INTERGENERATIONAL MOBILITY, INCOME INEQUALITY AND CHILDREN'S HUMAN CAPITAL INVESTMENT

BY OMAYMA ELSHENITI

A dissertation submitted to the

Graduate School—New Brunswick

Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

Graduate Program in Economics

Written under the direction of

Carolyn Moehling

and approved by

New Brunswick, New Jersey

October, 2014

ABSTRACT OF THE DISSERTATION

Intergenerational Mobility, Income Inequality and Children's Human Capital Investment

by Omayma Elsheniti

Dissertation Director: Carolyn Moehling

This dissertation focuses on examining the determinants of children's educational attainment in different settings. Specifically, Chapters 2 and 3 examine two key determinants of children's educational attainment in Egypt: parents' levels of education and mother's hours of work. Chapter 4 examines the evolution of common schooling in the nineteenth century in New Jersey. Since New Jersey in the nineteenth century shared many characteristics with developing countries today, having a better understanding of the rapid rise in school attendance in this setting should guide policy-makers in constructing the appropriate policies that may target educational attainment in developing countries.

In Chapter 2, I examine the relationship between income inequality and the intergenerational correlation in educational attainment in Egypt. I test whether the correlation between parents' and children's education is stronger or weaker in governorates with high income inequality. My results suggest a nonlinear relationship. School enrollment for children whose fathers are poorly educated is very low regardless of the degree of income inequality, whereas enrollment for children whose fathers are highly educated increases as the degree of income inequality increases. Notably, enrollment for children whose fathers have medium level of education decreases as the degree of income inequality increases.

In Chapter 3, I analyze the relationship between maternal labor supply and children's schooling in Egypt. The results suggest that a mother's employment adversely affects her children's school enrollment and grade attainment. These results are consistent across all children's outcome variables, and across different definitions of mother's work. As mother's hours of work increase, however, these adverse effects start to diminish. Once a mother's hours reach 24 in 2006 sample and 46 in 1998 sample, the effects on child's school enrollment and grade attainment become positive. Since a large percentage of working mothers have no schooling, I speculate that this positive effect is attributed to the increased household income from more hours of work, which compensates for the decrease in maternal time spent with children.

In Chapter 4, I examine the rise in school enrollment rates and increase in the length of school sessions in New Jersey in the nineteenth century. My results show that counties that were more urban and more industrialized observed higher school attendance rates. This result can be attributed to the increase in the demand for skilled labor resulting from the process of industrialization. Moreover, counties with more immigrants and more state appropriations had longer school sessions. This result can be an evidence of the desire of elite groups, who were controlling local school committees, to use public education as a socialization device to reduce social, religious and ethnic tensions, lower crime rates and promote democratic values.

Acknowledgements

I feel grateful to so many people in my doctorate journey. I consider it an honor to work with such a great group of committee members. First and foremost, I wish to express my deepest appreciation to my advisor, Professor Moehling, for being an extraordinary mentor. She taught me how to be a researcher. Her constructive comments and warm encouragement helped me get over my research worries. Thank you for reading each and every word of my work and getting back to me with numerous insights and suggestions. I also would like to express my sincere thanks to Professor White for motivating my interest in economic history and for his continuous encouragement. Professor Gang taught me to always take a step back and think about the value added of my research to the literature. I learnt from Professor Blair how to always link my research ideas to the economic theory. I have greatly benefited from the feedback and comments of Professor Khamis on my dissertation. Thanks to all my committee members, your advice on both my research as well as on my career have been priceless.

A special thanks to my mother, mother-in-law, father-in-law and all my family. Your prayer for me was what sustained me thus far. I would like to express my gratitude to my brother, Omar, for always being there when I needed him.

Words cannot express how grateful and indebted I am to my father for all of the sacrifices that he has made on my behalf.

I share the credit of my work with my beloved husband, Ali. Thank you for sharing all the stresses and joys of the graduate school with me. Without your love and support, this thesis would not have been possible.

Dedication

To my father, for his unconditional love and support.

Table of Contents

List of Tables

List of Figures

Chapter 1

Introduction

Education is a critical input to promoting productivity and human capital and thus contributes to economic growth. Since education enhances productivity and provides individuals with useful skills, individuals with higher levels of education tend to have higher income levels. Education also stimulates invention and innovation and promotes diffusion of technological advances. Moreover, literacy is an important factor for the proper functioning of democracy and hence enhances citizenship and community. Literate citizens are more aware of their duties and responsibilities and therefore, are more able to exercise their rights. (Goldin, 1999)

Hence, some of the goals of spreading mass education in any society are the diffusion of literacy to promote political participation and the provision of occupational training needed for particular desired jobs, cultural traditions and moral attitudes. As a result, education expansion is very important in the development and formation of any nation. In my dissertation, I focus on examining the determinants of children's educational attainment in different settings. Having a better understanding of these influences can help guide policymakers design programs that target children's educational attainment and help them succeed independently of their family background and geographic location. This can result in higher levels of educational attainment and greater economic growth of the society as a whole.

The first two chapters that comprise my dissertation study two key determinants of children's educational attainment in Egypt: mother's hours of work and parents' levels of education. In these papers, I use a relatively unexplored Egyptian dataset: the Egyptian Labor Market Panel Survey (ELMPS). Egypt serves as an excellent case study for examining children's educational attainment. Egypt has experienced large improvements in labor market and education outcomes in recent decades, particularly with respect to female labor force participation, literacy rates, attendance rates and school dropout rates. Despite this progress, gender and urban/rural gaps in education still exist and income inequality levels have increased. Focusing on children's educational attainment in Egypt, the first two chapters study how children's schooling is related to mothers' work decisions, parents' education, and income inequality.

In my second chapter, I examine the relationship between income inequality and the intergenerational correlation in educational attainment at the local level in Egypt. Many studies focus on finding a precise estimate for intergenerational socioeconomic mobility, but understanding the determinants of mobility has received less attention. Even though it is important to have accurate measures of mobility, the question that faces policymakers and decision-makers is how to achieve higher upward mobility. Hence a better understanding of the drivers of intergenerational mobility is crucial. Therefore the goal of this study is to examine one of the mobility drivers that has been stressed in the literature: income inequality.

In this chapter, I study the contemporaneous effect of income inequality on the relationship between parents' education and their children's current school enrollment and attainment across the different governorates of Egypt, which should help in understanding the mechanism by which intergenerational mobility operates. My results suggest a nonlinear relationship between income inequality and intergenerational educational correlation. School enrollment for children whose fathers are poorly educated is very low regardless of the degree of income inequality, whereas enrollment for children whose fathers are highly educated increases as the degree of income inequality increases. However, enrollment for children whose fathers have medium level of education decreases as the degree of income inequality increases.

In my third chapter, I analyze the relationship between maternal labor supply and children's schooling in Egypt using the same ELMPS dataset. Whether maternal employment has detrimental or positive effects on the well-being of children is not clear, particularly because of the opposing time and income effects associated with maternal work. Egypt witnessed a significant increase of 26 percent in female market labor force participation rates between 1998 and 2006. Moreover, about 83 percent of women who were employed in salary or wage jobs in the public sector were ever married in 2006, and about 79 percent of these women worked during their last pregnancy. What are the consequences of this increase in female labor force participation for their children? Are they better or worse off?

Identifying the causal effect of maternal employment is challenging because mother's decision to work may be affected by unobserved factors that, simultaneously, influence child outcomes. To address this issue, I use an instrumental variables approach in estimation, employing variables capturing local labor market conditions serving to instrument for maternal labor supply. My results show that the probability of a child ever being enrolled in school, being currently enrolled in school, or completing primary school decreases as his mother increases her hours of work. In addition, his probability of being overaged, or not being on track in school, increases as his mother works more.

In my fourth chapter, I study in a different setting the determinants of educational attainment. Specifically, I examine the evolution of common schooling in the nineteenth century in New Jersey. My purpose is to explore and examine the rise in school enrollment rates in New Jersey and assess the determinants behind this spread of common or elementary schools. Since New Jersey in the nineteenth century shared many characteristics with developing countries today, having a better understanding of this rapid rise should guide policy-makers in constructing the appropriate policies that may target educational attainment in developing countries. In this study, I use two sources of data. First, data on New Jersey schools come from the Annual Reports of the State Superintendent of Public Schools of New Jersey for years 1850 and 1860. Second, I use detailed county and state-level historical, demographic, economic, and social data that come from the 1850 and 1860 censuses.

I examine two proposed hypotheses of school expansion in the literature in the context of nineteenth century New Jersey. The first hypothesis is that the more developed and industrialized a town is, the higher the demand for skilled labor and the greater the wages of educated workers. As a result, demand for education and school attendance are expected to go up. This is referred to as the human-capital mechanism. The second hypothesis is that the greater the immigration flows, which may be related to industrialization, the higher the desire of elite groups to use public education as a socialization device to reduce social, religious and ethnic tensions, lower crime rates and promote democratic values. This should result in an increase in access to education. This is referred to as the socialization mechanism.

Empirically, I examine how various demographic and institutional factors influence both demand and supply sides of schooling decisions. To analyze the demand for schooling, I use percentage of school attendance as the dependent variable. On the other hand, I use length of school session for the analysis of supply of schooling. My results show that counties that were more urban and more industrialized observed higher school attendance rates. Moreover, I find that counties with more immigrants and more state appropriations had longer school sessions. Hence, these results represent an evidence for both human-capital and socialization mechanisms in the nineteenth century New Jersey.

Chapter 2

Educational Attainment and Income Inequality in Egypt

2.1 Introduction

In order for policy-makers to adopt the appropriate policies that target higher intergenerational mobility, there should be a firm understanding of the mechanisms through which intergenerational mobility is determined. In an effort to improve the understanding of the process by which this relationship is shaped, this paper studies the relationship between income inequality and the intergenerational correlation in educational attainment in Egypt. My goal is to examine whether the degree of inequality at the local level affects the level of persistence between parents' and children's educational outcomes. In other words, does income inequality across governorates negatively affect equality of opportunity?

Intergenerational mobility measures the relationship between parents' socio-economic outcomes and their children's socio-economic outcomes. It can be measured in terms of income and earnings, occupations, social class and educational attainment. Persistence in intergenerational socio-economic outcomes means that parents with low socioeconomic characteristics will have children with low socioeconomic characteristics and vice versa. Hence, when there is low intergenerational mobility, a child from a less advantaged family background will be trapped in this state.

Many studies have focused on finding a precise estimate for intergenerational socioeconomic mobility as an indicator for equality of opportunity, but understanding the determinants of mobility has received less attention. Even though it is important to have accurate measures of mobility, the question that policy-makers and decision-makers face is how to achieve higher upward mobility. Hence, better understanding of the drivers of intergenerational mobility is crucial. Therefore, the goal of this study is to fill part of this gap in the literature, by examining one of the mobility drivers that has been stressed in the literature: income inequality.

Previous studies have found a systematic relationship between mean school attainment and intergenerational educational mobility (Behrman et al., 2001). Therefore, a significant effect of income inequality on children's school attainment may result in a significant impact on intergenerational mobility as well. As a result, in this study I examine the contemporaneous effect of income inequality on the relationship between parents' education and their children's current school enrollment and attainment.

Egypt is an interesting setting in which to ask this question for the following reasons. First, there has been a popular demand for a more equal income distribution since the 25th of January Egyptian revolution. Income inequality is popularly seen as one of the major influences of social inequality in Egypt. This has led to significant pressure on all appointed governments to set minimum and maximum wages in the public sector, as well as, recently, the private sector. Second, differences in educational attainment levels in Egypt have been found to be largely determined by circumstances beyond the control of a student, such as family socioeconomic background, geographic location and gender, which may hinder equality of opportunity in educational attainment (Bank, 2012). Third, most of the existing literature has focused on examining this relationship in developed countries. To my own knowledge, there no evidence of how income inequality affects intergenerational correlation in educational attainment in the context of a developing country.

This Chapter is organized as follows. In Section 2, I review the literature related to the problem. In Section 3, I present a brief background on the geographical distribution of Egypt and on its education system. I describe the data and the empirical methodology in Section 4. Results are presented and discussed in Sections 5 and 6. In Section 7, I present and discuss the robustness checks I performed, and finally, I conclude the paper in Section 8.

2.2 Literature Review

A large literature measures intergenerational mobility in a variety of countries. Most of this literature focuses on developed countries. (A recent review of these studies can be found in Black and Devereux (2011).) A few studies address this question in the context of developing countries (Lillard and Willis, 1994; Kaghoma, 2012; Azam and Bhatt, 2012). However, less attention has been given to studying the mechanisms through which intergenerational mobility is determined, especially in developing countries. In this study, I examine the effect of income inequality on the relationship between parents' education and their children's school enrollment in Egypt.

Theoretically, the relationship between income inequality and intergenerational mobility is ambiguous. Different theories predict opposite directions of this relationship. A common perception is that the wider the income gaps, the lower the intergenerational mobility. There are several mechanisms through which this can take place. One way is through segregation along income lines which increases as income gaps widen, and which may result in adverse peer effects for children from low-income families (Durlauf, 1996). Another argument may be that poor children find it more difficult to compete successfully with rich children because, as income gaps widen, it is easier for rich parents to buy their children educational advantages that poor parents cannot afford (Burtless and Jencks, 2003).

On the other hand, Solon (2004) argues that an increase in income inequality may result in higher intergenerational mobility if it is accompanied by more progressive public investment in human capital. This means that if public programs are able to target more less-advantaged children, intergenerational mobility may increase despite the increase in income inequality. However, Checchi et al. (1999) argue that this positive relationship between income inequality and intergenerational mobility may take place because of the "role of incentives". Accordingly, wider income gaps cause children from lower income families to expect higher returns to their educational investment and hence have the incentive to achieve higher educational levels in hope for higher future earnings power. Given the theoretical ambiguity of the relationship between income inequality and intergenerational mobility, more empirical research must be done to identify the direction of this relationship.

Of the few studies that examine determinants of intergenerational mobility is the cross-country survey study on intergenerational mobility by Blanden (2013). In her study, she points out three factors that generate differences in intergenerational mobility across countries from the theoretical literature of mobility. These factors are income inequality, education investment and returns to education. Using cross-country data from a total of 65 countries, Blanden correlates various measures of mobility with each of these factors. She finds that lower mobility is associated with higher income inequality, lower education spending and higher returns to education. Moreover, she finds that inequality in childhood is more strongly correlated with all her estimated measures of intergenerational persistence than inequality in adulthood. She also emphasizes that this negative relationship between inequality and mobility is not driven by child poverty. However, her results show that inequality at the top end matters more.

Previous research has examined different aspects of intergenerational mobility in Egypt. All these studies use the Egyptian Labor Market Panel Survey (ELMPS) dataset. Using both the 1988 and 2006 waves, Nugent and Saleh (2009) examine both returns to education and intergenerational education mobility in Egypt. They employ two strategies in order to identify the causal effect of parent's education on their children education: one by using grandparent's years of schooling as an instrument for parents education and the other by using grandparent's years of schooling as an additional control variable in the child's education equation. They find that intergenerational education mobility increased between 1988 and 2006 especially for people living in urban areas and find that the transmission effects were stronger from a father to his children than from a mother to her children. They claim that this increase in mobility resulted from the rise in GDP per capita that Egypt experienced during the period of their study and from some education reforms, such as expanding public education to secondary schooling. Despite this increase in intergenerational mobility, they find less mobility in Egypt than in Norway. One explanation they offer is the imperfections in capital markets. They argue that poor families in a developing country are more credit constrained than poor families in a developed country, and hence this lowers *"the chances that their children can break the vicious circle of "low education" and "poverty" that causes educational attainment to be so highly correlated across generations within families"* (Nugent and Saleh, 2009, P.19).

Binzel and Carvalho (2013), using the 2006 cross-section of the ELMPS, examine both intergenerational educational and occupational mobility in Egypt. They study how the gradual suspension of the employment guarantee scheme for secondary and post-secondary graduates has affected both intergenerational educational and occupational mobility across well-educated cohorts in Egypt. They find that the decline in job opportunities in the formal sector as well as the decline in real wages in the government sector have led to a decline in social mobility in Egypt. They argue that this is a result of labor market inefficiencies rather than a capital market inefficiency.

Finally, pooling data from all the three waves of the ELMPS (1988, 1998 and 2006), Sieverding (2011) applies the educational transitions model proposed by Mare (1979; 1980; 1981) to the issue of class background and educational attainment in Egypt. Sieverding estimates the probability of a child completing an academic stage conditional on completing the most immediate prior stage controlling for various child's and parents' characteristics. Her results indicate that Egypt's educational expansion succeeded in reducing class advantage in completing the critical educational transition of finishing primary school, but had no effect on class differences in completing secondary education and above. Even though she finds that the overall transition rate to secondary education is very high for those who completed preparatory school, students from advantaged backgrounds are more likely to attain placements in the more prestigious educational track and hence have higher university completion rates. On the other hand, for most of their peers who enter the vocational track, the secondary degree is terminal.

All these studies on Egypt have focused on measuring intergenerational mobility across different time periods and relating changes in mobility to different institutional and economical changes. In contrast, in this study, a different approach is taken in analyzing intergenerational mobility. The main focus of this paper is to shed the light on the mechanism through which intergenerational mobility operates in Egypt.

The literature on the determinants of intergenerational mobility is very limited. Bauer and Schaltegger (2011) study the relationship between income inequality and intergenerational educational mobility in Switzerland. They empirically test whether school performance and intergenerational transmission of educational attainment depend on income equality on the local level using Swiss data. They use communal Gini coefficients as an indicator for income inequality. Their results show that income equality is not necessary for upward educational mobility and that there exists a nonlinear relationship between both. They find that children whose parents either completed mandatory school or continued and received a vocational degree, but not higher degrees, benefit the most from more income inequality compared to those with high and low educated parents, who do not benefit or even downgrade.

Since Switzerland is one of the richest countries in the world, ranked number one according to the where-to-be-born index (previously called quality-of-life index) in 2013[1], it's unlikely that these results will help in understanding how inequality affects mobility in developing countries. Hence, by analyzing the relationship between income inequality and intergenerational correlation in educational attainment in the context of a developing country, this study fills in a gap in this literature. It should be of a particular importance for policymakers and decision-makers in developing countries as it should help them design policies that target higher intergenerational educational mobility.

To sum up, in this paper I empirically examine how income inequality on the local level affect intergenerational correlation in educational attainment in Egypt. Following Bauer and Schaltegger, I use Gini coefficients as indicators for income inequality. Moreover, I examine the effect of different levels of father's education on both his children's school enrollment and grade attainment. The two main contributions of this study lie in its question and its setting. First, by examining how inequality affects intergenerational educational correlation, this study is a step further in understanding one mechanism

---

[1]According to an article in the *Economist,* Where to be born, in the The World in 2013 print edition by Laza Kekic. Url: http://www.economist.com/news/21566430-where-be-born-2013-lottery-life. Accessed on May, 6th 2014.

by which intergenerational educational persistence operates. Second, to my own knowledge, this is the first study to analyze this relationship in the context of a developing country.

2.3 Background

Geographically, Egypt is divided into 27 governorates for administrative purposes. Governorates are either fully urban or a mixture of urban and rural. Governorates are then divided into districts. Urban districts are divided into urban neighborhoods, called shiyakhas and rural districts are divided into villages. The governorates are grouped into seven regions: Metropolitan Governorates, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt, Rural Upper Egypt, Urban Frontiers, and Rural Frontiers. The metropolitan governorates include all-urban governorates, which are Cairo, Alexandria, Port Said, and Suez. Due to the aridness of Egypt's climate, the population is centered along the narrow Nile Valley and Delta, meaning that about 99% of the population uses only about 5.5% of the total land area. Most governorates have a population density of more than one thousand per square kilometer, while the three largest governorates have a population density of less than three per square kilometer. The five frontier governorates; Matrouh, New Valley, Red Sea, North and South Sinai are most of the time excluded from household surveys due to their remoteness and limited populations.

Egypt's educational system is divided into three broad levels: nine-year basic education, secondary education and tertiary education. The basic education consists of six-year primary education (ages 6-11) and three-year preparatory education (12-14). This nine-year basic education, including both primary and preparatory education, is compulsory. Secondary level consists of two broad tracks: either general or technical secondary education. General secondary education consists of three years of schooling (ages 15-17), while technical secondary education consists of either three or five years. Technical education provides training in industrial, agricultural and commercial vocations and accounts for more than 60 percent of secondary school enrollments. Finally, tertiary education consists of two broad tracks: either university or non-university. University track can take four to seven years to complete, depending on the specialization, while the non-university track, which consists of technical training, usually takes two to four years to complete.

