Is School the Best Route to Skills? Returns to Vocational School and Vocational Skills in Egypt

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Abstract

This paper tests the assumption that formal education is the best route to job skills. The returns to formal vocational secondary schooling are compared to the returns to acquiring skills outside the education system, such as undertaking an apprenticeship, for male wage workers in Egypt. A unique longitudinal dataset, with information on schooling and skills, allows for causal inference about returns by comparing siblings. For recent cohorts, the estimated returns to formal vocational secondary education are the same as attaining *no* formal education. However, the returns to skills obtained outside of formal education are substantial.

JEL Classifications: J24**,** J31**,** O12, I21, I25
Keywords: Education, Skills, Returns to Education, Vocational Education, Apprenticeship, Egypt

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Data availability

The data used in this study are available to researchers through the Economic Research Forum's Open Access Microdata Initiative (OAMDI) at http://www.erfdataportal.com/index.php/catalog
The STATA do files used in this study are available on the author's personal webpage.

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1 Introduction

Families, students and workers throughout the world struggle to decide what education and training to pursue. Governments also must choose how to invest in the education and training of their citizens. Formal, classroom-based education tends to be the most common choice and policy for increasing human capital—the skills and knowledge that can raise productivity and bring rewards in the labour market. Yet many people also engage in approaches other than formal schooling to develop their human capital, such as on-the-job-training or apprenticeships. When choosing between formal education and alternative routes to human capital, what path should individuals and governments pursue?

Governments have assumed that formal education is the best route to human capital and job skills. This assumption is embedded in government budgets and education systems, which prioritize formal schooling. Global development initiatives also assume that formal education is the best route to skills. For instance, UNESCO's Education for All initiative states that: 'Formal secondary schooling is the most effective way to develop the skills needed for work and life' (UNESCO, 2012, p. 4). That formal secondary schooling is the best route to skills is a frequently assumed but as yet unproven hypothesis. This paper tests this assumption by comparing the returns to formal education and alternative routes to skill acquisition for the case of Egypt. Specifically, this paper compares the returns to vocational secondary schooling—a common approach to providing job skills in the formal education system—to the returns to acquiring skills outside the education system, namely undertaking training or an apprenticeship, for male wage workers in Egypt.

What is known about the returns to different types of human capital? There is a substantial body of literature on the returns to education from both developed and developing countries which indicates that formal education is, in general, a worthwhile investment, with positive returns (Card, 1999; Duflo, 2000; Psacharopoulos & Patrinos, 2004; Montenegro & Patrinos, 2014). The methodological and empirical issues in accurately estimating the returns to education are well documented (Glewwe, 1996; Card, 1999, 2001), and there are sufficient studies to have generated some consistency and consensus across studies and methods (Card, 1999; Montenegro & Patrinos, 2014).

Other routes to human capital, outside the formal education system, such as work experience, training, and apprenticeships, have received far less methodological or empirical attention. There are an insufficient number of rigorous studies to assess the value of apprenticeships, even in developed countries (Wolter & Ryan, 2011). There is a limited body of rigorous research on training programs (McKenzie & Woodruff, 2014), including vocational and skills training programs that typically target unemployed youth, but the evidence suggests that they are generally ineffective at raising incomes (Cho & Honorati, 2014; Blattman & Ralston, 2015). Not only is the literature on the returns to human capital acquired outside formal education extremely limited, it also lacks a comparative element—when choosing between formal education or other routes to skill acquisition, which is a better investment? It is this vital question that this paper investigates, for the case of Egypt.

A unique dataset, the Egypt Labor Market Panel Survey, allows for estimates of the returns to schooling and skills. In addition to its information on skills and how those skills were acquired, the dataset includes actual years of work experience, which is usually not directly measured in surveys. Another key feature of these data is that they follow a panel of households

over time, including individuals who split from their households of origin. This allows for inference about the returns to schooling and skills by applying family fixed effects (comparing siblings), an effective method for causal identification of the impact of human capital on earnings (Card, 1999).

This paper shows that among male wage workers in Egypt, especially for recent cohorts, the estimated returns to formal vocational secondary education are essentially zero. Young Egyptians earn as much with a vocational degree as with *no* formal education. However, the returns to skills, specifically craft skills, are substantial. These differences in returns have important implications for Egyptian families and policymakers. Either major reforms will be needed to improve the quality and relevance of formal vocational schooling, or alternative routes to job skills—such as apprenticeships and on-the-job training—need to be expanded and encouraged. Globally, the assumption that formal education is the best investment in human capital must be re-examined.

The remainder of the paper proceeds as follows. Section 2 provides background on the education system, alternatives for acquiring human capital outside the education system, and returns to schooling and skills. The data are described in Section 3, and the methods for estimating returns in Section 4. Section 5 presents the results on the returns to formal education and to skills acquired elsewhere. Section 6 discusses the implications of the findings and concludes.

2 Background

2.1 Education in Egypt

Although pre-primary enrolments are rising, most young people enter the Egyptian school system at the primary stage. Figure 1 displays the structure of the education system in

Egypt. After six years of primary school, young people attend preparatory (lower secondary) school for three years. After preparatory school students are tracked into either vocational or general (upper) secondary school, both usually for three years, based on their test scores. General secondary, which requires higher test scores, is the 'academic' track, and almost all general secondary students go on to higher education. Vocational secondary is almost always terminal, with around 9 per cent of students going on to higher education, primarily in two-year programs at post-secondary institutes (Assaad, 2013; Krafft, Elbadawy, & Assaad, 2013). Most vocational secondary students receive a certificate in either commercial or industrial vocational secondary, with a number of students in the agricultural track as well. Vocational secondary schools are almost exclusively public (99%) (Population Council, 2011).

Egypt has steadily expanded its education system over the past several decades. Figure 2 displays educational attainment trends by age for men aged 25-64 (of an age to have reached their final educational attainment). The proportion with no formal educational certificate has fallen substantially over time. The share of men who attained only a primary or preparatory education has remained small and relatively flat, as has the share attaining general secondary (which is rarely terminal). The proportion of men attaining a vocational secondary degree has risen steadily, from around 10 per cent of those in their 60s in 2012 to more than 30 per cent of those aged 25 to 40, with nearly 40 per cent of the youngest cohorts attaining vocational secondary. Higher education[1] has also expanded, but more slowly than vocational secondary. Overall, there has been a substantial expansion in education, and this large increase in the supply of educated workers will affect their wages. Additionally, since nearly 40 per cent of recent graduates have a vocational secondary education, the returns to vocational secondary education are of substantial economic importance.

2.2 Challenges in the Education System Generally and Vocational Secondary in Particular

Egypt struggles with issues of education quality. Repetition, dropout, and absenteeism are all substantial problems (Krafft, 2012; Elbadawy, 2015). The education system is focused on generating credentials rather than increasing productivity (Assaad & Barsoum, 2009). Within the Egyptian education system, the quality of vocational secondary is particularly low, with weak curriculum and materials, poorly trained instructors, and limited connections to the private sector. The number of vocational secondary students is driven by the supply of young people rather than labour market demand for particular skills (World Bank, 2007; UNDP & Institute of National Planning, 2010). Although the deficiencies in vocational secondary are widely recognized, and numerous reform projects have been implemented, they have not substantially improved vocational secondary education (UNDP & Institute of National Planning, 2010).

