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

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Is School the Best Route to Skills?
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Abstract

Formal vocational schooling is expected by many to be the best route to job skills, to make young Egyptians highly employable and to generate substantial returns. This paper compares the returns to formal vocational secondary education and the returns to vocational skills acquired through other routes, such as apprenticeships, in Egypt. By using a unique panel data set that allows for a comparison of siblings, this paper estimates the impact of education and skills on wages in terms of causal effects. The evidence in this paper shows that for older adults there are substantial returns to a vocational secondary education. However, for recent graduates there are very limited, near zero returns to vocational secondary education, even as compared to attaining no formal education whatsoever. Additionally, this paper demonstrates that the returns to vocational skills, specifically craft skills obtained through an apprenticeship, are substantial even for recent graduates. Formal vocational secondary education is not the best route to employable skills and higher wages. Given this evidence, Egypt's current system of vocational secondary education should be dismantled. The widely held assumption that formal education is the most effective route to skills should be re-examined in other contexts as well.

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1. Introduction

Vocational schooling is supposed to train young people in skills that are relevant to employers and the modern economy. In Egypt, two-thirds of secondary students attend vocational secondary education at a substantial cost to society. This investment is expected to provide them with employable skills and higher wages. The assumption that formal secondary education is the best route to job skills is embedded in both Egypt's education system and global development initiatives. For instance, UNESCO's Education for All Initiative states, "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 unproven hypothesis. I test this hypothesis in the case of Egypt, where formal vocational schooling is often low quality, provides inadequate preparation for the labor market, and may not be the most effective route to skills acquisition.

In this educational and labor market context, Egyptian students and parents may question whether investing in formal vocational secondary education is worthwhile. The ambiguous value placed on formal vocational education is reflected in the behavior of students. Students in vocational secondary have the highest rate of absenteeism and are the most likely to report that one of their reasons for absence is that they do not benefit from school (Population Council, 2011). Would it instead be better to leave school and undertake an apprenticeship rather than attend vocational secondary education? To answer this question, I theorize that human capital, in the form of relevant skills, rather than simply years of schooling drives wages. I compare different routes to human capital accumulation: formal vocational secondary schooling versus skills acquired in apprenticeships and on-the-job training. Vocational skills, as a type of human capital, can be formed in myriad ways, and it crucial to understand the different routes and

returns to these skills. Focusing on male wage-workers, I test whether formal vocational secondary education yields higher returns than other routes to skill acquisition in Egypt. This is a crucial but untested assumption in development economics.

A unique dataset, the Egypt Labor Market Panel Survey, allows for causal estimates of the returns to school and skills. As well as being unusual for its information on skills and skill acquisition, the data set includes a complete life history, with actual years of work experience, which is rarely captured in surveys. Another key feature of this data is that it follows a panel of households over time, including individuals who split from those households, allowing for causal inference about the returns to schooling and skills by comparing siblings.

I find that among employed male vocational secondary graduates ages 15-64 in Egypt, only 40% are in jobs that require a skill, and just 18% of those individuals acquired their skill from their vocational secondary education. Especially for recent cohorts, the estimated returns to formal vocational secondary education are the same as attaining *no* formal education. However, the returns to skills, specifically craft skills, are substantial. The very different returns to skills and formal vocational secondary education have important implications for Egyptian families and policymakers. Either drastic 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.

2. The Human Capital Framework

In the human capital framework, individuals' skills and knowledge are considered a form of capital, 'human' capital, in which individuals can deliberately invest and from which individuals receive returns (Schultz, 1961). Investing in schooling, on-the-job training, health

maintenance, and information acquisition are all different ways to invest in human capital, albeit routes with different returns (Becker, 1962). Although the broader nature of human capital has long been recognized, in practice human capital is frequently operationalized as formal education, where education increases productivity and yields returns, in terms of higher wages (Mincer, 1974; Rosenzweig, 1995). Models of macro-economic growth likewise incorporate education, almost always formal schooling, as the measure of human capital to which growth is attributed (Barro & Lee, 1994; Sala-i-Martin, Doppelhofer, & Miller, 2004).

The main alternative to the human capital approach theorizes that education is either partially or primarily a method for screening or signaling (Jaeger & Page, 1996; Riley, 1979; Stiglitz, 1975; Weiss, 1983, 1995). Human capital theory maintains that higher wages associated with higher levels of education are due to time spent in school or work experience that increases a worker's productivity. In contrast, signaling, sorting, and screening models allow education to be correlated with differences among workers that predate the education system, such as ability (Weiss, 1983, 1995). Returns to schooling may therefore embody an effective signal of innate productivity, rather than productivity that has been increased by spending time in school.

Despite the ongoing enthusiasm for measuring the returns to education, whether due to increased productivity or optimal signaling, in terms of years of schooling, there is growing recognition that this is an incomplete measure or mis-specification of human capital (Glewwe, 1996; Hanushek & Woessmann, 2008; Hanushek & Wößmann, 2007; Pritchett, 2001; Wößmann, 2003). Even those authors who recognize the inadequacy of years of education as a measure of human capital nonetheless continue to mis-specify human capital as they tend to rely on test scores (in school), school quality, or other formal education-related measures of human capital, neglecting the formation of human capital outside the formal education system.

The assumption that returns to formal schooling are greater than those from alternative routes to skill acquisition is embedded in the ongoing focus on formal education as a cornerstone of development. The United Nation's Millennium Development Goals include achieving universal primary education, not achieving universal basic skills (World Bank, 2011). UNESCO's global Education for All Initiative includes a goal of promoting learning and life skills for young people and adults, but assumes that formal secondary schooling is the surest route to skills (UNESCO, 2012). This is a frequently assumed, but untested hypothesis. This belief is also embedded in government budgets, which allocate large shares of public spending to formal education. For example, the education system comprised 11.7% of the 2010/2011 public spending in Egypt (El-Baradei, 2013). I test whether it is in fact true that returns to formal vocational schooling are higher than returns to other routes to skills acquisition—such as on-the-job training and apprenticeships—in the case of Egypt.

3. Background

Education in Egypt

Although pre-primary enrollments 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. School entry begins at age six for primary. After six years of primary school, young people transition to preparatory (lower secondary) school for three years. The completion of preparatory school marks the end of compulsory education. Students who continue formal education after preparatory school are tracked into either vocational secondary or general secondary school (both generally three years), based on their test scores in preparatory school. General secondary, which requires higher test scores, is the 'academic' track, and includes an

implicit guarantee of university access after secondary school. Vocational secondary is almost always terminal, although a small minority of students (around 9% based on 2009 data) continued to two-year post-secondary institutes, four-year higher institutes, or, very rarely, to university (Assaad, 2013; Krafft, Elbadawy, & Assaad, 2013). Most vocational secondary students receive a certificate in either commercial or industrial vocational secondary, with a fair number of students in agriculture as well. Across all levels, around 88% of students attend public (government) schools, while 7% attend Azhari (religious) schools and 5% attend private schools. The exception to this pattern is vocational secondary, which is almost all public (99%) (Population Council, 2011).

Egypt has steadily expanded its education system over the past several decades. Figure 2 displays education enrollment trends by age for males ages 25-64 (of an age to have achieved their final educational attainment). Illiteracy has fallen substantially over time. The share of males who attained only a primary or preparatory education has remained relatively flat, as has the share attaining general secondary (not usually terminal). The proportion of males attaining a vocational secondary degree has risen steadily, from around 10% of those now in their 60s to more than 30% of those between 40 and 25 in 2012, with nearly 40% of the youngest cohorts having vocational secondary as their final educational status. Higher education has expanded, but more slowly than vocational secondary. Overall, there has been a substantial expansion in education, and the large increase in the supply of educated workers will affect their wages. Additionally, since nearly 40% of recent graduates have a vocational secondary education, the returns to vocational secondary education are of substantial economic importance.

Challenges in the Education System and Vocational Secondary

Although the Egyptian education system is approaching universal primary entry, and educational attainment has substantially risen over time, issues with educational quality persist. Repetition, dropout, and absenteeism are all substantial problems (Krafft, 2012). The education system is focused on generating credentials rather than increasing productivity (Assaad & Barsoum, 2009; Wahba, 2001). That Egyptian students are obtaining a relatively low quality of education and limited human capital accumulation, despite gains in years of schooling, is evidenced in Egyptian students' performance on standardized tests. Egypt is well below the international average for the TIMSS test (given to students in the 8th grade) and even compared to other countries in the region, Egypt is under-performing relative to its level of GDP (World Bank, 2008).