2.4 Data and Empirical Methodology

In this study, I use data from the Egyptian Labor Market Panel Survey (ELMPS), which is a nationally representative, longitudinal study of Egyptian households surveyed in 1998 and 2006 (Assaad and Barsoum, 2000; Barsoum, 2007). The ELMPS followed the Labor Force Sample Survey (LFSS) that took place in October 1988. Due to lack of data on income inequality measures prior to 1995, only the 1998 and the 2006 ELMPS waves are used in this study. Both 1998 and 2006 waves consist of 4,816 and 8,349 nationally representative households respectively. The 2006 sample covers households visited in 1998; households that split from the original sample as sons and daughters forming their own households; and a refresher sample of 2,500 households (Barsoum, 2007). This survey was conducted by the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) in collaboration with the Economic Research Forum (ERF).[2]

In this analysis, I use cross-section data from both 1998 and 2006 waves.[3] My sample is restricted to children between the age of 6 and 17, which is the school age range. The sample size for the cross-sections ranges from 1656 to 7825 observations depending on the definition of the dependent variable. In order to examine the effect of income inequality on the relationship between father's and children's educational attainment, I estimate the following baseline empirical model:

$$\text{Child Outcome}_{ijg} = \beta_1 + \text{Child Charact}'_{ijg}\beta_2 + \text{Household Charact}'_{jg}\beta_3 + \text{Parents Charact}'_{ijg}\beta_4$$

[2]Economic Research Forum, Egypt Labor Market Surveys 1998 and 2006 online databases. Url: http://www.erf.org.eg/cms.php?id=Labor_Market_Panel_Sur. The data were accessed in Sep 21st, 2010.

[3]Pooled models for all outcome variables were rejected, hence only the results for each cross-section are reported and discussed. In order to test for whether all independent variables have the same effects on each outcome variable for both years, a likelihood ratio test is conducted to compare between two models. One model includes interactions of all independent variables with a year dummy, in addition to the independent variables. This is the unrestricted model. The other model just includes a year dummy, in addition to the independent variables. This is the restricted model. The null hypothesis is rejected, which means that the coefficients on all the interaction terms with year dummies are statistically different from zero. Therefore, separate models have to be estimated for each year.

$$
\begin{aligned}
&+ \quad \beta_5 \text{Father low Educ}_{ijg} + \beta_6 \text{Father high Educ}_{ijg} + \beta_7 \text{Gini}_g \\
&+ \quad \beta_8 \text{Father low Educ}_{ijg} * \text{Gini}_g + \beta_9 \text{Father high Educ}_{ijg} * \text{Gini}_g + \epsilon_{ijg}
\end{aligned}
$$

The subscript i denotes "child", j denotes "household" and g denotes "governorate". The child's education outcome is measured using four dependent variables, three of which measure school enrollment, while the fourth measures school attainment. The school enrollment dependent variables are binary variables indicating whether a child, in a specific age group, is currently going to school at the time of the survey or not. The three age groups are 6 to 11, 12 to 14, and 15 to 17 years old. The goal of this division is to examine whether income inequality affects all age groups uniformly, or whether the effect is stronger or weaker at a certain age group. The school attainment dependent variable is a continuous variable that measures a child's years of schooling, for children between the age of 6 and 17, based on the last grade the child completed, whether the child is currently in school at the time of the survey or was at school in the past. Each regression includes only children in the specified age group according to the definition of the dependent variable.

Summary statistics for the child outcome variables for both cross-sections are reported in Table A.1.[4] First, notice that the percentage of children, between the ages 6 and 14, attending school is much higher compared to that of children between the ages 15 and 17. This is true for both 1998 and 2006. This higher percentage can be explained by the fact that education is compulsory for children between ages 6 and 14 in Egypt. On the other hand, children between ages 15 and 17 are mostly in secondary stage, which is not compulsory. The averages for all school outcome variables are higher in 2006 than 1998, which is evidence for the success of the Egyptian government in promoting universal education. School enrollment for children in the age groups 12-14 and 15-17 is around 5 to 6 percentage points higher in 2006 than in 1998. With regards to children's years of schooling, the average for both cross-sections is very close at about

[4]The 2006 sample is a random sample where the number of households chosen from each governorate is proportional to the governorate size and its urban/rural distribution. On the other hand, Cairo and Alexandria were over-sampled and rural areas were under-sampled in the 1998 sample. This was undertaken in order to increase the probability of obtaining women wage-workers in the private sector in 1998, which tend to be concentrated in metropolitan areas (Barsoum, 2007). Therefore, all summary statistics and regressions reported in this paper are estimated using weighted data.

five school years. Hence, the average child has either completed primary school or has one more year to complete it.[5]

Various child and household characteristics stressed in the education literature as important indicators of school attainment are controlled for in the regression models (Haveman and Wolfe, 1995): child's age, child's gender, household size, age of head of household, and region of residence. The latter is controlled for to account for geographic differences across educational institutions. The five geographic regions of Egypt included are the metropolitan governorates, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt, and Rural Upper Egypt. Rural Upper Egypt is the reference group.

Since distance to school is expected to significantly affect both demand for schooling (Glick and Sahn, 2006) and the likelihood of school enrollment (Huisman and Smits, 2009) in developing countries, I include a binary variable indicating walking to school rather than taking a motorized means of transportation and a variable measuring duration to school in minutes. In the household questionnaires, the head of household was asked about the means of transportation and duration to the closest school for each type: primary, preparatory and secondary. This information is used to create the variables indicating means and duration of transportation.

Parental characteristics include both father's and mother's age and age at first marriage and whether the father is living in the same household at the time of the survey. Father's level of education is divided into three categories: low, medium and high level of education.[6] Father's low level of education includes fathers who have either no schooling or only completed primary education. Father's medium level of education includes fathers who have either completed preparatory or secondary education. Finally, father's high level of education includes those who have either completed an above-intermediate degree, university degree or higher. Father's medium level of education is the reference

[5]Primary education was reduced from six years to five years in 1988 for budgetary reasons and then the sixth year was restored back in 1999. Since then, the primary education consists of six years of schooling.

[6]Since there is much less variation in mother's education level and both father's and mother's education levels are highly correlated, father's level of education is used. As a robustness check, another set of estimation is performed using mother's education. In these models, mother's level of education is divided into two categories, where medium and high level of education are combined. Results for these models are reported in the appendix in Table A.11.

category.

Gini coefficients are used as a proxy for income inequality. The Gini coefficients measures the income gap between two randomly selected individuals in the population. One should be careful when interpreting values of Gini coefficients. For instance, a country may have a low Gini, suggesting narrower income gaps across the population, yet at the same time experience high poverty rates and low quality of life and absolute income levels. Moreover, the Gini may be decreasing, yet the poor are getting poorer or everyone is getting poorer. However, the Gini is the most commonly used measure of inequality due to its ease of interpretation. The data on Gini coefficients is publicly available from *Egypt Human Development Reports* undertaken by the Egyptian Institute of National Planning in cooperation with the United Nations Development Programme.[7] These estimates were constructed using data from the latest CAPMAS Household Income, Expenditure and Consumption Survey at the time the report was prepared. For 2006 observations, Gini coefficients for year 2004 are used, while for 1998 observations, Gini coefficients for year 1995/1996 are used. These data are on the governorate level and are available for 22 out of Egypt's 27 governorates.[8] The five frontier governorates are not included in the survey data used. This procedure is undertaken in most surveys due to the remoteness and limited populations of these governorates.

Both coefficients on father's levels of education (β_5 and β_6) tell us how father's education level affects his child's school enrollment and attainment. The coefficient on the Gini (β_7) tells us how income inequality on the governorate level affects the child's school enrollment and attainment. While the coefficients on the interaction terms (β_8 and β_9) show how father's level of education affects his child's school outcome variables, but this time depending on the level of income inequality in each governorate.

Summary statistics for the independent variables for each cross-section are reported

[7] I could not calculate my own Gini coefficient measures using the ELMPS dataset because this dataset includes income information only for waged employees. No information on the income level of self-employed fathers or mothers exists. Moreover, it also lacks expenditure data.

[8] I am in the process of collecting additional data in order to be able to compute more disaggregated measures of income inequality, beyond the governorate level. By computing this, I should be able to pick up more precise effects of income inequality on school outcome measures and also on the relationship between father's education and children school outcome variables. In addition, this data will help me construct other measures of income inequality, in addition to the Gini coefficients.

in Tables A.2 and A.3. Child's age, gender, household size and age of head of household are on average very similar in both cross-sections. The average age of children is 12 years old. Slightly less than one-half of each year sample is girls, about 48 percent. The average household size is 7 and the average age for the head of the household is 47 years old. Differences between both cross sections begin to appear in the distribution of the households across geographic regions. The 1998 sample has more households from metropolitan governorates compared to 2006 sample. The figures are 22 percent compared to 16 percent. Conversely, the 2006 sample has more households from both Urban Upper Egypt and Rural Upper Egypt compared to the 1998 sample. The figures are 12 percent compared to 7 percent from Urban Upper Egypt and 30 percent compared to 28 percent from Rural Upper Egypt. This means that the effect of residing in Upper Egypt, whether urban or rural will be stronger in 2006 compared to 1998. Moreover, any individual, household or regional effects that are affected by the region of residence will also be stronger in 2006 compared to 1998.

The other difference between both cross section samples lies in the father's level of education, specifically low and medium education levels. Around 67 percent of fathers in the 1998 sample have low levels of education, whereas they constitute only 56 percent of the 2006 sample. On the other hand, around 28 percent of fathers in the 2006 sample have medium levels of education, whereas they constitute only 19 percent of the 1998 sample. The percentage of fathers with high levels of education is slightly higher in 2006, around 15 percent, than in 1998, around 14 percent. All these differences in father's levels of education in both samples are statistically significant. As for the Gini coefficient, it varies from 17.4 to 37.2 in 1998 and from 18.8 to 42.3 in 2006. Its average across all governorates is around two points higher for year 2006 than year 1998, 28 compared to 26. Hence, income inequality was higher in 2006 compared to 1998.

2.5 Results

Multiple regressions are estimated in order to examine the effect of income inequality on the relationship between father's education and his child's current education outcomes.

The child's educational outcome variables measure school enrollment and grade attainment of school-age children in Egypt. For the binary child's outcome variables, probit regressions are estimated. Marginal effects coefficients are reported instead of point estimates to facilitate interpretation.[9] These marginal effects represent the change in the probability of the outcome variable being equal to one with respect to a discrete change in the binary independent variables and a marginal change in the continuous ones. For the child's years of schooling variable, OLS regressions are estimated.[10]

Tables A.4, A.5, A.6 and A.7 show the 2006 results, one table for each of the four outcome variables. These outcome variables are school enrollment for age groups 6-11, 12-14 and 15-17 and child's years of schooling, respectively. The first model includes all the explanatory variables, except the income inequality measure and the interaction terms. In the second model, I evaluate the effect of the Gini coefficients at the local level on the child's outcome variables, in addition to father's education and the other child's, household and parents' characteristics. And in the final model, I add the interactions between the Gini coefficients and the father's level of education. These models represent baseline models, which will be extended later in additional specifications.[11]

Fathers with low levels of education affect their children's school enrollment adversely, compared to having medium levels of education, for all age groups. On the other hand, fathers with high levels of education have a positive effect on their children's school enrollment for all age groups, compared to having medium education levels, although not always is this difference statistically significant. The negative effect of having a father with low level of education is stronger for older children. The decrease in the probability of being enrolled in school when the father has low level of education is 3, 14 and 17 percentage points for age groups 6-11, 12-14 and 15-17, respectively. Similarly, the positive effect of having a father with a high level of education becomes

[9] All marginal effects reported are mean marginal effects, unless otherwise stated.

[10] All reported regressions output in this paper are clustered at the governorate level, rather than the household level, since clustering at the more aggregated level leads to more accurate statistical inferences (Pepper, 2002).

[11] Adjusted R-square is reported for each model. In addition, the chi-square test statistic of the likelihood ratio test is reported. This test evaluates the goodness of model fit as additional control variables are included.

stronger as children get older. The increase in the probability of being enrolled in school when the father has high level of education is only 2 percentage points for children ages 6 to 11 and 20 percentage points for children ages 15-17. All these results are significant at either one or five percent levels.

The Gini coefficients, both individually and jointly with interactions with father's education levels have insignificant effects for both age groups 6-11 and 12-14. In contrast, both individual test of the Gini coefficients and joint test of the Gini with both interaction terms are significant for children ages 15 to 17. A governorate with a Gini coefficient that is 10 points higher experiences 6 percentage points lower in school enrollment for children between the ages 15 and 17.

The stronger effects of the Gini coefficients and its interaction terms on school enrollment of children between ages 15 and 17 than between ages 6 and 14 may be due to the fact that schooling for age group 6-14 is compulsory and hence is less affected by inequality across governorates. In contrast, the schooling decision for children between ages 15 and 17 is under their discretion, their parents' discretion, or both. Therefore, this group of children is expected to be more affected by differences in inequality across governorates than the younger group. Despite this observation, the results show that school enrollment for children ages 6 to 14 is still affected by child's and father's socioeconomic characteristics; such as child's age, child's gender, father's education level and age at first marriage and region of residence. Hence, although schooling for this group may be less affected by income inequality across governorates than the older group, it is still affected by circumstances beyond the child's control.

The models that include the interaction terms are reported in the third columns of Tables A.4, A.5, A.6 and A.7. As regards to the models that include the interaction terms, we need to consider the joint significance of father's low level of education and its interaction with the Gini in order to find the effect of having a father with low level of education. The same procedure should be done when evaluating the effect of having a father with high level of education. The joint test for father's low level of education is significant for all age groups, while, on the other hand, the joint test for father's high level of education is significant only for both age groups 6-11 and 15-17.[12]

In Table A.7, after including the interaction terms, having a father with low level of education continues to have a significant adverse effect on child's years of schooling, while having a father with high level of education does not seem to affect child's years of schooling.[13] As for the Gini, it has a positive and significant effect at the five percent level before including the interaction terms. A child who is residing in a governorate that has a Gini coefficient that is ten points higher spends on average six more weeks at school. The joint F-test of the Gini with the interaction terms is significant at a five percent level.

Tables A.4, A.5, A.6 and A.7 show that gender only affects school enrollment of children ages 6 to 11. From Table A.4, it can be seen that being female in the age group 6-11 decreases the probability of being enrolled in school by 2 percentage points. This result is significant at the one percent level for all baseline regressions. On the other hand, Tables A.5 and A.6 show that school enrollment of children between ages 12 and 17 does not seem to be affected by their gender. With respect to child's age, as the child gets one year older, his probability of being enrolled in school increases by 1.5 percentage points if his age is between 6 and 11, and decreases by 4 and 3 percentage points if his age is in the age groups 12-14 and 15-17, respectively. These results are significant at either one or five percent level for all baseline regressions. The positive sign of the child's age effect may be picking up the difference in school entrance cut-offs for age group 6-11. By running the regression for children between ages 7 and 11, the child's age becomes insignificant.

Tables A.4, A.5 and A.6 show that the effect of geographic regions varies across outcome variables. All significant coefficients on geographic regions show positive effects

[12]Based on the joint Wald test of both father's level of education with the appropriate interaction term. In particular, the chi-square test statistic for jointly testing father's low level of education and its interaction with the Gini ranges from 14 to 78 for school enrollment for all age groups. On the other hand, the chi-square test statistic for jointly testing father's high level of education and its interaction with the Gini has value of 7 for school enrollment for age group 6-11 and has value of 20 for school enrollment for age group 15-17, while it has value of 1.67 for school enrollment for age group 12-14.

[13]Based on the joint F-test of both father's level of education with the appropriate interaction term. In particular, the F-test statistic for jointly testing father's low level of education and its interaction with the Gini has value of 43.6, while it has value of 2.4 for jointly testing father's high level of education and its interaction with the Gini.

on school enrollment for all age groups. The degree of significance varies from one to ten percent level. This means that residing in any of these four geographic regions, whether metropolitan governorates, Urban Lower Egypt, Rural Lower Egypt or Urban Upper Egypt, increases the probability of being enrolled in school compared to residing in Rural Upper Egypt.

Consistent with the other outcome variables, Table A.7 shows that residing in any geographic region other than Rural Upper Egypt increases the child's years of schooling. Hence, being in any region other than Rural Upper Egypt increases time spent at school from around four to seven months. These results are significant at the one percent level for all baseline models. Furthermore, the effect of having a father with low level of education is much stronger and more significant than having a father with high level of education, compared to medium level of education. Based on the first column results, having a father with low level of education decreases time spent at school by around seven months, while having a father with high level of education increases time spent at school by around a month.

Table A.8 shows the 1998 results of the baseline model for all four outcome variables, which are school enrollment for age groups 6-11, 12-14 and 15-17 and child's years of schooling, respectively. As for the Gini coefficients, they are jointly significant at one percent level with the interaction terms for both the school enrollment of age group 12-14 and years of schooling, and weakly significant at 10 percent level for the school enrollment of age group 6-11. In contrast, these variables are jointly insignificant for school enrollment of age group 15-17. The most adversely affected age group from income inequality in 1998 is children ages 12 to 14, while the most adversely affected age group in 2006 is older children ages 15 to 17. This may serve as evidence of the expansion of education between 1998 and 2006 in Egypt. By 2006, education outcome variables for children between ages 12 and 14 seem to be less affected by income inequality differences across regions and by parents' educational outcomes than they were in 1998.

Table A.8 also shows that child's gender has a stronger and a more significant effect in 1998 than in 2006. In 1998, being a female decreases both the probability of school enrollment for all age groups and grade attainment. This result gives some evidence on the success of narrowing the gender gap in educational attainment across time in Egypt. In addition, both father's low level of education and its interaction with the Gini are jointly significant at one percent level for all outcome variables. Furthermore, the same joint test for father's high level of education is significant for all outcome variables, except school enrollment for children between ages 6 and 11.

2.6 Predictions

In order to understand how the Gini coefficients affect the relationship between father's education level and his child's education outcome variables, I plot the predicted probability of school enrollment against different values of Gini coefficients.[14] Each line in the plot represents a different level of father's education. The solid, dashed and dotted lines represent father's low, medium and high levels of education, respectively. Out of the four outcome variables, I report the 2006 plot for school enrollment of children in the age group 15-17 only. For this group, the Gini coefficients and its interactions with father's level of education are jointly significant in 2006. In addition, as mentioned earlier, the schooling decision for this group of children is either under their discretion, their parents' discretion, or both. Hence, analyzing this group of children is of more interest in terms of policy recommendations.

Figure A.1 presents the 2006 plot for school enrollment of children between ages 15 and 17. The plot shows that the most disadvantaged children, whose fathers have low levels of education, are almost not affected by increases in income inequality across governorates. On the other hand, children of highly educated fathers benefit the most from increases in income inequality. However, the children of middle educated fathers are the ones who are most harmed from increases in income inequality. This finding is the opposite to what Bauer and Schaltegger (2011) found in Switzerland. They found that children of middle educated parents benefit the most from unequal municipalities. Their results show that these children have a higher probability of attending higher education

[14]The predictions figures are computed by first plugging into the baseline model the mean values for the independent variables. Then for different level of father's education, I vary the Gini coefficients to plot the corresponding predicted probability line.

programs than children of both highly and poorly educated parents. These opposite results between both countries are plausible, as Switzerland provides open access to public schools and infrastructure that are of higher quality than those in Egypt.

One possible explanation for this result in Egypt can be linked to the "role of incentives" introduced by Checchi et al. (1999). First notice that governorates with high income inequality differ in many aspects than governorates with low income inequality. Whereas governorates with low levels of Gini coefficients are characterized by mostly agricultural or industrial activities with plenty of job opportunities for people with medium level of education, highly competitive labor markets characterize governorates with high levels of Gini coefficients. Hence, children of middle educated parents may have a higher incentive to attain secondary education in governorates with less income inequality. This can be the case because it will increase their probability of obtaining a better paying and a more prestigious job. On the other hand, jobs available for people with either low or medium level of education are mostly similar in governorates with higher income inequality. Hence, in order for children of middle educated parents to differentiate themselves in these governorates and obtain a better job, they may need to attain either an above intermediate or a university degree, which may be infeasible. As a result, they may lose their incentive for higher grades attainment and their probability of school enrollment may go down.

In contrast, higher income inequality may cause children, whose fathers have high levels of education, to expect higher returns to their educational investment. As a result, these children may have greater incentive to achieve higher educational levels in hope for greater future earnings power. Clearly, the effect of income inequality on the relationship between father's education and his child's school enrollment is nonlinear. This effect differs for each level of father's education. Given these results, we can conjecture a negative relationship between income inequality and intergenerational educational mobility for this sample supported by the "role of incentives". This conjecture is opposite to the findings of Checchi et. al., which predicts a positive relationship between income inequality and intergenerational mobility. Although their interpretation of their results is based on the "role of incentives", their argument is opposite to the argument presented here. They argue that parents in a more unequal society may have higher incentive to invest in their children's education, particularly tertiary education, due to higher returns to education.