The expansion of vocational secondary in Egypt was in part a consequence of public policies that made government employment desirable and educational credentials a pre-requisite for government employment (Antoninis, 2001). Starting in the 1960s, the government guaranteed public sector jobs to all secondary and higher education graduates (Assaad, 1997a). Public sector jobs are particularly appealing to vocational secondary graduates, who obtained a substantial wage premium in the public sector compared to the private sector (Assaad, 1997a; Salehi-Isfahani, Tunali, & Assaad, 2009). The job guarantee was no longer in effect by the 1990s, and public sector hiring has declined (Assaad & Barsoum, 2009). The decreased opportunities for vocational secondary graduates to work in the public sector—and therefore to earn a substantial wage premium—will affect the returns to vocational secondary.

2.3 Alternatives to Formal Education: Apprenticeships and On-the-Job Training

Given the poor quality of the formal schooling system, apprenticeships and other forms of on-the-job training are the primary route to job skills for young people in Egypt. Traditional apprenticeships consist of a (male) youth assisting and being trained by a craftsman. It is usually a family's social networks and the concentration of craft trades in a community that provide a youth with apprenticeship opportunities (Assaad, 1997b). Craftsmen prefer apprentices under age 18, due to a perception that only young people are able to learn new skills and tolerate the harsh discipline of training (Assaad, 1993). Thus, young people undertake apprenticeships at an age that limits pursuing formal secondary education (Tunali & Assaad, 1992).

After a period of training and very low wages, apprentices can expect to eventually 'graduate' to being assistants and ultimately craftsmen themselves.[2] Familiarity and experience with tools and techniques, rather than formal learning, is what matters in the context of apprenticeships (UNDP & Institute of National Planning, 2010). Young people who pursue manual occupations but do not undertake an apprenticeship generally become common labourers, and remain so throughout their careers (Tunali & Assaad, 1992; Assaad, 1997b). The distinction between skilled and unskilled occupations in Egypt is well-defined, and a worker's path is essentially set at first entry into the labour market. For instance, in the construction sector, there is almost no mobility between craft (skilled) and unskilled occupations (Assaad, 1997b).

2.4 Returns to Education

The international evidence suggests that Egyptians could expect substantial returns to increases in education. A review of the returns to education identifies the overall average private return to a year of schooling as around 10 per cent (Psacharopoulos & Patrinos, 2004). Egypt has low private returns to schooling, about half the world average. An estimate based on 2006 data

found average returns of 5.4 per cent per year in Egypt (Salehi-Isfahani, Tunali, & Assaad, 2009). The rapid expansion of formal education, as well as the low quality of education and the labour market-education mismatch have all been identified as problems driving low returns in the region (World Bank, 2008; Assaad & Barsoum, 2009). In Egypt, private returns tend to be lower at lower levels of schooling, and highest at the tertiary level (Salehi-Isfahani, Tunali, & Assaad, 2009; Said, 2015), the opposite of the pattern observed globally (Psacharopoulos & Patrinos, 2004).

Globally, there has long been an on-going debate on the issue of investing in general versus vocational education, with periods of both favouring and disfavouring vocational education (Oketch, 2014). In individual studies, vocational secondary graduates have been shown to earn higher (Moenjak and Worswick (2003) in Thailand), equal (Pugatch (2014) in South Africa), or lower wages (Newhouse and Suryadarma (2011) in Indonesia) than their general secondary peers. In Egypt, attending general secondary and then higher education definitely generates much greater returns than does a vocational secondary education. Focusing on urban men ages 20-54 in Egypt, Salehi-Isfahani, Tunali, and Assaad (2009) found that, in 2006, the cumulative returns to completing vocational secondary (twelve years of school), as compared to not completing any level of education, were just 30 per cent. Returns to vocational secondary had declined substantially from 1988 to 2006 and were lower in Egypt than Iran or Turkey. Returns to vocational secondary education may since have decreased to zero. One of the most recent studies of returns to education in Egypt, using a 2009 survey and focusing on 15-29 year olds, found that the marginal return to secondary education was negative 3 per cent (El-Araby, 2013). The question also remains as to whether the apparent low returns to vocational education are due to low and diminishing returns to vocational skills, or little or no skills being

conferred by vocational education. In contrast, this paper sheds light on this important question by comparing the returns to vocational education with the returns to vocational skills acquired elsewhere.

2.5 Returns to Skills

While there are numerous studies on returns to formal education, both globally and in Egypt, there is a very limited body of evidence on the returns to other measures of skills. One of the challenges in evaluating the returns to human capital formed outside the education system, particularly in developing countries, is that programs are heterogeneous, targeting businesses or individuals, providing training on or off the job, and providing very different types of training. McKenzie and Woodruff (2014) review what is known about skills programs targeting entrepreneurs in micro and small enterprises in the developing world and find little evidence, primarily due to a shortage of high-quality studies. Blattman and Ralston (2015) find that skills training programs are rarely cost-effective, potentially due to the need for human capital to be complemented by financial and physical capital. Cho and Honorati (2014) undertake a meta-analysis of entrepreneurship training and likewise note that programs generally have no impact on income, but combined vocational training and financing is more effective. Blattman, Fiala, and Martinez's (2014) evaluation of a cash transfer program in Uganda illustrates this contention. The program provided youth with transfers to pay for vocational training, tools, and start-up costs. The study found that monthly earnings increased by 38 per cent after four years as a result of the program. Although the authors interpret the effect of the program as alleviating a credit constraint, it also suggests there are, under certain circumstances, substantial returns to skills. Those who received the cash transfer invested in skills training as well as tools and materials and were twice as likely to work in a skilled trade.

Even in the developed world, there is little evidence on the returns to other key routes to skill acquisition, such as apprenticeships (Wolter & Ryan, 2011). One of the few pieces of evidence from the developing world specifically on apprenticeships is a study from Ghana (Monk, Sandefur, & Teal, 2008). For those without education, apprenticeships have a return similar to that for primary education, more than a doubling of income. Looking at returns to apprenticeships in the long run, as in the Ghana study, may be particularly important. An experimental study in Malawi looking at the short run impact of apprenticeships (one month after training) found that apprenticeships led to on-going increased skill development but no change in earnings or expenditures (Cho, Kalomba, Mobarak, & Orozco, 2013). Apprenticeships, if they do pay off, do not necessarily pay off immediately. Overall, while a few studies provide some initial evidence on returns to skills, this paper addresses a clear need for additional research on skills.

3 Data

This paper uses the Egypt Labor Market Panel Survey (ELMPS), a panel data set that includes detailed data on individuals' labour market characteristics. The ELMPS was fielded in 1998, 2006, and 2012.[3] The 2012 sample followed previous round households and split households, as well as adding a refresher sample, for a total sample of 12,060 households and 49,186 individuals. Throughout the paper, the panel data are used only for the identification of siblings. Estimates of returns are based only on the 2012 round of the survey.

Using the ELMPS, the paper focuses on wage-earning men aged 15-64 in 2012, who are referred to as the 'OLS sample' and described in Table 1. This age group is considered the working-age population in the context of Egypt (Assaad & Krafft, 2015). Ideally, one would examine the returns to education regardless of whether an individual is a wage-earner or works in non-wage employment. However, realistically it is not possible to estimate the return to

labour, much less human capital, of individuals whose income is from self-employment. This paper therefore focuses solely on wage earners, who are almost three-fourths of men aged 15-64. In Egypt, effectively all men participate in the labour market, so selection into the labour market is not an issue for this sample. However, female labour force participation is low and there is selection into the labour market for women (Assaad & Krafft, 2015). Therefore, this paper examines the returns to education only for men.

An important set of estimates in this analysis are those that compare siblings by using family fixed effects. The panel nature of the ELMPS allows one to identify siblings even after they have left their natal household, which is particularly important for estimating returns, since income will affect individuals' ability to form new households. The 'family fixed effects sample' restricts the sample of wage-earning men 15-64 (the OLS sample) to those who were observed in at least one round (1998, 2006, or 2012) living in their birth household with their parent(s) as heads of household (which makes it possible to identify siblings). This subset is further restricted to those who, when they were living in their birth household, had a male sibling who is also a wage earner as of 2012. These male siblings are not necessarily living in the same household in 2012.

