	46%	54%	46%
University (4-Yrs)	56%	44%	60%	40%
University (5-Yrs)	77%	23%	79%	21%
Post Graduate	69%	31%	74%	26%

Table A3

Gender by Level of Education	2006		1998	
	Male	Female	Male	Female
Illiterate	19.4%	35.5%	18.8%	38.5%
Read & Write	10.9%	7.9%	12.4%	9.1%
Primary	14.7%	10.7%	21.5%	17.1%
Preparatory	11.2%	9.5%	13.6%	10.6%
General Secondary	4.2%	4.4%	0.9%	0.7%
Voc. Sec. Agriculture	3.1%	1.0%	2.3%	0.8%
Voc. Sec. Industrial	12.9%	5.1%	9.5%	2.7%
Voc. Sec. Commerce & Others	7.2%	13.6%	5.9%	11.0%
Vocational Sec. (5-Yr)	0.2%	0.2%	2.6%	1.8%
Post Secondary	3.5%	3.0%	2.0%	1.6%
University (4-Yrs)	11.1%	8.5%	8.5%	5.5%
University (5-Yrs)	1.1%	0.3%	1.5%	0.4%
Post Graduate	0.5%	0.2%	0.5%	0.2%
Total	100%	100%	100%	100%

Table A4 - Summary of Rates of Return to Education

Education Level	Preceding Level	ROR 1998	ROR 2006
Primary		2.72%	1.83%
Preparatory	Primary	2.19%	3.21%
General secondary	Preparatory	19.40%	4.50%
3-year vocational edu (agriculture)	Preparatory	4.64%	5.37%
3-year vocational edu (industry)	Preparatory	9.49%	4.22%
3-year vocational edu (commerce & others)	Preparatory	7.32%	5.58%
5-year vocational edu	Preparatory	6.08%	8.16%
Post secondary	General secondary	0.57%	6.08%
	3-year vocational edu (agriculture)	14.76%	5.20%
	3-year vocational edu (industry)	9.67%	6.36%
	3-year vocational edu (commerce & others)	11.89%	4.99%
4-year university edu	General secondary	2.99%	8.36%
5-year university edu	General secondary	5.40%	11.03%
Post graduate	4-year university edu	17.27%	13.43%

Different Paths of Education by Gender

In 2006, for males who were to enter the labor market after secondary education, 5-year vocational education was the most rewarding. Among males who decided to join the labor market after post-secondary education, those who graduated from 3-year vocational education specializing in commerce earned the highest returns. However, for general secondary graduates, 5-year university education was the most rewarding (see Figure A1).

For females, joining the labor market after attaining a post-secondary certificate after general secondary education was the most rewarding educational path in 2006. However, surprisingly, primary level female graduates earned returns that were the second highest, even higher than those with post-graduate studies. Among females who joined the labor market after secondary education, graduates of 3-year vocational education specializing in commerce earned the highest returns, followed by those with 5-year vocational education (see FigureA2).

