AMERICAN UNIVERSITY OF BEIRUT

EXPLAINING RETURNS TO EDUCATION IN EGYPT: EFFECT OF EDUCATION ON LABOR FORCE PARTICIPATION AND AGE OF MARRIAGE

by
REEM WAJIH ZAIOUR

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Arts
to the Department of Economics
of the Faculty of Arts and Sciences
at the American University of Beirut

Beirut, Lebanon
May 2018

AMERICAN UNIVERSITY OF BEIRUT

EXPLAINING RETURNS TO EDUCATION IN EGYPT: EFFECT OF EDUCATION ON LABOR FORCE PARTICIPATION AND AGE OF MARRIAGE

by

REEM WAJIH ZAIOUR

Approved by:

Dr. Nisreen Salti, Associate Professor Economics	Advisor
Dr. Serena Canaan, Assistant Professor Economics	Member of Committee
Dr. Hossein Radmard, Assistant Professor Economics	Member of Committee

Date of thesis/dissertation defense: May 3, 2018

AMERICAN UNIVERSITY OF BEIRUT

THESIS, DISSERTATION, PROJECT RELEASE FORM

Student Name: Zaiour (Last) Reem (First) Wajih (Middle)

☑ Master's Thesis ○ Master's Project ○ Doctoral Dissertation

☑ I authorize the American University of Beirut to: (a) reproduce hard or electronic copies of my thesis, dissertation, or project; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes.

☐ I authorize the American University of Beirut, to: (a) reproduce hard or electronic copies of it; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes
after : **One ---- year from the date of submission of my thesis, dissertation, or project.**

Two ---- years from the date of submission of my thesis, dissertation, or project.

Three ---- years from the date of submission of my thesis, dissertation, or project.

Reem Zaiour — May 15, 2018

Signature — Date

ACKNOWLEDGEMENTS

To begin with, I would like to thank my advisor, Dr. Nisreen Salti, for her continuous guidance, positivity and patience. My sincere thanks also goes to my committee members, Dr. Serena Canaan and Dr. Hossein Radmard, for their valuable feedback and readiness to help at any time.

My deepest gratitude extends to the rest of the faculty of the Economics department at AUB for being a source of inspiration, and a huge support system. And to my family and friends, for their unfailing presence and emotional support.

Finally, I am especially thankful and forever grateful for the presence of my person and intellectual companion, Reem Taha. She may not have had anything to do with the surface of this thesis, but her unfaltering support and everyday presence had a hand in its completion. Her unwavering faith in me, first and foremost, is the blessing and source of confidence that keeps me motivated.

AN ABSTRACT OF THE THESIS OF

Reem Wajih Zaiour for Master of Arts
Major: Economics

Title: Explaining Returns to Education in Egypt: Effect of Education on Labor Force Participation and Age of Marriage

Extensive literature has studied the effect of education on wages and other labor market outcomes. However, it is hard to isolate the effect of education due to endogeneity, selection bias and omitted variable bias. Methods that employ institutional changes as sources of exogenous variation in years of schooling have been used in order to identify causal effects.

For example, a recent paper by Assaad et al. (2016) uses Law No.233 in Egypt, that reduced the number of years of primary schooling from 6 to 5 years in year 1988/89, thus decreasing compulsory years of education from 9 to 8 years. Their findings show that the intervention significantly affected the years of education received for males but not for females. Through 2SLS regressions (within an IV framework), they then estimate returns to education to be between 2 and 5.7% for men, which is lower than returns to education found in other countries.

Our paper aims to look more closely at the effect of this intervention on other outcomes, such as labor force participation and age of marriage, that in turn impact wages.

Results of Linear Probability Models show that receiving the treatment is correlated with a significant increase in the probability of leaving the labor force for females. However, the treatment has no significant effect on males' labor force participation when we control for age polynomials. In addition, the treatment is found to have a significant effect on the age of marriage of females, and an insignificant effect on the age of marriage of males when we control for age polynomials. These findings show that the treatment could have affected wages of females through links other than its main effect on years of schooling, which may explain the insignificance of the first stage results that Assaad et al(2016) found. Furthermore, given that when we control for our treatment variable along with cohort dummy variables instead of age polynomials, the coefficient of the treatment variable is significant for males, then the validity of this treatment as an instrument is questioned.

Finally, where we find the intervention to be a valid source of exogenous variation (i.e. for men), the paper investigates the effect of years of education on labor force participation and age of marriage through 2SLS regressions.

CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

Table Page

CHAPTER 1

INTRODUCTION

Many studies have focused on education and its efficiency in allowing for social and economic mobility. Economists have spent a lot of time attempting to estimate the value of education, and determining the optimal level of investment in education. Economists also aspire to uncover the causal effect of education on wages and earnings, thus estimating the returns to education. However, it is hard to isolate the effect of education on wages and to calculate returns to education due to endogeneity or the presence of unobserved characteristics, such as motivation and personal capabilities that might affect both schooling and wages. If an individual with a university degree earns more than an individual without a university degree, the difference in earnings is not necessarily due to the degree, but rather the former might have some innate abilities that make her/him more productive. Innate abilities might drive the individual to get the college education to begin with, so comparing these two individuals' earnings to estimate the returns to education would lead to biased results. The vast literature on identifying the returns to education has produced widely varied estimates, and ones with very limited external validity

Considering that a peculiar characteristic of the Arab World is its large youth cohort, where in 2016, 1.3 billion people were between 12 and 24 years old, education is essential in order to provide this cohort with sufficient opportunities that would allow them to gain financial independence and enjoy a good standard of living (AHDR 2016). However, enrollment in tertiary education in the MENA region is still lower than that in East Asia and Latin America. Low enrollment in higher education is basically due to

low returns of education and the uncertainty of labor market outcomes. Accordingly, one in three young people are unemployed. Females generally experience unemployment more than males; female unemployment is higher than that of the males by 10%, since gender discrimination and bias in both education and the labor market persist (AHDR 2016). In addition, inequality of opportunity in education in the Arab world hinders education's effect on social and economic mobility. Circumstances that are beyond the control of children determine their educational progress, attainment and achievement. These circumstances include the family background, the location of the child's community (urban vs rural) and the quality of the schools in his/her region. To mitigate inequality of opportunity in education, some countries have provided free education at different schooling levels. This policy aims at giving individuals of different social and economic backgrounds equal opportunities in schooling. It was assumed that by making more services free or available, the social composition of the student body will change in a way that benefits children from poor families.

This paper will look specifically at Egypt, where 19% of the population in 2016 are individuals between 15 and 24 years old (AHDR 2016). In fact, the most vulnerable Egyptian girl, coming from a background of rural, illiterate parents and in the lowest wealth quintile, has a 75% chance of ever attending school compared to a 100% chance for the most Egyptian advantaged girl, with a background of urban parents with above secondary education and in the top wealth quintile. Similar differences exist regarding the probability of reaching secondary school, where the most vulnerable girl has only 43% chance to do so, while the most advantaged girl has a 99% chance to do so (Assaad, Salehi-Isfahani, and Hendy 2014). Between 2000 and 2005, 75% of

individuals who entered the labor market in Egypt got employed in the informal sector (AHDR 2016).