3.1 Key Outcome and Explanatory Variables

The key question this paper examines is whether individuals earn higher wages from formal vocational secondary education or from vocational skills acquired through other means. The dependent variable, wages, is the natural log of hourly wages in 2012 Egyptian Pounds (LE).[4] Years of school are measured as the number of years completed. The level of education is the highest level an individual completed within the schooling system. The self-reported educational requirements of a job are also controlled for, to distinguish between the returns to

different educational requirements and formal education attained, as returns may vary depending on whether education matches job requirements (Hartog, 2000).

The regressions control for actual years of work experience,[5] rather than the more common 'potential' work experience (usually age minus years of schooling and school entry age). The regressions also control for the year an individual worked for the first time with dummy variables for different five-year cohorts of labour market entrants. Given the changing economic conditions and policies in Egypt, the timing of labour market entry may affect wages. It is also important to account for regional differences in wages, so controls for the six different regions of Egypt are included.

In terms of skills, individuals were asked, 'Does your job require any skill?'[6] and a dummy variable was used to indicate 'yes' responses. The coefficient on this variable will indicate the combined returns to having both a skill and a job requiring that skill. Individuals in craft occupations were asked their skill level, specifically whether they were an apprentice, an assistant, or a craftsman.[7] Dummy variables were created for these skill levels, since different skill levels will have different returns.[8]

3.2 OLS and Family Fixed Effects Samples

As well as applying ordinary least squares (OLS), this paper estimates family fixed effects models. There are therefore two different samples used in estimation. Table 1 describes the characteristics of the samples. The first is the sample of all male wage earners, ages 15-64 ('OLS sample'). This sample has 8,372 observations. The second sample is the family fixed effects (male sibling) sample. This sample consists of 2,300 observations from 955 (birth) households, and is denoted 'Family FE Sample' in Table 1. The most substantial differences between the OLS and family FE samples are in terms of age; the six-year average age difference

across the samples is due to limiting the FE analysis to siblings observed together in their natal household in 1998, 2006, or 2012. The family FE sample has education and skill distributions similar to the OLS sample. Overall, the family FE sample is quite similar to the sample of all male wage-earners 15-64, bolstering the generalizability of results based on this sample.

4 Methods for Estimating Returns to Education and Skills

The standard method to estimate private returns to education uses the Mincer equation, which regresses the log of wages (*W*) on years of schooling (*S)*, work experience (*E)*, and work experience squared for individual *i* (Mincer, 1974):

$$\ln W_i = \beta_0 + \beta_1 S_i + \gamma_1 E_i + \gamma_2 E_i^2 + \varepsilon_i \quad (1)$$

Throughout, the error term, ε_i, necessarily includes any omitted variables. The coefficient on years of schooling, β_1, is interpreted as the return to an additional year of schooling (in percentage terms).

While the linear Mincerian approach is very popular, the empirical evidence suggests that the impact of years of schooling on (log) wages is not linear, but may vary across different levels of education (Psacharopoulos & Patrinos, 2004; Salehi-Isfahani, Tunali, & Assaad, 2009). The Mincer equation can be modified to estimate separate returns for each level of education as follows:

$$\ln W_i = \beta_0 + \sum_j \beta_j L_{ij} + \gamma_1 E_i + \gamma_2 E_i^2 + \varepsilon_i \quad (2)$$

where L_{ij} is a series of dummy variables for *j* different levels of education. Returns are then estimated for attaining a certain level of education, rather than per year.[9] Non-linearities can be due to credentialism or a 'sheepskin effect' (Card, 1999), or they may be due to screening or signalling (Weiss, 1995).

To control for other important factors, a number of additional variables can be incorporated into the model as controls, X_{ij}, where *j* denotes different dummy variables for regional categories and for five-year labour market entry cohorts. Controls are also included for the categorical education requirements of a job, R_{ij}, where *j* denotes different education categories, such as a job requiring a university education. It is important to note that including the education requirements of the job effectively splits the return to education across two terms. The first term is the return to attaining a particular level of education (β_j). The second term is the return to having a job that requires that education, θ_j, which is only applicable for the fraction of the educated with jobs requiring their education. With the addition of these controls, the Mincerian levels model can also be extended to include the private returns to skills as:

$$\ln W_i = \beta_0 + \sum_j \beta_j L_{ij} + \sum_j \delta_j K_{ij} + \gamma_1 E_i + \gamma_2 E_i^2 + \sum_j \theta_j R_{ij} + \sum_j \mu_j X_{ij} + \varepsilon_i \quad (3)$$

where K_{ij} is a dummy variable for whether individual *i* has a skilled job or skill level *j*. The coefficients on skills, δ_j, represent the returns to having both a skill and a job that requires that skill. The δ_j, coefficients on skills, can be contrasted with combinations of β_j and θ_j, the returns to education and to having a job that requires a specific level of education, respectively. By controlling for both work experience and education, estimated returns to skills will also exclude the level of skills accumulated through education or acquired based on simply time spent in a job, and thus be more representative of acquiring skills outside of education or daily experience.

The Mincerian approach is unlikely to yield causal estimates of the impact of schooling on wages, because differences in ability, school quality and family background can substantially bias estimated returns (Glewwe, 1996; Card, 1999; Wößmann, 2003). A variety of approaches

have been used to overcome this problem. The first is to claim that this is not, in fact, a problem, since the standard Mincer estimates have been consistent with higher quality studies that successfully identify causal effects (Card, 1999; Duflo, 2000). Instrumental variable (IV) approaches are also common but they require a good instrument, which is not available in the ELMPS.

Another approach that allows for causal estimates of returns to education is to apply family fixed effects. The idea behind this approach is that estimating returns within families substantially reduces the unobservables that bias normal cross-sectional comparisons (Card, 1999). The fixed effects approach is particularly effective at diminishing bias in countries where family characteristics play a large role in educational outcomes, as is the case in Egypt (Assaad, 2013; Krafft, Elbadawy, & Assaad, 2013; Krafft & Alawode, 2016). Family characteristics play a large role in selection into different occupations and skills as well. For instance, an individual with family working in craft trades in the construction sector is significantly more likely to enter craft work himself (Assaad, 1997b). Family characteristics can also have direct impacts in the labour market even after accounting for human capital (Assaad, Krafft, & Salehi-Isfahani, 2014).

For individual *i* from natal household *h* one can estimate equation (3) as a family fixed effects model:

$$\ln W_{ih} = \beta_0 + \sum_j \beta_j L_{ihj} + \sum_j \delta_j K_{ihj} + \gamma_1 E_{ih} + \gamma_2 E_{ih}^2 + \sum_j \theta_j R_{ihj} + \sum_j \mu_j X_{ihj} + \eta_h + \varepsilon_{ih} \quad (4)$$

where the family fixed effect, η_h, allows any unobservables that do not vary within the family to be differenced out when comparing siblings. In order for this method to generate a causal estimate of the returns to education and skills, unobservables that do vary within the family, such as differences in ability and aptitude between siblings, would have to be unrelated to schooling

and skills. Although most of the unobservable differences are likely to be removed by family fixed effects, this method is unlikely to eliminate *all* bias. Unobserved differences in ability among siblings can still be an issue with this method. However, Card (1999) shows that ability bias is lower in fixed effects comparisons of twins or siblings than in OLS or IV estimates. Additionally, some assessment of the direction of bias can be undertaken. Results are presented below which show that, between siblings, the more able (those with higher test scores) are selected into additional education.