2.7 Robustness checks

To check for the robustness of my results, I run multiple estimations extending from the baseline model. These additional specifications are intended to target several concerns regarding missing variables from the baseline that may influence the coefficients of interest. One of these missing variables is household income which is expected to have a positive and significant effect on school enrollment (Huisman and Smits, 2009) and hence its omission may result in biased estimates. If the household income is positively correlated with the Gini coefficients, then not controlling for the household income may lead to over-estimation of the Gini impact and its interaction with father's education levels. To address this concern, the models should include household income. Since income information is available only for waged employees, I include, in one specification, wages for waged employees and non-labor income, in addition to indicators for whether the father is self-employed and his employment sector.

In another specification, father's employment characteristics are controlled for. These include binary variables for whether the father is a waged employee, self-employed or unemployed. The latter is the reference category. The self-employed category includes those who are employers, self-employed or work for family for no wage. Furthermore, I include a variable that indicates the father's employment sector. This variable is equal to one if father's employment sector is either public or governmental and is equal to zero if it is either private, investment, foreign, non-profitable or non-governmental organizations or other sectors. The variables in this specification are included to proxy for father's personal networks or connections which may have a positive effect on the likelihood of either enrolling in school or attaining higher grades and its omission may also result in over-estimation of the Gini impact and its interaction with father's education levels.

Another concern is that the effect of the Gini and its interaction terms that we are observing may be just picking up differences in quality of educational institutions across governorates and not due to differences in income inequality per se. Therefore, I include variables that proxy for quality of educational institutions on the governorate level in order to address this concern. These variables are the primary student/teacher ratio, primary class size, preparatory student/teacher ratio, preparatory class size and percentage of unfit school buildings. These variables are on the governorate level. They are also available from *Egypt Human Development Reports* mentioned earlier. For 2006 observations, 2003 figures are used, while 1998 figures are used for 1998 observations.

Summary statistics for these additional control variables are reported in Table A.9. First, note that fathers' unemployment was higher in 1998 than 2006, 8 percent compared to 5 percent. Percentage of fathers who are self-employed is higher in 2006 than 1998, 30 percent compared to 27 percent. With regard to educational institutions variables, the big difference between both cross-sections lies in the student/teacher ratios for both primary and preparatory stages. These ratios are much lower in 2006 compared to 1998, 13 compared to 24 for primary schools and 12 compared to 23 for preparatory schools.

I report the results for school enrollment of children in the age group 15-17 only for year 2006, since the baseline models show significant effects only for this outcome variable.[15] The results for these additional estimations are reported in Table A.10. The first column shows the results for the baseline model. I only report the marginal effects for the variables of interest, which are father's education levels, Gini coefficients and the interactions terms. The joint tests for all variables of interest are significant at the one percent level in all the reported models.

All the additional controls in the models presented in the second and the third columns are on the individual level. The second column presents the results for the model that includes controls for whether the father is a self-employed and whether he

[15] I also run a set of estimations using a slightly different definition for this outcome variable. I use high school enrollment, which is equal to one if a child between the age of 15 and 17 is currently enrolled in high school. The Gini coefficients and the interaction terms are no longer jointly significant. These results are reported in the appendix in Table A.12. The difference between both outcome variables is that the original variable looks at all the children in age group 15-17 who are enrolled in school, even those who are lagging behind, while the other variable considers those who are lagging behind as not being enrolled in school.

is a waged employee. The reference category is if the father is unemployed. In addition to these variables, an indicator for the father's employment sector in included. These variables proxy for the father's networks and connections, where it is expected that the more the father's connections, the higher the probability of being enrolled in school due to the higher expected probability of finding a job.

In the model presented in the third column, I include non-labor income and wages for waged employees, in addition to controlling for whether the father is a self-employed and the father's job sector. These variables are proxies for the level of father's income for only the group of waged employees that there exists data on their income. This specification examines whether the effect of the income inequality that we are observing is due to to father's level of income. Finally, in the model presented in the fourth column, I control for the quality of educational institutions.[16]

Although some of these additional control variables show a significant effect on the probability of school enrollment, the effect of the Gini coefficients and the interaction terms continues to be jointly significant in all models. In other words, this effect on the child's probability of school enrollment seems not to be driven by father's work characteristics, income level or quality of educational institutions. Hence, the effect of income inequality on the relationship between father's education and his child's probability of school enrollment for age group 15-17 seems to be robust. The only significant change on the effect of the Gini coefficients lies in the fourth model, after the variables proxying for the quality of educational institutions were included. To clarify these changes, I plot the probability of school enrollment of children between ages 15 and 17 for year 2006 after these proxies were included in Figure A.2. Children whose fathers have low

[16] I also estimated returns to secondary degree, compared to attaining middle school degree, in order to address the concern that the income inequality results we are getting may be picking up differences in returns to education across governorates and not differences in income inequality. The returns to attaining a secondary degree is constructed by estimating a wage equation for adults between ages 25 and 45 using the ELMPS dataset for year 2006. The log of wages and salaries is regressed on gender, age, age squared, experience, experience squared, urban vs rural residence and a set of binary variables indicating the highest educational degree completed for each governorate. Including this measure and interacting it with father's level of education in the baseline model, I did not find any changes in the reported baseline results. But because we could not reject that the estimated coefficients of completing a secondary degree are statistically different from zero in most of the estimated returns to education models, the results for this model were not reported.

levels of education are the ones mostly affected. Their probability of school enrollment is much higher in governorates with high Gini coefficients. On the other hand, children of middle educated fathers are not as disadvantaged as before. Their probability of school enrollment is still lower as income inequality increases, but that decrease is not as steep as before controlling for quality of educational institutions. The probability of school enrollment for children of highly educated fathers is still higher than the other groups of children and is still increasing as income inequality increases. One reason for these changes can be attributed to the low quality of educational institutions in governorates with high income inequality. Hence, when controlled for, the probability of school enrollment goes up for all children, both those of middle and low educated fathers. As for children of highly educated fathers, their school enrollment rates are originally very high, close to 100 percent, in governorates with high income inequality. In addition, these children might also be going to different types of schools, for instance private schools, which are not picked up by the proxies controlled for in this model. The variables included in this model proxy for the quality of public educational institutions.

Given these results, we can conjecture a negative relationship between income inequality and intergenerational educational mobility for this sample. As discussed earlier, one interpretation for this result can be driven by the "role of incentives". Two mechanisms by which this relationship can take place were mentioned earlier. One is Durlauf's segregation along income lines story, in which he argues that higher income gaps result in more segregation along income lines, which may result in adverse peer effects for children from low-income families. In order to examine this hypothesis, I need to have information on the quality of educational institutions within governorates. However, I only have data on proxies for quality of educational institutions across governorates. These proxies are averages over each governorate, hence they lack the variation needed within each governorate. However, controlling for these proxies should help in verifying whether the relationship we observe is picking up differences in levels of income inequality rather than differences in quality of educational institutions. After controlling for these proxies, I found that the probability of school enrollment for age group 15-17 goes up for children of middle and low educated fathers in governorates with high income inequality, yet the gap in school enrollment between children of fathers with different levels of education still exists. One reason for these changes can be attributed to the low quality of educational institutions in governorates with high income inequality. Another argument is the one by Burtless and Jencks (2003). They argue that more inequality leads to lower intergenerational mobility because rich parents are more able to buy their children educational advantages that poor parents cannot afford. To empirically test this argument, I controlled for father's work characteristics, as well as his earnings from wages and household non-labor income, but did not find evidence for their argument.

2.8 Conclusion

In this paper, I analyze the effect of income inequality on the relationship between father's education and his child's school enrollment and grade attainment using Egyptian dataset. I use data from the ELMPS, in addition to data from *Egypt Human Development Reports*. Examining this relationship should help us understand one mechanism by which intergenerational educational mobility could operate. Since theoretically there is an ambiguous relationship between inequality and intergenerational mobility, I present several models to examine the relationship between income inequality and father's-child's education.

My results suggest that father's level of education plays a substantial role in his children's school enrollment and grade attainment. In addition, income inequality seems to matter more beyond compulsory schooling. In other words, school enrollment for children between the ages of 6 and 14 does not seem to be affected by income inequality. However, school enrollment for children between the ages of 15 and 17 is adversely affected by income inequality. Furthermore, the school enrollment for this group of children seems to be more sensitive to their father's education level as the degree of income inequality changes across governorates.

However, this relationship is far from being linear. School enrollment for children whose fathers are poorly educated is very low regardless of the degree of income inequality, where enrollment for children whose fathers are highly educated increases as the degree of income inequality increases. However, enrollment for children whose fathers have medium level of education decreases as the degree of income inequality increases. One explanation for this result may come from the "role of incentives". Since the more unequal governorates are the ones that are more urban and have more competitive labor market, higher education degrees are required in order to attain a job better than the one could be acquired with a low level of education. Children whose fathers have medium levels of education may find it infeasible to attain higher levels of education. Hence, they may lose their incentive of attaining higher education levels and thus their school enrollment may go down. However, I did not find evidence for the other mechanisms suggested by theories that predict negative relationship between income inequality and intergenerational educational mobility.

More rigorous tests to check for the robustness of these results can be implemented by constructing additional control variables. These can include measures that capture parents' awareness of the returns to education, other proxies for quality of educational institutions, and controlling for public programs that target less-advantaged children. Furthermore, by having access to additional data on distribution of income or expenditure at more disaggregated levels and for more time periods, I can perform various extensions to this study. First, I can construct more disaggregated measures of income inequality beyond the governorate level. Moreover, poverty measures can be constructed and tested too. Finally, having data on income inequality measures at the time schooling decisions were undertaken for the adults in my sample will enable me to examine the long term effects of income inequality on intergenerational educational mobility. In particular, I will be able to look at the effect of income inequality on the relationship between parents' education and their children's highest degree of educational attainment as adults.

Chapter 3

The Effect of Maternal Employment on Child Development in Egypt

3.1 Introduction

Mothers are dual-role players. They are considered primary caregivers for children and hence their choices and behaviors have significant effects on their children's development and educational attainment. In addition, they are also considered income providers, either through sharing household financial responsibilities with their spouses, or through being heads of households. As mothers struggle to balance these responsibilities, there may be significant consequences for their children.

Whether maternal employment has detrimental or positive effects on the well-being of children is not clear, particularly because of the opposing time and income effects associated with maternal work. On one hand, mother's work may result in more family income, which leads to additional financial resources that could enhance children's development. On the other hand, maternal work may lead to the decrease in the quantity and quality of maternal time spent with children.

Female labor force participation rates in the Middle East and North Africa (MENA) region are among the lowest in the world, at 29 percent for female adults (age 25-64) and 24 percent for female youth (age 15-24). However, female labor force participation rates increased among all age groups in Egypt from the mid 1970s to the mid 1990s (Kabbani and Kothari, 2005). For the period from 1998 to 2006, Assaad and ElHamidi (2009) shows that female market labor force participation increased from 21.4 percent to 26.9 percent. They find that about 83 percent of women who were employed in salaried or wage jobs in the public sector were ever married in 2006, and about 79 percent of these women had been at work during their last pregnancy. What are the consequences of this sharp rise in labor force participation by married women? Does it benefit or harm children?

In this study, I examine the effects of maternal employment on children's school enrollment and grade attainment in Egypt. To my knowledge, this is the first study using Egyptian data to explore this problem. Unlike most other studies which analyze the effects of maternal employment on children aged less than six years, this study focuses on the school-age group, from 6 to 19 years old. I use data from the Egyptian Labor Market Panel Survey (ELMPS) of 1998 and 2006.[1] Identifying the causal effect of maternal employment is challenging because mother's decision to work may be affected by unobserved factors that simultaneously influence child outcomes. In other words, maternal labor supply may be endogenous to child's development outcomes. To address this issue, I use an instrumental variables (IV) approach. Variables representing local labor market conditions are used to instrument for maternal labor supply.

This Chapter is organized as follows. In Section 2, I review the literature related to the problem. In Section 3, theoretical and empirical methodology are laid out. In Section 4, I describe the data that is used in this study and provide descriptive statistics for the variables of my model. I present and discuss the results in Section 5, and finally, conclude the paper in Section 6.

3.2 Literature Review

The relationship between maternal employment and child development has been widely studied, especially in sociology, psychology, and economics. Most of these studies focus on developed countries, especially the United States, while very few addressed this problem in developing countries.

Most studies of the effects of maternal employment in the US use a single source of data: the National Longitudinal Survey of Youth (NLSY). This dataset provides longitudinal information on a large number of children and includes great detail on maternal, child and household characteristics (Ruhm, 2008). Most of the studies using

[1]Economic Research Forum, Egypt Labor Market surveys 1998 and 2006 online databases.

this dataset are concerned with the impact of maternal employment on children's scores on tests of cognitive ability. However, the results are mixed and are sensitive to different methodological approaches regarding sample selection, estimation techniques, and instrumenting strategies.

Several studies have addressed the possible endogeneity problem mentioned earlier. There exist factors which both affect the mother's decision to work and at the same time affect her child's outcomes. For example, mothers with higher skills and abilities are more likely to have children with higher cognitive skills and are also more likely to work. In addition, mothers with low ability or special needs children may be less likely to work in order to spend more time with their children. Not accounting for this endogeneity problem may result in biased estimates of the effects of maternal employment on children's outcomes.

Vandell and Ramanan (1992); Ruhm (2004); Gregg et al. (2005) and Ruhm (2008) use an extensive set of control variables to reduce the influence of factors affecting maternal labor supply and, at the same time, independently influencing child's outcomes. Some of the control variables used in these studies are mother's family background and experiences in her childhood home, mother's and children's health, and pre-birth and post-birth maternal employment characteristics.

On the other hand, Blau and Grossberg (1992); Baum (2003); James-Burdumy (2005) and Cawley and Liu (2007) use instrumental variables (IV) estimation technique. Blau and Grossberg (1992) use an IV approach to correct for the potential heterogeneity between employed and unemployed mothers and the self-selection into employment. Using data on preschool children aged three and four years old born to female respondents aged 21 to 29 from the 1986 NLSY, they instrument for maternal labor supply in the first year of the child's life and in the second and later years using a predicted wage. Using Hausman test, they fail to reject the null hypothesis that both the OLS and IV coefficients are equivalent. Hence, they proceed with their analysis assuming that their sample is homogenous.

Baum (2003) corrects for this potential heterogeneity between employed and unemployed mothers by including a large number of exogenous background characteristics, by instrumenting maternal labor supply using local labor market conditions, and by estimating a portion of the models with the seemingly more homogeneous group of mothers who were employed prior to giving birth. Using data on children born between 1988 and 1993 to mothers who were between the ages of 23 and 30 in 1988 from the NLSY, he instruments for maternal labor supply with the local unemployment rate, local per capita income, percentage of the local labor force that is female, percentage of the local population that is urban and female, local population, and percentage of the local population employed.

James-Burdumy (2005) uses a fixed effects (FE) approach to account for the unobserved time-invariant family or mother's characteristics. She uses data from the US NLSY from 1979 to 1994. Using both cross-sectional data on multiple members of the household and time series data on siblings in the same household, this study is a blend of individual FE approach and family/siblings FE approach. Moreover, in order to address the problem of endogenous maternal labor supply, she uses IV FE approach in the estimation. She includes county per capita income, county unemployment rate, and percentage of the county labor force employed in services as instruments for mother's employment. She finds that the percentage of a county's labor force employed in services is the best instrument in terms of its correlation with hours worked, and therefore, she uses it in all IV FE estimations. The weaker the correlation between the instrument and the endogenous variable, the weaker this instrument will be, and hence, the lower its power and the larger the standard errors. Hausman tests reject both OLS and IV FE models against FE models, suggesting that the FE models are the ones producing consistent results.

Cawley and Liu (2007) use pooled data from the American time use survey for years 2003 to 2006. They use state unemployment rate as an instrument for maternal employment to control for the unobserved factors that simultaneously affect the mother's decision to work and the outcome variables. Similar to Baum (2003) and James-Burdumy (2005), Hausman tests indicate that the null hypothesis that employment status is exogenous cannot be rejected.

On the other hand, Bernal (2008) develops and estimates a structural dynamic model of maternal employment and child care choices of mothers and assesses the effects of these decisions on children's cognitive outcomes. She pursues this alternative approach using the sample of married mothers in the 1979 NLSY. For identification, she relies on the structure of the model, distributional assumptions, and certain exclusion restrictions. Similar to previous work, local labor market conditions are used as instruments to generate the exogenous variation in employment and child care decisions of mothers.

The results of these studies are mixed, tending to conclude a negative impact of mother's work in the child's first year on his cognitive skills. These mixed results may be due to the diversity in the methodologies and approaches being used. Bernal (2008) finds negative effects of maternal employment and child care on ability test scores, specifically the Peabody Picture Vocabulary Tests (PPVT) scores and the Peabody Individual Achievement Test (PIAT) scores (Math and Reading Sections) during the first five years of the child's life. She finds that having a full-time working mother that uses child care during an entire year within the first five years after the birth of the child results in a 1.8 percent reduction in ability test scores. Similarly, Baum (2003) and Ruhm (2004) find a negative impact of maternal employment during the first year of the child's life on PPVT, PIAT math and PIAT reading scores, while Blau and Grossberg (1992) find this negative effect on the child's PPVT scores only. James-Burdumy (2005) finds the same negative effect on both PIAT math and reading scores. Moreover, Cawley and Liu (2007) find that maternal employment is associated with a lower probability of, and reductions in time spent, reading to children, helping children with homework, and other activities related to child's education.

Baum (2003) suggests that the increase in family income from mother's work partially offsets this negative effect of maternal labor supply. Blau and Grossberg (1992) show that there is a positive impact on second and subsequent years of child's life from mother's employment offsetting the negative impact of first year, resulting in a zero net effect on child's cognitive ability throughout his three or four years of life. Using data from the Avon Longitudinal Study of Parents and Children in the UK in 1991 and 1992, Gregg et al. (2005) find that only full time work when the child is younger than 18 months has adverse consequences on children's cognitive development at ages of 4 and 7. Children's cognitive development is captured by test scores that measure ability in reading, writing, mathematics and language skills. However, these effects are quantitatively small and often insignificant. In contrast, they find that part-time work and work after 18 months are not harmful.

On the other hand, Vandell and Ramanan (1992), in studying the effects of maternal employment in low-income families, find that children benefit from their mother's work. They use data from the 1986 NLSY on children aged 80 to 100 months. They find that children's math achievement scores are positively related to early maternal employment, even after controlling for the maternal and demographic selection factors. The selection factors they control for are mother's Armed Forces Qualification Test as a measure of the mother's intellectual aptitude, mother's self esteem and traditional values, and child's age and race. In addition, they find that reading achievement scores are positively related to recent maternal employment, even after controlling for selection factors.

Very little research has examined the relationship between maternal employment and child development in developing countries. An exception is Bajracharya (2010) who examines the influence of the nature of mother's work on Nepalese children's schooling outcomes. Using nationally representative cross-sectional data from the Nepal Living Standards Survey, he analyzes whether the engagement of mothers in non-agricultural work has significant effects on their children's school attendance and grade attainment compared with the consequences when parents' work is in traditional subsistence agriculture. This study finds that when both parents work in the non-agriculture sector, their children are more likely to attend and complete school in a timely manner. These results are significant and consistent when both parents work in the non-agriculture sector, but not when only one parent works outside of agriculture. The author suggests that this result may be due to the cumulative effect of the higher family income earned when both parents engage in non-agricultural work.

There are few studies that examine the determinants of child's schooling in Egypt. Namoro and Roushdy (2009) use the 2006 Egyptian Labor Market Panel Survey to study the effect of parent-specific characteristics, particularly the contributions made by the mother and the father to marriage costs and the formation of the household and their educational attainment, on children's years of education. They find that both parents' educational attainment have a significantly positive effect on boys' education, while father's education has a more favorable effect on girls' education compared to mother's education. Moreover, they find that the mother's contribution to marriage costs, unlike the father's, positively affects child schooling. Given these results, they claim that more bargaining power for women positively influences child's welfare, measured as children's years of education. Finally, they find that living in rural areas has a negative effect on girls' education but not on boys' education. Similarly, using data from the 1997 Egypt Integrated Household Survey, Dancer and Rammohan (2007) find that being male and living in urban areas significantly improves schooling attainment, measured as the probability of being currently enrolled in school. They also find that father's education greatly improves the likelihood of current enrollment of both male and female children, while mother's education only affects the likelihood of rural and female children being currently enrolled. Finally, they find that female headship has a favorable impact on schooling attainment in rural areas.

To my own knowledge, there are no studies that examine the effect of maternal employment on children's educational attainment in Egypt. In this study, I am seeking to fill this gap in the literature by investigating whether there exists a significant impact of mothers' work on their children's schooling in Egypt. Using ELMPS 1998 and 2006, I examine this on children's school enrollment and grade attainment.

3.3 Methodology

Becker's economic model of the family serves as the theoretical framework for most studies of the relationship between maternal employment and child development (Becker, 1965, 1981). In this model, the household is a productive entity in which parents make decisions about resource expenditures, including investment decisions affecting children's education. In this model, the mother maximizes her utility subject to her child's development production function, a budget constraint, and her own and her children's time constraints. Quantity and quality of maternal time spent with the child are inputs in the child's development production function. Hence, the basic intuition of this model is that the mother allocates her time and income in order to maximize her utility, which includes, among other things, child's outcomes.