Egypt has historically focused on the importance of equality of opportunity in education. After the revolution of 1952, the Egyptian constitution stated: "The State shall guarantee equal opportunity to all citizens," and, "All citizens are equal before the law. They have equal public rights and duties regardless of race, ethnic origin, language, religion or belief"(UNESCO-IBE 2006). Education in Egypt is, thus, free at all educational levels. Furthermore, transition from one level to the next is based on standardized national examination only, which also paves the way for equality of opportunity in education (World Bank 2007). In addition to providing a constitutional framework, the state allocates a specific percentage of its spending (4% of Gross National Product) to education, as specified by article 19 of 2014's constitution (Egypt Healthcare 2016).

This paper uses reform No. 233 in Egypt, which reduced the years of primary education from 6 to 5 years in 1988/89 leading to a decrease in compulsory education from 9 to 8 years. We hope that this change allows us to overcome endogeneity by utilizing the exogenous difference in years of schooling between different cohorts. This policy was revoked in 1999, when the length of primary education was returned to 6 years, but it is a particularly interesting case because exogenous institutional changes in years of education usually include an increase in compulsory education rather than a reduction. However, according to Assaad et al (2016), the non-complier problem is avoided in this case, since the treatment group completed primary school by receiving 5 years of education only as opposed to 6.

A recent paper by Assaad, Aydemir, Dayioglu and Kirdar (2016) in the Economic Research Forum (ERF) exploited the same intervention. They use the 2012 round of the Egypt Labor Market Panel Survey (ELMPS) to find the causal impact of education on wages in Egypt by comparing cohorts who were affected by this reform to cohorts who were not. Data includes 7,519 wage earners that are between 20 and 45 years old in 2012. The discontinuity exists for individuals who were born after January1978, so the treatment dummy variable takes the value 1 for individuals who were born in or after 1978 and 0 for others. First stage regressions show that the coefficient of the treatment dummy is negative and significant for males, but it is not significant for females. Their findings also show that the reduction in the years of schooling affected people with at least primary education. Using OLS and 2SLS regressions along with a Mincerian wage function, returns of education were estimated to be 2 to 5.7%, which is lower than returns found in other developing countries. Since first stage results were not significant to begin with, they do not find returns of schooling for women.

This paper looks instead at two specific outcomes, labor market participation and age at first marriage, using the same reform as a source of exogenous variation in years of schooling. In order to understand why returns to education are low among men and insignificant among women, we will check the effect of the policy on labor market participation, for some individuals might have left the labor force all together, which explains the low estimate of the returns to education for males and the insignificance of results for females. Assaad et al (2016) only compare wage earners, so differences within those who stayed in the labor force and who may have completed their education due to other unobservable characteristics might be missing the fact that some

individuals left the labor force, and are thus not captured by the study. On the other hand, age at first marriage is investigated in order to provide an additional explanation as to why first stage regressions are insignificant for women. The treatment might have affected age of marriage of individuals, thus affecting their wages in ways other than through their years of schooling. When the instrument proves to be valid, we use instrumental variables to identify the effect of education on other outcome variables.

This paper contributes to the literature that studies the effect of education on labor market outcomes. It incorporates the impact of education on marriage decisions. It uses the Egypt Labor Market Panel Survey (ELMPS) in its 3 rounds covering years 1998, 2006 and 2012. Unlike Assaad et al, our treatment group accounts for law No. 23 that later revoked policy No.233 and restored years of primary education to 6. The panel aspect of the dataset was also exploited in the creation of our own dummy variable regarding labor force participation.

Results from Linear Probability Models show that receiving the treatment is correlated with a significant increase in the probability of leaving the labor force for females. The treatment does not significantly affect the probability of leaving the labor force for males when we control for age polynomials. In addition, being in the treatment group is associated with a significant increase in the age of marriage of females. These findings show that the treatment has affected wages of females through links other than its main effect on years of schooling. On the other hand, using this intervention as a treatment when proven valid allows us to estimate the effect of education on labor force participation and age of marriage for males.

The rest of the paper is organized as follows: Chapter 2 provides a literature review of major papers that utilize exogenous changes in compulsory education as instruments to measure the causal effect of education on several outcomes. Chapter 3 provides an overview of the educational system in Egypt and its development. Chapters 4 and 5 present our conceptual framework, empirical methodology and our results respectively. Finally, chapter 6 concludes and presents possible extensions of this paper.

CHAPTER 2

LITERATURE REVIEW

After World War 2 and the appearance of Development Economics as a new sub-discipline of economics, economists sought to explain developmental gaps across and within countries. To begin with, multiple measures were utilized to assess countries' development and their growth. Per capita income was taken as the main measure of development, but this posed multiple challenges and limitations, for per capita income can be driven by certain variables that do not touch the lives of the population living in a country and thus does not capture the full picture. In fact, Amartya Sen argues that economic development should be more than just a rise in per capita income. It should rather embrace all social and economic objectives that countries thrive for. Thus, development, according to Sen, should be defined in terms of entitlements and capabilities that give an individual freedom. Accordingly, other indices were used to evaluate a country's development, such as the Human Development Index and the Human Poverty Index. The Human Development Index (HDI) is based on 3 main variables: educational attainment, life expectancy at birth and standard of living measures using the Purchasing Power Parity (PPP). Educational attainment is especially important because low levels of education make it more difficult for countries to develop new industries and use new technologies, making people less adaptive to change. Education is essential in the formation of human capital and improvement of people's quality of life through securing their social and economic progress. Moreover, educational stratifications are particularly important and crucial in any society, for education is able to separate people and prepare them for different occupations and

opportunities. Thus, education is a widely sought after mechanism that allows for upward social mobility. Inequities in education and educational opportunities have, therefore, formed a focal point for economists, policy makers and governments.

Extensive literature exists on the effect of education, and many different methodologies are employed to reach causal estimates. To begin with, the effect of education on labor market outcomes has been of particular interest because education is considered as a direct driver of economic welfare. Gary Becker's approach (1964) and his, proposed human capital theory, looked at schooling as a financial investment where individuals spend their time and their money in order to acquire human capital and increase lifetime wealth (Oreopoulos & Salvanes 2009). Money and time spent in education are used to develop human capital to increase long-term wealth, which will subsequently result in more consumption, better health and greater wellbeing. However, the causal effect of education on earnings is not easily calculated due to the presence of multiple factors that impact wages and educational choices at once. For example, an individual who chooses to attend university might have personal characteristics that make him more productive in the labor market at every level of educational attainment. Issues of endogeneity have pushed researchers to use different assumptions, contexts, data sets and methodologies, which has resulted in varying estimates of the return to education.

Methodologies to approximate returns to education can be divided into two general approaches. The first one uses structural models that examine both schooling choices and outcomes, while the second designs treatment effects models that include IV methodologies or are based on randomization methods and regression discontinuities (Heckman, Humphries & Veramendi 2016).