Figure A1 – Educational Paths – Males

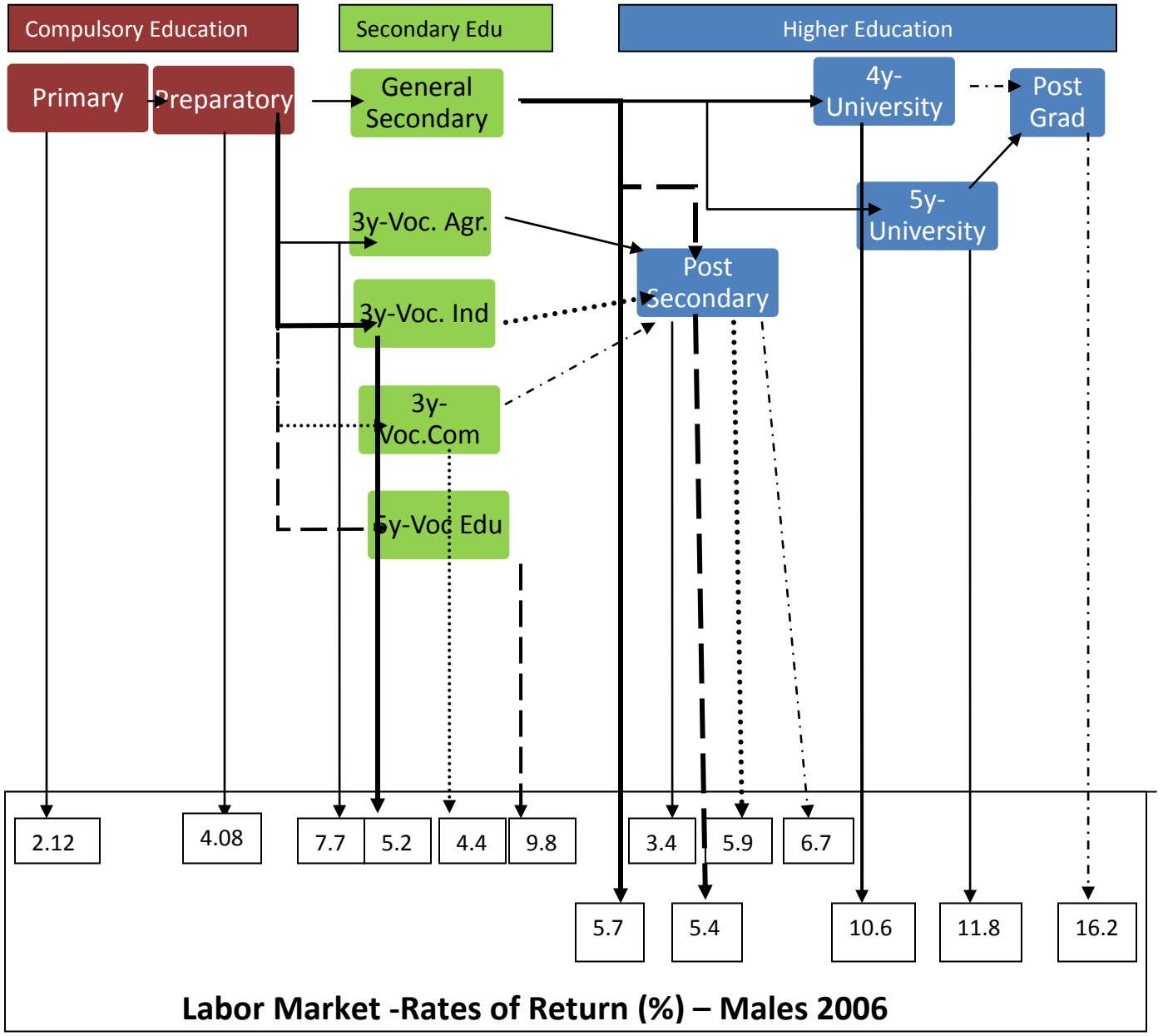
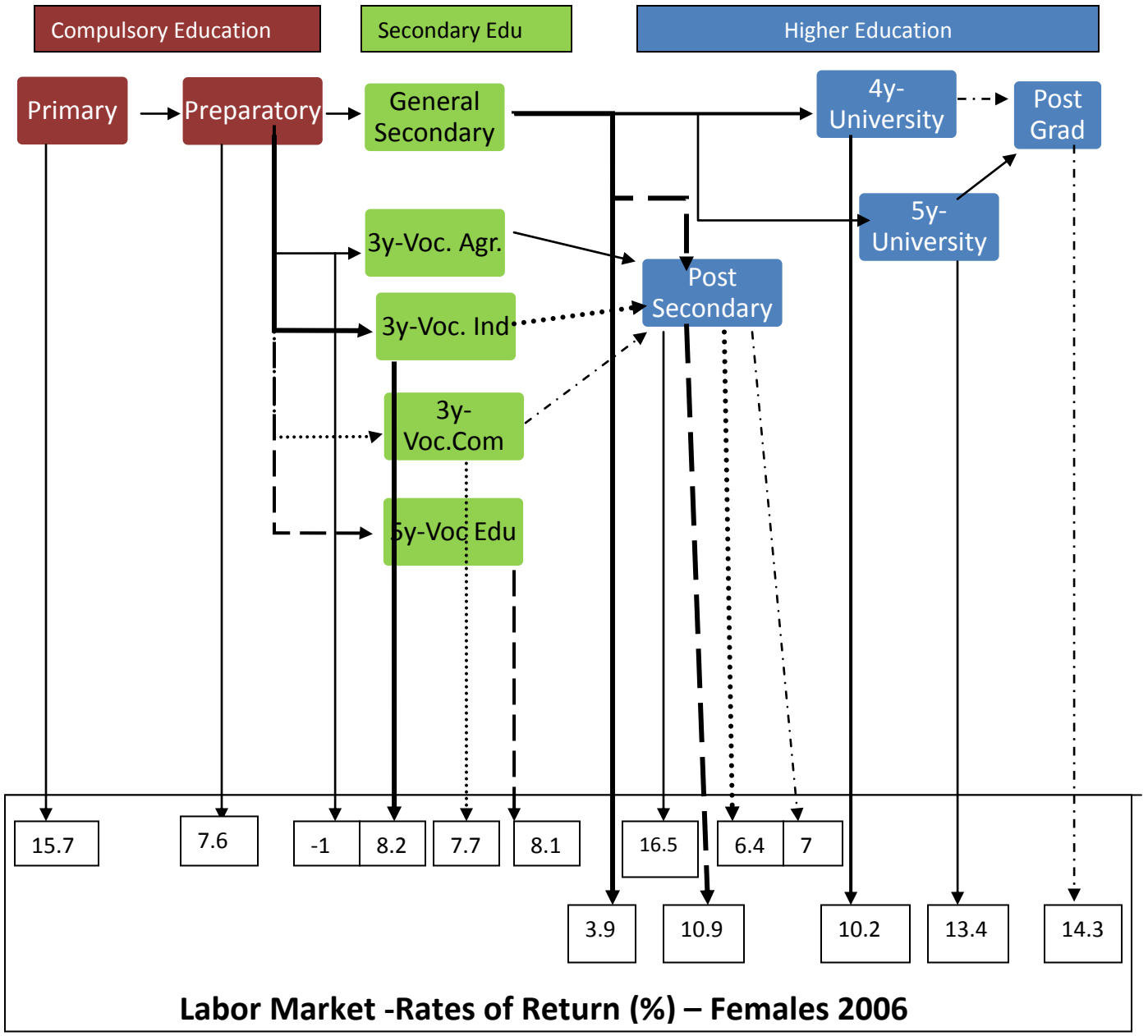


Figure A2 – Educational Paths – Females



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