A recent review of national policies for education effectively summarized the state of vocational secondary education: "the technical and vocational education and training (TVET) system is very weak and poorly regarded by Egyptian society, and is an unattractive alternative in its present form" (OECD/World Bank 2010, p. 16). Vocational secondary tends to have weak curricula and materials, poorly trained instructors, and limited connections to the private sector. Youth are trained on equipment and skills that are outdated, and training is driven by the supply of students rather than labor market demand (UNDP & Institute of National Planning, 2010; World Bank, 2007). These quality issues diminish the level of skills that can be acquired in formal vocational secondary education. 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).

There is evidence that the expansion of vocational secondary in Egypt was not designed to increase the level of vocational skills in the work force, but rather was 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, 1997). Public sector jobs are particularly appealing to vocational secondary graduates, who obtain a substantial wage premium in the public sector compared to the private sector (Assaad, 1997; Salehi-Isfahani, Tunali, & Assaad, 2009). Therefore, while vocational secondary is supposed to confer job skills upon young people, many young people have pursued vocational secondary in hopes of obtaining a public sector job, which requires such credentials. The job guarantee is no longer in effect as of the end of the 1990s, and public sector hiring has declined (Amer, 2009; Assaad, 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.

Education and Labor Market Mismatches

In part due to the problems in the Egyptian education system, especially in vocational secondary, education and labor market mismatch is a serious problem in Egypt (UNDP & Institute of National Planning, 2010). For instance, 2009 data showed that less than half of vocational secondary students who received hands-on training and had obtained employment reported that their training reflected the needs of the labor market (Krafft, 2012). Because of the low quality of vocational secondary education, employers sometimes express preference for hiring young people who have *not* attended formal vocational secondary (El-Ashmawi, 2011).

The recognized irrelevance of vocational secondary and employer preferences are likely to shape the potential returns to vocational secondary education.

The mismatch between education and the labor market is an impediment not only to individual success but also to macroeconomic growth. The Middle East and North Africa region has the highest percentage of firms (54.4%) stating that an inadequately educated workforce is a major constraint for business operation and growth. In Egypt, less than twenty percent of human resource managers agreed that vocational graduates have the hard or soft skills they need (World Bank, 2013a). Self-employment, or starting a small business with the skills an individual *does* have, is not usually viewed as a viable alternative to wage work. While attitudes towards entrepreneurship are positive, with 73% of Egyptians considering entrepreneurship a desirable activity, fewer (53%) felt they had the skills and knowledge to start a business, and only 40% felt there were good opportunities for starting a business in the next six months (Wally, 2012).

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

Given the poor quality of the education system, apprenticeships and other forms of on-the-job training are the primary route to jobs skills for many young people in Egypt. Traditional apprenticeships consist of a (male) youth assisting and being trained by a craftsman. Families often have to pay the craftsman for training (UNDP & Institute of National Planning, 2010). Apprentices do not typically live with craftsmen but remain with their families during training. It is usually a young person's family's social networks and the concentration of craft trades in a community that provide a youth with apprenticeships. Craftsmen prefer younger apprentices, under age 18, due to a perception that only young people are able to learn new skills and tolerate the harsh discipline typically entailed in training (Assaad, 1993). This limits the opportunities for

older youth or adults to learn a craft, or for adults to retrain in a different skill. After a period of training and very low wages, apprentices can expect to eventually 'graduate' to being assistants and ultimately craftsmen themselves. 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 vocational occupations but do not undertake an apprenticeship at an early age generally become common laborers, and remain so throughout their careers (Tunali & Assaad, 2006).

Schooling and Work Decisions

With the choice between formal education and alternative routes to skills, such as apprenticeships and on-the-job training, how do Egyptian families make school and work decisions? Theoretically, young people no longer attend school when the marginal utility of future returns to education is less than the utility lost to schooling costs and the value of their (potentially employable) time (Edmonds, 2008). That a child receives formal education and does not engage in early work is not necessarily the optimal, efficient outcome, but only one potential result depending on the returns to different alternatives. Additionally, young people and families faced with school and work decisions do not necessarily subscribe to the same perspective as academics. Schooling decisions are based on a mix of youth and parental preferences over different educational and work options. Information on the returns to education plays a key role in the decision, and while *perceived* returns to education drive educational decisions, these perceptions may not be accurate, especially in developing countries (Jensen, 2010). In the case of Egypt, future returns to education may have substantial non-monetary components, including the

prestige of a job (especially the higher prestige of a public sector job), the security of employment, returns in the marriage market, and other benefits.

There are conflicting perspectives on the impact of early work on human capital accumulation. Early work may be competitive with human capital accumulation by limiting education (Baland & Robinson, 2000). Alternatively, children engaged in work may actually acquire skills that increase their human capital (Bourdillon, Levison, Myers, & White, 2010). Often families in Egypt consider children's work to be an opportunity for skill development, with young people who receive on-the-job training perceived as having better prospects for employment (Carothers, Breslin, Denomy, & Foad, 2009). Anecdotally, youth have expressed a preference for combining school and work, and if this is not possible, that early work is more important than formal vocational education (Carothers et al., 2009). This suggests that early work may in fact be more important to human capital accumulation than formal education.

The potential complementarity between school and work can also be seen in programs for older children and adults. Apprenticeships and internships can link school with work, helping young people accumulate skills and work experience. The German model of training with a company combined with part-time classroom learning is a prime example (UNESCO, 2012). Apprenticeships are also particularly important for the acquisition of job skills that actually match the needs of the labor market (UNESCO, 2012). Informal combinations of school and work are very common in the developing world but are not coordinated to link school and work. Formal, coordinated school/work combinations are rarer in the developing world, but they do exist. One example is the Mubarak-Kohl Initiative in Egypt. Designed as an alternative to traditional vocational secondary, this program consisted of two days in school and four days in workplace per week, for three years (Adams, 2010). However, apprenticeships in Egypt are

entirely separate from the education system and young people undertake apprenticeships at an age that limits pursuing formal secondary education (Tunali & Assaad, 2006). Thus, young people and their families are often faced with a choice of whether to pursue formal vocational secondary education or vocational skills outside the education system based on the expected returns to these alternatives.

Returns to Education

The international evidence indicates that Egyptians could expect substantial returns to increases in education. A 2004 review of the returns to education across 98 countries identifies the overall average private return to a year of schooling as around 10% (Psacharopoulos & Patrinos, 2004). This is averaging across all years and types of education. Breaking down returns by education level, private and social returns both decrease as the level of education increases (Psacharopoulos & Patrinos, 2004). While there is some consensus about individual, micro-economic returns to education, cross-national country data shows no association between rising education levels and the growth in productivity per worker: effectively zero macro-economic returns (Pritchett, 2001). The macroeconomic evidence contradicts the idea that education automatically results in useful human capital and increases in productivity.

Egypt has low private returns to education, about half the world average. A 2006 estimate found average returns of 5.4% per year in Egypt (Salehi-Isfahani et al., 2009). This is comparable to returns to physical capital, which have been estimated to be around 5% in microenterprises (de Mel, Mckenzie, & Woodruff, 2008). The rapid expansion of education, as well as the low quality of education and a labor market-education mismatch have all been identified as problems driving low returns in the region (Assaad & Barsoum, 2009; World Bank,

2008). In Egypt, private returns tend to be lower at lower levels of education, and highest at the tertiary level (Salehi-Isfahani et al., 2009), the opposite of the pattern observed globally (Psacharopoulos & Patrinos, 2004).

While globally vocational secondary graduates may earn higher (Moenjak & Worswick, 2003), equal (Pugatch, 2012), or lower wages (Newhouse & Suryadarma, 2011) than their general secondary peers, overall returns to general education tend to be higher than returns to vocational education (Said & El-Hamidi, 2008). Certainly it is the case that attending general secondary and then higher education generates much greater returns than does a vocational secondary education in Egypt. Focusing on urban men ages 20-54 in Egypt, and comparing Mincerian returns to different levels of education over time, Salehi-Isfahani et al. (2009) found that, in 2006, the cumulative returns to completing vocational secondary as compared to less than a primary education were 30%, an average of 2.5% per year of schooling for the twelve years of education culminating in a vocational secondary education. Returns to vocational secondary had also declined substantially by 2006 as compared to 1988 and were lower in Egypt than in Iran or Turkey. The study also found substantial non-linearities in education, indicating that the standard (linear) Mincer model is unlikely to be appropriate in Egypt.