The empirical literature (specifically in the United States and developed countries) has shown that for every additional year in high school, the annual monetary returns to education are on average about 7 to 12%. In addition, returns are generally higher for individuals with a disadvantaged background (Oreopoulos & Salvanes 2009). Card (1999) gives an overview of the literature that links education and earnings. He concludes that IV estimates are systematically higher than OLS estimates by 20%. In addition, returns to education are not standard across populations, but rather they vary with factors such as parental education and school quality (Card 1999).

Using compulsory education to estimate financial returns to education was initiated by Angrist and Krueger (1991). They argue that education is crucial in determining labor market outcomes and formulating the decision-making process, for it influences the probability of being employed, the chances of entering jail, of getting a divorce, of getting pregnant before the age of 20 or even of being admitted to a mental institution (Angrist & Keueger 1991). Different studies followed Angrist and Krueger's approach. For instance, Del Bono and Galindo-Rueda (2006) use a similar quasi-natural experiment to study how differences in compulsory education and educational outcomes affect labor market outcomes. A policy in England and Wales allows students, depending on their date of birth, to leave school after they finish their compulsory years of schooling but only after one of two dates. Thus, the date of birth exclusively separates students and allows the authors to develop a Regression Discontinuity Design (RDD). Results show that the difference in educational attainments clearly affects employment, wages and participation. These results, which are obtained with a RD design followed by IV estimation are higher than those found through OLS regressions (Del Bono & Galindo-Rueda 2006). On the other hand, Liwiński claims that the results

obtained by RDD are generally lower than those obtained with an IV estimate. Grenet (2013) compared the returns to education between France and England and Wales. He found that the reform that changed compulsory years of education in France did not affect wages. However, in England, the hourly wage rate was raised by 6 to 7%. This disparity in the results was due to the fact that in England and Wales individuals with no qualifications dropped out, but not in France. Devereux and Hart (2010) investigated the returns to education in the UK, also, using the reform in compulsory education of 1947. Results show no returns to education for women, and a 4 to 7% return for men. Dickson and Smith (2011) study employment outcomes and wages. They exploit changes in the minimum school leaving age to obtain IV estimates and compare them with IV estimations from changes in compulsory schooling. In addition, Oreopoulos (2006) finds that benefits from compulsory education are between 10 and 14% in the UK. He reaches his results using local average treatment effects (LATE) and through employing the same intervention that changed the minimum school-leaving age. Using the Labor Force Survey of the UK, Harmon, Hogan and Walker (2003) estimated that average return to education between 1993 and 2000 is 7% with a standard deviation of 4%. Other studies that investigate returns to education include Fuwa and Korwatanasakul (2015), who found that increasing compulsory years of education by 2 years in Thailand increased wages by 8%.

In the context of Egypt, Assaad et al. (2016) employed the exogenous intervention that decreased primary schooling in Egypt from 6 to 5 years to estimate returns to education as previously mentioned. Using an IV framework, they show that the causal effect of education on wages of men who are between 20 to 45 years old is between 2% to 5.7%. ElSayed and Marie (2015) also studied the effect of education on

labor market outcomes using the same reform and using the 2006 and 2012 data of the ELMPS. Results prove that the policy actually had a positive impact on educational outcomes, for the likelihood of finishing compulsory education increased by 5.5% and increased the total years of education by 0.64 years. Rizk (2016), on the other hand, used the Harmonized Household Income Expenditure Surveys of 2010/2011 to study the return of education in three Arab countries: Egypt, Palestine and Tunisia. Results show that returns to education rise with years of schooling in Egypt. All countries show that returns to tertiary education is higher than that of basic education (Rizk 2016).

Other studies have focused on the non-monetary benefits and returns to education. These returns are defined by Oreopoulos and Salvanes (2009) as "non-pecuniary returns": education affect the overall wellbeing of an individual through channels other than income. For example, education impacts individuals' decisions about marriage and parenting styles. Haveman and Wolfe (1984) studied health, fertility, saving ratios, marital sorting and broader enjoyment of activities as benefits of education. Oreopoulos (2007) shows that additional years of schooling decrease the probability of having poor health, being unhappy or being unemployed. Moretti (2004) and Hanuchek (2002) have studied outcomes of education that include innovation, crime, medical insurance, stock options and externalities. Results show that individuals with one to three years of college education and with similar external background are in jobs that on average measure 4.5 points higher in occupational prestige than graduates that are without college education. Individuals with more education and more earning potential are also more attractive or appealing in the marriage market. Lochner (2004) finds that education decreases criminal behavior using changes in compulsory years of education, and the estimated social worth of this return is approximately between 14

and 26%. Finally, Milligan, Moretti and Oreopoulos (2004) show that education raises voter turnouts in the US and makes people more informed citizens on the political level. Similarly, Dee (2004) confirms that education enhances civic knowledge and freedom of speech.

CHAPTER 3

OVERVIEW ON EDUCATION IN EGYPT: THE EDUCATIONAL LADDER

The development of the educational system in Egypt started with Muhammad 'Ali, who established a system that operates separately but side by side with the traditional religious educational system of Al-Azhar in 1836 (Hyde 2013). Mohammad 'Ali worked on strengthening Egypt with a strong army and a well-built economy relying on modern factories rather than small home industries, both of which could not be attained without scientific progress and training. Thus, Muhammad 'Ali set up modern schools and also enhanced cultural exchange by sending qualified Egyptian students to Europe on educational missions and inviting foreign teachers to work in Egypt. Afterwards, the British occupation affected the educational system by increasing the number of secondary schools and language schools. These language or mission schools developed modern curricula (Hyde 2013).

Following Egypt's independence in 1922, educational policies were based on constitutional principles that identify the functioning framework and its fundamental features. As a matter of fact, the constitution of 1923 promoted universalizing education (NCERD 2001). Article 19 specifies that elementary education is compulsory for all Egyptian children (NCERD 2001). In addition, Article 18 indicates that education is a right and that primary education is compulsory. It also affirms that the state will work on increasing the years of compulsory education. Article 20 states that education is free in all state institutions and at all levels (World Data on Education 2012). Article 21

recognizes the importance of eradicating illiteracy as a national duty (World Data on Education 2012).

After the revolution of 1952, the Egyptian constitution focused on the importance of equality of opportunity. Thus, two basic principles that govern education in Egypt are equality and equal opportunity. This is evident in Article 8 of the 1971 constitution that states: "The State shall guarantee equal opportunity to all citizens," and in Article 40 of the same constitution that declares: "All citizens are equal before the law. They have equal public rights and duties regardless of race, ethnic origin, language, religion or belief (World Data on Education 2012)."

Article 18 affirmed that education is a basic right for all and specified that the Egyptian state supervises education and equity. As for compulsory education, it was restricted to the primary stage of education before 1981, but it was later extended in law No. 139 in 1981 to include preparatory education (increased from 6 to 9 years).