As a result of the opposing time and income effects associated with mother's work, maternal work has ambiguous theoretical effects on children's development. On one hand, maternal work increases financial resources which can be invested in improving children's health status, schooling and other human capital. Moreover, it can be used to provide child's development inputs, such as books, educational games, and tutoring when needed. In addition, these resources may be invested to provide a better home environment that helps children in learning and studying. Thus, controlling for maternal time, income effects are expected to increase the likelihood that the child will be enrolled in school (Glick, 2002).

On the other hand, mother's work may lead to less maternal time spent with children. Less maternal time being devoted to children may be detrimental, especially in the case of poor quality non-maternal childcare. In addition, maternal work may decrease the quality of maternal time if mothers are subject to exhaustion, stress, and overload. For example, mothers who are subject to long working hours and tense work atmospheres may be subject to a great deal of stress, which, therefore, may lower their stamina and level of energy. As a result, these mothers may not be as patient as they should be with their children. Also, their ability to engage in developmental activities with their children, such as reading books, going to field trips, and playing, may decrease. Nonetheless, maternal work may have positive side effects by reducing depression, especially for low-income families (Moore and Driscoll, 1997). McLoyd et al. (1994) find that mothers experiencing unemployment have high rates of depression, which, in turn, leads to an increase in their punishment of their adolescent children.

Maternal work may also lead to low levels of fertility (Stafford, 1987). This decrease in fertility may benefit child's development by reducing the number of siblings who compete for the limited financial resources and parental time available (Hanushek, 1992). This illustration of the mixed expected effects of maternal employment makes it clear that the consequences of maternal employment on children's development are difficult to predict.

I estimate a reduced form econometric model of a child's development outcomes on maternal employment. The basic estimation equation is:

$$\begin{aligned}\text{Child Outcome} &= \beta_0 + \beta_1\text{Maternal Employment} + \beta_2\text{Child Characteristics} + \\ &+ \beta_3\text{Household Characteristics} + \beta_4\text{Mother's Human Capital} + \epsilon\end{aligned}$$

where ϵ is the error term.

Maximum likelihood probit models are estimated for all the binary outcome variables, which are whether the child completed primary school, was ever enrolled in school, is currently enrolled in school, and is overaged.

To correct for the endogeneity in the maternal labor supply, instrumental variables models are estimated. Following previous studies, variables representing local labor market conditions, which may affect maternal labor supply but not child outcomes, are used to instrument for mother's work. These variables include governorate unemployment rate, governorate female employment rate, governorate female labor force estimates, and governorate average per capita income.

3.4 Data and Descriptive Statistics

I use 1998 and 2006 data from the Egyptian Labor Market Panel Survey (ELMPS). ELMPS is the first panel data available in the Arab region. This survey was executed by the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) in collaboration with the Economic Research Forum (ERF). It follows a first wave of 4,816 nationally representative households initially surveyed in 1998. The 2006 sample covers households visited in 1998; households that split from the original sample as sons and daughters forming their own households; and a refresher sample of 2,500 households, reaching a total number of 8,349 in 2006 (Barsoum, 2007). The 2006 sample is a random sample where the number of households chosen from each governorate is proportional to the governorate size and its urban/rural distribution. On the other hand, Cairo and Alexandria were over-sampled and rural areas were under-sampled in the 1998 sample.

This was undertaken in order to increase the probability of obtaining women wage-workers in the private sector in 1998, which tend to be concentrated in metropolitan areas (Barsoum, 2007). Therefore, all summary statistics are estimated using weighted data.[2]

This survey contains two levels of questionnaires, household-level and community-level. The household-level questionnaire contains a great deal of information on demographic characteristics, household assets and housing conditions, education and work characteristics of individuals aged six years and more, migrants from the household, household enterprises, and non work-related sources of income. The community questionnaire includes information on access to schools, health services, utilities, and work opportunities in a locality. This dataset represents a rich source of data that is appropriate for the purpose of this study as it contains detailed data on various demographic, economic and labor market characteristics on all members of the households interviewed in the survey.

Egypt's educational system is divided into three broad levels: nine-year basic education, secondary education and tertiary education. The basic education consists of six-year primary education (ages 6-11) and three-year preparatory education (12-14). This nine-year basic education, including both primary and preparatory education, is compulsory. Secondary level consists of two broad tracks: either general or technical secondary education. General secondary education consists of three years of schooling (ages 15-17), while the technical secondary education consists either of three or five years. Technical education provides training in industrial, agricultural and commercial vocations and accounts for more than 60 percent of secondary school enrollments. Finally, tertiary education consists of two broad tracks: either university or non-university. University track can take four to seven years to complete, depending on the specialization, while the non-university track, which consists of technical training, usually takes two to four years to complete.

[2]Since many of the characteristics used in sampling are controlled for in the models, all reported regressions are not weighted. Moreover, results of the probit models with and without weights are similar.

The children's outcome variables capture both school enrollment and grade attainment for children ages 6 to 19 in Egypt. School age ranges from 6 to 17 as discussed earlier. I extend the age group to age 19 to reflect overaged children. Each concept is expressed using two measures. In terms of school enrollment, the first measure indicates whether the child was ever enrolled in school. This variable is equal to one if a child is currently enrolled in school at the time of the survey, or was ever enrolled in school in the past, and is equal to zero if the child has never been enrolled in school. The second measure indicates whether the child is enrolled in school in the present. It is coded one if the child is currently enrolled in school at the time of the survey and is coded as zero otherwise.

In terms of grade attainment, the first outcome variable is a measure for whether the child is on track in schooling or not. An "overage" variable is constructed using a "grade-for-age" variable which compares a child's highest grade attained to the grade expected given his age.[3] "Overage" is measured for children aged 8-19 and is equal to one if grade-for-age score is less than 100, and zero otherwise. In other words, "Overage" is equal to one if the child is not on track in schooling and zero if the child is on track. The second outcome variable measures whether children have completed primary school or not. In constructing this variable, our sample is restricted to children old enough to have completed primary school. This variable is measured for children above the age of 10, since children, who are on track in Egypt, are expected to have completed primary school by the age of 11 and 12 in years 1998 and 2006 respectively. [4]

---

[3]Following Bajracharya (2010); Psacharopoulos and Patrinos (1997), a grade-for-age variable is constructed as follows:

$$\text{Grade-for-age} = 100(\text{Highest Grade Attained})/(\text{Child's Age} - 7)$$

Seven years are subtracted from the child's age in the denominator, six of them due to the fact that children in Egypt typically start school at the age of six. An additional year is subtracted because the survey asks about "Year of schooling during the last year".

Child's age used is a constructed age, which I call "academic age". This academic age is computed as the difference between the survey year and the child's year of birth, if the child was born before October. An additional year is subtracted, if he is born in October or later. This is done to avoid an upward bias in the grade-for-age variable, which occurs if we ignore the fact that children should turn 6 before October 1st in order to start school.

A score of zero means that the child either has dropped from school or has never been enrolled in school. All children scoring below 100 are considered to be not on track in schooling.

[4]Primary education was reduced from six years to five years in 1988 for budgetary reasons, then

The main explanatory variable in our models is one that measures maternal labor supply: the number of hours the mother was working in the week preceding the survey. In constructing this variable, I follow the definition of economically active population provided by the International Labor Organization (Organization, 1982). This definition includes all those engaged in the "production and processing of primary products, whether for the market, for barter, or for own consumption, the production of all other goods and services for the market and, in the case of households which produce such goods and services for the market, the corresponding production for own consumption". Accordingly, mothers who are engaged in animal husbandry and processing of dairy products for the purpose of household consumption are considered employed. Assaad and ElHamidi (2009) refer to this definition as the extended definition of labor force. These cases are common in Egypt, especially in rural and agricultural villages. Hence, not considering those mothers in calculations would underestimate mother's labor force participation.

Several explanatory variables are included in the models to control for child's and household characteristics, access to schools, and mother's human capital. I include child's gender and age. For the household characteristics, I include the number of siblings[5], household size, mother's marital status, mother's age at first marriage, and age of head of household. In addition, I include a variable that indicates whether the child is living in a rural area or an urban one. As mentioned earlier, residing in rural areas is expected to have a negative impact on children's school attainment (Dancer and Rammohan, 2007; Namoro and Roushdy, 2009). Moreover, a variable that indicates father's presence in the house is included, since the presence of the father may increase parental time spent with children and may affect their school attainment. In addition, household income is included to control for the level of household resources. Huisman and Smits (2009) found that children from wealthier households are more likely to be enrolled in primary school. For 2006, household income includes monetary charitable donations,

---

the sixth year was restored back in 1999. Since then, the primary education consists of six years of schooling.

[5]This variable is not included in 1998 estimations since the 1998 survey did not ask for the number of siblings.

monetary value of assistance given in terms of food or other goods, retirement pensions, governmental social programs benefits, illness or injury compensations, assistance from religious organizations, rental income, interest and other financial returns and father's total earnings. For 1998, household income only includes father's total earnings due to the lack of information on non-labor income for this survey year.[6]

In addition, distance to schools is expected to play an important role in the decision to enroll a child in school. Glick and Sahn (2006) found that distance to school has a strong negative effect on the demand for schooling in Madagascar. Also Huisman and Smits (2009), in studying the effects of household- and district-level determinants of primary school enrollment in 30 developing countries, found that the longer the distance to school in rural areas, the lower the likelihood that children in these areas are enrolled in school. Therefore, binary and continuous variables are constructed to measure both means of transportation and duration to schools. These variables are included for both primary and preparatory schools. The variable that indicates means of transportation is coded as one if the child walks to school and zero if another means of transportation is used, such as a private car, school bus, public bus, or taxi cab. The durations to school variables are measured in minutes spent to reach to a particular school.

Both Ersado (2005) and Glick and Sahn (2006) found that higher education levels of both parents increase the likelihood of the child being enrolled in school. Hence, a series of dummy variables are included to control for mother's education level. These variables indicate whether the mother has never attended school, has completed primary school but did not earn a school-leaving certificate (where school-leaving certificate in Egypt is obtained when completing the twelfth grade), has completed secondary school but not an above intermediate or university degree, or has completed an above intermediate, university, or post graduate degree. The reference group is the group of mothers who completed preparatory school, but did not obtain a school-leaving certificate.

To check for the robustness of the results, an alternative model containing mother's

[6]Father's total earnings include earnings from primary and secondary jobs. For children who live in the same house as their father, father's earnings account, on average, for 70% of household income. All earnings included in the household income are yearly.

hours of work per week excluding hours spent in subsistence work is estimated. Next, in order to determine whether maternal labor supply has nonlinear effects on child's outcomes, several model specifications are estimated. One specification adds a binary variable indicating whether the mother is working or not to the number of hours worked by the mother in order to test for any effects of just entering the labor force. Another specification includes a quadratic form of mother's hours of work. In addition, a regression is estimated to test for different effects across the different categories of mother's hours of work. All these robustness checks are implemented for both 1998 and 2006 cross-sections.

The summary statistics for the dependent variables for both 1998 and 2006 are reported in Table B.1. In 1998, around 93 percent of the children between 6 and 19 years old were ever enrolled in school, whereas 78 percent of those children were currently enrolled in school at the time of the survey. In 2006, around 95 percent of the children between 6 and 19 years old were ever enrolled in school, whereas 79 percent of those children were currently enrolled in school at the time of the survey. This gap may be due to the need for children to work or get married at young ages, which in turn makes them incapable of attending school. The percentage of children between 11 and 19 years old who had completed primary school is slightly greater in 1998 (around 76 %) than in 2006 (around 74 %). Finally, around 28 percent of the children between the age of 8 and 19 were overaged in 1998. In other words, 28 percent of the children 8 to 19 years old were falling behind in school in year 1998. This may be due to grade repetition or leaving school. On the other hand, around 50 percent of children aged 8 to 19 were overaged in 2006, meaning that more children had repeated grades or had dropped out of school in 2006 than 1998.

Table B.2 reports the means and standard deviations of the explanatory variables for both 1998 and 2006. The average age of children in both samples is 13 years. Females are slightly less than one-half of both samples. Around 47 percent of 1998 sample are living in rural areas, while 63 percent of 2006 sample are living in rural areas. The average number of children's siblings is 3.5 in 2006. The average size of household is 6.7 in 1998 and 6.5 in 2006. The average age of the head of household is 48 for both years.

Around 93 percent of mothers were married in 1998, while only 7 percent were either divorced or widowed. And around 91 percent of mothers were married in 2006. Around 88 percent of the children in 1998 had their fathers living with them in the same house, while this percentage is 86 in 2006. The average age of mother's first marriage is 20 years in both samples. The average household annual income in 1998 is around 4,800 Egyptian pounds, while it is around 5,700 Egyptian pounds in 2006. Note, however, that household annual income in 1998 is composed of both non-labor income and father's earnings, while that of 2006 is only composed of father's earnings.[7]

Around 62 percent of mothers in 1998 did not obtain any schooling degree, either by not enrolling in school at all, or dropping out before obtaining any school certificate. This percentage is around 59 percent in 2006. The percentage of completing primary school, but not obtaining a school-leaving certificate, is very close for both years; 8 percent in 1998 and 7 percent in 2006. Around 15 percent in 1998 and 20 percent in 2006 completed secondary school, obtaining a general or technical secondary certificate but not an above intermediate or university degree. And finally, around 11 percent in 1998 and 9 percent in 2006 had obtained an above intermediate, university, or post graduate degree. The omitted group of mothers are those who completed preparatory school, but did not obtain a school-leaving certificate.

There is huge difference in the percentage of working mothers across the years; 26 percent in 1998, while 60 percent in 2006. The average number of working hours for all mothers in the week preceding the survey is around 9 hours in 1998 and 11 hours per week in 2006. As for working mothers only, the average number of working hours is around 36 in 1998 and 19 hours in 2006. This means that there were more mothers working in 2006, but a large number of these mothers were working part-time. In 1998, fewer mothers worked but most of these mothers were working full-time. Figure B.1 illustrates the distribution of mothers' hours of work in both years. As demonstrated in the Figure, mothers' hours of work vary mostly between 2 and 20 hours of work in year 2006. Moreover, additional variation lies between 30 and 50 hours of work in both

[7] Household income in 1998 is adjusted for inflation using the Consumer Price Index (CPI) value of 0.7011, considering 2006 as the base year. This CPI was provided in the ELMPS dataset.

years.

Regarding the instrumental variables, the average national unemployment rate is around 8 percent in 1998 and 11 percent in 2006. Luxur experienced the highest unemployment rate of 22.9 percent and Beni-Suef the lowest rate of 4.2 percent in 2006. The average national female employment rate is around 14 and 18 percent for years 1998 and 2006 respectively, with Behera experiencing the highest rate of 34.2, and Luxur experiencing the lowest rate of 7.7 in year 2006.[8] The average national per capita annual income was around 3,700 Egyptian pounds in 1999/2000 and 3,000 pounds in 2004/2005, where families living in Port-Said receive the highest per capita annual income of 4,882 Egyptian pounds in 1999/2000, while those living in Cairo receive the highest per capita annual income of 5,132 Egyptian pounds in 2004/2005. Those living in Asyout receive the lowest per capita annual income of 1,372 Egyptian pounds in 1999/2000 and 1,767 pounds in 2004/2005. The average national female labor force increased from around 230,000 in 1998, which represents around 20 percent of total labor force in 1998, to around 300,000 in 2006, which represents around 22 percent of total labor force in 2006.[9]

3.5 Results

The F-tests of the joint significance of the four instruments from the hours of work regression reject the null hypothesis that these instruments have no effect on mother's hours of work for both 1998 and 2006 cross-sections.[10] Also, all instruments passed the Hansen exogeneity test for all the dependent variables for the 1998 sample. On the other hand, for the 2006 models, we fail to reject the null hypothesis that these instruments have no effect on both the probability of a child being ever enrolled in school, and his

[8]Female employment rate = Total number of female employees (age 15-64) / Total number of female population (age 15-64). For year 1998, it is calculated for age group 12 to 64. Data on number of female employees, provided by CAPMAS, is categorized by economic activities, such as agricultural, fishing, education, health care, social services, etc.

[9]Data on the instrumental variables are collected from the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS).

[10]First stage results for both 1998 and 2006 regressions are reported in Tables B.7, B.8, B.9, B.10, B.11, B.12, B.13 and B.14.

probability of completing primary school, while we reject this null hypothesis for both the probability of the child being currently enrolled in school and his probability of being overaged. The rejection of the null hypothesis means that one or more of these instruments are not exogenous to these two outcome variables. Further research will be done to find more valid instruments regarding these two outcome variables.[11]

The marginal effects from the probit and IV probit estimations of both ever enrolled and currently enrolled in school outcomes are reported in Tables B.3 and B.4 for both 1998 and 2006.[12] These estimations include all children between the ages of 6 and 19. In the binary probit models, mother's working hours have weak effects on the probability of being ever enrolled and the probability of being currently enrolled in school. The IV models, on the other hand, show negative and significant effects of maternal labor supply on both school enrollment outcomes. The results show that when the mother works one more hour per week, her child's probability of being ever enrolled in school decreases by about 1.2 and 0.7 percentage points and his probability of being currently enrolled in school decreases by about 1 and 0.5 percentage points for both years. These differences between the probit and the IV probit results show that not accounting for the unobserved factors that affect both maternal employment and children's school enrollment outcomes leads to a bias towards zero in the estimated coefficients.

One possible explanation for these probit results is that highly skilled mothers may more likely work more hours and at the same time be more likely to enroll their children in school. This positive effect may counteract any negative effects that result from more hours of work hence leading to a near-zero estimated effect on children school enrollment. Therefore failing to control for the unobserved level of mothers' skills leads to a bias towards zero in the estimated coefficients which does not reflect the true effect of mother's hours of work on her children's school enrollment. On the other hand, IV probit results reflect the true effect of changes in mother's hours of work on her children's

---

[11] A concern about the validity of local labor market conditions as instruments for mother's hours of work is that they may affect children's employment opportunities, which may then affect their school enrollment and attainment rates. Estimating a simple model of child labor shows that these instruments have jointly insignificant effects on child labor for the 2006 sample. The results for this estimation is reported in Table B.27.

[12] All reported regressions are clustered at the household level.

school enrollment. These results indicate that an increase in mothers' hours of work for those mothers' whose decisions to work more or less depends on local labor market conditions leads to a decrease in the probability of their children's school enrollment. This effect is referred to as the local average treatment effect: it is the average effect on school enrollment for children whose mothers changed their hours of work only due to the exogenous changes in these local labor market conditions used as instruments (Imbens and Angrist, 1994).

Results for estimated models of grade attainment outcome variables, which are primary-school completion and overage, are reported in Tables B.5 and B.6 for both 1998 and 2006. Estimation of primary-school completion outcome is restricted to the sample of children aged between 11 and 19 for year 1998 in order to decrease the censoring that will, otherwise, occur as a result of presence of children below the age of primary-school completion, which is the age of 11 in year 1998.[13] Similar to the results from the regressions of school enrollment outcomes, probit estimates reveal only weak effects of mother's work on her child's probability of completing primary school while IV estimates reveal negative and significant effects. These patterns are consistent across the survey years. As the mother works one more hour per week, her child's probability of completing primary school decreases by 1 and 0.4 percentage points for years 1998 and 2006, respectively.

Estimation for overage variable is conducted for children between the age of 8 to 19. Similarly, probit estimates show no significant effects of mother's work on her child's probability of being overaged for year 2006, while the IV probit estimated coefficients show a positive and significant effect. This means that as the mother works one more hour per week, the probability of her child being behind in school increases by 0.7 percentage point. On the other hand, both probit and IV probit estimations indicate positive and significant effects of an increase in mother's hours of work on the probability of her child being overaged for year 1998. The IV probit estimated marginal effects show that as the mother works one more hour, the probability of her child being behind in

[13]Since primary school became six years in year 2006, the sample is restricted for children between the age of 12 and 19 years old for the 2006 estimations.

school increases by 1 percentage point. Hence, models of all the outcome variables have consistent results. All of them reveal a negative impact of mother's increase in hours of work on her children's enrollment and attainment in school.

Being a female decreases the probability of school enrollment in both 1998 and 2006. On the other hand, it does not affect grade attainment. In addition, living in rural areas has a negative effect on both school enrollment and grade attainment in both 1998 and 2006, although this negative effect disappears in some models after instrumenting for maternal labor supply. The gender and geographic differences are consistent with Dancer's and Rammohan's (2007) results. In addition, household size has a negative effect in almost all the estimated models. This negative effect is expected due to the competition for family resources as household size increases. Finally, having mothers with no schooling reduces children's schooling, while having mothers with high levels of education increases children's schooling.