Measurement error in schooling or skills can also affect estimates, usually biasing them downward (Glewwe, 1996; Card, 1999). One drawback to within-family estimates is that measurement error creates larger downward biases than for other methods (Card, 1999). However, measurement error will affect reports of both education and skills, so the relative returns of schools and skills may be less distorted.

5 Findings

5.1 Education, Skills, and Employment

One consequence of the expansion of education in Egypt is that individuals often work in jobs that they report require less education than they have obtained. Table 2 presents the percentage of employed men working at a job that requires an education level *below* the education level they have attained as well as working at a job that requires *no* formal schooling, by educational attainment. Overall, about half (51%) of workers report that they have a job that requires education below their educational attainment, and slightly more than half (55%) report that they are working at a job that in fact requires no formal education. Notably, nearly two-thirds of vocational secondary graduates (63%) are working at jobs that they report require less

than their education level and half (49%) are working at jobs that they report require no formal education whatsoever. The supply of educated graduates has expanded well beyond the demand for educated workers and will reduce the returns they can obtain for their education.

Almost two-fifths (39%) of employed men 15-64 work at jobs that they report require a specific skill (Table 3). While only 28 per cent of illiterate men work in skilled jobs, men with a primary education or higher have similar chances (between 39% and 45%) of reporting being in a skilled job, regardless of their education level. Individuals with less than a secondary education who report working in a skilled job primarily learned their skills on the job or through a craftsman (that is, in an apprenticeship). Notably, only 18 per cent of vocational secondary educated individuals in jobs requiring a skill learned that skill in vocational secondary education. The combined low level of skilled work and acquiring skills through vocational secondary means that out of all vocational secondary graduates, just 7 per cent are engaged in skilled work using skills from vocational secondary education.

More often, vocational secondary graduates working in a skilled job learned their skills through a craftsman (in an apprenticeship) (40%). On-the-job learning was also a common route to skills (22%). The share of men with lower education levels learning their skills through a craftsman was 62-65 per cent, which is comparable to the sum of vocational secondary graduates who learned their skills either through vocational secondary or from a craftsman. This indicates that vocational secondary education and apprenticeships, as routes to skill acquisition, have the potential to be substitutes. However, that vocational secondary graduates were more than three times as likely to have learned their skills from a craftsman or on the job as from their vocational education indicates that vocational secondary is a poor source of job-appropriate skills.

The historically higher wages associated with vocational and university education were in large part a product of high public sector wages. However, as the government has attempted to decrease the size of the public sector and as the supply of graduates has increased, the relationship between wages and education has changed. Figure 3 presents hourly wages in 2012 LE[10] by education level[11] and years of work experience. Youth with 0-10 years of work experience have very similar wages if they have no education or any education up through vocational secondary education. Only higher education has a higher return. While wages rise somewhat with years of work experience for vocational secondary graduates, the gradient is fairly slight, especially compared to higher education. Young people would be as well off, in terms of wages, without any formal educational certificate as they would be having attained a vocational secondary education.

5.2 Returns to Education and Skills Using OLS

Estimating the standard Mincerian equation for 15-64 year-olds (Table 4, specification 1) the rate of return to education is 4.1 per cent per year. However, as seen in Figure 3, returns to education appear to have substantially diminished for recent graduates. Specification 2 therefore restricts the sample to young men, ages 15-34 in 2012. These are individuals who would have been of working age starting in the mid-1990s and thereafter, and would have been facing the end of the government employment guarantee for educated graduates. Looking at these 15-34 year olds, the return to education is 2.2 per cent per year. This is a substantial decrease from the return experienced by the older generation (ages 35-64) of 5.3 per cent per year (specification 3). Increases in the quantity of education and the end of the government employment guarantee may all be contributing to the very low returns to education for young people in Egypt.

Given that there are substantial non-linearities in the returns to education in Egypt, in Table 5, specifications 4 through 6 estimate the returns to education using the level of education attained. The different educational attainments are compared to the reference category of an individual who is illiterate or can read and write but did not complete any formal education. These specifications also include a series of five-year labour market entry cohort dummies, to adjust for different wages facing later cohorts, and controls for regional wage differences. Although not shown, these controls tend to be significant. Looking at the returns to different levels of education for 15-64 year-olds (specification 4) the cumulative returns to vocational secondary are 21.7 per cent.

Since returns to education, and especially vocational secondary, appear to have substantially diminished for recent graduates, specification 5 re-estimates specification 4 with a sample restricted to men aged 15-34 in 2012. These are individuals who have a particularly high rate of vocational secondary attainment (Figure 2) and low wages associated with vocational secondary education (Figure 3). Looking at these 15-34 year olds, the returns to vocational secondary are near zero and not statistically significant. The bias in these regressions, in terms of selection on ability, or even the type of family connections that will yield more advantageous employment, is still a concern. However, the contrast across generations is another notable piece of evidence towards the devaluing of vocational secondary. Older Egyptians (ages 35-64, specification 6), for whom all levels of education generate substantially higher returns, have high returns to vocational secondary, a return of 40.4 per cent compared to remaining uneducated.[12] Therefore, finding that for 15-34 year olds the returns to completing a vocational secondary education—twelve full years of school—are so low as to be statistically indistinguishable from remaining uneducated is remarkable.

The differences in returns across generations are in large part due to changes in public policy, specifically in terms of government hiring and compensation, particularly for vocational secondary graduates.[13] Additional analyses showed that there are large premiums to education for public sector workers 35-64 years of age in 2012. Compared to uneducated workers, vocational secondary graduates in the public sector have 69.3 per cent higher wages. In the private sector, this difference is just 11.7 per cent. In contrast, among 15-34 year-olds, there is a near zero (2.9 per cent) and statistically insignificant return to vocational secondary in the public sector, and just a 5.6 per cent return to all twelve years culminating in a vocational degree in the private sector.[14] The premium to vocational secondary in the public sector that the older generation enjoyed no longer exists for the younger generation.

As an alternative to investing in formal vocational secondary education, should young people invest in other routes to vocational skills? Starting with specification 7, Table 5 investigates the returns to holding a job that respondents report requires skills, and additionally the returns to different levels of skill in craft occupations, after controlling for an individual's education level and the job's education requirements. After adding the job's education requirements and skills, the returns to vocational secondary for 15-64 year-olds, which were 21.7 per cent, are split into a 14.9 per cent return to attaining vocational secondary[15] and a 14.2 per cent return to a job that requires secondary education (which only pertains for some secondary graduates).[16] Vocational secondary graduates' returns are mediated through job education requirements due to wage premiums for public sector jobs requiring vocational secondary, even after accounting for skills (not shown).

Focusing on 15-34 year olds, and incorporating job requirements and skills in specification 8, the return to vocational secondary is again near zero and statistically

insignificant. There is also no statistically significant return to obtaining a job that requires secondary education. The sum of the vocational secondary coefficient with obtaining a job that requires secondary education is statistically significant, but the sum is just a 7.2 per cent return relative to remaining without education in a job that requires no education. In contrast, for 35-64 year olds (specification 9), after accounting for skills the return to vocational secondary education is 20.3 per cent and the return to a job that requires secondary education is 25.0 per cent. Vocational secondary education's benefits have dropped substantially across generations.