This paper's methodology focuses on Law No.233. As previously stated, in 1988/1989, Law No. 233 reduced the years of compulsory education from 9 to 8 years. Thus, the primary stage of education included 5 years rather than 6 years of schooling, while preparatory school remained 3 years. This law's implementation was initiated with the 4th and 5th graders of the academic year 1988/89 (Assaad, Aydemir, Dayioglu & Kirdar 2016). Fourth graders were given the curriculum of the fourth grade and a summarized version of the fifth grade curriculum. In 1989/1990, fourth graders would proceed to grade 5 and sit for their final exams for the completion of primary education, then advance to preparatory school. As for students enrolling in grade 5 in the academic year of 1988/89, they would study the curriculum of grade 6, and then sit for their final

exams with sixth graders. The law also increased the academic year from 32 to 38 weeks. Nevertheless, the curricula and the textbooks of both, primary and preparatory stages, remained unchanged (Assaad, Aydemir, Dayioglu & Kirdar 2016). This reduction in compulsory years of education was done due to the huge increase in students in all stages of education and the consequential pressure on the schooling system; it also aimed at reducing financial pressures on the schooling system. In 1999, law No. 23 emphasized the fact that the duration of compulsory education is 9 years, 6 years of which represent primary education. This law revoked that of 1988/1989 that had deleted the sixth primary grade and reduced compulsory education to 8 years (NCERD 2001).

Currently, the duration of pre-university education is 12 years starting at the age of 6 and ending at the age of 18. Pre-university education consists of 9 years of compulsory education (Law No.233 was revoked in 1999): 6 years of primary education and 3 years of a preparatory cycle. After preparatory schooling, students can take one of two different tracks, general or vocational secondary education, which have a duration of 3 years. The first year of secondary education is general for students in both tracks as dictated by decree No. 2, published in 1994. Alternatively, students can choose to take 5 years of advanced technical secondary education directly after they finish their basic preparatory cycle (NCERD 2001). Admission to university from school is solely based on the students' performance in the 'Thanaweyya 'Amma', the high school exit exam. Thus, success in the system is based on clear terms, which are more easily achieved by those who are able to pay for private tutoring and pass their exams (World Bank 2007).

Figure 1(in the Appendix) provides an overview on the current structure of education in Egypt.

However, the educational system in Egypt remains inefficient. There are multiple problems that plague the system. Some problems concern classrooms and the ways of teaching, while others are related to the insufficiency and misplacement of funds and the inability of the government to further develop the system. For example, teaching is based on memorization rather than analytical thinking, classrooms are often overcrowded with students, and teachers do not have sufficient time to teach (Dixon 2010). In fact, multiple World Bank reports have urged the Egyptian government to decrease their funds towards university education and rather focus on primary and secondary education, for supporting higher education at the expense of primary and secondary education particularly benefits the higher class and upper-middle class of society. Private schools were officially recognized and supported upon publishing Law 306 in 1993. However, privatization also occurred informally through the spread of private tutoring. Given the quality of education in Egypt, the rich as well as the poor demand private tutoring which constitutes a substantial portion of the Egyptian family's budget (Dixon 2010). There has also been a debate by policy makers on whether reforms in the educational system should start with the quality of education or with increasing access and attendance (Hyde 2013)

The ministry of education has been working on increasing access and attainment of education since 1993. Many initiatives were implemented to enhance educational achievement among deprived people in remote areas. Thus, new educational policies were initiated to eliminate the effect of circumstances that are beyond the control of children on education. Initiatives such as One-classroom schools for girls, Community Schools projects and Girls' Education Initiatives aim to reduce the impact of the socio-economic circumstances of school children (NCERD 2008). In fact, presidential decrees

No. 290 and 329 in 2004 and 2005 respectively are concerned with establishing funds for educational development and progress (NCERD 2008).

CHAPTER 4

EMPIRICAL ANALYSIS

A. Data

Our analysis employs the Egypt Labor Market Panel Survey (ELMPS). This survey covers 3 cross-sections pertaining to years 1998, 2006 and 2012. Refreshment samples are added in each round, which makes this pooled panel survey highly representative of the Egyptian population. Thus, some individuals are followed in the whole 3 rounds, while others are only observed once or twice. Questionnaires of the surveys provide detailed information about the education and employment of individuals.

To begin with, our variables include data on governorates and urban versus rural regions. As for information regarding the general circumstances of the individual, we use data about marital status, household size, quintile of wealth that the household belongs to, father's highest education and mother's highest education. We also employ variables that relate to the personal characteristics of the individual. These comprise age, the economic sector of the primary job and the total years of schooling received or educational levels attained. These variables were included as standard control variables because literature has shown that they directly affect school attendance, educational attainment, probability of finishing levels of education, and access to services and opportunities (Filmer (2005), Filmer and Pritchett (1999) and Smits (2007)).

We generate 4 and 5-years cohort dummies. These were created in a way to replicate the cohort variables in Assaad et al (2016). However, we generate a larger number cohort dummies to cover our dataset, which includes more rounds of the

ELMPS than Assaad et al (2016). Birth year groups included are: 1951-55, 1956-60, 1961-65,1966-70, 1971-74, 1975-77, 1988-92, 1993-97 and 1998-2002, defining cohorts 1 till 9 respectively. Also following Assaad et al, we alternate between age polynomials (age, age squared and age cubed) and cohort dummies in the regressions.

To create a variable that divides our sample into a treatment and control group, we generate a dummy variable T that is based on the year of birth of individuals. As previously mentioned in the background section, the reform affected individuals who were in grade 4 or below in year 1988. Official education starts at the age of 6 in Egypt; therefore, individuals who were born in or after 1978 are treated and have received one less year of primary education. However, it is important to note that this reform was reversed in 1999. Thus, treated individuals are those who were born between 1978 and 1987 inclusive. The dummy variable T takes the value 1 for the treatment group, and a value 0 otherwise.

This paper focuses on two main outcome variables: labor force participation and age at first marriage. We produce our own dummy variable (L) to account for changes in labor force participation. Variable L takes the value 0 for people who remain in the labor force and takes a value 1 for all people in the sample that used to be in the labor force, either before we observe them in 1998, 2006 and 2012 or in earlier rounds when we observe them, and are no longer. Since our panel data allows us to observe the individual more than once and asks whether the individual has ever worked or not, we can identify people who left the labor force as anyone that is not in the labor force (in the most recent round we observe them) but has worked in the past. Hence, L contains individuals who were observed in one, two or three rounds.

Table 1 and Table 2 (in the appendix section) provide data statistics around each outcome variable separately.

B. Methodology

We hope to understand people's labor market decisions in ways that complete the picture that emerges from the work of Assaad et al (2016), in which years of schooling for females are unaffected by the change in policy and returns to education are significant but relatively low for males. We are looking at two main outcomes, the propensity of people to leave the labor force and age at first marriage. Both of these variables can affect wages or labor market decisions taken by individuals. Examining characteristics of individuals that might help us understand their propensity to leave the labor force might nuance the reading and external validity of the estimates of returns to education reported in Assaad et al (2016).

On the other hand, and for women, we look into the effect of the intervention on their age at marriage, which might also pose another link that relates to labor market outcomes, including their wages. We also check if the intervention had any impact on the females' decision to participate in the labor force or not.