As a robustness check, probit and IV probit models are estimated for all children's outcome variables containing mother's hours of work per week following the market definition of labor force. This is accomplished by excluding hours spent in animal husbandry and processing of dairy products for the purpose household consumption (Assaad and ElHamidi, 2009). Results are consistent to the standard model. IV probit estimations find a negative and significant effect of an increase in mother's hours of work on the probability of being currently enrolled in school, being ever enrolled in school, and completing primary school, while it finds a positive and significant effect on the probability of the child being overaged, or not being on track in school. These results are consistent for both 1998 and 2006 cross-section estimations.

Several model specifications are estimated to test for nonlinear effects of maternal employment on child outcomes. The first specification included a quadratic form of mother's hours of work as a regressor in addition to mother's hours of work. Joint F-tests of both mother's hours of work variables show significant effects on all children's outcomes. In all models except overage, mother's hours of work have negative and significant effects, while squared mother's hours of work have positive and significant effects. As for the overage model, mother's hours of work have positive and significant effects, while squared mother's hours of work have negative and significant effects. The consistency of these results demonstrate that this negative impact of mother's work starts to disappear after working 46 hours in 1998 and 24 hours in 2006, after which mother's work starts to yield positive effects on children's enrollment and attainment in school.[14]

The second specification includes five categories of mother's hours of work; zero hours of work, between zero and 10 hours, between 10 and 30 hours, between 30 and 50 hours, and more than 50 hours. Dropping zero hours of work, probit models are estimated for all child's outcome variables. For completed primary school, ever enrolled, and currently enrolled, the 1998 probit results show that working more than 50 hours per week has negative and significant effects, while working more than 10 hours per week has a positive and significant effect on the probability of the child being overaged. On the other hand, 2006 results do not show any significant effects, except that working less than 10 hours a week has a positive and significant effect on the probability of the child completing primary school.[15][16]

The third specification includes a binary variable indicating whether a mother works or not, in addition to mother's hours of work. The IV probit models for year 1998 of probability of being currently enrolled in school, ever enrolled in school, and completion of primary school show negative effects of mothers just entering the labor market, while it shows positive effects of an increase in mother's hours of work, though not all of these effects are significant. Regarding the overage outcome variable, mother's work has positive and significant effect, while hours of work has negative and significant effect on the probability of her child being behind in school. On the other hand, IV probit models for year 2006 of the probability of being currently enrolled in school, ever enrolled in school, and completion of primary school show positive and significant effects of mothers just entering the labor market, while they show negative and significant effects of an

---

[14]Results of IV probit models for 1998 and 2006 models including the quadratic form of mother's hours of work are reported in Tables B.15, B.16, B.17 and B.18.

[15]Only probit models are estimated for this specification.

[16]Results of probit models for both years 1998 and 2006 including categories of mother's hours of work are reported in Tables B.19, B.20, B.21 and B.22.

increase in mother's hours of work. Regarding the overage outcome variable, mother's work and hours of work variables show negative and positive effects, respectively, on the probability of her child being overaged, though both effects are insignificant.[17]

3.6 Conclusion

In this study, my aim was to examine the effects of maternal employment on children's schooling outcomes in Egypt using both 1998 and 2006 cross-sections of the ELMPS. Maternal labor supply is expected to be correlated with some unobserved factors which, simultaneously, affect children's schooling outcomes. Hence, in order to reduce the bias that results from this endogeneity problem, I used an instrumental variables approach. Local labor market conditions were used as instruments for maternal labor supply. For the 2006 sample, these instruments passed the exogeneity test with respect to two of my outcome variables, namely, probability of a child being ever enrolled in school, and his probability of completing primary school, but it did not pass it with respect to the other two outcome variables, namely, the probability of the child being currently enrolled in school and his probability of being overaged. This entails that one or more of the instruments may be correlated with any of the latter outcome variables. More work needs to be done to find better instruments regarding these two outcome variables. However, the instruments passed the exogeneity test with respect to all outcome variables for the 1998 sample.

Both probit and IV probit models were estimated for all the four outcomes for both cross-sections. All probit results show weak or insignificant effects of mother's hours of work on children's schooling variables. On the other hand, IV probit estimated marginal effects are significant and larger in absolute value for all outcome variables. This result emphasizes the fact that not accounting for unobserved factors, which affect both mother's work and children's outcomes simultaneously, biases estimated coefficients towards zero. The results show that the probability of a child being ever enrolled in

[17]Mother's binary work variable is treated as exogenous variable in these IV probit models, only mother's hours of work variable is considered endogenous and thus instrumented for. The results for both 1998 and 2006 models are reported in Tables B.23, B.24, B.25 and B.26.

school, being currently enrolled in school, and completing primary school decreases as his mother increases her hours of work. In addition, his probability of being overaged, or not being on track in school, increases as his mother works more. These results are consistent for both cross-section estimations. A possible explanation for these adverse effects of mother's work is that time effects of mother's work outweigh its income effects. This means that the detrimental effects that are due to lower quantity or quality of maternal time spent with children may overwhelm the positive effects that are due to an increase in the total family income. Around 27 and 60 percent of working mothers in 1998 and 2006 samples, respectively, have no schooling, which may justify these low income effects. Mothers with no or low education levels may have very few job opportunities and hence be forced to work in low-wage jobs. The small contribution to family income may not compensate for the decrease in maternal time spent with children.

In order to test for nonlinear effects of mother's work, different model specifications were estimated. Models including a quadratic form of mother's hours of work were estimated. Both mother's hours of work variables were jointly statistically significant with respect to all of our outcome variables. Results for both 1998 and 2006 show that the detrimental effects of mother's work on children's schooling are decreasing as mother's hours of work increase, until it reaches a certain limit, at which mother's work starts yielding positive effects on her child's schooling. This limit is around 46 and 24 hours of work for all children's outcomes variables for years 1998 and 2006, respectively. As a result, 2006 results suggest that mother's working part-time is worse off than not working or working full-time with respect to her children's school enrollment and grade attainment. This may be due to the fact that working full-time will add more to the family income and hence will increase income effects of mother's work, which then may outweigh the adverse time effects. Since a large percentage of the working mothers has no schooling, one possible short-term policy intervention to mediate these negative effects of mother's work is providing poorly educated mothers with the appropriate training that can qualify them for full-time jobs or assist them in starting their own small businesses. Another long-term suggestion of these results is focusing the attention to girls' education, especially those living in rural areas or coming from disadvantaged backgrounds. One suggestion is building more schools in remote areas to reduce the distance children, especially girls, have to travel. Another suggestion is providing uniforms and textbooks for free in subsequent academic years to those children who showed high attendance rates in current academic year.

In sum, this study reveals detrimental effects of mother's work on her children's school enrollment and grade attainment. Nonetheless, these adverse effects disappear as mother's hours of work increase, suggesting a nonlinear relationship between mother's hours of work and children's outcome variables.

Chapter 4

The Common School and the Expansion in Education in Nineteenth-Century New Jersey

4.1 Introduction

At the birth of the United States, the founding fathers were warned by classical political theory and contemporary opinion that republican government would not work in a country as large as America, especially with its well-defined divisions and heterogeneous population. Hence, education was viewed as playing an important role in reconciling freedom and order (Kaestle, 1983). Leaders of this period believed that this new nation could be saved not by a new constitution alone, but also by a well-structured education system. Despite this concern, the Constitution mentioned education only in general terms, which left each state to make its own journey to mass education (Burr, 1942).

One of the characteristics of the rapid spread of education in the US was the decentralization; school finances and curriculum were the responsibility of school districts, and the federal government accounted for a tiny fraction of primary school expenditures. Other factors were high levels of wealth, relatively low opportunity costs for youths, competing religious sects that valued the ability of reading the bible, and the ideology of democratic ideals to reach universal literacy (Goldin, 1999).

In this article, I study the evolution of common schooling in the nineteenth century in New Jersey. My purpose is to explore and examine the rise in school enrollment rates and the increase in the length of school sessions in New Jersey and assess the determinants behind the spread of common or elementary schools. In particular, I examine two proposed hypotheses of school expansion in the context of nineteenth century New Jersey. The first hypothesis is that the more developed and industrialized a town is, the higher the demand for skilled labor and the greater the wages of educated workers. As a result, demand for education and school attendance are expected to go up. This is referred to as the human-capital mechanism. The second hypothesis is that the greater the immigration flows, which may be related to industrialization, the higher the desire of elite groups to use public education as a socialization device to reduce social, religious and ethnic tensions, lower crime rates and promote democratic values. This is referred to as the socialization mechanism. In testing these two hypotheses, I use the percentage of school attendance as a proxy for demand for education, and the length of school session as a proxy for supply of education, or access to education.

This Chapter is organized as follows: in Sections 2 and 3, I present a brief overview of the history of education in the United States and New Jersey, respectively. In Section 4, a description of the data used in this study is presented. In Section 5, the empirical results are presented and discussed, and finally, I conclude the paper in Section 6.

4.2 Education History in US

America borrowed many educational concepts and institutions from Europe but tailored them to be more practical and applied, yet less industrial and vocational. In this respect, historians recorded the prominent role played by Jefferson in adapting European ideas to suit American conditions. America imported instructional staff for colleges and universities and also exported students many of whom returned as trained academics. By the 1840's, primary school enrollment per capita for the free population in the United States had exceeded that in Germany, and Americans had became the most educated people among the world's richer nations (Goldin, 1999).

The American education system tended to be "egalitarian", whereas the European system was more "elitist". European secondary and higher education was reserved for persons with exceptional abilities, often dependent on their family status. In contrast, the American education system fostered the notion that everyone should receive a common academic education. The gaping hole in the US education system was that slaves did not receive any formal education. Southern states passed laws that prohibited teaching slaves reading. Moreover, free blacks in the north were in legally segregated schools with substantially lower quality compared to the whites schools (Goldin, 1999).

The period before 1820 was one of gradual preparation for a significant reform in education. Between 1820 and 1850, the universal spread of education started to take place. Historians attribute this to the Industrial Revolution and the waves of immigration from Europe. At that time, most elementary education was offered in "common schools", which were publicly operated but not completely publicly funded. Reformers and intellectuals, who were mostly college students, sons of ministers, farmers and merchants, sympathized with the struggles of the poor to improve their conditions. Beginning in the cities, campaigns began to abolish school fees that prevented many poor children from going to school. Following the Civil War, all states shifted to publicly funded education at the elementary or common school level. In the 1850's and 1860's, northern and western states started to establish free public school systems.

A common view among historians is that the expansion of education in the US is attributable to the "Common School Movement" adopted by reformers in the Northeastern states. But Fishlow (1966) doubts this claim. Fishlow (1966) examined the progress of common schooling in the US before the Civil War and its unequal regional diffusion. He compared the school enrollment rates in New England, Southern and Western (North Central) states between 1840 and 1860. He found that most of the improvement in enrollment rates was concentrated in Southern and Western states and little, if any, improvement took place in the New England states. Thus, he claimed that researchers exaggerate the role of common school revival in the spread of education in the US before 1860. During the period of the educational crusade, two simultaneous processes affecting formal education were taking place. First, common schools were centered in New England with its emphasis on free public education, higher standards and increased state supervision. The second process was the diffusion of public education to the new states of the West and the laggard South, which he claimed had the greater impact. The rapid Western growth that took place between 1830 and 1840 was driven by the expansion of railways which permitted commercial agriculture and induced migration from the East in large numbers. Most of those immigrants brought their educational heritage to the West and aimed to duplicate their previous environment. Hence, Fishlow concluded that the great advance in enrollment rates which occurred between 1840 and 1850 was mostly the result of independent forces working for education diffusion in the South and West, and not the result of common school movement in the East.

The Bureau of Education was established in 1867.[1] Each state also eventually appointed a superintendent or commissioner of education and established a board of education. The first state board of education was established in Massachusetts in 1837 and was headed by Horace Mann who was known for his tireless efforts for free common schools (Goldin, 1999). Many historians date both educational expansion and reform in Massachusetts to his appointment as first secretary of state board of education. Mann was also known as the "Father of Common School Movement". Massachusetts was also among the first states to industrialize, emphasizing to other states the importance of education in the process of industrialization.

Field (1976) studies the education expansion in Massachusetts in the mid-nineteenth century. Using data from the annual reports of the Massachusetts Board of Education, he examines the trends in Massachusetts school attendance rates and length of school session. He finds substantial growth in both public and total school attendance in Massachusetts for the period 1837-1880. He argues that his results cast doubt on Fishlow's findings, at least for Massachusetts. In addition, Field proposes two mechanisms that link school expansion with industrialization in Massachusetts. The first mechanism is the human-capital mechanism, which operates through the market. New technologies, which were developed as a result of industrialization, caused an increase in the demand for skilled and educated labor, and hence, wages for educated workers went up. As a result, the incentive to invest in schooling increased and school enrollment and attendance rates rose.

The second mechanism is the socialization mechanism, which operates through the political system. Industrialization resulted in geographical and occupational shifts, which led to huge gaps between economic classes and increases in crime rates and social unrest. Field argues that elite groups, who were mostly professionals, merchants,

[1] The Department of Education, its successor, became a separate cabinet-level agency in 1980.

and manufacturers, used schooling as an agency for socialization. These groups viewed public schooling as a way to reconcile different socioeconomic classes and control crime and social unrest.

Field finds no evidence for the human-capital mechanism in his 1976 paper. First, he finds that the increase in the number of jobs requiring advanced schooling cannot explain the rise in primary school enrollments. Very small number of primary school graduates advanced to the high school and moreover, this advancement was strongly correlated with parental background. Second, he does not find evidence that industrialization led to a shift to capital-intensive technologies and increased the demand for skilled workers. He finds little expansion in occupations that required formal training and finds only small increases in the number of trained technical workers. He also shows that there was a decline in the employment of skilled workers in the two most important manufacturing industries, boot and shoe and cotton-textiles, and the trade and service sector.

In a later paper, Field (1979) tests for the effect of elite groups on the length of the school session using a cross section of 329 towns in Massachusetts in 1855. He claims that the length of school session is an index of community interest in education. At that time the length of school session was under control of local school committees, which were dominated by certain elite groups. He finds positive relationships between the length of school year and number of families per dwelling, the share of Irish, and the share of merchants in population. He argues that these results reveal the intent of elite groups in Massachusetts to use schools as agencies of socialization.

4.3 Education History in New Jersey

New Jersey lagged behind the New England states in establishing a free public education system. New Jersey lacked the homogenous society that gave public schools a head start in New England. Diversity of national origins, religious differences, and cultures encouraged private, parochial, and charity schools, and their vested interests hindered the efforts exerted by reformers to keep pace with other states (Burr, 1942).

The first education laws of New Jersey were passed in 1693 and 1695. Due to the various ethnic and religious groups, it was easier for New Jersey to allow each group to control its own schools. For over a hundred and fifty years, primary education in New Jersey was under the control of the different religious institutions. During this period, little was done for the education of teachers, expansion of the curriculum, or common school education (West, 1964).

James Parker, who was a member of New Jersey General Assembly and Mayor of Perth Amboy in 1815, was influenced by Jefferson's educational views and fought for common schools. In 1817, the State School Fund (SSF) was established. State appropriations, which were funded by US bonds and an endowment of other stocks, were allocated to the SSF. This fund was a first step towards establishing a public common school system that guaranteed that children of the rich, children of the poor and children from all national backgrounds would receive the same level of education (West, 1964).

During this period, the schools were not free and the tuition fees ranged from $1.33 per child per quarter in Cape May to $2.43 in Burlington County. When parents could not afford to pay the full year school fees, the school year was shortened. In Cape May, school was open for two months, whereas in other counties, such as Bergen, it was open for eleven months. The SSF was apportioned to counties and then townships according to the taxes collected from each, and hence, the wealthy counties received more funds for education than the poor ones. In 1844, a new state Constitution provided for a perpetual SSF and the distribution of its income to support public schools. In the same year, the first free school was opened in Nottingham under the leadership of Dr. Charles Skelton, who was often called the "Father of Public Schools" in New Jersey (West, 1964).

In 1845, the legislature authorized the Trustees of the SSF to appoint a State Superintendent of schools. The superintendent's main duties were to work for the advancement of schools and provide information to the public. In his report to the legislature in 1847, the state superintendent, Dr. T. F. King, a physician from Perth Amboy, discussed the general conditions of schools, the work done by examiners to license teachers, the teachers associations and the quality of teachers (West, 1964). He believed that the future conditions of schools depended on the inhabitants' choice of town superintendents. Hence, he urged the people not to base their choice on politics, religion, or calling of the individual but on qualifications (New Jersey, 1848).

In his report, King discussed in detail the duties of teachers, inhabitants, and state to resolve the shortage of good teachers. First, he suggested that every county should form a "Teacher's Institute", a school for teachers. Teachers should meet there and present reports on the classes they were teaching and on their methods of teaching and discipline. In addition, lectures and discussions should take place. At the end of the course of this institute, a committee of teachers would grant certificates to those teachers who were thought deserving, based especially on their morals (New Jersey 1848, P. 6-11).

King also reported that to the sorrow of the town superintendents, parents often neglected to visit schools and that it was difficult to interest them in the education of their children. He argued that nothing should be of greater importance and deserve more attention from parents as the education of their children. He stressed the importance of honoring and respecting teachers, and argued that parents should set an example to their children.

Finally, he held the state responsible for providing education to all the children within its borders. He suggested that sufficient appropriations must be made by the legislature. Citizens should be required to contribute to guarantee quality education for all children, proper administration needed to be appointed to supervise the appropriation and distribution of these funds, and a well devised plan needed to be formed in order to supply qualified teachers. He suggested the establishment of a state Normal School, an institution for the education of teachers, paid for by the state treasury.

In 1866, the State Board of Education was established. Its main duties were to appoint the State Superintendent of Public Instruction, recommend changes in the school law, and make an annual report to legislature. Ellis Apgar was appointed as the first State Superintendent of Public Instruction. His appointment marked the beginning of an active crusade for improvement of schools and for free education. He made a detailed study of all New Jersey schools and provided the legislature with statistics and recommendations in his 1866 report. In the following year, Apgar reported that excellent results were already observable. There was more interest among teachers in improving teaching methods, higher salaries, an increase in the uniformity of textbooks, and the demolition of old school houses and erection of new ones (West, 1964).

Table C.1 shows the trend in school enrollment rates in New Jersey from 1840 to 1880. The enrollment rates are calculated using census data as the total number of students in primary schools, academies, and colleges divided by white population aged 5-19. According to these figures, the percentage of students enrolled in schools increased from 43.69 percent in 1840 to 57.64 percent in 1860 and to 67 percent in 1880.[2]

The development of public education in New Jersey has been a long journey. The goal of this paper is to study the factors the led to this rapid expansion of education in New Jersey focusing on the period between 1850 and 1860. Since the economic and demographic characteristics of nineteenth century New Jersey resembles a lot the economic and demographic characteristics of many developing countries today, having a better understanding of how New Jersey reached this rapid education expansion in this early period may help guide the developing countries that share similar characteristics in their process of developing their education systems. The lessons learned from reviewing the history of education in New Jersey are that appropriating more school funds for the purpose of improving school facilities, increasing teachers salaries and improving school curricula lead to rise in enrollment and attendance rates. Electing state and township superintendents who were responsible for reporting on schools and their problems was also a key to achieving quick progress in education expansion. Another lesson is the importance of better preparation of teachers.

Finally, elite groups, who regarded public education as a universal agency of socialization and promotion of democracy worked to make citizens and parents aware of the importance of sending their children to schools and to promote more interest in supporting the cause of free public education. Due to lack of data on many of these aspects

---

[2]This large shift in enrollment rates from 1870 to 1880 may be, partly, due to different denominators. See Table C.1 footnotes.

during the period of my study, I will only be able to quantitatively examine a few of these factors.

4.4 Data

National data on school enrollment and attainment, teachers, and school finances started to be collected after the establishment of the Bureau of Education in 1867. Hence, most studies focus on the period starting 1870 when administrative school records are available. Nevertheless, some scholars use the US census and the school reports of state boards of education to study the evolution of common schooling and diffusion of mass education before 1870. In studying educational expansion in New Jersey, I use two sources of data. First, data on New Jersey schools come from the Annual Reports of the State Superintendent of Public Schools of New Jersey for years 1850 and 1860 (New Jersey, 1851, 1861). Second, detailed county and state-level historical, demographic, economic, and social data from the 1850 and 1860 censuses as provided by Haines (2010).

I test two proposed hypotheses for the school expansion in New Jersey that took place between 1850 and 1860. The first hypothesis is the human-capital mechanism which predicts an increase in the demand for education and the school attendance as a result of industrialization. The second hypothesis is the socialization mechanism which predicts an increase in the supply of education. This increase is due to the greater immigration flows which led the elite groups to use public education as a socialization device to reduce social, religious and ethnic tensions, lower crime rates and promote democratic values.