Returns to vocational secondary education may in fact have decreased to zero. One of the most recent studies of returns to education in Egypt, using a 2009 survey and focusing on youth ages 15-29, found that the marginal return to secondary education[2] was -3% (El-Araby, 2013). This means that continuing from preparatory into secondary yields *negative* returns. There are

[2] Vocational and general secondary education were not distinguished in this study. However, since general secondary education is rarely terminal, the vast majority of individuals attaining only a secondary education are vocational secondary graduates.

some potential econometric issues with this study. For instance, although there is a control for gender, males and females are not treated separately. Controls are included for job type, which may itself be influenced by type of education, i.e. secondary certificate holders may be more able to access permanent or private sector jobs. No effort is made to address selection into education. The question also remains whether 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 and vocational skills acquired elsewhere.

Returns to Skills

While there are numerous studies on returns to formal education, in Egypt and globally, there is a very limited body of evidence on the returns to skills. Some research exists on the returns to cognitive skills, as measured in the context of traditional education (Hanushek & Wößmann, 2007), but research is especially thin on the returns to vocational or business skills, despite the fact that they represent about 8% of recent education-related aid from the World Bank (Blattman, Fiala, & Martinez, 2011). A recent evaluation of a skills training program in Uganda self-identified as the first rigorous evaluation of vocational training programs in the least developed nations, and identified only three previous evaluations of job training programs, all in Latin America (Blattman et al., 2011). Mckenzie & Woodruff (2012) review what is known about business training programs and find little evidence, primarily due to a shortage of high-quality studies. Blattman, Fiala and Martinez's (2011) mid-term evaluation of a cash transfer program in Uganda, which provided youth with transfers to pay for vocational training, tools, and start-up costs, found that hours of employment doubled and earnings increased by nearly

50%. This increase in earnings, if a result of vocational training, suggests that returns to skills may be quite high, but overall the evidence is very limited.

Skills can be task-specific, and there is evidence that task-specific human capital plays an important role in individual wages (Gathmann & Schönberg, 2007). Returns to skills therefore relate to the matches between skills and tasks. Mismatches between education and educational requirements also occur and can affect returns. There is a lower return to education that is greater than the education required for a job, as well as a penalty to education that falls short of the education required for a job (Hartog, 2000). Job-appropriate education and skills are therefore an important component of returns. The evidence in Egypt suggests that job-specific skills, rather than education, are the most important pre-requisite for vocational employment; employability is based on workshop experience, with the result that employers prefer less educated workers (Antoninis, 2001). These studies provide some tentative evidence of the existence of returns to skills. However, comparing the vast literature on returns to education with the limited literature on returns to skills, this paper is addressing a clear need for additional research on skills.

3. Data

This paper uses the Egypt Labor Market Panel Survey (ELMPS), a rich panel data set that includes detailed data on individuals' labor market characteristics. The ELMPS was fielded in 1998, 2006, and 2012.[3] It is a household survey, with each round nationally representative at the time of fielding, and with weights that account for attrition processes. The 2012 sample followed previous round households and split households, as well as adding a refresher sample, totaling

[3] The surveys were conducted by the Economic Research Forum (ERF) and the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). See Assaad & Krafft (2012) for additional details on the ELMPS 2012.

12,060 households and 49,186 individuals.[4] Throughout the paper, although the panel data is used for the identification of siblings, I examine wages and their relationship with labor market characteristics in the 2012 round of the survey.

Using the ELMPS, I focus on wage-earning males ages 15-64 in 2012, which I refer to as the 'OLS sample' and describe in Table 1. This age group is considered the working-age population in the context of Egypt (Assaad, 2009). Ideally, we would like to examine the returns to education regardless of whether an individual is a wage-earner or works in a non-wage employment. However, realistically it is not possible to estimate equivalent self-employed, farm or family income. I therefore focus solely on wage earners, who are almost three-fourths of males ages 15-64 (see Table 2). In Egypt, effectively all males participate in the labor market, so selection into the labor market is not an issue for males. However, female labor force participation is low and there is selection into the labor market for females, which would potentially bias results. Additionally, since women have both different labor market behaviors (Assaad, 2009) and different wages, which vary by their labor market characteristics (Said, 2009), in this paper I focus solely on the returns to education for males.

An important component of my analysis is based on family fixed effects, which exploit the fact that the ELMPS includes a sample of siblings. The ELMPS's panel nature makes it possible to identify siblings even after they have left their natal household, which is particularly important for estimating the returns to education because income will affect individuals' ability to form new households. The 'family fixed effect sample' is a subset of wage-earning males ages

[4] Both the panels and cross-sections have sample weights to allow for the calculation of nationally representative statistics. Descriptive statistics in this paper use sampling weights. Regressions do not use sampling weights, as unweighted OLS is the preferred approach when the sampling scheme is unrelated to the dependent variable (Winship & Radbill, 1994). This is the case with the ELMPS, which sampled geographically.

15-64 in 2012 (a subset of the OLS sample). The family fixed effect sample consists of males 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. Additionally, this subset is restricted to those who, when they were living in their original natal household, were living with a male sibling who is also a wage earner in 2012. These male siblings are not necessarily living in the same household in 2012. By applying (birth) family fixed effects to this sample, that is by comparing siblings, it is possible to generate a causal estimate of the returns to education and skills.

Key Variables

The key question I examine is whether individuals ought to pursue formal vocational secondary education or acquire vocational skills through other means. Specifically, which path will yield higher wages? The dependent variable, wages, is the natural log of hourly wages in 2012 Egyptian Pounds (LE).[5] Years of school is measured as the number of years completed successfully. The level of education is the highest level an individual successfully completed within the education system. The self-reported educational requirements of a job are also controlled for, to distinguish between the returns to different educational requirements, which may be associated with required credentials or job-specific skills.

The ELMPS has a complete life history, including work experience. Therefore, I control for actual years of work experience, rather than the more common 'potential' work experience (usually age minus years of schooling). Additionally, I control for the year an individual worked for the first time with dummy variables for different five-year cohorts of labor market entrants.

[5] This measure is the hourly average for all wage compensation, including overtime, bonuses, incentives, profit sharing and any other types of wages.

Given the changing economic conditions and policies in Egypt, the timing of labor market entry may impact wages. Regional differences in wages are also important to account for, so controls for the six different regions of Egypt are included. In terms of skills, individuals were asked 'Does your job require any skill?' and a dummy variable was used to indicate 'yes' responses. The coefficient on this variable will indicate the returns to skills. It is important to note that returns to skill are therefore returns to an individual who has 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. Dummy variables were created for these skill levels, since different skill levels will have different returns.

Sample Descriptives

Table 1 describes the characteristics of the two samples. The first is the sample of all male wage earners, ages 15-64 ('OLS sample'). This sample has 8,368 observations. Individuals have an average of 9.9 years of school, with 20% being illiterate, 12% completing a primary education, 7% a preparatory education, 35% a vocational secondary education, 3% a general secondary education, and 24% a higher education. Around 2% of this sample is currently in school. More than half (56%) are working in jobs that have no formal educational requirements, while a fifth (19%) are working in jobs that require a secondary education. Two-fifths (41%) are working in skilled jobs. Looking specifically at the skill level in craft occupations, 1% of the sample is skilled apprentices in craft occupations, 6% are assistants, and 15% are skilled craftsmen in craft occupations, while 78% of the sample is either unskilled or not in a craft occupation. The average wage earned in this sample is 6.4 LE per hour.