To begin with, we run the following regressions:

(1) $L_i = \beta_0 + \beta_1 T_i + \beta_2 S_i + X\theta + v_{1i}$

where L denotes the dummy variable that we generated to account for the individual's presence or absence from the labor force. T is the treatment dummy variable, and S denotes the total years of schooling that the individual receives. X is a vector of control variables including governorates, urban vs rural regions, marital status, household size,

wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

In our specification, we run regressions with two different specifications for age: a third degree polynomial in one instance, and cohort dummy variables, as described above, in another.

We also use two specifications for education: a linear specification with total years of schooling, and a non-parametric specification for education by controlling for highest level of education achieved.

(2) $L_i = \lambda_0 + \lambda_1 T_i + \lambda_2 SL_i + X\Delta + v_{2i}$

where SL denotes the highest educational level attained by the individual.

We run the same regressions with age at first marriage as the dependent variable:

(3) $A_i = \pi_0 + \pi_1 T_i + \pi_2 S_i + X\psi + u_{1i}$

(4) $A_i = \alpha_0 + \alpha_1 T_i + \alpha_2 SL_i + X\tau + u_{2i}$

where A_i denotes age at first marriage of individual$_i$. The same control variables are used here, with the same alterations between age variables and cohort dummy variables.

In the above regressions, we are mainly interested in coefficients β_1 ,λ_1, π_1,and α_1. Their significance indicates that the intervention has an impact on the outcome of interest and thus can explain some of the variation in labor force participation and the age at first marriage.

Were we to find a direct link of the treatment variable on labor force participation and age at first marriage, we would expect that the treatment variable does not satisfy the exclusion restriction in Assaad et al's (2016) two-stage least square regressions. Assaad et al's paper (2016) assumes that the only effect that this instrument has on wage is through its effect on total years of schooling, which makes it a valid instrument, but our paper tries to find the effect of the intervention on other variables that might complement his final results.

In a second instance, and should the instrument prove valid, we will run 2nd stage regressions for outcome variables other than wages. One of the determinants of labor force participation and of age at first marriage is education. But, in order to properly identify the effect of education on these decisions, we will use exogenous variation in years of education due to the intervention. Thus, 2nd stage regressions are run where appropriate and controlling for the same variables as the previous regressions. Total years of schooling are used as the main independent variable (rather than educational levels).

CHAPTER 5

RESULTS

Regressions are run separately for males and females. For every outcome variable, we control for total years of schooling in the first set of regressions, while in the second set, we control for the highest level of education attained by the individuals. Accordingly, our findings include 8 regressions for each outcome variable. Table 1.3 and Table 1.4 (in the Appendix) show the results of Linear Probability Models where the outcome we are investigating is an indicator variable which takes on the value 0 for all respondents who have ever worked, and 1 if they leave the labor force. Table 1.5 and Table 1.6 (in the Appendix) pertain to age at first marriage (A_i). For each outcome variable, we control for age using a cubic function in the first table and using cohort dummies in the second one.

A. Labor Force Participation

Starting with labor force participation, governorate dummy variables are almost always insignificant. The same can be said for wealth quintiles, father's highest educational attainment and mother's highest educational attainment. On the other hand, the coefficients on the age polynomials are always highly significant.

Findings show that when we control for age, the coefficient of T is insignificant for males (1.3(1) and 1.3(3)), while the coefficient of T is highly significant and positive for females (1.3(2) and 1.3(4)). These results hold when we replace total years of

schooling with the highest educational attainment. As for the coefficient of the total years of schooling, it is significant and negative for females only (1.3(2)). In equation 1.3(2), where we regress T and years of schooling on L_i for females, the coefficient of T equals 0.041, indicating that the treated group are subject to a 4.1% higher probability of leaving the labor force. The coefficient of S_i on the other hand equals -0.013 indicating that a one year decrease in the years of schooling is correlated with a 1.3% increase in the probability of leaving the labor force.

Replacing age polynomials with cohort dummy variables results in significant coefficients for all cohort dummy variables for males (1.4(1) and 1.4(3)). However, the coefficient of dummy variable T, that pertains to the treated cohort, is negative and highly significant with the largest t-statistic in absolute value. The coefficient of the T_i here equals -0.099 (1.4(1)) indicating that the treated cohort are subject to a lower probability of leaving the labor force by 9.9%. In this case, the coefficient of total years of schooling is significant and negative (1.4(1)). As for females, the coefficient of T is insignificant when we control for total years of schooling, but is significant and positive when we control for educational levels instead (1.4(2) and 1.4(4)). In the case of females, the coefficient of total years of schooling is negative and significant (1.4(2)).

In all these equations, not all dummy variables for educational levels are significant. Their significance varies by the sex of the individual.

Thus, these significant results for females show that the treatment has had an effect on their decision to stay in the labor market or leave. This might help explain why in their regression of Y on X, Assaad et al (2016) found insignificant first stage results for females, for the treatment might have affected their wages through links other than

directly affecting total years of schooling received through selection on the treatment variable of who stays in the labor force and who leaves. As for males, the treatment coefficient becomes significant only in the presence of cohort dummies, implying that it might be taking some of the significance of age variables previously used. However, the especially high significance of the treatment dummy variable compared to other cohort dummy variables merits more explanation, for it might indicate that the intervention also affected males' decisions on whether to stay or leave the labor force by a probability of 9.9% as indicated above. In addition, the coefficient of the variable T is larger than that of all other cohort dummy variables. The insignificance of the T coefficient with age polynomials for males allows us to run 2SLS regressions nevertheless.

Assaad et al (2016) note that returns to education found for men are lower than those in other developed countries. When coupled with some of our findings, the result of returns to education may suffer from selection bias, because the choice of being in the labor force or not may itself be related to the treatment. Thus, for males, if the intervention exogenously affects not only people's years of schooling but also their decision of whether to participate in the labor force or not, then the returns of education found by Assaad et al (2016) are partial and conditional on staying in the labor force. In this case, even if T is proven to be a relevant instrument, it might not be a valid one, since it may be affecting labor market outcomes in ways other than through total years of schooling.

B. Age at first marriage

Our second outcome, A_i, is the age at first marriage. Regressions are run in similar setups as with the previous outcome. Coefficients on dummy variables pertaining to governorates, father's highest education, mother's highest education and economic sector of primary job are insignificant in all regressions. Age variables are always significant.

Controlling for age polynomials, the coefficient of the dummy variable T is insignificant for males with total years of schooling but significant and negative with educational levels (1.5(1) and 1.5(3)). This indicates that the intervention might have decreased the age of marriage for males, controlling for educational attainment (rather than total years of schooling).

As for females, the coefficient of T is positive and significant with both total years of schooling and educational levels (1.5(2) and 1.5(4)). The coefficient on total years of schooling is significant and positive for both genders (1.5(1) and 1.5(2)). In 1.5(2), the coefficient of treatment for females equals 0.4, which means that the treatment is associated with an increase in the age of marriage by 0.4 years on average.

When we replace age variables by cohort dummy variables, coefficients of all cohort dummy variables are significant and negative for males (1.6(1) and 1.6(3)). However, the coefficient of T, that concerns the cohort which received one less year of education, is highly significant with the largest t-statistic in absolute value. The coefficient of T in this case is equal to -2.4 which indicates that receiving the treatment

(or less years of education) is associated with a decrease in the age of marriage by 2.4 years on average.