I combine the census data and the school reports data for the two years. One limitation of the census data is that the published reports of both the 1850 and 1860 censuses provide only county level information; no information on the township level is reported. Hence, variables that are constructed from the census data are on the county level, while those constructed from the school reports are on the township level.[3] In addition, a limitation of the school reports is that, during the period of study, not all counties returned reports to the state superintendent and not all counties that returned reports had received reports from all townships. This could be the fault of the town superintendent as mentioned in New Jersey (1848). In addition, the state superintendent mentioned in his 1847 report that some townships had not elected town superintendents, which could be another reason for not receiving reports from all townships. New Jersey had an improvement in the number of townships returning reports to the state superintendent between 1850 and 1860: 213 townships in 1860 compared to 182 townships in 1850 had returned reports. Moreover, as shown in Figure C.1, reports that were returned to the state superintendent of public schools suffered from missing observations. Hence, the number of observations differ across different variables. Since townships that have a smaller number of missing observations are expected to be more developed, this missing data problem may result in biased results.[4]

Two dependent variables are examined in this study: the average number of months the schools were open, in other words, the length of school session in months, and the percentage of the school age population attending school during the year. Complicating matters further is the fact that in 1850, the school age population was defined as children between the ages of 5 and 16, while in 1860, the definition was children between the ages of 5 and 18. I examine how changes in economic and demographic variables between 1850 and 1860 affected the change in each of the dependent variables. Hence, I present the first-difference results. The advantage of the first-difference models is that they are controlling for all unobserved time-invariant townships effects. In addition, I present the cross-section results for each of the two years. The advantage of cross-section models is that they enable us to see the effects that are due to geographical variation at a certain point in time.

As shown in Figure C.1, the 1860 school report provided information on the "whole number of children attended school". In addition to the number of children attended

---

[3]All reported regressions are clustered at the county level.

[4]I will discuss the possible effects and different ways to deal with this problem below.

school, the 1850 school report provided information on the "whole number of children taught". For the 1850 cross-section, I use the percentage of "children taught" during the year to school-age population as a proxy for school attendance. This procedure is due to missing data on the number of children attending school in 1850. There is no information provided in the school reports on the difference between number of children taught and number of children attending school. It could be that the number of children attending school represents the school enrollment, while number of children taught represents the actual number of children who attended school during the year.[5] During this period the length of school session was determined by local school committees, hence length of school session is a measure of supply of education (Field, 1979). On the other side, school attendance decisions are determined by households. Hence, the percentage of children attending school is a a measure of demand for education (Field, 1979).

I control for economic and demographic factors. These variables include the percentage of the population that is foreign-born, the percentage of the population employed in manufacturing, the percentage of the population living in towns 2,500 and over (urbanization), the improved farmland-per-family, the number of churches in each county, and the share of Roman Catholic churches. All these variables are on the county level. In addition, I control for the amount of money appropriated for school purposes and average tuition per quarter. These variables are on the township level.

According to the socialization mechanism, local school committees which consist of elite groups, such as merchants, professionals and manufacturers, will increase the supply for schooling the greater the immigration flows. Hence, the length of school session is expected to be positively related with percentage foreign born. On the other hand, the

[5]To assess whether townships with missing data on number of children taught and townships with non-missing data differ in observable characteristics, I present the summary statistics of each group in Table C.11. Townships with missing data have larger fractions of foreign born, greater shares employed in manufacturing, more urbanization, more money appropriations, higher average tuition, and less improved farmland per family than other townships. Regression results when using percentage of school attendance as a dependent variable for year 1850 are reported in Table C.12 and results when using percentage of children taught as a dependent variable only for the sample that has non-missing attendance information are reported in Table C.13. Both tables show similar results, though percentage of foreign born has a stronger effect on the percentage of school attendance than on the percentage of children taught. In addition, urbanization has a positive and significant effect on the percentage of school attendance, while no significant effect on percentage of children taught. These differences may be explained by the different nature of each sample.

percentage foreign born is expected to be negatively related with school attendance. This can be due to two reasons. One is the high opportunity cost of sending children to school rather than working and helping their families with their living expenses. The other is the potential distrust of public schools by some religious groups. Other religious leaders at that time feared the secular influence of the public schools (West, 1964).

Since most manufactures at this period required predominantly unskilled labor, I expect that the higher the percentage of the population employed in manufacturing, the lower the demand for education, due to higher opportunity cost of going to school rather than working in factories. Similarly, I expect a negative effect on the supply of education. Manufacturers on the local school committees would have had less incentive for promoting longer school sessions. The percentage of the population living in towns of 2,500 and over is used as a proxy for urbanization (Kaestle and Vinovskis, 1974). According to the human-capital mechanism, the higher the degree of urbanization, the higher the demand for education and hence the higher the percentage of school attendance. Moreover, I expect the degree of urbanization to be positively related with the supply of education and hence with the length of school session. Improved farmland-per-family can be a proxy for two things. On one hand, it can proxy for the degree of agricultural activities in the county. Accordingly, it is expected to be negatively related with both supply and demand for education due to the high opportunity cost of going to school and not working in farms. On the other hand, it can be a proxy for rural wealth. Greater wealth is expected to be positively related with both supply and demand for education. In their study of high school movement in Iowa at the beginning of the twentieth century, Goldin and Katz have found great returns to education above "common schooling" within the agricultural sector. They attribute this observation to the widespread support of education from the agricultural population (Goldin and Katz, 2000).

Table C.2 shows the summary statistics for all dependent and independent variables for both years 1850 and 1860. On average, around 67 percent of the school-age population were taught, and around 74 percent were attending public schools in New Jersey in 1850. Public school attendance improved and reached 90 percent in 1860. There was a slight improvement in the length of school session from around 8.8 months in 1850 to around 9.3 months in 1860. The average percentage of foreign-born rose from around 9.4 percent in 1850 to around 13.4 percent in 1860. The average percentage of population employed in manufacturing also increased from around 5.9 percent in 1850 to around 6.4 percent in 1860. The average percentage of population living in towns 2,500 and over increased from 4 percent in 1850 to 6.7 percent in 1860, which shows growth in urbanization. The average percentage of churches that were Roman Catholic almost doubled between 1850 and 1860, reflecting Irish immigration. Finally, there was an improvement in school accessibility between 1850 and 1860, as average tuition declined from 2.4 dollars per quarter in 1850 to 1.7 dollars per quarter in 1860.[6]

4.5 Empirical Results

Tables C.3 and C.4 display the correlation coefficients between all dependent and independent variables. These figures can give us some preliminary insights into the relationship between both dependent and independent variables. According to these estimates, the percentage of children taught in 1850 and percentage of school attendance in 1860 are negatively correlated with the percentage of the population foreign-born, the percentage of the population employed in manufacturing and the percentage of the population living in towns 2,500 and over. The same two dependent variables are positively correlated with improved farmland-per-family and the amount of money appropriated for school purposes. The length of school session is positively correlated with all independent variables, except improved farmland-per-family. Since these correlation coefficients are inadequate in establishing a relationship between our variables of interest, multiple regressions are estimated for both dependent variables.

Table C.5 presents the results of regressing the change in the length of school session between 1850 and 1860 on changes in all independent variables between 1850 and 1860. There is a consistent positive relationship between the first difference of the length of school session and the first difference of the percentage of foreign-born population. This

[6]These changes are in real terms. The real wage indices showed slight increase between 1850 and 1860; from 97.4 to 100 (Margo 2000, P.71).

relationship is only statistically significant though in model number 4 after we include the amount of money appropriated for school purposes. This means that towns with growing immigrant population observed longer school sessions in 1860 compared to 1850. On average, a 10 percentage points increase in the percentage of foreign-born between 1850 and 1860 resulted in opening public schools one month and nine days more in 1860. This can be regarded as an evidence for the socialization mechanism. It conforms with what was found for Massachusetts in 1855 (Field, 1979). During this period, elite groups perceived public education as a device to promote democracy, reduce tensions between different religious and ethnic groups, and transform immigrant newcomers into American citizens (West, 1964).

Changes in both the percentage of population employed in manufacturing and improved farmland per family between 1850 and 1860 do not seem to have affected the length of school session between both years. Moreover, urbanization has a consistent negative and significant effect over all models on the length of school session. On average, a 10 percentage points increase in the degree of urbanization between 1850 and 1860 led to opening public schools from 9 to 18 fewer days. This result is inconsistent with the common urbanization argument, which states that the more developed and industrialized a town is, the higher the demand and wages for skilled workers and hence the higher the demand for education. Simultaneously, higher levels of urbanization should increase the desire of elite groups to increase the length of school session in order to reduce crime rates and facilitate access to receiving higher levels of education. Hence, we should expect increase in urbanization levels to increase the length of school session between both years, but the opposite relationship is found. One explanation for this negative relationship could be that manufactures and industries in New Jersey during this period mostly required unskilled workers. This suggests that manufacturers on school committees during this period might have wanted to insure access to child labor and hence push for shorter school sessions. Tuttle (1970), P.11, has found that the percentage of unskilled workers to working males increased from 19 percent to 27 percent between 1850 and 1860 in Perth Amboy, New Jersey. This increase might have taken place in other New Jersey cities too. Therefore, the negative effect of an increase in industries that required unskilled workers might have outweighed the positive effect of urbanization on school sessions.

The increase in the number of churches per county that took place between 1850 and 1860 led to longer school sessions in 1860 compared to 1850. This result suggests that churches may have pressured boards to increase the length of school sessions, supporting the socialization hypothesis. Finally, average tuition was negatively related to term length. However, average tuition per quarter might suffer from an endogeneity problem, resulting in biased results. The length of school session and tuition per quarter were jointly determined by local school committees. In some townships, money appropriated for schools were used to open schools for free for several months, and then when the money ran out, schools were either closed or tuition was charged to the parents who were still sending their children to school (West, 1964). Hence, there may exist unobserved factors that simultaneously affect both length of school session and tuition per quarter, which may result in biased estimates.

Tables C.6 and C.7 display the cross-section results for the multiple regressions estimated for the length of school session for years 1850 and 1860, respectively. These results are mostly consistent with the first difference results, with a few exceptions. First, improved farmland-per-family has a consistent positive and significant effect on the length of school session for both years. This means that the positive wealth effect of having more improved farmlands outweighs the negative opportunity cost effect that is due to having more improved farmlands. On average, increasing improved farmland per family by ten acres results in opening public schools a half more month. On the other side, the decrease in the improved farmland per family between 1850 and 1860 does not seem to have affected the length of school session between both years.

Second, the amount of money appropriated for school purposes has a consistent positive and significant effect on the length of the school session. On average, appropriating $1,000 more for school purposes results in opening public schools 15 more days in 1850 and 3 more days in 1860. Hence, as seen in Table C.5, the increase in the amount of money appropriated for school purposes between 1850 and 1860 led to a decrease in the length of school session between both years.

Third, the change in the direction of the relationship between the length of school session and both the percentage of population employed in manufacturing and level of urbanization between 1850 and 1860 conforms with our first difference results presented earlier and could be attributed to the increase in manufacturing firms that required unskilled workers between 1850 and 1860.

Table C.8 presents the first difference results of the multiple regressions estimated for the change in percentage of school attendance between 1850 and 1860.[7] There is a consistent negative and significant relationship between demand for education and the change in percentage of foreign-born population. On average, a one percentage point increase in the percentage of foreign-born between 1850 and 1860 resulted in around 14 percentage points decrease in percentage of school attendance in 1860 compared to 1850. This means that families in towns with high concentrations of immigrants have lower incentive to send their children to school. This may be the result of higher poverty rates among immigrants and social tensions that were due to differences in religious practices, traditions and customs. In addition, there is a consistent negative and significant relationship between the change in improved farmland-per-family and the change in the percentage of school attendance. This means that the decrease in improved farmlands per family that took place between 1850 and 1860 led to an increase in the percentage of school attendance between both years. This could be due to the decrease in the opportunity cost of going to school rather than working in farms that resulted from the declining importance of agriculture.

Moreover, the increase in urbanization levels that took place between 1850 and 1860 led to an increase in the demand for education. A 10 percentage points increase in the percentage of population living in towns 2,500 and over between both years resulted in around 15 percentage points increase in percentage of children attending school in 1860 compared to 1850. This result conforms with the human-capital mechanism, where higher levels of urbanization and industrialization lead to higher wages for educated workers and hence a higher demand for education. In contrast, Field (1979) did not

[7]First difference results estimated for the difference between percentage of children attending schools in 1860 and percentage of children taught in 1850 are presented in Table C.14.

find any evidence for the human-capital mechanism in Massachusetts in 1855. Neither the change in the share of churches that are Roman Catholic, nor the change in average tuition per quarter has any significant effects on change in percentage of school attendance between 1850 and 1860.

Tables C.9 and C.10 display the cross-section results for the multiple regressions estimated for percentage of children taught in 1850 and percentage of children attending schools in 1860. Most of these results conform with the first difference results. One exception is that the higher the percentage of the population employed in manufacturing, the lower the demand for education in both years, though this effect is weaker and not always significant in 1860. A 10 percentage points increase in percentage of population employed in manufacturing results in approximately a 10 percentage points decrease in percentage of children taught or attended school. This can be explained by the increase in opportunity cost of going to school rather than working and adding to family income.

4.6 Conclusion

The goal of this paper is to study the factors the led to the rapid expansion of education in New Jersey in the nineteenth century. To test for some of the determinants of this increase, I construct a panel dataset using both the census data and data from the annual report of the State Superintendent of New Jersey public schools. I control for a set of demographic and economic variables to test for both the human-capital mechanism and the socialization mechanism that were proposed by Field (1979) in his study on education expansion in Massachusetts in 1855. My results support both mechanisms for New Jersey in 1850 and 1860. The human-capital mechanism states that the new technologies, which were developed as a result of industrialization, result in an increase in the demand for skilled and educated labor, and hence, wages for educated workers increase. As a result, the incentive to invest in schooling increases and school enrollment and attendance rates rise. My results show that counties that were more urban and more industrialized observed higher school attendance rates. On the other side, the socialization mechanism states that the demographic, geographical and occupational shifts that resulted from industrialization led the elite groups to view public schooling as an agency of socialization, and this was done through lengthening school sessions. Conforming with the socialization mechanism, I find that counties with more immigrants and more state appropriations had longer school sessions.

Appendix A

Tables and Figures of Chapter 2

A.1 Tables

Table A.1: Summary statistics for child outcome variables

	1998		2006	
	Mean/SD	N	Mean/SD	N
Child aged 6 to 11 years old is currently attending school	.925	3019	0.954	3752
	(0.243)		(0.226)	
Child aged 12 to 14 years old is currently attending school	0.852	1770	0.911	1913
	(0.330)		(0.307)	
Child aged 15 to 17 years old is currently attending school	0.748	1656	0.799	2160
	(0.396)		(0.435)	
Child's years of schooling based on current grade	4.999	6439	5.176	7825
	(3.330)		(3.921)	

Summary statistics based on weighted data
Standard deviations in parentheses

Table A.2: Summary statistics for independent variables

	1998 Mean/SE	2006 Mean/SE
Child's age	11.780	11.695
	(3.045)	(3.703)
Child is a girl	0.484	0.482
	(0.461)	(0.540)
Household size	7.034	6.515
	(2.546)	(2.694)
Age of head of household	47.058	46.520
	(9.247)	(11.867)
Metropolitan region	0.215	0.156
	(0.379)	(0.393)
Urban lower Egypt	0.093	0.086
	(0.268)	(0.303)
Rural lower Egypt	0.338	0.334
	(0.436)	(0.510)
Urban upper Egypt	0.073	0.122
	(0.240)	(0.354)
Rural upper Egypt	0.281	0.302
	(0.414)	(0.497)
Child goes to primary school walking	0.990	0.972
	(0.093)	(0.179)
Duration to prim school (in mins)	8.980	10.768
	(5.991)	(6.571)
Child goes to preparatory school walking	0.918	0.908
	(0.253)	(0.313)
Duration to prep school (in mins)	11.235	12.642
	(7.019)	(7.662)
Child goes to secondary school walking	0.550	0.460
	(0.459)	(0.540)
Duration to secondary school (in mins)	16.001	18.083
	(10.334)	(11.170)

Summary statistics based on weighted data
Standard deviations in parentheses

Table A.3: Summary statistics for independent variables - Continued

	1998 Mean/SE	2006 Mean/SE
Mother's age	39.133	39.115
	(6.701)	(7.944)
Mother's age at first marriage	19.013	19.689
	(3.687)	(4.345)
Father is present	0.891	0.873
	(0.288)	(0.360)
Father's age	41.190	39.928
	(15.144)	(18.386)
Father's age at first marriage	23.086	22.800
	(8.782)	(10.597)
Father has low level of education	0.666	0.564
	(0.435)	(0.536)
Father has medium level of education	0.194	0.281
	(0.364)	(0.486)
Father has high level of education	0.139	0.153
	(0.319)	(0.390)
Gini coefficients	26.170	28.054
	(4.561)	(7.752)

Summary statistics based on weighted data
Standard deviations in parentheses

Table A.4: 2006 Results: Dependent variable is school enrollment for age group 6-11

	(1)	(2)	(3)
Father has low level of education	-.03196***	-.03186***	-.05489*
	(.00883)	(.00881)	(.03162)
Father has high level of education	.02362**	.02367**	.05544
	(.011)	(.01086)	(.04111)
Gini coefficients (2004)		.00024	-.00022
		(.00033)	(.00084)
Father low education * Gini			.00083
			(.00108)
Father high education * Gini			-.00104
			(.00135)
Child's age	.01461***	.01464***	.01468***
	(.00267)	(.0027)	(.0027)
Child is a girl	-.01987***	-.01983***	-.01985***
	(.00734)	(.00731)	(.00735)
Household size	-.00058	-.00054	-.00054
	(.0014)	(.00142)	(.00141)
Number of siblings	-.00297	-.00294	-.00294
	(.00283)	(.00284)	(.00286)
Age of head of household	.00023	.00024	.00023
	(.00045)	(.00045)	(.00045)
Child goes to primary school walking	.00111	.00196	-.00057
	(.01488)	(.01488)	(.01501)
Duration to prim school (in mins)	-8.6e-05	-.0001	-.0001
	(.00043)	(.00043)	(.00043)
Mother's age	-.0002	-.00021	-.00022
	(.00087)	(.00087)	(.00086)
Mother's age at first marriage	.00045	.00044	.00043
	(.00138)	(.00139)	(.00137)
Father's age	-.00058	-.00059	-.00061
	(.00098)	(.00098)	(.00098)
Father's age at first marriage	.00209***	.00209***	.00206***
	(.00078)	(.00078)	(.00077)
Father is present	-.02642	-.02637	-.02532
	(.03575)	(.03572)	(.03583)
Metropolitan region	.04975***	.0474***	.04878***
	(.01128)	(.01121)	(.01151)
Urban lower Egypt	.02303	.02379	.02317
	(.01772)	(.01799)	(.01818)
Rural lower Egypt	.04809***	.049***	.04897***
	(.0079)	(.00814)	(.00818)
Urban upper Egypt	.01058	.00991	.00988
	(.00811)	(.00821)	(.00837)
Observations	3749	3749	3749
Adjusted Pseudo R^2	.13641	.13653	.13749
Likelihood ratio test		312.15	2560.1

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table A.5: 2006 Results: Dependent variable is school enrollment for age group 12-14

	(1)	(2)	(3)
Father has low level of education	-.14098***	-.14087***	-.1116
	(.02459)	(.02451)	(.07682)
Father has high level of education	.04036	.04053	.13286
	(.03371)	(.03376)	(.10946)
Gini coefficients (2004)		-.00027	.00075
		(.00085)	(.00274)
Father low education * Gini			-.00107
			(.00272)
Father high education * Gini			-.00312
			(.00291)
Child's age	-.03731***	-.03738***	-.03742***
	(.00866)	(.00881)	(.00885)
Child is a girl	-.01749	-.01761	-.01743
	(.01533)	(.01543)	(.01544)
Household size	.00163	.00156	.00155
	(.00302)	(.00311)	(.00308)
Number of siblings	-.00828	-.00832*	-.00829*
	(.00505)	(.00499)	(.00496)
Age of head of household	.00079	.00079	.0008
	(.00086)	(.00086)	(.00087)
Child goes to preparatory school walking	.03235	.03201	.03206
	(.03297)	(.0333)	(.03341)
Duration to prep school (in mins)	-.00045	-.00045	-.00046
	(.00122)	(.00123)	(.0012)
Mother's age	-.00191	-.00192	-.00192
	(.00135)	(.00135)	(.00135)
Mother's age at first marriage	.00285	.00285	.00287
	(.00234)	(.00233)	(.00233)
Father's age	-.00064	-.00064	-.00065
	(.00085)	(.00085)	(.00084)
Father's age at first marriage	-.00114	-.00114	-.00114
	(.00163)	(.00162)	(.00162)
Father is present	.06084	.06093	.06088
	(.05182)	(.05182)	(.0513)
Metropolitan region	.05209**	.05453**	.05502**
	(.02335)	(.02549)	(.02567)
Urban lower Egypt	-.00243	-.00312	-.00328
	(.03111)	(.03113)	(.03103)
Rural lower Egypt	.04491***	.04397***	.04405***
	(.01142)	(.0106)	(.01057)
Urban upper Egypt	.04535*	.04657*	.04688*
	(.02481)	(.02628)	(.02637)
Observations	1911	1911	1911
Adjusted Pseudo R^2	.1787	.17874	.179
Likelihood ratio test		92.8	550.21