Compared to the return to vocational secondary, skills are a better investment. Among 15-64 year-olds (specification 7), the return to an individual's job requiring any skill is 10.2 per cent. Although apprentices and assistants in craft trades obtain no higher returns than other skilled workers, craftsmen in craft trades receive a 8.4 per cent return to their skill level—on top of the return to a job that requires a skill. This is notably higher than the return to vocational secondary education, although less than the return to vocational secondary education and obtaining a job that requires that level of education.[17] When restricting specification 7 to 15-34 year olds (specification 8), the return to skills persists at 8.4 per cent, and the returns to being a craftsman actually rise to 11.4 per cent.[18] For 35-64 year-olds, the return to skills is 10.8 per cent, and craftsmen receive an additional 6.7 per cent (the latter is insignificant, but also difficult to distinguish from having a skill in this older age group as very few older men are assistants or apprentices). So while vocational secondary returns have fallen to near zero for 15-34 year olds, the returns to skill and the additional effect of becoming a craftsman remain similar across generations.

5.3 Returns to Education and Skills Using Family Fixed Effects

While OLS regressions are commonly used for estimating returns to education, they are potentially biased due to omitted variables. One method for removing bias from estimates of the returns to education is the use of family fixed effects. By comparing two or more siblings from the same family, bias associated with family characteristics will be removed. Bias related to individual characteristics—including ability—is likely to remain. However, the direction of bias related to individual ability can also be signed by looking at observable measures of ability. Test scores for the primary and preparatory exams are analysed; these scores are out of 100. In Table 6 these scores are compared among siblings in the family fixed effects sample whose households have variation in education or skills as well as data on the various tests. Data are collected only for individuals 45 and younger, if they attended a given level. Since many individuals also do not recall their scores, the samples for these analyses are quite small, at most 71 individuals from 34 households. As well as a small sample size, these self-reported test scores are likely to suffer from measurement error. With a continuous dependent variable, random errors will not affect estimates so long as errors are not related to level of schooling or skills.

The results show that even within families, siblings with higher ability attain more education, yielding a bias in favour of finding higher and positive returns to education. Those siblings who were most educated had 4.3 point higher primary test scores and 6.7 point higher preparatory test scores compared to their less educated siblings (both significant). In contrast, siblings who obtained skills or became craftsmen tended to have lower academic ability as measured by test scores, although differences were not statistically significant. More academically able siblings continue in school, while the less able drop out and work in craft and

skilled trades. Thus, ability bias is likely to inflate the returns to school and may even deflate the returns to skills acquired elsewhere even in family fixed effects estimates.

Table 4 includes the estimates of linear returns to education for the family fixed effects sample.[19] Estimates for ages 15-64 and 15-34 are presented; there are too few men 35-64 with siblings of the same age who were observed in their natal household to present models separately for this age group. The linear returns to education using family fixed effects are substantially lower than the OLS returns. The standard Mincerian return to a year of school is only 1.8 per cent for ages 15-64 (specification 10), about one-fifth the international average (Psacharopoulos & Patrinos, 2004). Among 15-34 year-olds, the linear returns are not significantly different from zero, although the estimate of 0.7 per cent is imprecisely estimated due to the reduced sample size (specification 11). Looking at the returns to different levels of education in the family fixed effects model (Table 5), among 15-64 year-olds, the return to vocational secondary is 10.2 per cent, significant at only the 10 per cent level (specification 12). For 15-34 year olds, there is no level of education that has a statistically significant return (specification 13). The increase in standard errors engendered in moving from OLS to fixed effects and restricting the age range means that non-zero but low returns remain plausible.

Although the returns to education are substantially diminished in the family fixed effects model, suggesting that the OLS models for returns to education were biased upwards, the returns to skills—specifically, becoming a craftsman—remain substantial. In specification 14, for 15-64 year-olds, the return to vocational secondary is insignificant. The returns to having a skill, and obtaining a job that requires a skill, are essentially zero and insignificant. However, the returns to attaining a craftsman level of skill, in a craft trade, are 17.7 per cent. Being a craftsman has the same return as attaining higher education and approximately half the return of attaining higher

education and a job that requires higher education, the only other positive and significant returns in the model. Restricting to the sample of 15-34 year olds (specification 15), it is notable that the return to being a craftsman for this age group is 20.3 per cent. The return to vocational secondary education is near zero and insignificant, although the return to obtaining a job that requires secondary is 15.4 per cent. Although estimates are less precise, the family fixed effects model suggests that the returns to education are lower than the (already low) estimates obtained from the OLS model. Vocational skills acquired outside the formal schooling system, specifically apprenticing in a craft trade and ultimately becoming a craftsman, are consistently a better investment for young people than formal vocational secondary education.

6 Discussion and Conclusions

Historically, there have been high private returns to vocational secondary education in Egypt. However, these high returns occurred due to high public sector wages and the public sector employment guarantee (Assaad, 1997a; Salehi-Isfahani, Tunali, & Assaad, 2009). OLS estimates suggest that there remain positive private returns to vocational secondary education, as compared to no formal education, for men 15-64. Returns to education estimated using OLS are unlikely to be causal estimates. Therefore, to obtain causal estimates, this paper compared male siblings who were wage earners. Returns to education were notably lower for all levels of education using this estimation technique. However, focusing on male youth 15-34, returns to vocational secondary education are indistinguishable from zero with both family fixed effects and OLS. Young men receive the same wages after twelve years of education, culminating in a vocational secondary degree, as they would have if they had not attended school at all.

In contrast to the nil returns to vocational secondary education, the returns to skills are substantial. For men 15-64, in the OLS model the rate of return to a job that requires skill is

estimated to be around 10.2 per cent, and achieving the craftsman level in a craft trade confers an additional 8.4 per cent return. These returns hold for young men as well. While the returns to obtaining both skills and a job that requires those skills generally did not persist in the family fixed effects model, the returns to being a craftsman in a craft trade were 17.7 per cent in the working-age family fixed effects model. Moreover, the estimated coefficient on becoming a craftsman was similar for youth age 15-34 as for 15-64 year-olds and remained significant. The family fixed effects estimates confirm that youth receive higher returns from investing in alternative routes to vocational skills—specifically, apprenticing in a craft trade in order to become a craftsman—than from investing in vocational secondary education. Despite the fact that the returns to skills acquired elsewhere are higher, young people may still prefer to attend vocational secondary education for other reasons, especially a chance at a public sector job, with the associated non-monetary benefits and higher prestige.

A substantial amount of money is spent on vocational secondary education, supposedly to provide young people with job skills. This investment will be further expanded because secondary education became compulsory in the 2016/17 school year (Egypt State Information Service, 2014). Public investment in education can be justified on a number of grounds, but all rest upon young people benefiting from that education. Yet the different methods consistently indicated that young vocational secondary graduates earn no higher wages and are no more likely to be in a skilled job. Thus, 'investing' in vocational secondary education appears to have no economic benefits.

It could be argued that vocational secondary should be reformed. However, given that the problems with vocational secondary have been recognized for decades, and the long list of failed reform attempts (Antoninis, 2001; OECD/The World Bank, 2010; Wally, 2012), this route does

not show much promise. Perhaps vocational secondary should be abandoned entirely. There are myriad alternative uses for vocational secondary's funding—such as paying for skills training, tools, and start-up costs, a worthwhile strategy in Uganda (Blattman, Fiala, & Martinez, 2014), or improving the quality of basic education, which is more likely to generate public returns. Vocational secondary schools could also be transformed into general secondary schools, although the value of broadly providing general secondary education requires further research.

Ending vocational secondary education would also address Egypt's education/labour market mismatch. The results of this paper suggest that mismatch, characterized by low returns, is more of a problem when skills are acquired in the education system than through alternatives such as apprenticeships. The mechanisms underlying this result are important, and merit consideration in vocational policy. First, employers have much better information on what skills are in demand (since they demand them) than the education system or students. Second, while vocational secondary education trained students essentially regardless of labour demand (World Bank, 2007; UNDP & Institute of National Planning, 2010), craftsmen are very unlikely to take on apprentices without work for them to do. These information and labour demand issues make it difficult for the education system to perform as well as employers in providing training. Employer-driven training for current workers and new hires may therefore be a better approach for matching workers' skills with the skills demanded by the labour market.