The second sample is the family fixed effects (male sibling) sample. This sample consists of 2,104 observations from 866 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 family FE individuals have an average age of 29.9 compared to 35.5 for the OLS sample. This younger sample is consistent with limiting the analysis to siblings observed together in their natal household in 1998, 2006, or 2012. The average years in the labor force for this sample is 12.9, with 12.1 years of work experience, and an average wage of 5.9 LE. The family FE sample has years of schooling and levels of schooling similar to the OLS sample. Individuals in this sample are slightly less likely to work in a job that requires formal education: 62% work in a job that requires no formal education, compared to 56% in the OLS sample. However, a similar share work in a job that requires skill, and a similar percentage are at the different levels of craft occupations. There are small geographic differences between the two samples; while 19% of the OLS sample lives in Greater Cairo, only 15% of the family FE sample does so, and correspondingly has slightly more individuals from rural Lower Egypt and rural Upper Egypt. 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

Traditional private returns to education are estimated with the standard Mincer equation, regressing the log of wages on years of schooling, work experience, and its square (Mincer, 1974). While the traditional Mincerian approach is very popular, it is not without its problems. The empirical evidence suggests that returns are not a linear constant, but may be specific to different levels of education (Psacharopoulos & Patrinos, 2004; Salehi-Isfahani et al., 2009). The

Mincerian approach is unlikely to yield causal estimates, and differences in ability, school quality and family background can substantially bias estimated returns (Glewwe, 1996). This approach also assumes that wage earners are paid their marginal product (Glewwe, 1996), a contention that is unlikely to hold in the context of public sector wage setting. In the context of individuals and families deciding what educational path to pursue, this issue is irrelevant; for governments setting education and economic policy, it is quite important. Measurement error in wages or schooling can also affect estimates, usually biasing them downward (Card, 1999; Glewwe, 1996). There is also the issue that many adults are not wage-workers. Individuals select into wage work, and this selection process can bias estimated returns to education (Glewwe, 1996). However, in the case of Egypt almost three-quarters of males 15-64 are wage earners, so findings for wage earners will represent conditions for the majority of the workforce.

A variety of approaches have been used to overcome the problem that Mincerian returns are not causal estimates. The first is to claim this is not, in fact, a problem, since the standard Mincer estimates have been consistent with higher quality studies that identify causal effects (Card, 1999; Duflo, 2000). Instrumental variables approaches are also common but are not without limitations, and they require a high-quality instrument to identify schooling decisions (Card, 1999). Common instruments include parents' education, which is a dubious instrument, and institutional factors such as the rules about enrollment and the geographical proximity of schools. As Card (1999) shows, even valid instruments can generate biased estimates in the presence of heterogeneous individuals. Additionally, IV estimates tend to have a larger upward bias due to omitted ability than do OLS estimates (Card, 1999). Given the fact that IV tends to be more biased than OLS or sibling comparisons, and that a good instrument is not available in the ELMPS, IV methods were not used for this paper.

Another approach that allows for causal estimates of returns to education is to apply family fixed effects. This process compares education and wages for siblings, twins, father/son or mother/daughter pairs. The idea behind this approach is that estimating returns within families substantially reduces the unobservables that bias normal cross-sectional comparisons (Card, 1999). Additionally, Card (1999) shows that ability bias seems to be lower in fixed effects comparisons of twins or siblings than in OLS or IV estimates. This approach is particularly effective in countries where family characteristics play a large role in educational outcomes, as is the case in Egypt (Assaad, 2013; Krafft et al., 2013). One drawback to within-family estimates is that measurement error creates larger downward biases in this method than other methods (Card, 1999). However, measurement error will affect reports of both education and skills, so this will not affect the relative returns of schools and skills. Therefore, family fixed effects are the best approach for identifying the causal impact of education on earnings.

In this paper, several different estimation methods for returns to education are applied and compared. First, I use OLS to estimate traditional, linear Mincerian estimates of returns to education, and compare these to Mincerian returns to different levels of education, since past research suggests substantial non-linearities relating to the level of education (Salehi-Isfahani et al., 2009). I also control for additional variables not traditionally included in Mincerian models. Subsequently, I re-estimate the OLS models using family fixed effects.

Traditional private returns to education are estimated with the standard Mincer equation (Mincer, 1974) as:

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

where *i* denotes an individual, *W* the hourly wage, *S* the years of schooling, and *E* years of work experience. Throughout, the error term, ε_i, is assumed to be normally distributed, and necessarily includes any omitted variables.

The Mincer equation can be modified for the case of non-linearities in private returns to education to estimate the returns to levels of education as:

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

where L_{ij} is a dummy variable for the level, *j*, of education of individual *i*. Non-linearities can be due to credentialism or a 'sheepskin effect' (Card, 1999), or they may be due to screening/signaling (Weiss, 1995). The latter perspective is not incompatible with the fact that passing a certain level of education may mean more human capital is in fact accumulated, the amount of human capital that allows one to pass out of that level (Strauss & Thomas, 1995).

To control for other important factors, such as differences in wages by region and labor market entry cohorts, 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 labor market entry cohorts. I also add controls for the categorical education requirements of a job, R_{ij} , where *j* denotes different education categories, such as a job requiring a university education. As well as returns to education attained, research has shown that there are returns specific to the educational requirements of a job (Hartog, 2000). With the addition of these controls, the Mincerian levels model can also be extended to include the private returns to skills as:

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

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, and can be contrasted with combinations of β_j and θ_j, the returns to education and having a job that requires a specific level of education.

For individual *i* in family *h* one can estimate equation 3 as a family fixed effect model:

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

where the family fixed effect, η_h, allows any unobservables that do not vary within the family to be differenced out in comparing siblings.

5. Findings

Education, Skills, and Employment

Participation and employment during peak working-age years is essentially a given for Egyptian males regardless of education (Assaad, 2009). However, currently employed males (ages 15-64) engage in varying types of employment by education (Table 2). The probability of being a waged employee increases with education, with 60% of currently employed illiterate males in wage work, but 84% of currently employed university educated males engaged in wage work. Males with lower levels of education are much more likely to be self-employed or employers. Notably, vocational secondary education does not have a strong relationship with being an employer or self-employed (i.e. starting a microenterprise with one's vocational skills). One important feature of the Egyptian labor market is the predominance of public sector employment, especially among the educated. Table 2 includes the share of currently employed males ages 15-64 working in the public sector. While only 9% of illiterates work in the public

sector, 16% of those with a preparatory education, 25% of those with a vocational secondary education, and 47% of those with a university education work in the public sector.

While education has dramatically expanded in Egypt, individuals often work in jobs that, according to self-reports, require lower education than they have obtained. Table 3 presents the percentage of employed males working at a job that requires an education *below* the education level they have attained by educational attainment. Additionally, Table 3 shows the percentage of employed males working at a job that requires *no* formal schooling, by educational attainment. Overall, around half (51%) of workers have a job that requires education below their educational attainment, and slightly more than half (55%) are working at a job that in fact requires no formal education, substantial evidence for a mismatch between the education system and the labor market. Notably, nearly two-thirds of vocational secondary graduates (63%) are working at jobs they report require less than their education level, and half (49%) are working at jobs that require no formal education whatsoever. The supply of educated graduates has expanded independent of the demand for educated workers, and this is a problem that affects most vocational secondary graduates and will impact the returns they can obtain for their education.

Slightly less than two-fifths (39%) of employed males 15-64 work at jobs that they report as requiring a specific skill[6] (Table 4). While only 28% of illiterates work in skilled jobs, males with a at least a primary education have similar chances (between 39 and 45%) of being in a skilled job regardless of their education level. Notably, only 18% of vocational secondary educated individuals in jobs requiring a skill learned that skill in vocational secondary education. More often vocational secondary graduates learned the skill through a craftsman, in an

[6] Individuals were asked 'Does your job require any skill?' as well as questions about skill level and skill acquisition. All data is therefore self-reported responses to questions about skills.

apprenticeship (40%). On-the-job learning was also a common route to skills (23%), comparable to vocational secondary schooling. Individuals with less than a secondary education who work in a skilled job primarily learned their skills on the job or through a craftsman. The share of men learning their skills through a craftsman was around 63% across lower education levels, comparable to the sum of vocational secondary graduates learning skills in vocational secondary or from a craftsman. This indicates that these routes to skill acquisition have the potential to be substitutes. However, the fact that vocational secondary graduates were twice as likely to have learned their skills from a craftsman as from their vocational education shows that vocational secondary is not the best source of job-appropriate skills.

Ideally, wages reflect the marginal productivity of workers, their education, and their skills; in reality, they often reflect a mix of this ideal and other factors, essentially portraying wages associated with an education or career path. Table 5 presents mean and median hourly wages in 2012 LE (Egyptian Pounds)[7] by educational attainment, among male wage-workers. The average wage across all levels of education is 6.40 LE, and the median wage is 4.50. Mean and median wages for lower levels of education show only minor variation. There is a moderate bump in hourly wages at the vocational secondary level, with median wages being 0.28 LE per hour higher than median preparatory wages, and the mean gap being 0.99. The largest jump is at the level of university, where both mean and median wages rise substantially.