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table A.6: 2006 Results: Dependent variable is school enrollment for age group 15-17

	(1)	(2)	(3)
Father has low level of education	-.17384***	-.17377***	-.35652***
	(.02026)	(.02014)	(.08598)
Father has high level of education	.19947**	.19911**	-.28727**
	(.07785)	(.07783)	(.13561)
Gini coefficients (2004)		-.00079	-.00606**
		(.00153)	(.00274)
Father low education * Gini			.00622**
			(.00251)
Father high education * Gini			.01697***
			(.00441)
Child's age	-.02634**	-.02635**	-.02648**
	(.01184)	(.01183)	(.01185)
Child is a girl	-.03052	-.03069	-.03027
	(.02793)	(.02796)	(.02747)
Household size	-.00935	-.00944	-.00941
	(.00634)	(.00633)	(.00627)
Number of siblings	-.0101	-.01031	-.01039
	(.00652)	(.00651)	(.00656)
Age of head of household	.00102	.00102	.00095
	(.00106)	(.00106)	(.00106)
Child goes to secondary school walking	-.0315*	-.03168*	-.03351*
	(.01883)	(.01875)	(.01888)
Duration to secondary school (in mins)	-7.1e-05	-7.4e-05	-3.5e-05
	(.00128)	(.00128)	(.00129)
Mother's age	-.00055	-.00053	-.00047
	(.00207)	(.00208)	(.00208)
Mother's age at first marriage	-.00063	-.00063	-.00078
	(.00324)	(.00324)	(.00325)
Father's age	-.00276	-.00283	-.00267
	(.00229)	(.00234)	(.00235)
Father's age at first marriage	.0066**	.00665**	.00666**
	(.0026)	(.00264)	(.00264)
Father is present	.00647	.00905	.00138
	(.08941)	(.0911)	(.09231)
Metropolitan region	.02919	.03692	.03661
	(.04669)	(.04739)	(.04663)
Urban lower Egypt	.12586**	.12339**	.12228**
	(.05947)	(.05963)	(.06053)
Rural lower Egypt	.06118***	.05828**	.0581**
	(.02154)	(.02283)	(.02306)
Urban upper Egypt	.07852*	.08145*	.08395*
	(.04432)	(.04591)	(.04492)
Observations	2159	2159	2159
Adjusted Pseudo R^2	.14043	.14054	.1433
Likelihood ratio test		480.16	11221

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table A.7: 2006 Results: Dependent variable is child's years of schooling based on current grade

	(1)	(2)	(3)
Father has low level of education	-.56292***	-.5652***	-.94319***
	(.06047)	(.06101)	(.19304)
Father has high level of education	.08477*	.07737*	-.07591
	(.0426)	(.04279)	(.13236)
Gini coefficients (2004)		.01257**	.00461
		(.00489)	(.00552)
Father low education * Gini			.01357**
			(.00624)
Father high education * Gini			.00559
			(.00463)
Child's age	.93723***	.93714***	.93704***
	(.01567)	(.01563)	(.01565)
Child is a girl	-.11458	-.11188	-.11288
	(.08197)	(.08142)	(.08116)
Household size	-.04542*	-.04387*	-.0437*
	(.02192)	(.02236)	(.02231)
Number of siblings	-.05735	-.05461	-.05456
	(.03407)	(.03392)	(.03429)
Age of head of household	.00852**	.00872**	.00855**
	(.00352)	(.00351)	(.00358)
Mother's age	-.01349	-.01363*	-.01342
	(.00789)	(.00783)	(.00783)
Mother's age at first marriage	.00313	.0029	.00321
	(.01284)	(.01315)	(.01314)
Father's age	-.00026	-.00023	-.00018
	(.00614)	(.00617)	(.00625)
Father's age at first marriage	.00067	.00077	.00047
	(.00737)	(.00733)	(.00737)
Father is present	.0758	.07124	.07581
	(.22453)	(.22997)	(.23234)
Metropolitan region	.47328***	.35507***	.36245***
	(.11779)	(.09534)	(.09698)
Urban lower Egypt	.53718***	.57984***	.57151***
	(.13459)	(.13853)	(.13787)
Rural lower Egypt	.41515***	.46291***	.46144***
	(.12631)	(.12166)	(.12119)
Urban upper Egypt	.48043***	.43643***	.43691***
	(.08999)	(.09373)	(.09226)
Constant	-5.2533***	-5.6179***	-5.3976***
	(.41919)	(.35637)	(.42766)
Observations	7819	7819	7819
Adjusted R^2	.76214	.76246	.76253

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table A.8: 1998 Results of baseline models for all four dependent variables; school enrollment for age group: (1) 6-11, (2) 12-14, (3) 15-17 and (4) years of schooling

	(1) Probit	(2) Probit	(3) Probit	(4) OLS
Father has low level of education	-.22342***	.17341	-.21346	-1.352***
	(.0596)	(.19929)	(.25466)	(.3494)
Father has high level of education	.03777	.47333**	.16669	.73098***
	(.09618)	(.19201)	(.20811)	(.20484)
Gini95/96	-.0033	.0057	.00172	-.01571
	(.00282)	(.0059)	(.00773)	(.01161)
Father low education * Gini95/96	.0042**	-.01468**	-.00348	.01785
	(.00208)	(.0072)	(.00926)	(.01247)
Father high education * Gini95/96	-.00109	-.01617**	.00554	-.02083***
	(.00309)	(.00636)	(.0057)	(.00712)
Child is a girl	-.05814***	-.07311***	-.06659*	-.36828***
	(.01368)	(.02162)	(.03517)	(.11333)
Adjusted R^2	.15184	.15457	.16577	.64106

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table A.9: Summary statistics for additional independent variables

	1998 Mean/SE	2006 Mean/SE
Father is self-employed (Binary)	0.266	0.304
	(0.407)	(0.498)
Father is waged employee (Binary)	0.557	0.516
	(0.458)	(0.541)
Father is unemployed (Binary)	0.083	0.052
	(0.254)	(0.240)
Father's earnings from wages	3319.637	4466.698
	(5494.88)	(16892.07)
Father working in public sector (Binary)	0.378	0.236
	(0.447)	(0.459)
Mother is self-employed (Binary)	0.053	0.194
	(0.206)	(0.428)
Mother is waged employee (Binary)	0.123	0.146
	(0.303)	(0.382)
Mother is unemployed (Binary)	0.470	0.396
	(0.460)	(0.529)
Mother's earnings from wages	413.428	998.290
	(1261.151)	(10703.57)
Mother working in public sector (Binary)	0.107	0.132
	(0.285)	(0.366)
Primary student/teacher ratio	24.287	12.768
	(3.283)	(2.849)
Preparatory student/teacher ratio	22.815	12.193
	(4.038)	(3.158)
Primary average class size	42.987	41.491
	(3.192)	(3.357)
Preparatory average class size	44.068	42.013
	(2.664)	(3.714)
Percentage of unfit school buildings	23.619	21.188
	(4.338)	(6.429)

Summary statistics based on weighted data
Standard deviations in parentheses

Table A.10: 2006 Results: Dependent variable is school enrollment for age group 15-17 - Robustness checks

	(1)	(2)	(3)	(4)	(5)
Father has low level of education	-.35652***	-.33378***	-.33324***	-.36594***	-.33737***
	(.08598)	(.08855)	(.08866)	(.08951)	(.0859)
Father has high level of education	-.28727**	-.31816**	-.31957**	-.28097**	-.28041**
	(.13561)	(.1281)	(.13)	(.13606)	(.13487)
Gini coefficients (2004)	-.00606**	-.00585**	-.00596**	-.00648**	-.00179
	(.00274)	(.00278)	(.00276)	(.00281)	(.00261)
Father low education * Gini	.00622**	.00587**	.00592**	.00658**	.00569**
	(.00251)	(.00252)	(.00257)	(.00269)	(.00253)
Father high education * Gini	.01697***	.01741***	.01738***	.01662***	.01655***
	(.00441)	(.00441)	(.00446)	(.00441)	(.00427)
Father's work charact w/o income	No	Yes	No	No	No
Father's work charact with income	No	No	Yes	No	No
School types	No	No	No	Yes	No
Quality of educ institutions proxies	No	No	No	No	Yes
Observations	2159	2159	2159	2159	2159
Adjusted Pseudo R^2	.1433	.14657	.14696	.14498	.15096

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table A.11: 2006 Results: Dependent variable is school enrollment for age group 15-17 using mother's education level

	(1)	(2)	(3)
Mother has low level of education	-.33641***	-.33622***	-.46696***
	(.04248)	(.04236)	(.12686)
Gini coefficients (2004)		-.00058	-.00442
		(.00157)	(.00362)
Mother low education * Gini			.00408
			(.00344)
Child's age	-.0255**	-.02549**	-.02562**
	(.01185)	(.01185)	(.01186)
Child is a girl	-.02699	-.0271	-.02711
	(.026)	(.026)	(.02612)
Household size	-.01011	-.01017	-.01018
	(.00637)	(.00636)	(.00635)
Number of siblings	-.00915	-.00931	-.00918
	(.00616)	(.00613)	(.00612)
Age of head of household	.00142	.00142	.00141
	(.00113)	(.00113)	(.00112)
Child goes to secondary school walking	-.02377	-.02387	-.02429
	(.01723)	(.01722)	(.01711)
Duration to secondary school (in mins)	-.00028	-.00028	-.00026
	(.00132)	(.00133)	(.00133)
Mother's age	-.00046	-.00044	-.00043
	(.00199)	(.002)	(.002)
Mother's age at first marriage	-.00085	-.00085	-.00082
	(.00353)	(.00353)	(.00354)
Father's age	-.00358	-.00362	-.00356
	(.00238)	(.00243)	(.00245)
Father's age at first marriage	.00624**	.00627**	.00622**
	(.00296)	(.003)	(.00303)
Father is present	.05378	.05551	.05389
	(.08944)	(.09115)	(.09097)
Metropolitan region	-.0047	.00115	.00352
	(.05469)	(.05505)	(.05569)
Urban lower Egypt	.08885	.08729	.08533
	(.05523)	(.05527)	(.05555)
Rural lower Egypt	.04696**	.04491*	.04507*
	(.02229)	(.02331)	(.02329)
Urban upper Egypt	.06509	.06719	.06728
	(.04482)	(.04644)	(.04611)
Observations	2160	2160	2160
Adjusted Pseudo R^2	.1417	.14176	.14211
Likelihood ratio test		248.05	1425.2

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table A.12: 2006 Results: Dependent variable is high school enrollment

	(1)	(2)	(3)
Father has low level of education	-.2211***	-.22085***	-.29347***
	(.02234)	(.02209)	(.09245)
Father has high level of education	.03881	.03916	.01444
	(.04585)	(.04553)	(.15206)
Gini coefficients (2004)		-.00106	-.00294
		(.00197)	(.00351)
Father low education * Gini			.00253
			(.00274)
Father high education * Gini			.00092
			(.00481)
Child's age	.06156***	.0615***	.06133***
	(.00967)	(.00969)	(.00974)
Child is a girl	.02025	.01981	.01948
	(.02633)	(.02654)	(.02614)
Household size	-.00939	-.00953*	-.00948*
	(.00578)	(.00578)	(.00576)
Number of siblings	-.01712**	-.01741**	-.01742**
	(.008)	(.00794)	(.00797)
Age of head of household	.00058	.00058	.00055
	(.00121)	(.0012)	(.0012)
Child goes to secondary school walking	-.01188	-.01202	-.01227
	(.02247)	(.02253)	(.0224)
Duration to secondary school (in mins)	.00092	.00093	.00095
	(.0011)	(.00111)	(.00111)
Mother's age	.00024	.00028	.00033
	(.00267)	(.00268)	(.00269)
Mother's age at first marriage	-.00101	-.00102	-.00099
	(.00374)	(.00373)	(.00379)
Father's age	-.00207	-.00216	-.00208
	(.0025)	(.00253)	(.00251)
Father's age at first marriage	.00622**	.00626**	.00621**
	(.00277)	(.0028)	(.0028)
Father is present	-.02562	-.02188	-.025
	(.10596)	(.10754)	(.10657)
Metropolitan region	.07355	.08362*	.0848*
	(.04868)	(.04822)	(.04927)
Urban lower Egypt	.16161***	.15807**	.15701**
	(.05936)	(.06175)	(.06193)
Rural lower Egypt	.10906***	.10516***	.1057***
	(.03459)	(.03819)	(.03848)
Urban upper Egypt	.08338*	.08743*	.08864*
	(.04634)	(.04667)	(.04659)
Observations	2159	2159	2159
Adjusted Pseudo R^2	.12417	.1243	.12455
Likelihood ratio test		692.79	1191.9

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

A.2 Figures

Figure A.1: 2006 Probability of school enrollment for age group (15-17)

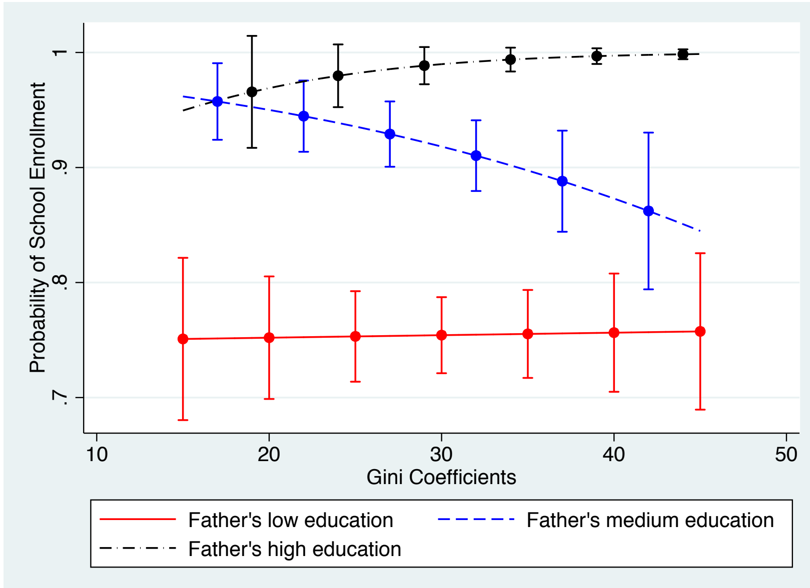
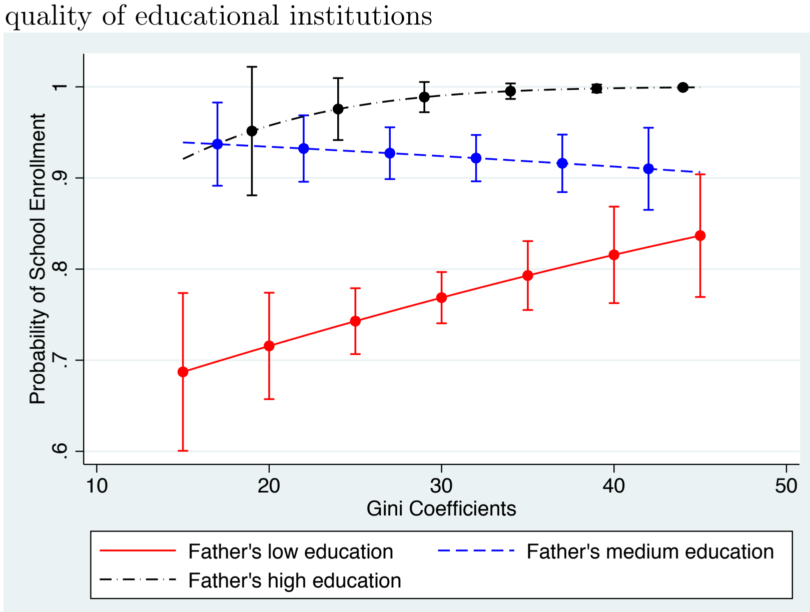


Figure A.2: 2006 Probability of school enrollment for age group (15-17) after including proxies for quality of educational institutions



Appendix B

Tables and Figures of Chapter 3

B.1 Tables

Table B.1: Summary statistics for child outcome variables

	1998		2006	
	Mean/SE	N	Mean/SE	N
Child has ever been enrolled in school (age 6-19)	0.933	5271	0.950	9325
	(0.234)		(0.228)	
Child is currently enrolled in school (age 6-19)	0.776	5271	0.794	9325
	(0.392)		(0.424)	
Child has completed primary school (age 11-19)	0.758	3962	0.742	6225
	(0.403)		(0.459)	
Child is overaged (age 8-19)	0.284	4516	0.502	8135
	(0.424)		(0.524)	

Summary statistics based on weighted data
Standard deviations in parentheses

Table B.2: Summary statistics for independent variables

	1998 Mean/SE	2006 Mean/SE
Child's age	12.670	12.764
	(3.590)	(4.185)
Child is girl	0.490	0.478
	(0.467)	(0.522)
Child lives in rural area	0.474	0.628
	(0.466)	(0.505)
Number of siblings		3.462
		(1.911)
Household size	6.663	6.458
	(2.522)	(2.560)
Age of head of household	47.622	47.773
	(9.187)	(10.314)
Father is present	0.882	0.864
	(0.301)	(0.358)
Child goes to primary school walking	0.989	0.972
	(0.098)	(0.171)
Duration of a one-way journey to primary school	8.843	10.689
	(5.430)	(6.276)
Child goes to preparatory school walking	0.901	0.908
	(0.279)	(0.301)
Duration of a one-way journey to preparatory school	11.309	12.573
	(6.640)	(7.371)
Mother's age at first marriage	19.501	19.696
	(3.824)	(4.207)
Mother is working	0.262	0.602
	(0.410)	(0.511)
Mother's working hours per week (All mothers)	9.431	11.263
	(15.798)	(15.789)
Mother's working hours per week (Working mothers only)	36.117	18.655
	(10.989)	(15.681)
Mother has no schooling	0.617	0.594
	(0.454)	(0.513)
Mother completed primary school	0.081	0.072
	(0.255)	(0.270)
Mother completed secondary school	0.149	0.198
	(0.332)	(0.416)
Mother obtained intermediate, university or higher than university	0.113	0.089
	(0.296)	(0.298)
Mother's marital status (1 if married, 0 if divorced or widowed)	0.927	0.911
	(0.243)	(0.298)
Household annual income	4797.059	5695.284
	(7224.992)	(12802.47)
Unemployment rate (age 15-64)	7.652	10.567
	(2.847)	(2.753)
Female employment rate (age 15-64)	13.887	18.052
	(6.120)	(6.753)
Average per capita annual income	3649.954	2939.173
	(1300.53)	(947.207)
Female labor force (age 15-64) in hundreds	2328.069	3046.911
	(1103.657)	(1596.016)

Summary statistics based on weighted data
Standard deviations in parentheses

Table B.3: 1998 and 2006 Probit and IV Probit marginal effects: Dependent variable is that children aged 6-19 have ever been enrolled in school

	1998		2006	
	Probit	IVProbit	Probit	IVProbit
Mother's working hours per week	-.00044*	-.01169***	-.00014	-.00723***
	(.00023)	(.00306)	(.00021)	(.00209)
Child's age	.00104	.00364***	.00131**	.00337***
	(.00079)	(.00135)	(.00064)	(.00109)
Child is girl	-.0403***	-.04723***	-.02693***	-.03722***
	(.00676)	(.01034)	(.00473)	(.007)
Child lives in rural area	-.04892***	-.02483	-.01483**	.00196
	(.00829)	(.01857)	(.00595)	(.01066)
Household size	-.00253*	-.00376**	-.00321**	-.00394**
	(.00143)	(.00187)	(.00132)	(.00198)
Number of siblings			-.00482***	-.00667***
			(.00162)	(.0025)
Age of head of household	-.00011	-.00078	5.2e-05	.00044
	(.00037)	(.00061)	(.0003)	(.00047)
Father is present	.00559	.02859	.00257	-.01787
	(.01817)	(.03464)	(.01265)	(.02096)
Child goes to primary school walking	-.0028	-.02445	-.00342	-.00282
	(.02956)	(.05722)	(.0187)	(.03137)
Duration of a one-way journey to primary school	-7.3e-05	.0002	-.00093*	-.00129
	(.0009)	(.00159)	(.00051)	(.00078)
Child goes to preparatory school walking	.01603	.0097	.00686	.0146
	(.01243)	(.02121)	(.00886)	(.01336)
Duration of a one-way journey to preparatory school	.00037	-.00076	.00046	.00035
	(.00086)	(.00147)	(.00045)	(.00068)
Mother's age at first marriage	.00111	.00459**	8.0e-05	.00229
	(.00114)	(.00202)	(.00082)	(.00141)
Mother has no schooling	-.09136***	-.09595**	-.03371**	-.03705
	(.03117)	(.04009)	(.01535)	(.02428)
Mother completed primary school	.01362	.01718	.00821	.0037
	(.042)	(.05525)	(.01869)	(.02867)
Mother completed secondary school	-.02501	.16574**	.01266	.07617**
	(.03267)	(.068)	(.01666)	(.03146)
Mother completed intermediate or higher	.00814	.27761***	.02263	.16174***
	(.03691)	(.08314)	(.0202)	(.04898)
Mother's marital status	.01752	-.03615	.00688	.01405
	(.02086)	(.04178)	(.01424)	(.02325)
Household annual income	-3.5e-07	-4.7e-07	1.1e-06	1.2e-06
	(4.1e-07)	(7.0e-07)	(7.9e-07)	(1.1e-06)
Observations	5271	5271	9260	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.4: 1998 and 2006 Probit and IV Probit marginal effects: Dependent variable is that children aged 6-19 are currently enrolled in school