The fact that acquiring vocational skills through an apprenticeship, and ultimately becoming a craftsman, yields higher returns than vocational secondary education has important implications not only for young people and the government in Egypt, but also for development policy worldwide. Although the body of evidence is limited, generally entrepreneurship and skills training programs are not effective at improving labour market outcomes (Cho & Honorati,

2014; McKenzie & Woodruff, 2014; Blattman & Ralston, 2015). The more promising interventions tend to be the ones that combine skills training and capital investments (Blattman & Ralston, 2015). Apprenticeships may be a particularly effective and market-driven mechanism for simultaneously building a body of knowledge, skills, tools, and other forms of capital.

The economic literature on human capital has over-emphasized formal education. While there are numerous returns to education studies, this is one of few studies examining the returns to human capital acquired outside the formal education system. This deficit needs to be redressed, with substantial additional research on skills acquisition and the returns to skills, as well as other forms of human capital. The bias in favour of formal schooling is also apparent in government budgets and the efforts of international organizations. The Education for All Initiative includes a goal of promoting learning and life skills, yet states, 'Formal secondary schooling is the most effective way to develop the skills needed for work and life' (UNESCO, 2012, p. 4), a frequently assumed hypothesis that—in the case of Egypt—is not as true as it once was. The primacy of formal education needs to be re-evaluated in light of these findings.

Endnotes

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[1] Higher education includes two-year post-secondary education.

[2] For instance, in the construction sector it takes two to three years for an apprentice to become an assistant and an additional three to four years for an assistant to then become a craftsman who can work independently (Assaad, 1997b).

[3] See Assaad and Krafft (2013) for additional details on the ELMPS.

[4] This measure is the hourly average for all wage compensation, including overtime, bonuses, incentives, profit sharing and any other types of wages. Hourly wages are based on workers' reports of the net amount received in each of these categories, the frequency of receipt, and their hours of work.

[5] Calculated based on spans of work, in years, from the survey's life events calendar.

[6] Questions were asked in Arabic, with the exact word for skill being literally translated as 'technical skill.'

[7] The majority of skilled wage workers (54.4%) work in craft occupations.

[8] The reference category is therefore non-skilled or non-craft occupations.

[9] The interpretation of a coefficient in these semi-logarithmic equations as a percentage change is an approximation that holds most closely for small changes in continuous variables. For dummy variables, although an interpretation in percentage terms is a close approximation for small coefficients, the coefficient and percentage change diverge as the coefficient increases in magnitude (Halvorsen & Palmquist, 1980). The approximate nature of the percentage change interpretation must be kept in mind throughout.

[10] As of 2012, the exchange rate was approximately 6.1 LE to one U.S. Dollar (World Bank, 2013).

[11] Post-secondary institutes and university & above have been combined into the category 'higher education,' which is used hereafter.

[12] The differences across generations in the returns to vocational secondary are also visible when comparing returns in different rounds of the ELMPS. The returns to vocational secondary have been approximately halved for young Egyptians over the 14 years from 1998 to 2012.

[13] Results of regressions examining returns by generation and sector available from the author on request.

[14] The change across generations is not due to differences in the skill level of jobs by age or sector.

[15] There are essentially no changes to the returns to education if skills and skill levels are added without adding the educational requirements of a job (not shown), which suggests that education and skilled work are essentially orthogonal, consistent with Table 3.

[16] Job requirements are self-reported and do not distinguish between general and vocational secondary. Since general secondary is not generally terminal, jobs requiring a secondary education will be expecting a vocational secondary degree.

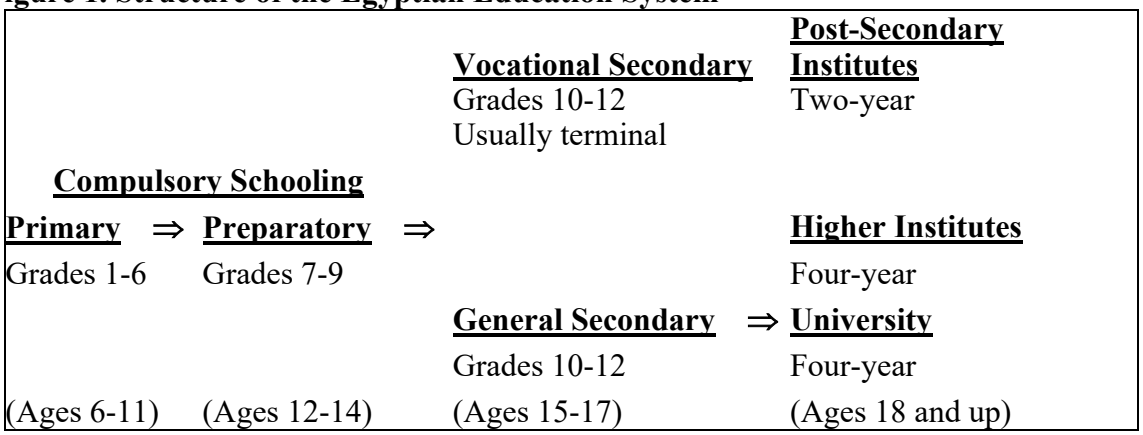
[17] Vocational secondary graduates do not receive differential returns to their skills. Skill and skill level interactions with education levels showed no statistically significant interactions for vocational secondary graduates.

[18] The returns to skill are not driven by returns for those with general secondary or higher education; for both 15-64 year-olds and 15-34 year-olds the returns to skills and skill levels are similar when general secondary and higher education graduates are excluded.

[19] The family fixed effects model identifies returns based on households that vary in terms of their characteristics. In the 2,300 individuals and 955 households in the family fixed effects sample, 1,395 individuals in 551 households vary in education, with 1,000 respondents in 386 households having variation in vocational secondary. There are 861 respondents in 337 households with variation in having a job requiring skills and 533 respondents in 206 households with variation in being a craftsman. While a larger sample might allow for more precise estimation, for the variables of interest there is sufficient variation to expect reasonable estimates.