The higher wages associated with vocational and university education are in large part a product of high government 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

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

wages and education has changed. Figure 3 presents wages by education level[8] 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 through vocational secondary education. Only higher education has a higher return. Additionally, 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, having decided to remain illiterate as they would be having attained a vocational secondary education.

Returns to Education & Skills

To understand the relationship between education and wages, that is, the returns to education, I begin by computing the unadjusted association between the natural log of wages and years of school for males 15-64 who are currently wage workers (the OLS sample). Each additional year of schooling is associated with a 3.3% rate of return on average. Estimating the standard Mincerian equation (Table 6, Specification 1) with years of school, work experience and its square, the rate of return to education is estimated at 4.1% per year. Specification 2 adds a series of five-year labor market entry cohort dummies, to adjust for different wages facing later cohorts, as observed in Figure 3. Specification 2 also controls for regional wage differences. Although not shown, these controls tend to be significant. After controlling for the timing of labor market entry and regional wage differences, the return to education remains 4.1% per year.

The standard Mincerian equation can act as a helpful reference, and indeed, indicates that, as previous research suggests, the returns to education in Egypt are quite low relative to

[8] Post-Secondary Institutes and University & Above have been combined into the category 'higher education,' which is used hereafter.

international averages. However, there are also substantial non-linearities in the returns to education in Egypt. Specifications 3 through 5 therefore estimate the returns to education using the level of education attained, with the different educational attainments compared to the reference category of an individual who is illiterate or can read and write but did not complete any formal education. Looking at the unadjusted associations between education levels and wages, the returns to vocational secondary education compared to no education are 10.5% (Specification 3). After accounting for work experience (Specification 4), they rise to 21.6%. And after accounting for the five-year labor market entrant cohorts and regional differences (Specification 5), returns are 21.7%, substantially higher than the returns to preparatory, which are 7.2%. The substantial non-linearities in returns to education are obvious in Specification 5, since different levels of education have very different returns. For instance, the returns to six years of primary as compared to illiteracy or literacy without a formal certificate are statistically insignificant, while the returns to higher education are quite high, at 56.5%.

However, as seen in Figure 3, returns to education, and especially vocational secondary, appear to have substantially diminished for recent graduates. Specification 6, in Table 7, therefore re-estimates Specification 5 with a sample restricted to young males, ages 15-34 in 2012. These are individuals who have a high rate of vocational secondary attainment (Figure 2) and low returns associated with vocational secondary education (Figure 3). They 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 returns to vocational secondary are not, in fact, statistically significantly different from the returns to being illiterate. The direction of bias in these regressions, in terms of selection on ability, or even the type of family connections that will yield more advantageous

employment, is positive, that is, likely to bias results in favor of higher returns to increasing levels of education. Therefore, finding that for 15-34 year olds the returns to completing a vocational secondary education—twelve full years of school—are no different than remaining illiterate is remarkable.

One possible factor contributing to the low returns to vocational secondary is that many vocational secondary graduates are not, in fact, in jobs that require or utilize their education (see Table 3). Specification 7 therefore, for ages 15-64, estimates both the returns to education and the returns to the required education level for a job. The coefficient on the *required* education level will capture returns to the required education level, both productivity and additional wages. Any productivity or additional wages related to education *obtained* regardless of the education *required* will be captured by the coefficients on the education level obtained. In this specification, the returns to preparatory remain relatively unchanged and there are not significant returns to being in a job that requires a preparatory education. However, the returns to vocational secondary have dropped somewhat, from 21.7% to 15.2% and the returns to a job that requires secondary[9] education are 13.1%. While individuals who both attain vocational secondary and obtain a job that requires secondary can expect 28.3% higher wages than individuals who are illiterate and whose job requires no education, vocational secondary educated individuals who do not obtain a job requiring this level of education receive only a 15.2% increase in wages relative to remaining illiterate. Unlike for a preparatory education, vocational secondary graduates' returns are mediated substantially through job education requirements, although it is not clear if

[9] 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 usually be expecting a vocational secondary degree.

this is due to increased productivity in vocational secondary job-skill matches, or due to substantial wage premiums for public sector jobs requiring vocational secondary. Restricting Specification 7 to 15-34 year olds (Specification 8), the return to vocational secondary remains essentially unchanged from Specification 6, near zero and statistically insignificant and there is no return to obtaining a job that requires secondary education. Vocational secondary education does not have a substantial benefit for this age group; given the opportunity cost, and cost to society of educating these individuals for an additional three years, vocational secondary is a very poor economic investment, yielding no higher wages when compared to illiterate and barely literate individuals.

As an alternative to investing in formal vocational education, should young people invest in other routes to vocational skills? Specification 9 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, among 15-64 year olds. The returns to education and to the required level of education for the individual's job remain essentially unchanged with the addition of the skill requirement indicator. This is consistent with skilled jobs being distributed relatively equally across education levels (Table 4). The return to an individual's job requiring any skill is 10.2%. Although apprentices and assistants in craft trades obtain no higher skills than other skilled workers, craftsmen in craft trades receive a 8.4% return to their skill level—on top of the return to a job that requires a skill, a net 18.6% return for the combination. 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. When restricting specification 9 to only 15-34 year olds (Specification 10), the return to skills persists at 8.4%,

and the returns to being a craftsman actually rise to 11.4%. The marginal return to attaining vocational secondary is statistically insignificant, as is the return to obtaining a job that requires secondary. Compared to the return to vocational secondary in this age group, skills are a substantially better investment.

Family Fixed Effects

While OLS regressions are commonly used for estimating returns to education, they are potentially biased due to omitted variables. The best method for removing bias from estimates of the returns to education is the use of sibling comparisons or 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, in Egypt, family characteristics are essentially deterministic in terms of both educational attainment and job access. Additionally, the direction of bias related to individual characteristics, especially ability, can be signed. Self-reported test scores[10] (out of 100) show that while the average primary score of a less-educated sibling was 71.5, the average primary score of the most-educated siblings was 78.8. Likewise in preparatory the average test score of a less-educated sibling was 64.8, while the average test score of a most-educated sibling was 70.2. This indicates that even within families, more able siblings attain more education, yielding a bias in favor of finding higher and positive returns to education even within families.

[10] Individuals have to pass an exam to complete a level of school, and it is the scores on these tests, at the end of primary and the end of preparatory, that are reported in the ELMPS. Data is only collected for individuals 45 and younger, if they attended a given level. Many individuals also do not recall their scores. N=47 for less educated siblings reporting primary scores, N=77 for more educated siblings reporting primary scores, N=42 for less educated siblings reporting preparatory scores, N=117 for more educated siblings reporting preparatory scores.

Table 8 essentially recreates Table 6 for the basic linear and level estimates of returns to education for the family fixed effect sample. Notably, the linear returns to education using family fixed effects are substantially lower than the traditional returns, as shown in Table 6. The unadjusted association between log-wages and years of school is just a 1.5% increase (not shown); after accounting for differences in work experience, it is only 2.0% (Specification 11), and after accounting for regional wage differences and the timing of labor market entry, it is only 2.1% (Specification 12), about one-fifth the international average (Psacharopoulos & Patrinos, 2004). Looking at the returns to different levels of education in the family fixed effects model, only higher education is associated with significantly higher wages than illiteracy by 19.0% (Specification 13). After accounting for differences in work experience, the return to vocational secondary is significant at the 10% level at 10.7% (Specification 14), and after accounting for differential timing of labor market entry and regional differences, this rises slightly to 11.0% (Specification 15). Higher education is the only other level with a significant return, at 27.8%.

Table 9 recreates Table 7 for the estimates of returns to education and skills using the family fixed effect sample. Comparing just the 15-34 year olds in the sample (Specification 16), there is no level of education that has a statistically significant return. Accounting for educational requirements among the family fixed-effect sample, ages 15-64 (Specification 17), vocational secondary does not have a significant return, nor does obtaining a job that requires secondary. Only higher education and obtaining a job that requires higher education have significant, positive returns. For 15-34 year olds (Specification 18), no level of education has a significant return, but obtaining a job that requires a vocational secondary education has a 13% return and is significant at the 10% level.