Similar results are found for females where cohort dummies including T are significant but positive (1.6(2) and 1.6(3)). In addition, the coefficient of total years of schooling is significant and positive with both males and females. Results indicate that the intervention might have affected the age at first marriage of the treatment group, which might ultimately affect their wages.

C. 2SLS Regressions

We run first stage regressions following instances when the instrument proves to be valid. The coefficient of T in these regressions is always highly significant (for males). Thus, second stage regressions are also run with these outcomes for males.

Table 1.7 (in the Appendix) show the results of first stage regressions of T on total years of schooling for males. Tables 1.8 and 1.9 (in the Appendix) present the 2nd stage (2SLS) regressions for males. Table 1.8 reports regressions of L_i, while table 1.9 reports regressions of A_i.

Second stage regressions with L_i show that the coefficient of total years of schooling is negative and significant only in the presence of cohort dummies. Thus, the increase in the total years of schooling is associated with lower probability of leaving the labor force for males (1.8(1) and 1.8(2)).

The coefficient of schooling is insignificant in both, OLS and 2SLS regressions on Li when we use age polynomials. However, using cohort dummy variables, the coefficient of schooling is significant in OLS and 2SLS regressions. The coefficient has a higher magnitude in the case of 2SLS regressions indicating that when schooling increases by 1 year, the probability of leaving the labor force decreases by 4.7% in 2SLS regressions as opposed to 0.085% in the case of OLS.

On the other hand, total years of schooling with A_i are significant, but the change in sign across 1.9(1) and 1.9(2) leads to inconclusive results. The coefficients of years of schooling are significant and positive with age polynomials in both OLS and 2SLS. In fact, the magnitude of the coefficient in 2SLS is of greater magnitude than in OLS (with age polynomials). The coefficients are also significant in both regressions with cohort dummies.

Our results raise several questions regarding work that has used this intervention as a source of variation in years of schooling that is exogenous to some other labor market decisions. Given that in several instances, as indicated above, the choice of remaining or leaving the labor force is significantly correlated with the treatment, the intervention may also be affecting the decision of individuals of whether to participate in the labor force or not, especially for females. Thus, returns to education estimated by Assaad et al (2016) or other papers that use this intervention may in this case be partial and only capturing the returns of education of individuals who actually stay in the labor force.

Furthermore, the significance of the correlation between T and age at first marriage shows other possible links than years of schooling between the treatment and

wages, especially for females, which might also explain the insignificant first stage results found by Assaad et al (2016).

Finally, when we take into account the validity of T variable as an instrument, the significance of 2nd stage results on L_i and A_i shows that the variation in years of schooling causes a change in the decision of whether to stay in the labor force and in the age at first marriage for males. This result allows us to estimate the effect of education on outcomes other than wage.

CHAPTER 6

CONCLUSION

This paper focuses on estimating the effect of education the probability of leaving the labor market and age at first marriage in Egypt following a change in the law that reduced the total duration of primary education. We follow model specifications similar to those used by Assaad et al(2016) in their IV framework. However, we modify our treatment variable to account for Law No.23 that revoked Law No.233 and restored primary education to 6 years. We also use the 3 cross-sections of the Egypt Labor Market Panel Survey, pertaining to years 1998, 2006 and 2012 in order to create our labor force participation dummy variable.

Using Linear Probability Models, results show the treatment associated with the intervention is correlated with a significant increase in the probability of leaving the labor force for females. In addition, the treatment group is correlated with a change in the age at first marriage, where receiving the treatment is associated with a decrease in the age of marriage of males and an increase in the age of marriage of females. These findings show that the treatment have affected wages through links other than its main effect on years of schooling of females, which further explains Assaad et al's (2016) results. However, T does not seem to have a significant effect on L and A when we control for age polynomials for males, which allows us to move to 2nd stage regressions.

Second stage regressions are then run for males to study the effect of education on outcome variables and assuming that using the treatment as an instrument is valid. This step would complement and extend Assaad et al's (2016) work. Results show that

years of schooling are significant and negatively affect the probability of leaving the labor force. The magnitude and sign of effect of education on age of marriage is, however, inconclusive.

APPENDIX

A. FIGURES

<table>
<tr><th>Age</th><th>Grade</th><th colspan="3">Level</th></tr>
<tr><td>22+</td><td>17+</td><td rowspan="5">University Education (4-, 5-, and 6-year programs)</td><td colspan="2" rowspan="2">Non-University Middle and Higher Technical Institutes (2-, 4-, and 5-year programs)</td></tr>
<tr><td>21</td><td>16</td></tr>
<tr><td>20</td><td>15</td><td rowspan="3"></td><td rowspan="4">Technical Secondary School (5-year)</td></tr>
<tr><td>19</td><td>14</td></tr>
<tr><td>18</td><td>13</td></tr>
<tr><td>17</td><td>12</td><td rowspan="3">General Secondary</td><td rowspan="3">Technical Secondary School (3-year)</td></tr>
<tr><td>16</td><td>11</td></tr>
<tr><td>15</td><td>10</td></tr>
<tr><td>14</td><td>9</td><td colspan="3" rowspan="3">(Basic) Preparatory Education</td></tr>
<tr><td>13</td><td>8</td></tr>
<tr><td>12</td><td>7</td></tr>
<tr><td>11</td><td>6</td><td colspan="3" rowspan="6">(Basic) Primary Education</td></tr>
<tr><td>10</td><td>5</td></tr>
<tr><td>9</td><td>4</td></tr>
<tr><td>8</td><td>3</td></tr>
<tr><td>7</td><td>2</td></tr>
<tr><td>6</td><td>1</td></tr>
<tr><td>3,4,5</td><td></td><td colspan="3">Pre-school</td></tr>
</table>

Source: Nagwa Megahed, "Secondary Education Reforms in Egypt: Rectifying Inequality of Educational and Employment Opportunities," in C. Acedo, ed., Secondary Education Reform Case Studies *(Washington, DC: American Institutes for Research [USAID-funded Improving Educational Quality Project], 2002), p. 54 (modified).*

Figure 1 Overview on the Current Structure of Education in Egypt

B. TABLES

Table 1. 1: Descriptive statistics- Regressions with Outcome Variable L

	Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.
L	0.04	0.19	0.26	0.49
Age	38	14.4	38.76	13.56
Treated	0.33	0.47	0.325	0.47
S	9.1	5.18	8.8	6.11
C1	0.065	0.25	0.077	0.267
C2	0.08	0.26	0.1	0.3
C3	0.09	0.28	0.128	0.334
C4	0.097	0.296	0.118	0.323
C5	0.099	0.299	0.0972	0.296
C6	0.092	0.289	0.093	0.29
C7	0.0844	0.278	0.071	0.26
C8	0.03	0.173	0.017	0.13
C9	0.004	0.066	0.004	0.6
Observations	16793		5771	