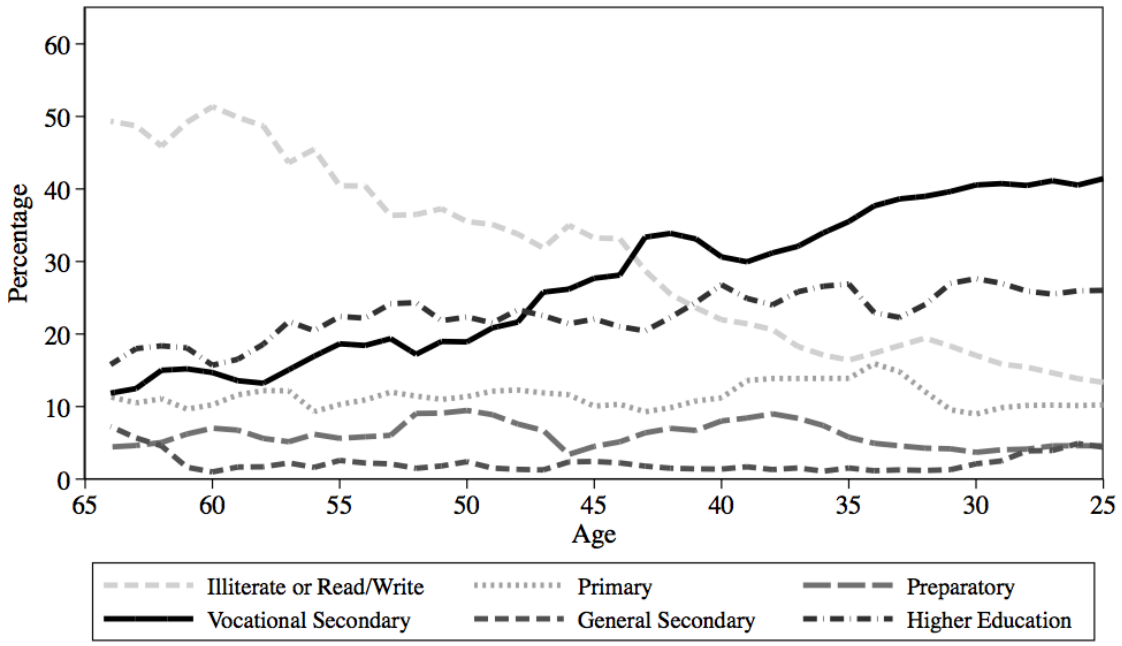
Figures

Figure 1. Structure of the Egyptian Education System



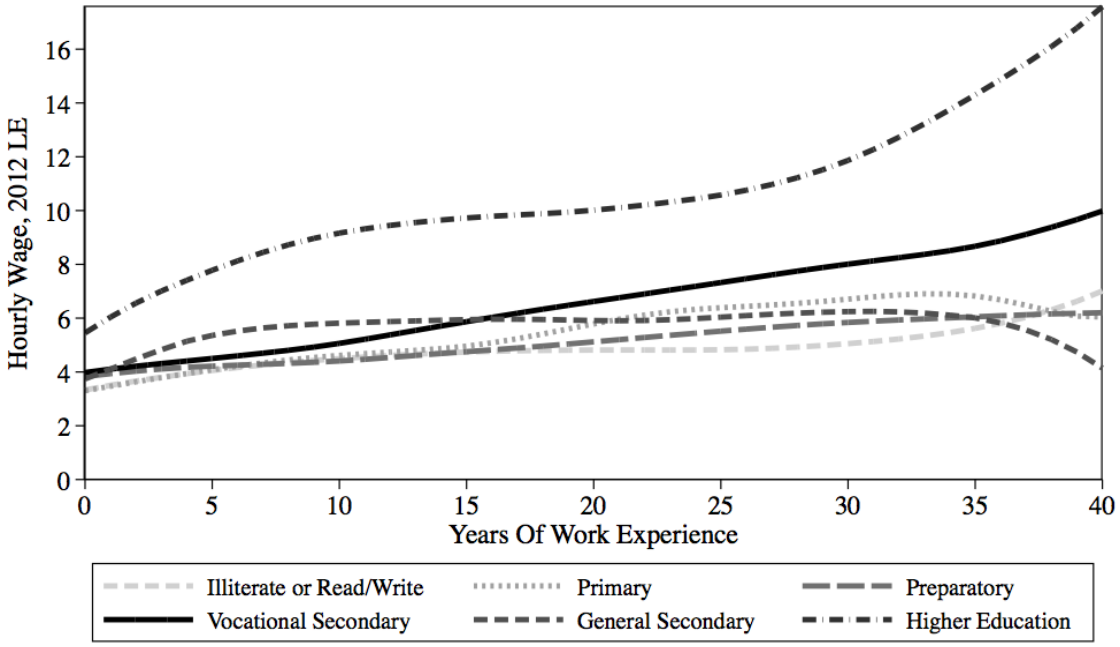
Note: Ages in parentheses are ideal, assuming on time entry and no repetition.

Figure 2. Educational Attainment by Age, Three-Year Moving Averages, Men, Ages 25-64



Source: Author's calculations using ELMPS 2012.

Figure 3. Smoothed Mean Hourly Wages (in 2012 LE) by Educational Attainment and Years of Work Experience, Male Wage Workers, Ages 15-64, 0-40 Years Work Experience



Note: Lowess smoother with bandwidth 3.
Source: Author's calculations using ELMPS 2012.

Tables

Table 1. Sample Descriptives

	OLS Sample	Family FE Sample
	Percentage of Sample	***Percentage of Sample***
Current Student	2.1	2.5
Education Level		
Illiterate or Read/Write	19.7	17.7
Primary	12.0	13.7
Preparatory	6.8	6.8
Vocational Secondary	34.7	37.1
General Secondary	2.5	2.9
Higher Education	24.3	21.8
Required Education for Job		
Illiterate or Read/Write	55.5	63.0
Primary	4.1	4.0
Preparatory	2.5	2.2
Secondary	18.5	15.8
Higher Education	19.4	15.0
Region		
Greater Cairo	19.4	15.8
Alexandria & Suez Canal	8.8	8.7
Urban Lower	9.3	8.4
Urban Upper	7.2	8.7
Rural Lower	31.6	31.1
Rural Upper	23.6	27.3
Job Requires Skill	41.1	40.6
Skill Level, Craft Occupations		
Not Skilled or Not a Craft Occupation (Reference)	77.6	74.8
Apprentice	1.2	1.4
Assistant	5.8	7.4
Craftsman	15.3	16.4
	Means (Standard Deviations)	***Means (Standard Deviations)***
Years of School	9.89	9.81
	(4.80)	(4.37)
Age	35.50	29.52
	(11.07)	(7.33)
Years Since First Job	18.30	12.58
	(11.68)	(7.87)
Years of Work Experience	16.94	11.78
	(11.25)	(7.53)
Hourly Wage (2012 LE)	6.40	5.81
	(12.46)	(19.38)
Observations (N)	8,372	2,300

Notes: OLS sample is male wage earners 15-64. Family FE sample is male wage earners 15-64 who were sons of the household head in 1998, 2006, or 2012, and had a male sibling who was also a wage earner in 2012.
Source: Author's calculations using ELMPS 2012.

Table 2. Education Requirements of Jobs by Education Level, Employed Men, Ages 15-64 (Percentages)

	Job Requires an Education below Education Attained	Job Requires no Formal Schooling
Illiterate	0.0	93.0
Reads & Writes	73.9	73.9
Primary	87.1	73.2
Preparatory	86.9	63.9
General Secondary	58.7	46.5
Vocational Secondary	63.1	49.0
Post-Secondary Inst.	57.5	19.1
University & Above	30.5	12.9
Total	50.5	54.9

Source: Author's calculations using ELMPS 2012.

Table 3. Job Skills and Skill Acquisition, Employed Men, Ages 15-64 (Percentages)

	Illiterate	Reads & Writes	Primary	Preparatory	General Secondary	Vocational Secondary	Post-Secondary Institutes	University & Above	Total
Job Requires Skill	27.8	45.0	43.6	39.3	27.6	39.8	40.7	44.0	38.8
Skill Acquisition, Conditional on Having a Job that Requires a Skill									
Regular School (Except Vocational Education)	0.2	0.2	1.3	2.5	14.1	6.6	17.6	69.5	17.6
Vocational Education	0.9	0.7	1.3	2.0	4.3	18.2	35.0	2.9	8.6
Vocational Training	3.3	3.4	6.2	5.0	5.3	5.7	4.9	1.5	4.4
Through Contractor	9.3	6.0	5.3	4.8	0.0	4.6	2.7	0.6	4.4
Through Craftsman	63.2	63.4	64.7	62.4	49.9	40.1	21.7	6.2	42.2
On the Job	20.7	21.7	18.3	20.4	26.0	22.4	17.6	17.3	20.3
Other	2.4	4.7	2.9	3.0	0.5	2.4	0.6	2.0	2.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's calculations using ELMPS 2012.