Although the returns to education are substantially diminished in the family fixed effects model, suggesting the OLS models for returns to education were biased upwards, the returns to skills—specifically, becoming a craftsman—remain substantial. In Specification 19, 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 17.9%. Reaching a craftsman level in craft skills has nearly the same return as higher education. Restricting to the sample of 15-34 year olds, it is notable that the return to being a craftsman for this age group is 18.6%, significant at the 10% level. The return to vocation secondary education is near zero and insignificant, although the return to obtaining a job that requires secondary is 14.7% (significant at the 10% level). Although the family fixed effects model is estimated less precisely due to a smaller sample size, it indicates that the returns to education are, in fact, much lower than the OLS model indicated, and that vocational skills, specifically apprenticing in a craft trade and ultimately becoming a craftsman, are a better investment for young people than formal vocational secondary.

6. Discussion and Conclusions

In Egypt, historically there have been high private returns to vocational secondary education. However, this has occurred primarily in the public sector due to high public sector wages and the employment guarantee (Assaad, 1997; Salehi-Isfahani et al., 2009). The OLS estimates suggested that there remain positive private returns to vocational secondary education, as compared to no formal education, for the working age population. These returns are comparatively low; Egyptian vocational secondary graduates receive lower returns to their education than students in other countries in the region, such as Turkey and Iran (Salehi-Isfahani

et al., 2009). Additionally, focusing on male youth 15-34, there were essentially no returns to vocational secondary education with either family fixed effects or OLS. Young men would receive the same wages after twelve years of education, culminating in a vocational secondary degree, as if they had not attended school at all. In sharp contrast to the nil returns to vocational education, the returns to skills are substantial. For all working age men, the returns to a job that requires skill are estimated to be around 10.2%, and additionally, achieving the craftsman level in a craft trade confers an additional 8.4% return. These returns hold for young males as well.

Returns to education estimated using OLS are unlikely to be causal estimates. Therefore, to obtain causal estimates, I compared male siblings who were wage earners. Returns to education were notably lower for all levels of education using this estimation technique, and no level of education yielded a statistically significant return when focusing only on 15-34 year-olds. 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 statistically significant at 17.9% in the working-age family fixed effects model. Moreover, the estimated coefficient was similar for youth ages 15-34 and significant at the 10% level. The causal family fixed effect estimates therefore also indicate that youth should invest in vocational skills—specifically, apprenticing in a craft trade in order to ultimately become a craftsman—as a substantially better investment than vocational secondary education. Despite the fact that investing in craft skills will yield higher wages than investing in a vocational secondary education, young people may still prefer to attend vocational secondary education for 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. In Egypt, education is nominally free of charge. While

there are associated costs, and indeed, often quite substantial expenditures (El-Baradei, 2013), the government is funding a vocational secondary education for around two-fifths of each recent birth cohort. Public investment in education can generally be justified on a number of grounds, but all rest upon young people benefiting from that education. Yet today's vocational secondary graduates can expect no higher wages, are no more likely to be in a skilled job, nor any more likely to be self-employed or an employer. 'Investing' in vocational secondary education has no real economic benefits.

Given limited returns, perhaps vocational secondary should be abandoned entirely, a policy that would yield substantial savings to society. Young people who tested into general secondary at the end of preparatory could then continue on for general secondary and higher education; young people who did not would stop at the end of preparatory, around age fifteen, and enter into the labor market. Although *some* (18%) of vocational graduates ages 15-64 with skilled jobs obtained their skills from vocational secondary education, workers were twice as likely to have obtained their skills through a craftsman (in an apprenticeship) as through formal vocational education, and slightly more likely to have learned them on the job. Vocational secondary and apprenticeships and on-the-job training may sometimes be substitutes, but apprenticeships and on-the-job training are surer routes to appropriate job skills. Abandoning vocational secondary would leave young people with only the more effective routes to skills. While not all young men could become apprentices and ultimately craftsmen, none would experience a costly form of education that generates no returns. Other forms of work-place training and apprenticeships outside the craft trades are likely to also be valuable, and should be encouraged. Ending vocational secondary education would also address Egypt's education/labor

market mismatch. That most educated men are in jobs that do not require their education, or frequently that do not require any education at all, is just one illustration of this mismatch.

Alternatively, 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 reform attempts (Adams, 2010; Antoninis, 2001; OECD/World Bank, 2010; Wally, 2012) with no discernable improvements, this route does not show much promise. There are myriad alternative uses for the funding for vocational secondary education—such as to pay for vocational training, tools, and start-up costs, as in Uganda (Blattman et al., 2011), or improving the quality of basic education, which is more likely to generate public returns.

The fact that acquiring vocational skills through an apprenticeship, and ultimately becoming a craftsman, yields higher returns than formal vocational secondary education has important implications not just for young people and families in Egypt and the Egyptian government. A sizeable body of literature indicates that there are high returns to capital for microenterprises (de Mel et al., 2008). This research drives the push for microfinance as a development tool. However, the education-employment mismatch in Egypt suggests that a lack of opportunities to form appropriate *human* capital is limiting development.

Formal education is over-emphasized in the economic literature on human capital. While there are numerous returns to education studies, this is one of very few studies examining the returns to skills. 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 favor of formal schooling is also apparent in the economics of development and the efforts of NGOs and other international organizations. The Millennium Development Goals include achieving universal primary education, not achieving universal basic skills (World Bank, 2011). 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—has just been disproven. Having set out to test whether returns to formal vocational schooling are higher than alternative routes to skills acquisition, I have found substantial evidence to the contrary. In Egypt, the returns to formal vocational secondary schooling are substantially and significantly lower than alternative routes to skills acquisition, specifically acquiring vocational skills on the job, in an apprenticeship. The primacy of formal education needs to be re-evaluated in light of these findings.

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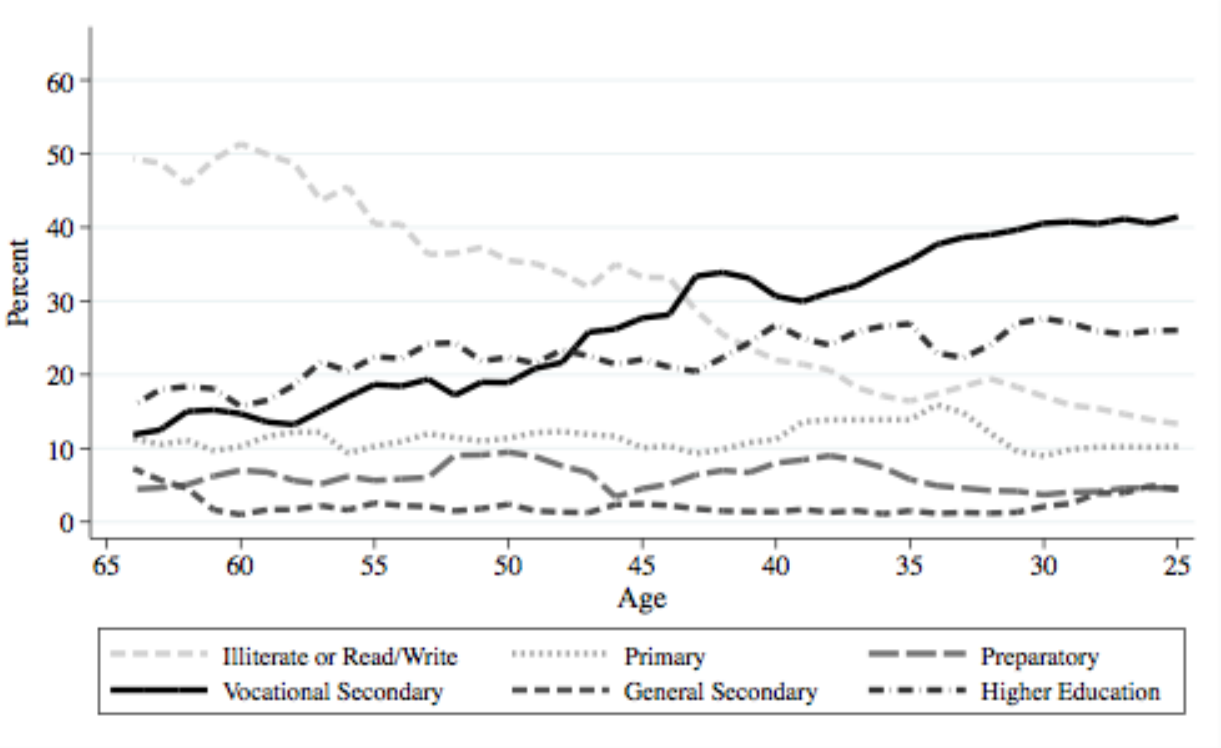
Figures & Tables