Table 1. 2: Descriptive statistics- Regressions with Outcome Variable A

	Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.
A	26.76	4.96	20.842	4.87
Age	42.3	13.27	41.8	14.2
Treated	0.28	0.45	0.27	0.45
S	8.9	5.43	6.79	6.09
C1	0.09	0.28	0.09	0.3
C2	0.09	0.3	0.12	0.32
C3	0.11	0.32	0.13	0.34
C4	0.12	0.32	0.12	0.33
C5	0.11	0.32	0.09	0.29
C6	0.1	0.3	0.084	0.28
C7	0.02	0.14	0.07	0.25
C8	0.002	0.04	0.009	0.09
C9	0	0	0.0004	0.2
Observations	12567		7709	

Table 1. 3: OLS regressions, Li, Parametric Age controls

Variables	(1) Males	(2) Females	(3) Males	(4) Females
Treated	0.003	0.041***	0.004	0.051***
	[0.00366]	[0.0145]	[0.0036637]	[0.01453]
S_i	0.0004	-0.013***	No	No
	[0.0003541]	[0.001465]		
SL_i	No	No	Yes	Yes
Age	-0.045***	-0.045***	-0.044***	-0.043***
	[0.0024]	[0.0088]	[0.00224]	[0.0088402]
Agesq	0.001***	0.001***	0.001***	0.001***
	[0.0000497]	[0.0002]	[0.0000498]	[0.0002]
Agecube	-6.78e-06***	-9.51e-0.6***	-6.66e-06***	-8.96e-06***
	[3.49e-07]	[1.47e-06]	[3.50e-07]	[1.47e-06]
Observations	16793	5771	16794	5771
R-squared	0.0952	0.2054	0.0969	0.2111

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, marital status, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 4: OLS regressions, Li, Cohort Dummy Variables

Variables	(1) Males	(2) Females	(3) Males	(4) Females
Treated	-0.099*** [0.0045]	0.023 [0.0172]	-0.097*** [0.00454]	0.034** [0.0172959]
S_i	-0.00085** [0.00035]	-0.01346*** [0.001448]	No	No
SL_i	No	No	Yes	Yes
C1	0.0107* [0.006283]	0.167*** [0.02213]	0.01041* [0.0062793]	0.164*** [0.022]
C2	-0.068*** [0.00589]	0.032 [0.01979]	-0.068*** [0.0058845]	0.028 [0.01974]
C3	-0.084*** [0.0056]	0.028 [0.0184987]	-0.084*** [0.0055912]	0.025 [0.0184552]
C4	-0.082*** [0.0053885]	0.024 [0.0191224]	-0.081*** [0.0053764]	0.0213 [0.019]
C5	-0.086*** [0.00539]	0.04** [0.0202]	-0.085*** [0.0053789]	0.038* [0.0201]
C6	-0.084*** [0.00547]	0.019 [0.0207]	-0.083*** [0.0054627]	0.0206 [0.02073]
C7	-0.049*** [0.0065798	0.009 [0.0242]	-0.049*** [0.0066219]	0.014 [0.02426]
C8	-0.06167*** [0.01074]	-0.00723 [0.04711]	-0.0672681*** [0.0108]	-0.04 [0.0475]
C9	-0.079*** [0.02329]	-0.12 [0.0998]	-0.0796*** [0.0233]	-0.119 [0.0997132]
Observations	16793	5771	16794	5771
R-squared	0.08111	0.2056	0.0835	0.2121

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, marital status, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 5: OLS regressions, Ai, Parametric Age controls

Variables	(1) Males	(2) Females	(3) Males	(4) Females
Treated	-0.1004 [0.1276838]	0.401*** [0.1382859]	-0.246* [0.127623]	0.239* [0.1381849]
S_i	0.213*** [0.0097441]	0.223*** [0.013151]	No	No
SL_i	No	No	Yes	Yes
Age	1.989*** [0.077938]	0.723*** [0.0746332]	2.003*** [0.0780361]	0.683*** [0.074635]
Agesq	-0.036*** [0.0016156]	-0.012*** [0.0016433]	-0.036*** [0.0016171]	-0.012*** [0.0016421]
Agecube	0.0002*** [0.0000108]	0.00006*** [0.0000114]	0.0002*** [0.0000108]	0.00006*** [0.0000113]
Observations	12567	7709	12569	7710
R-squared	0.2435	0.2852	0.2436	0.2928

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 6: OLS regressions, Ai, Cohort Dummy Variables

Variables	(1) Males	(2) Females	(3) Males	(4) Females
Treated	-2.45*** [0.1255458]	0.634*** [0.145908]	-2.427*** [0.1272372]	0.525*** [0.1469929]
S_i	0.198*** [0.0097652]	0.217*** [0.012871]	No	No
SL_i	No	No	Yes	Yes
C1	-0.282* [0.1587907]	1.028*** [0.1771175]	-0.243 [0.1587992]	1.017*** [0.1762808]
C2	-0.173 [0.149802]	0.5808*** [0.1639181]	-0.085 [0.1496358]	0.643*** [0.1633737]
C3	0.628**** [0.14271]	0.857*** [0.1576105]	0.732*** [0.1425594]	0.886*** [0.1569627]
C4	0.602*** [0.140334]	1.053*** [0.1620631]	0.728*** [0.140184]	1.094*** [0.1613091]
C5	0.243* [0.144182]	1.31*** [0.1788452]	0.381*** [0.1438299]	1.351*** [0.1780291]
C6	-0.392*** [0.1478847]	1.373*** [0.1875021]	-0.281* [0.1477453]	1.376*** [0.1867572]
C7	-5.738*** [0.2986229]	-0.809*** [0.2182843]	-5.599*** [0.29993]	-0.783*** [0.2193594]
C8	-3.91*** [0.9097223]	-2.472*** [0.5104962]	-3.748*** [0.9097825]	-1.89*** [0.5149086]
C9	0	-0.329 [2.04015]	0	-0.605 [2.390916]
Observations	12567	7709	12569	7710
R-squared	0.213	0.2818	0.2138	0.2889

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 7: 1st stage regressions, Males, Si

Variables	(1)	(2)
T	-0.49*** [0.0798]	2.12*** [0.098]
Age	0.67*** [0.0487]	No
Agesq	-0.0157*** [0.001]	No
Agecube	0.0000991*** [7.59e-06]	No
C1	No	-0.44*** [0.14844]
C2	No	0.513*** [0.129]
C3	No	0.899*** [0.123]
C4	No	1.735*** [0.118]
C5	No	2.276*** [0.1176439]
C6	No	2.327*** [0.11935]
C7	No	1.993*** [0.1442]
C8	No	1.542*** [0.23661]
C9	No	-0.087 [0.51365]
Observations	16793	16793
R-squared	0.45	0.43

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, marital status, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 8: 2SLS regression, Males, Li

Variables	(1)	(2)
s_i	-0.006	-0.047***
	[0.007475]	[0.00299]
Age	-0.041***	No
	[0.0052735]	
Agesq	0.00094***	No
	[0.0001199]	
Agecube	-6.19e-06***	No
	[7.53e-07]	
C1	No	-0.01
		[0.0095416]
C2	No	-0.044***
		[0.0079739]
C3	No	-0.043***
		[0.0073444]
C4	No	-0.002
		[0.007181]
C5	No	0.0198***
		[0.0076378]
C6	No	0.024***
		[0.0080541]
C7	No	0.043***
		[0.0082349]
C8	No	0.01
		[0.0145227]
C9	No	-0.083**
		[0.0333339]
Observations	16793	16793
Prob>chi^2	0.000	0.000