Table 4. Estimates of Linear Returns to Education, OLS and Fixed Effects, Male Wage Workers

Dependent Variable: ln(hourly wage).

Model:	**OLS**			**Fixed Effects**	
Specification:	**Spec. 1**	**Spec. 2**	**Spec. 3**	**Spec. 10**	**Spec. 11**
Ages:	**15-64**	**15-34**	**35-64**	**15-64**	**15-34**
Years of School	0.041***	0.022***	0.053***	0.018***	0.007
	(0.002)	(0.002)	(0.002)	(0.005)	(0.007)
Work Experience (Yrs)	0.023***	0.034***	0.001		
	(0.002)	(0.006)	(0.005)		
Work Experience (Yrs) Sq./100	-0.024***	-0.107***	0.017*		
	(0.005)	(0.025)	(0.010)		
Constant	0.835***	0.997***	1.009***		
	(0.026)	(0.040)	(0.071)		
Observations	8369	4738	3631	2298	1650
Groups				955	706
Adjusted R-sq.	0.093	0.023	0.117	0.018	0.007

Notes: *p<0.1 **p<0.05 ***p<0.01
Robust (Huber/White) standard errors in parentheses.
Source: Author's calculations using ELMPS 2012.

Table 5. Estimates of Levels Returns to Education, OLS and Fixed Effects, Male Wage Workers
Dependent Variable: ln(hourly wage).

Model:	**OLS**						**Fixed Effects**			
Specification:	**Spec. 4**	**Spec. 5**	**Spec. 6**	**Spec. 7**	**Spec. 8**	**Spec. 9**	**Spec. 12**	**Spec. 13**	**Spec. 14**	**Spec. 15**
Ages:	**15-64**	**15-34**	**35-64**	**15-64**	**15-34**	**35-64**	**15-64**	**15-34**	**15-64**	**15-34**
Education Level (Illiterate/R&W Omitted)										
Primary	0.035	-0.046	0.059	0.028	-0.043	0.031	0.054	-0.034	0.044	-0.043
	(0.027)	(0.032)	(0.047)	(0.027)	(0.032)	(0.048)	(0.057)	(0.062)	(0.056)	(0.061)
Preparatory	0.072**	-0.028	0.119**	0.064**	-0.017	0.051	0.029	-0.083	0.023	-0.086
	(0.030)	(0.040)	(0.047)	(0.031)	(0.040)	(0.048)	(0.069)	(0.075)	(0.067)	(0.076)
Voc. Sec.	0.217***	0.031	0.404***	0.149***	0.024	0.203***	0.102*	0.039	0.081	0.014
	(0.021)	(0.027)	(0.032)	(0.022)	(0.028)	(0.041)	(0.055)	(0.061)	(0.054)	(0.061)
Gen. Sec.	0.236***	0.116**	0.274***	0.151***	0.092	0.072	0.100	0.040	0.067	-0.014
	(0.045)	(0.056)	(0.076)	(0.046)	(0.056)	(0.081)	(0.113)	(0.119)	(0.114)	(0.118)
Higher Ed.	0.565***	0.326***	0.763***	0.294***	0.158***	0.360***	0.267***	0.112	0.176**	0.050
	(0.024)	(0.035)	(0.036)	(0.035)	(0.045)	(0.056)	(0.074)	(0.091)	(0.082)	(0.092)
Required Education Level (Illit./R&W Omitted)										
Requires Primary				-0.102***	-0.156***	0.003			-0.198**	-0.194*
				(0.036)	(0.043)	(0.061)			(0.086)	(0.100)
Requires Preparatory				-0.011	-0.133**	0.145*			0.010	0.085
				(0.049)	(0.058)	(0.076)			(0.138)	(0.144)
Requires Secondary				0.142***	0.047	0.250***			0.066	0.154**
				(0.023)	(0.030)	(0.038)			(0.064)	(0.076)
Requires Higher Ed.				0.359***	0.278***	0.441***			0.211**	0.193*
				(0.033)	(0.045)	(0.050)			(0.093)	(0.116)
Requires Skill				0.102***	0.084***	0.108***			-0.030	-0.083
				(0.022)	(0.029)	(0.032)			(0.068)	(0.092)
Apprentice, Craft Trade				0.053	-0.095	0.397**			0.083	-0.155
				(0.082)	(0.076)	(0.201)			(0.310)	(0.174)
Assistant, Craft Trade				-0.014	-0.016	-0.003			0.094	0.073

Model:	**OLS**						**Fixed Effects**			
Specification:	**Spec. 4**	**Spec. 5**	**Spec. 6**	**Spec. 7**	**Spec. 8**	**Spec. 9**	**Spec. 12**	**Spec. 13**	**Spec. 14**	**Spec. 15**
Ages:	**15-64**	**15-34**	**35-64**	**15-64**	**15-34**	**35-64**	**15-64**	**15-34**	**15-64**	**15-34**
				(0.037)	(0.042)	(0.090)			(0.091)	(0.114)
Craftsman, Craft Trade				0.084***	0.114***	0.067			0.177**	0.203**
				(0.027)	(0.035)	(0.042)			(0.072)	(0.095)
Work Experience (Yrs)	-0.002	0.021**	0.001	-0.001	0.021**	-0.011	-0.004	0.031*	-0.006	0.027
	(0.005)	(0.010)	(0.005)	(0.005)	(0.010)	(0.007)	(0.015)	(0.019)	(0.015)	(0.019)
Work Experience (Yrs) Sq./100	0.015	-0.082**	0.003	0.011	-0.082**	0.032**	0.034	-0.155*	0.041	-0.138
	(0.012)	(0.040)	(0.010)	(0.012)	(0.039)	(0.016)	(0.048)	(0.085)	(0.045)	(0.086)
Constant	1.122***	1.193***	1.580***	1.062***	1.126***	1.405***	1.039***	1.181***	1.026***	1.164***
	(0.038)	(0.049)	(0.086)	(0.039)	(0.049)	(0.222)	(0.187)	(0.286)	(0.183)	(0.290)
Region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5-year Labour Market Entry Cohorts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8371	4741	3630	8371	4741	3630	2300	1652	2300	1652
Groups							955	706	955	706
Adjusted R-sq.	0.124	0.054	0.151	0.149	0.079	0.179	0.032	0.022	0.044	0.037

Notes: *p<0.1 **p<0.05 ***p<0.01
Robust (Huber/White) standard errors in parentheses.
Source: Author's calculations using ELMPS 2012.

Table 6. Fixed Effects Estimates of Primary and Preparatory Test Scores by Relative Education, Skills, and Craftsman Status

Test:	Primary	Prep.	Primary	Prep.	Primary	Prep.
Relative Education (Less Educated Omitted)						
Most educated	4.318**	6.655**				
	(1.963)	(2.722)				
Skill Level (Not skilled omitted)						
Skilled			-3.000	-5.000		
			(2.004)	(3.390)		
Craftsman Status (Not a craftsman omitted)						
Craftsman					-2.103	-1.184
					(2.111)	(2.858)
Constant	70.625***	64.382***	77.306***	74.410***	75.736***	69.841***
	(0.945)	(1.572)	(1.058)	(1.912)	(0.946)	(1.281)
Observations	54	71	36	39	29	29
Groups	27	34	17	18	13	12
R-sq.	0.044	0.050	0.000	0.032	0.001	0.003

Notes: *p<0.1 **p<0.05 ***p<0.01
Robust (Huber/White) standard errors in parentheses.
Restricted to individuals with score, with natal household sibling(s) with test scores, and with natal household sibling variation in education, skills, or craftsman status.
Source: Author's calculations using ELMPS 2012.

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