Figure 1. Structure of the Egyptian Education System

		Technical Secondary Grades 10-12 Usually terminal	**Post-Secondary Institutes** Two-year
Primary ⇒	**Preparatory** ⇒		**Higher Institutes**
Grades 1-6	Grades 7-9 End of compulsory schooling	**General Secondary** ⇒	**University**
		Grades 10-12	Four-year
(Ages 6-11)	(Ages 12-14)	(Ages 15-17)	(Ages 18 and up)

Note: Parenthetical ages are ideal, assuming on time entry and no repetition

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



Source: Author's calculations using ELMPS 2012

Table 1. Sample Descriptives

	OLS Sample *Percent of Sample*	**Family FE Sample** *Percent of Sample*
Current Student	2.1	2.2
Education Level		
Illiterate or Read/Write (reference)	19.7	17.0
Primary	12.0	13.3
Preparatory	6.8	6.6
Vocational Secondary	34.7	37.8
General Secondary	2.5	2.6
Higher Education	24.3	22.7
Required Education for Job		
Illiterate or Read/Write (reference)	55.5	61.6
Primary	4.1	3.9
Preparatory	2.5	2.4
Secondary	18.5	16.2
Higher Education	19.4	15.9
Region		
Greater Cairo (reference)	19.4	14.7
Alexandria & Suez Canal	8.8	8.8
Urban Lower	9.3	8.9
Urban Upper	7.2	8.8
Rural Lower	31.6	32.9
Rural Upper	23.6	25.9
Job requires skill	41.1	39.7
Skill Level, Craft Occupations		
Not skilled or Not a Craft Occupation (reference)	77.6	76.3
Apprentice	1.2	1.5
Assistant	5.8	6.7
Craftsman	15.3	15.5
	Means (Standard Deviations)	***Means (Standard Deviations)***
Years of School	9.889	9.954
	(4.799)	(4.318)
Age	35.496	29.943
	(11.071)	(7.408)
Years in Labor Force	18.296	12.928
	(11.680)	(7.979)
Years of Work Experience	16.938	12.107
	(11.252)	(7.636)
Hourly Wage (LE)	6.404	5.927
	(12.460)	(20.219)
Observations (N)	8,368	2,104

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. Employment Status by Education and Percentage Employed in Public Sector by Education, Employed Males, Ages 15-64 (Percentages)

	Waged Employee	Employer	Self-Employed	Unpaid Worker	Total	Public Sector
Illiterate	60.0	22.5	13.8	3.7	100.0	9.2
Reads & Writes	66.8	18.3	12.8	2.1	100.0	18.8
Primary	69.2	11.3	11.8	7.7	100.0	12.2
Preparatory	69.6	7.2	10.5	12.7	100.0	16.3
General Secondary	72.2	9.4	8.1	10.3	100.0	21.9
Vocational Secondary	78.2	8.2	8.2	5.5	100.0	25.2
Post-Secondary Inst.	79.2	9.5	9.4	1.9	100.0	41.2
University & Above	84.2	8.8	5.2	1.8	100.0	47.2
Total	73.4	11.9	9.6	5.1	100.0	24.0

Source: Author's calculations using ELMPS 2012

Table 3. Percentage of Employed Males, Ages 15-64, (1) Working at a Job that Requires an Education below Education Attained and (2) Working at a Job that Requires no Formal Schooling, by Education Level (Percentages)

	(1) Working at a Job that Requires an Education below Education Attained	(2) Working at a Job that Requires no Formal Schooling, by Education Level
Illiterate	0.0	92.9
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 4. Job Skills and Skill Acquisition, Employed Males, Ages 15-64 (Percentages)

	Illit.	Reads & Writes	Primary	Prep.	Gen Sec.	Voc. Sec	Post-Sec. Inst.	Uni. & Above	Total
Job Requires Skill	27.8	45.0	43.6	39.3	27.6	39.8	40.7	44.0	38.7
Skill Acquisition									
Regular School (Except Vocational Education)	0.2	0.1	1.3	2.5	14.1	6.6	17.6	69.5	17.6
Vocational Education	0.8	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	5.2	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	20.8	21.6	18.4	20.4	25.9	22.5	17.5	17.3	20.2
Other	2.4	4.7	2.9	3.0	0.5	2.4	0.6	1.9	2.5
Total	100	100	100	100	100	100	100	100	100

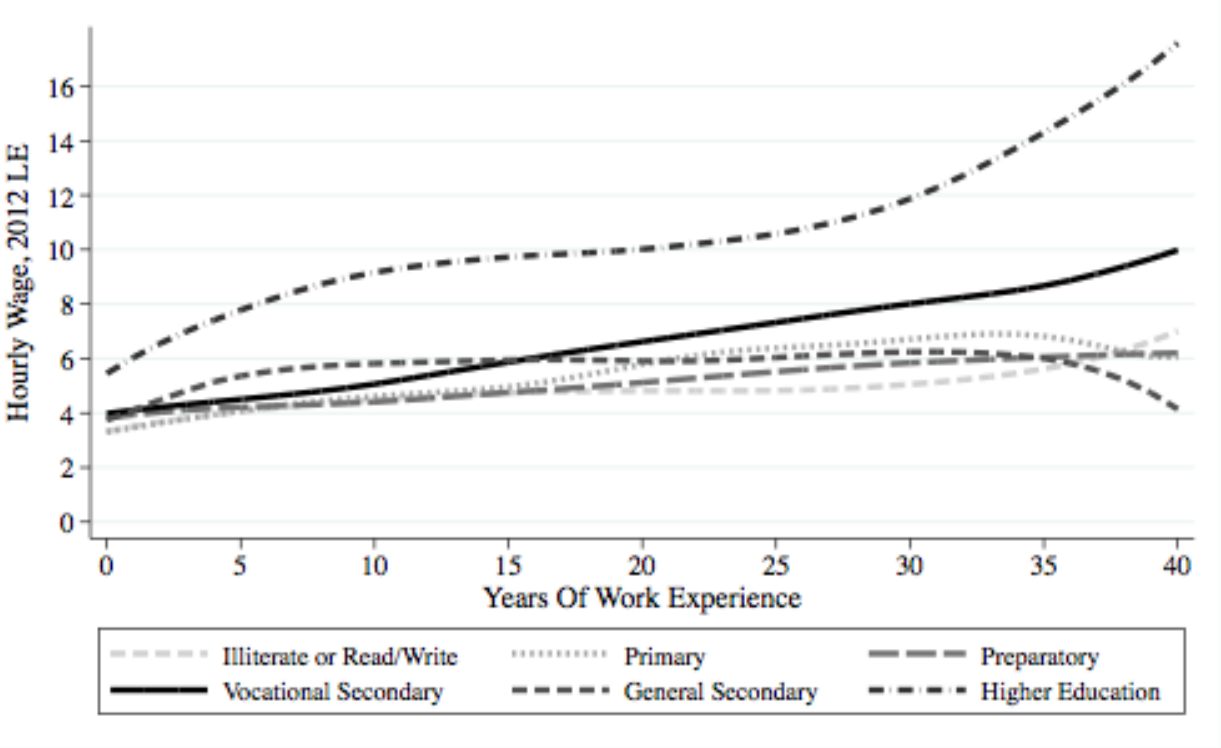
Source: Author's calculations using ELMPS 2012

Table 5. Mean and Median Hourly Wages (in 2012 LE) by Educational Attainment, Male Wage Workers, Ages 15-64

	Mean	Median
Illiterate	4.78	3.89
Reads & Writes	5.30	3.85
Primary	5.45	4.00
Preparatory	4.87	4.12
General Secondary	5.76	4.40
Vocational Secondary	5.77	4.40
Post-Secondary Inst.	7.47	5.22
University & Above	9.89	6.59
Total	6.40	4.50

Source: Author's calculations using ELMPS 2012

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



Source: Author's calculations using ELMPS 2012

Table 6. Linear and Level Estimates of Returns to Education, Wage Workers, Ages 15-64
Dependent Variable: ln(hourly wage)