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, marital status, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

Table 1. 9: 2SLS regression, Males, Ai

Variables	(1)	(2)
s_i	0.346**	-0.7789364***
	[0.1703823]	[0.0657728]
Age	1.914***	No
	[0.1364597]	
Agesq	-0.034***	No
	[0.0030262]	
Agecube	0.0002***	No
	[0.000019]	
C1	No	-0.525**
		[0.2191446]
C2	No	0.518***
		[0.1877484]
C3	No	1.694***
		[0.1743781]
C4	No	2.510927***
		[0.1764837]
C5	No	2.735***
		[0.1931646]
C6	No	2.181***
		[0.2077089]
C7	No	-3.338***
		[0.3949333]
C8	No	-3.945***
		[1.217709]
C9	No	0
Observations	12567	12567
Prob>chi^2	0.000	0.000

Note: *** p<0.01, ** p<0.05, * p<0.1
Standard errors are reported inside [ ].
Other variables controlled for in these regressions: governorates, urban vs rural regions, marital status, household size, wealth quintiles, father's highest educational attainment, mother's highest educational attainment, economic sector of primary job and the most recent year we observe the individual.

BIBLIOGRAPHY

Angrist, J. D., & Keueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings?. The Quarterly Journal of Economics, 106(4), 979-1014.

Arab Human Development Report. 2016. UNDP.

Assaad, R., Aydemir, A., Dayioglu, M., & Kirdar, G. (2016, May). Returns to schooling in Egypt. In Economic Research Forum Working Papers (No. 1000).

Assaad, Ragui, and Caroline Krafft. "The Egypt Labor Market Panel Survey: Introducing the 2012 Round." (2013).

Card, D. (1999). The causal effect of education on earnings. In Handbook of labor economics (Vol. 3, pp. 1801-1863). Elsevier.

Dee, T. S. (2004). Are there civic returns to education?. Journal of Public Economics, 88(9-10), 1697-1720.

Del Bono, E., & Galindo-Rueda, F. (2006). The long term impacts of compulsory schooling: Evidence from a natural experiment in school leaving dates (No. 2006-44). ISER Working Paper Series.

Dickson, M., & Smith, S. (2011). What determines the return to education: an extra year or a hurdle cleared?. Economics of education review, 30(6), 1167-1176.

Dixon, M. W. (2010). Investing in inequality: Education reform in Egypt. Middle East Report, (255), 40-47.

Egypt Healthcare, Education Bill to Account for 17% of Government Spending in FY16/17,AHRAM ONLINE(Apr. 18, 2016), http://english.ahram.org.eg/NewsContent/3/12/201887/Business/Economy/Egypt-healthcare,education-bill-to-account-for--o.aspx, archived athttps://perma.cc/7DQR-78S5.

Elsayed, A., & Marie, O. (2015, September). How Does Reducing Years of Compulsory Schooling Affect Education and Labor Market Outcomes in a Developing Country?. In Economic Research Forum (ERF).

Filmer, D. (2005). Gender and wealth disparities in schooling: Evidence from 44 countries. International Journal of Educational Research, 43(6), 351-369.

Filmer, D., & Pritchett, L. (1999). The effect of household wealth on educational attainment: evidence from 35 countries. Population and development review, 25(1), 85-120.

Fuwa, N., & Korwatanasakul, U. (2015). Revisiting the Returns to Education during the Rapid Structural and Rural Transformation in Thailand: a regression discontinuity approach.

Grenet, J. (2013). Is extending compulsory schooling alone enough to raise earnings? Evidence from French and British compulsory schooling laws. The Scandinavian Journal of Economics, 115(1), 176-210.

Harmon, C., Hogan, V., & Walker, I. (2003). Dispersion in the economic return to schooling. Labour economics, 10(2), 205-214.

Haveman, R. H., & Wolfe, B. L. (1984). Schooling and economic well-being: The role of nonmarket effects. Journal of human Resources, 377-407.

Heckman, J. J., Humphries, J. E., & Veramendi, G. (2016). Returns to education: The causal effects of education on earnings, health and smoking (No. w22291). National Bureau of Economic Research.

Hyde, G. D. (2013). Education in modern Egypt (RLE Egypt): Ideals and realities. Routledge.

Liwiński, J. The Impact of Compulsory Schooling on Earnings. Evidence from the 1999 Education Reform in Poland

Lochner, L. (2004). Education, work, and crime: A human capital approach. International Economic Review, 45(3), 811-843.

Lochner, L., & Moretti, E. (2004). The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. American economic review, 94(1), 155-189.

Milligan, K., Moretti, E., & Oreopoulos, P. (2004). Does education improve citizenship? Evidence from the United States and the United Kingdom. Journal of public Economics, 88(9-10), 1667-1695.

Nagwa Megahed, "Secondary Education Reforms in Egypt: Rectifying Inequality of Educational and Employment Opportunities," in C. Acedo, ed., Secondary Education Reform Case Studies (Washington, DC: American Institutes for Research [USAID-funded Improving Educational Quality Project],2002),p.54 (modified).

National Centre for Educational Research and Development (NCERD). Education Development: National report of the Arab Republic of Egypt from 1999 to 2000. (Under the co-ordination of N.G. El-Din). International Conference on Education, 46th session, Geneva, 2001.

National Centre for Educational Research and Development (NCERD). Education Development: National report of the Arab Republic of Egypt from 2004 to 2008.

OAMDI, 2016. Labor Market Panel Surveys (LMPS), http://erf.org.eg/data-portal/. Version 2.2 of Licensed Data Files; ELMPS 2012. Egypt: Economic Research Forum (ERF).

OAMDI, 2016. Labor Market Panel Surveys (LMPS), http://erf.org.eg/data-portal/. Version 4.2 of Licensed Data Files; ELMPS 2006. Egypt: Economic Research Forum (ERF).

Oreopoulos, P., & Salvanes, K. G. (2009). How large are returns to schooling? Hint: Money isn't everything (No. w15339). National Bureau of Economic Research.

Oreopoulos, Philip. 2006. "Estimating Average and Local Average Treatment Effects of Education when Compulsory Schooling Laws Really Matter." American Economic Review, 96 (1): 152-175.

Rizk, R. (2016, April). Returns to Education: An Updated Comparison from Arab Countries. In Economic Research Forum Working Paper.

Smits, J. P. J. M. (2007). Family background and context effects on educational participation in five Arab countries.

UNESCO-IBE. "World Data on Education, Egypt." 6th Edition, 2006/07. Retreived from: http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/ARAB_STATES/Egypt/Egypt.pdf

United Nations Educational, Scientific and Cultural Organization (2012). World Data on Education. 7th edition.

World Bank (2007). Improving Quality, Equality, and Efficiency in the Education Sector, Arab Republic of Egypt. Report No. 42863-EG. 2007.