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Years of School	0.041***	0.041***			
	(0.002)	(0.002)			
Work Experience (Yrs.)	0.023***	-0.001		0.026***	-0.002
	(0.002)	(0.005)		(0.002)	(0.005)
Work Experience (Yrs.) Squared	-0.000***	0.000		-0.000***	0.000
	(0.000)	(0.000)		(0.000)	(0.000)
Education Level (Illiterate/R&W Omitted)					
Primary			-0.030	0.038	0.035
			(0.027)	(0.027)	(0.027)
Preparatory			-0.001	0.088**	0.072*
			(0.030)	(0.030)	(0.030)
Voc. Sec.			0.105***	0.216***	0.217***
			(0.019)	(0.020)	(0.021)
Gen. Sec.			0.092*	0.241***	0.236***
			(0.046)	(0.045)	(0.045)
Higher Ed.			0.447***	0.574***	0.565***
			(0.023)	(0.023)	(0.024)
Constant	0.835***	0.568*	1.386***	0.997***	0.721*
	(0.026)	(0.267)	(0.015)	(0.026)	(0.326)
Region	No	Yes	No	No	Yes
5-year Labor Market Entry Cohorts	No	Yes	No	No	Yes
Observations	8369	8368	8372	8372	8371
Adjusted R-Squared	0.093	0.112	0.063	0.105	0.124

+p<0.1 *p<.05 **p<.01 ***p<.001
Robust standard errors in parentheses.
Source: Author's calculations using ELMPS 2012

Table 7. Level Estimates of Returns to Education and Skills, Wage Workers
Dependent Variable: ln(hourly wage)

	Spec. 6 Ages 15-34	**Spec. 7** Ages 15-64	**Spec. 8** Ages 15-34	**Spec. 9** Ages 15-64	**Spec. 10** Ages 15-34
Education Level (Illiterate/R&W Omitted)					
Primary	-0.046	0.039	-0.039	0.028	-0.043
	(0.032)	(0.027)	(0.032)	(0.027)	(0.032)
Preparatory	-0.028	0.068*	-0.016	0.064*	-0.017
	(0.040)	(0.031)	(0.040)	(0.031)	(0.040)
Voc. Sec.	0.031	0.152***	0.025	0.149***	0.024
	(0.027)	(0.023)	(0.028)	(0.022)	(0.028)
Gen. Sec.	0.116*	0.139**	0.081	0.151**	0.092
	(0.056)	(0.046)	(0.056)	(0.046)	(0.056)
Higher Ed.	0.326***	0.288***	0.146**	0.294***	0.158***
	(0.035)	(0.036)	(0.045)	(0.035)	(0.045)
Work Experience (Yrs)	0.021*	-0.002	0.021*	-0.001	0.021*
	(0.010)	(0.005)	(0.010)	(0.005)	(0.010)
Work Experience (Yrs) Sq.	-0.001*	0.000	-0.001*	0.000	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Required Education Level (Illit./R&W Omitted)					
Requires Primary		-0.103**	-0.152***	-0.102**	-0.156***
		(0.037)	(0.045)	(0.036)	(0.043)
Requires Preparatory		-0.027	-0.153**	-0.011	-0.133*
		(0.049)	(0.058)	(0.049)	(0.058)
Requires Secondary		0.131***	0.041	0.142***	0.047
		(0.023)	(0.029)	(0.023)	(0.030)
Requires Higher Ed.		0.352***	0.275***	0.359***	0.278***
		(0.033)	(0.044)	(0.033)	(0.045)
Requires Skill				0.102***	0.084**
				(0.022)	(0.029)
Apprentice, Craft Trade				0.053	-0.095
				(0.082)	(0.076)
Assistant, Craft Trade				-0.014	-0.016
				(0.037)	(0.042)
Craftsman, Craft Trade				0.084**	0.114**
				(0.027)	(0.035)
Constant	1.356***	0.770*	1.342***	0.675*	1.260***
	(0.129)	(0.325)	(0.128)	(0.264)	(0.127)
Region	Yes	Yes	Yes	Yes	Yes
5-year Labor Market Entry Cohorts	Yes	Yes	Yes	Yes	Yes
Observations	4741	8371	4741	8371	4741
Adjusted R-sq.	0.054	0.139	0.067	0.149	0.079

+p<0.1 *p<.05 **p<.01 ***p<.001
Robust standard errors in parentheses.
Source: Author's calculations using ELMPS 2012

Table 8. Family Fixed Effects Linear and Level Estimates of Returns to Education, Wage Workers, Ages 15-64, Dependent Variable: ln(hourly wage)

	Spec. 11	Spec. 12	Spec. 13	Spec. 14	Spec. 15
Years of School	0.020***	0.021***			
	(0.006)	(0.006)			
Work Experience (Yrs.)	0.020**	-0.007		0.020**	-0.009
	(0.007)	(0.016)		(0.007)	(0.016)
Work Experience (Yrs.) Squared	-0.000	0.000		-0.000	0.000
	(0.000)	(0.001)		(0.000)	(0.000)
Education Level (Illiterate/R&W Omitted)					
Primary			0.016	0.039	0.050
			(0.059)	(0.060)	(0.060)
Preparatory			-0.024	0.021	0.034
			(0.071)	(0.073)	(0.073)
Voc. Sec.			0.051	0.107+	0.110+
			(0.055)	(0.057)	(0.057)
Gen. Sec.			0.011	0.086	0.111
			(0.125)	(0.125)	(0.125)
Higher Ed.			0.190*	0.263***	0.278***
			(0.075)	(0.077)	(0.076)
Constant	1.062***	1.275**	1.373***	1.152***	1.429**
	(0.080)	(0.454)	(0.045)	(0.073)	(0.448)
Region	No	Yes	No	No	Yes
5-year Labor Market Entry Cohorts	No	Yes	No	No	Yes
Observations	2102	2102	2104	2104	2104
Adjusted R-Squared	0.017	0.034	0.006	0.018	0.034

+p<0.1 *p<.05 **p<.01 ***p<.001

Robust standard errors in parentheses.

Source: Author's calculations using ELMPS 2012

Table 9. Family Fixed Effects Level Estimates of Returns to Education and Skills, Wage Workers, Dependent Variable: ln(hourly wage)

	Spec. 16 Ages 15-34	**Spec. 17** Ages 15-64	**Spec. 18** Ages 15-34	**Spec. 19** Ages 15-64	**Spec. 20** Ages 15-34
Education Level (Illiterate/R&W Omitted)					
Primary	-0.029	0.047	-0.031	0.039	-0.041
	(0.068)	(0.058)	(0.067)	(0.059)	(0.067)
Preparatory	-0.079	0.030	-0.087	0.024	-0.093
	(0.082)	(0.072)	(0.083)	(0.072)	(0.082)
Voc. Sec.	0.047	0.089	0.020	0.084	0.016
	(0.066)	(0.057)	(0.066)	(0.057)	(0.066)
Gen. Sec.	0.057	0.087	0.032	0.080	0.006
	(0.137)	(0.126)	(0.139)	(0.127)	(0.135)
Higher Ed.	0.129	0.191*	0.073	0.194*	0.077
	(0.095)	(0.086)	(0.097)	(0.084)	(0.096)
Work Experience (Yrs)	0.026	-0.011	0.021	-0.012	0.019
	(0.020)	(0.016)	(0.020)	(0.016)	(0.020)
Work Experience (Yrs) Sq.	-0.001	0.000	-0.001	0.001	-0.001
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Required Education Level (Illit./R&W Omitted)					
Requires Primary		-0.213*	-0.211*	-0.204*	-0.213*
		(0.091)	(0.102)	(0.089)	(0.106)
Requires Preparatory		0.002	0.060	0.012	0.081
		(0.143)	(0.154)	(0.142)	(0.150)
Requires Secondary		0.052	0.130+	0.076	0.147+
		(0.068)	(0.078)	(0.066)	(0.080)
Requires Higher Ed.		0.156+	0.115	0.193*	0.149
		(0.095)	(0.116)	(0.095)	(0.119)
Requires Skill				-0.021	-0.061
				(0.070)	(0.095)
Apprentice, Craft Trade				0.076	-0.190
				(0.321)	(0.183)
Assistant, Craft Trade				0.058	0.014
				(0.093)	(0.118)
Craftsman, Craft Trade				0.179*	0.186+
				(0.074)	(0.098)
Constant	1.662***	1.707***	1.682***	1.635***	1.654***
	(0.387)	(0.435)	(0.389)	(0.428)	(0.406)
Region	Yes	Yes	Yes	Yes	Yes
5-year Labor Market Entry Cohorts	Yes	Yes	Yes	Yes	Yes
Observations	1633	2104	1633	2104	1633
Adjusted R-sq.	0.025	0.041	0.033	0.047	0.039

+p<0.1 *p<.05 **p<.01 ***p<.001

Robust standard errors in parentheses.

Source: Author's calculations using ELMPS 201