	1998		2006	
	Probit	IVProbit	Probit	IVProbit
Mother's working hours per week	-.00058	-.01032***	.00044	-.00523**
	(.0004)	(.00284)	(.00031)	(.00217)
Child's age	-.02947***	-.02406***	-.03008***	-.02841***
	(.00137)	(.00291)	(.00108)	(.00154)
Child is girl	-.03351***	-.02574***	-.01418**	-.0139*
	(.00946)	(.00988)	(.00713)	(.00722)
Child lives in rural area	-.05647***	-.01618	-.00884	.01015
	(.01279)	(.01869)	(.009)	(.01176)
Household size	-.00324	-.00322	-.00217	-.00173
	(.00219)	(.00211)	(.00213)	(.00215)
Number of siblings			-.00757***	-.00722***
			(.00257)	(.00267)
Age of head of household	5.8e-06	-.0006	.00014	.00042
	(.00056)	(.00061)	(.00049)	(.0005)
Father is present	-.02347	-.00215	.01429	-.00304
	(.03112)	(.03669)	(.02099)	(.02171)
Child goes to primary school walking	.06866	.04247	.03084	.03144
	(.04374)	(.04718)	(.03354)	(.03525)
Duration of a one-way journey to primary school	.00358***	.00365**	-.00147*	-.00137
	(.00134)	(.00156)	(.00088)	(.0009)
Child goes to preparatory school walking	-.02524	-.03184	-.00253	.00121
	(.01985)	(.02135)	(.01622)	(.0164)
Duration of a one-way journey to preparatory school	-.0034***	-.00418***	.00025	-1.7e-05
	(.00114)	(.00133)	(.0007)	(.00071)
Mother's age at first marriage	.0013	.00411**	.00272**	.00447***
	(.00158)	(.00188)	(.00124)	(.00144)
Mother has no schooling	-.13527***	-.10638***	-.12335***	-.11328***
	(.04182)	(.03994)	(.02098)	(.02211)
Mother completed primary school	-.01214	-.01341	-.07208***	-.07875***
	(.04465)	(.04239)	(.02464)	(.02481)
Mother completed secondary school	.05123	.21517***	.03483	.08156***
	(.04628)	(.06074)	(.02399)	(.03)
Mother completed intermediate or higher	.21309***	.41727***	.1266***	.22933***
	(.06619)	(.07371)	(.03694)	(.05247)
Mother's marital status	.03167	-.02343	.0068	.00991
	(.03418)	(.04329)	(.02313)	(.02334)
Household annual income	-2.1e-07	-2.4e-07	1.9e-06**	1.7e-06*
	(7.4e-07)	(7.6e-07)	(9.2e-07)	(8.9e-07)
Observations	5271	5271	9260	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.5: 1998 and 2006 Probit and IV Probit marginal effects: Dependent variable is that children aged 12-19 have completed primary school

	1998		2006	
	Probit	IVProbit	Probit	IVProbit
Mother's working hours per week	-.00099**	-.01039***	-.00011	-.00416*
	(.00042)	(.0031)	(.00035)	(.00216)
Child's age	.06337***	.05441***	.06924***	.06803***
	(.00207)	(.00612)	(.00166)	(.00218)
Child is girl	-.00618	-.00046	-.00857	-.00858
	(.01186)	(.0112)	(.00963)	(.00951)
Child lives in rural area	-.04369***	-.00543	-.02626**	-.01123
	(.01613)	(.02171)	(.01105)	(.01317)
Household size	-.0067**	-.00662**	-.00654**	-.00609*
	(.00303)	(.00266)	(.00313)	(.00311)
Number of siblings			-.00902**	-.00909**
			(.00366)	(.00366)
Age of head of household	.0003	-.00048	.00025	.00036
	(.00078)	(.0008)	(.00058)	(.00058)
Father is present	.05692*	.07932**	.02616	.00697
	(.03014)	(.0345)	(.02438)	(.02701)
Child goes to primary school walking	.02893	-.00378	.02663	.02214
	(.04281)	(.04763)	(.03534)	(.03596)
Duration of a one-way journey to primary school	.00141	.00123	-.00145	-.00128
	(.00151)	(.00151)	(.00115)	(.00117)
Child goes to preparatory school walking	-.00412	-.01528	-.0135	-.01056
	(.02138)	(.0219)	(.01854)	(.0182)
Duration of a one-way journey to preparatory school	-.00036	-.00082	-.00029	-.0005
	(.00124)	(.00125)	(.00103)	(.00104)
Mother's age at first marriage	.00557***	.00682***	.00053	.00149
	(.00199)	(.00201)	(.00159)	(.00166)
Mother has no schooling	-.09962***	-.07846***	-.11501***	-.1091***
	(.02378)	(.02543)	(.02354)	(.02424)
Mother completed primary school	.02158	.00743	.0054	-.00338
	(.02919)	(.02903)	(.02822)	(.02933)
Mother completed secondary school	.03461	.20957***	.00963	.05082
	(.02644)	(.06304)	(.02484)	(.03241)
Mother completed intermediate or higher	.06385**	.2867***	.00889	.08612*
	(.02978)	(.07661)	(.02776)	(.04805)
Mother's marital status	-.0323	-.08574**	.0059	.01544
	(.03678)	(.04311)	(.02986)	(.03034)
Household annual income	2.4e-08	-1.4e-07	7.0e-07	5.9e-07
	(9.4e-07)	(9.2e-07)	(6.3e-07)	(6.2e-07)
Observations	3962	3962	6178	6178

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.6: 1998 and 2006 Probit and IV Probit marginal effects: Dependent variable is that children aged 8-19 are overaged

	1998		2006	
	Probit	IVProbit	Probit	IVProbit
Mother's working hours per week	.00129***	.01009***	.00044	.00714***
	(.00045)	(.00329)	(.00038)	(.00245)
Child's age	.05486***	.04815***	.04941***	.04512***
	(.00161)	(.00515)	(.00129)	(.00295)
Child is girl	.0141	.00709	-.00937	-.01094
	(.01167)	(.0117)	(.00961)	(.00933)
Child lives in rural area	.04529***	.00979	.01438	-.0085
	(.01643)	(.02185)	(.01242)	(.01504)
Household size	.00342	.00397	.00888***	.00785**
	(.00298)	(.00277)	(.00325)	(.00323)
Number of siblings			.01122***	.0103***
			(.00403)	(.00399)
Age of head of household	.00064	.00113	-.001	-.00129**
	(.00069)	(.00072)	(.00065)	(.00065)
Father is present	-.03437	-.05238	-.02199	-.0013
	(.03502)	(.03877)	(.02691)	(.02906)
Child goes to primary school walking	.08341	.09299*	-.01847	-.01717
	(.051)	(.05365)	(.03872)	(.03963)
Duration of a one-way journey to primary school	-.00156	-.0017	.00191	.00183
	(.0017)	(.00162)	(.00128)	(.00127)
Child goes to preparatory school walking	.0227	.03056	-.04037*	-.04356**
	(.02267)	(.02267)	(.02274)	(.02207)
Duration of a one-way journey to preparatory school	.0003	.00102	-.00184*	-.00159
	(.00139)	(.00145)	(.00109)	(.00107)
Mother's age at first marriage	-.00247	-.00452**	-.00519***	-.00693***
	(.00196)	(.0021)	(.00164)	(.00172)
Mother has no schooling	.10129**	.08322**	.15729***	.13896***
	(.04368)	(.04088)	(.02617)	(.02815)
Mother completed primary school	.01207	.01693	.0403	.04785
	(.04672)	(.0438)	(.03146)	(.03123)
Mother completed secondary school	-.06803	-.22369***	-.03257	-.08689**
	(.04637)	(.06794)	(.02868)	(.0343)
Mother completed intermediate or higher	-.07789*	-.27668***	-.08332**	-.20359***
	(.04646)	(.08287)	(.03419)	(.0544)
Mother's marital status	.00782	.05493	.00984	.00572
	(.03963)	(.04553)	(.032)	(.03292)
Household annual income	1.7e-06*	1.6e-06*	-3.5e-07	-2.4e-07
	(9.3e-07)	(9.3e-07)	(3.2e-07)	(3.2e-07)
Observations	4516	4516	8078	8078

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.7: 1998 First stage results. Dependent variable is that children aged 6-19 have ever been enrolled in school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.22428***	(.06124)
Child is girl	.44085	(.40036)
Child lives in rural area	2.2618***	(.87451)
Household size	-.08388	(.13492)
Age of head of household	-.05993*	(.03496)
Father is present	2.0297	(2.0485)
Child goes to primary school walking	-1.7184	(3.5954)
Duration of a one-way journey to primary school	.03047	(.10221)
Child goes to preparatory school walking	-1.395	(1.2638)
Duration of a one-way journey to preparatory school	-.09518	(.0713)
Mother's age at first marriage	.34179***	(.10048)
Mother has no schooling	.45717	(1.0476)
Mother completed primary school	-.8232	(1.1857)
Mother completed secondary school	16.244***	(1.4517)
Mother completed intermediate or higher	22.773***	(1.5307)
Mother's marital status	-5.2244**	(2.3878)
Household annual income	3.2e-06	(3.8e-05)
Unemployment rate (age 15-64)	-.10319	(.10104)
Female employment rate (age 15-64)	.13858**	(.06138)
Average per capita annual income	-.00106***	(.00028)
Female labor force in hundreds (age 15-64)	-7.1e-05	(.00027)
Constant	6.9928	(5.2795)
Observations	5271	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.8: 1998 First stage results. Dependent variable is that children aged 6-19 are currently enrolled in school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.22282***	(.0612)
Child is girl	.43464	(.40074)
Child lives in rural area	2.3631***	(.87677)
Household size	-.0788	(.13582)
Age of head of household	-.0582*	(.03498)
Father is present	2.0232	(2.0464)
Child goes to primary school walking	-1.8347	(3.589)
Duration of a one-way journey to primary school	.0355	(.10252)
Child goes to preparatory school walking	-1.294	(1.2658)
Duration of a one-way journey to preparatory school	-.09368	(.07125)
Mother's age at first marriage	.33941***	(.10051)
Mother has no schooling	.3775	(1.0494)
Mother completed primary school	-.89221	(1.1878)
Mother completed secondary school	16.206***	(1.4544)
Mother completed intermediate or higher	22.693***	(1.5334)
Mother's marital status	-5.212**	(2.3851)
Household annual income	2.3e-06	(3.8e-05)
Unemployment rate (age 15-64)	-.18538*	(.106)
Female employment rate (age 15-64)	.1306**	(.06448)
Average per capita annual income	-.00108***	(.00028)
Female labor force in hundreds (age 15-64)	2.4e-05	(.00028)
Constant	7.5483	(5.3317)
Observations	5271	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.9: 1998 First stage results. Dependent variable is that children aged 11-19 have completed primary school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.02463	(.08519)
Child is girl	.5559	(.46568)
Child lives in rural area	2.427**	(.94292)
Household size	-.14134	(.13592)
Age of head of household	-.07371*	(.03882)
Father is present	3.268	(2.2267)
Child goes to primary school walking	-2.7378	(3.4111)
Duration of a one-way journey to primary school	-.00727	(.09937)
Child goes to preparatory school walking	-1.4579	(1.378)
Duration of a one-way journey to preparatory school	-.0288	(.06964)
Mother's age at first marriage	.25314**	(.10726)
Mother has no schooling	-.19762	(1.3483)
Mother completed primary school	-1.5121	(1.4615)
Mother completed secondary school	17.794***	(1.7993)
Mother completed intermediate or higher	23.682***	(1.9022)
Mother's marital status	-6.049**	(2.5081)
Household annual income	-9.4e-06	(4.4e-05)
Unemployment rate (age 15-64)	-.16553	(.11589)
Female employment rate (age 15-64)	.12712**	(.0634)
Average per capita annual income	-.00106***	(.00032)
Female labor force in hundreds (age 15-64)	5.9e-05	(.0003)
Constant	13.653***	(5.2987)
Observations	3962	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.10: 1998 First stage results. Dependent variable is that children aged 8-19 are overaged. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.14328*	(.07394)
Child is girl	.5996	(.43401)
Child lives in rural area	2.4128***	(.93074)
Household size	-.13591	(.13734)
Age of head of household	-.05948	(.03751)
Father is present	2.5332	(2.0843)
Child goes to primary school walking	-1.9928	(3.2444)
Duration of a one-way journey to primary school	.01501	(.09805)
Child goes to preparatory school walking	-1.6295	(1.3416)
Duration of a one-way journey to preparatory school	-.05718	(.07107)
Mother's age at first marriage	.28955***	(.10058)
Mother has no schooling	.03427	(1.1917)
Mother completed primary school	-1.155	(1.3213)
Mother completed secondary school	17.206***	(1.6251)
Mother completed intermediate or higher	22.826***	(1.7138)
Mother's marital status	-5.323**	(2.3714)
Household annual income	7.8e-06	(4.2e-05)
Unemployment rate (age 15-64)	-.12352	(.11937)
Female employment rate (age 15-64)	.15193**	(.06263)
Average per capita annual income	-.001***	(.00032)
Female labor force in hundreds (age 15-64)	6.2e-05	(.0003)
Constant	8.8524*	(5.0714)
Observations	4516	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.11: 2006 First stage results. Dependent variable is that children aged 6-19 have ever been enrolled in school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.24347***	(.04218)
Child is girl	.10944	(.29447)
Child lives in rural area	2.6668***	(.54737)
Household size	.02012	(.10281)
Number of siblings	-.00139	(.13561)
Age of head of household	.05765**	(.02414)
Father is present	-2.9956**	(1.4696)
Child goes to primary school walking	-.36526	(1.9558)
Duration of a one-way journey to primary school	-.02494	(.04864)
Child goes to preparatory school walking	.69496	(.86046)
Duration of a one-way journey to preparatory school	-.01084	(.03879)
Mother's age at first marriage	.35687***	(.07261)
Mother has no schooling	.42218	(1.194)
Mother completed primary school	-1.7458	(1.2516)
Mother completed secondary school	7.2937***	(1.2872)
Mother completed intermediate or higher	17.62***	(1.5927)
Mother's marital status	.54147	(1.7035)
Household annual income	-1.0e-05	(8.2e-06)
Unemployment rate (age 15-64)	-.453***	(.08423)
Female employment rate (age 15-64)	.18963***	(.06364)
Average per capita annual income	-.00063**	(.00031)
Female labor force in hundreds (age 15-64)	-.0005**	(.00024)
Constant	.46553	(3.4098)
Observations	9260	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.12: 2006 First stage results. Dependent variable is that children aged 6-19 are currently enrolled in school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.24292***	(.04219)
Child is girl	.11448	(.2944)
Child lives in rural area	2.7392***	(.55077)
Household size	.024	(.10274)
Number of siblings	.00304	(.13558)
Age of head of household	.05774**	(.02413)
Father is present	-3.011**	(1.4673)
Child goes to primary school walking	-.32732	(1.9561)
Duration of a one-way journey to primary school	-.02437	(.04861)
Child goes to preparatory school walking	.71176	(.86159)
Duration of a one-way journey to preparatory school	-.01117	(.03874)
Mother's age at first marriage	.35557***	(.07263)
Mother has no schooling	.48231	(1.1939)
Mother completed primary school	-1.7243	(1.251)
Mother completed secondary school	7.3493***	(1.2864)
Mother completed intermediate or higher	17.657***	(1.5924)
Mother's marital status	.54718	(1.7008)
Household annual income	-1.0e-05	(8.2e-06)
Unemployment rate (age 15-64)	-.4701***	(.0859)
Female employment rate (age 15-64)	.19788***	(.06463)
Average per capita annual income	-.00045	(.00032)
Female labor force in hundreds (age 15-64)	-.0006**	(.00024)
Constant	.07664	(3.4437)
Observations	9260	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.13: 2006 First stage results. Dependent variable is that children aged 12-19 have completed primary school. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.13443**	(.06803)
Child is girl	.05046	(.36637)
Child lives in rural area	2.831***	(.62024)
Household size	.0176	(.11927)
Number of siblings	-.12356	(.15196)
Age of head of household	.03845	(.02848)
Father is present	-4.5296**	(1.828)
Child goes to primary school walking	-1.5345	(2.3265)
Duration of a one-way journey to primary school	-.00723	(.05955)
Child goes to preparatory school walking	.77156	(1.0255)
Duration of a one-way journey to preparatory school	-.01707	(.0481)
Mother's age at first marriage	.29415***	(.07871)
Mother has no schooling	-.2711	(1.5349)
Mother completed primary school	-2.4725	(1.6216)
Mother completed secondary school	9.1579***	(1.6777)
Mother completed intermediate or higher	18.146***	(1.977)
Mother's marital status	2.2208	(2.0051)
Household annual income	-1.6e-05	(1.1e-05)
Unemployment rate (age 15-64)	-.48506***	(.0972)
Female employment rate (age 15-64)	.20316***	(.07225)
Average per capita annual income	-.00057	(.00037)
Female labor force in hundreds (age 15-64)	-.00067**	(.00028)
Constant	6.1612	(4.1885)
Observations	6178	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.14: 2006 First stage results. Dependent variable is that children aged 8-19 are overaged. Endogenous variable: Mother hours of work

	First Stage	
Mother's working hours per week		
Child's age	.25235***	(.04844)
Child is girl	.39179	(.31759)
Child lives in rural area	2.5944***	(.57092)
Household size	.01052	(.10597)
Number of siblings	.0072	(.14248)
Age of head of household	.06077**	(.02532)
Father is present	-2.8778*	(1.5313)
Child goes to primary school walking	-.56303	(1.9817)
Duration of a one-way journey to primary school	-.0432	(.05137)
Child goes to preparatory school walking	.8864	(.90126)
Duration of a one-way journey to preparatory school	.01212	(.04044)
Mother's age at first marriage	.35113***	(.07547)
Mother has no schooling	.33395	(1.2837)
Mother completed primary school	-1.889	(1.3395)
Mother completed secondary school	7.2874***	(1.3841)
Mother completed intermediate or higher	17.852***	(1.7032)
Mother's marital status	.5538	(1.7571)
Household annual income	-9.1e-06	(7.6e-06)
Unemployment rate (age 15-64)	-.44234***	(.08962)
Female employment rate (age 15-64)	.21001***	(.06631)
Average per capita annual income	-.00062*	(.00033)
Female labor force in hundreds (age 15-64)	-.00059**	(.00025)
Constant	-.07181	(3.5835)
Observations	8078	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

Table B.15: 1998 and 2006 IV Probit results with mother's hours of work squared. Dependent variable is that children aged 6-19 have ever been enrolled in school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	-.0506***	-.0296***
	(.0142)	(.00833)
Mother's working hours per week squared	.00106***	.00061***
	(.0003)	(.00017)
Child's age	.0026**	.00215**
	(.0013)	(.00103)
Child is girl	-.04916***	-.04466***
	(.01196)	(.00767)
Child lives in rural area	-.02646	.05819**
	(.02108)	(.02344)
Household size	-.00183	-.00207
	(.00216)	(.00235)
Number of siblings		-.00181
		(.00332)
Age of head of household	-.00043	.00018
	(.00063)	(.0005)
Father is present	.02741	.00827
	(.03377)	(.02194)
Mother's age at first marriage	.00289	-.00013
	(.00189)	(.00137)
Mother has no schooling	-.12268***	.00532
	(.04128)	(.02817)
Mother completed primary school	.02713	.04945
	(.05639)	(.0309)
Mother completed secondary school	.10314*	.08764***
	(.05936)	(.03362)
Mother completed intermediate or higher	.21295***	.13921***
	(.07511)	(.04246)
Mother's marital status	.00156	.02894
	(.03996)	(.02598)
Household annual income	-5.2e-07	1.3e-06
	(6.7e-07)	(1.1e-06)
Observations	5271	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.16: 1998 and 2006 IV Probit results with mother's hours of work squared. Dependent variable is that children aged 6-19 are currently enrolled in school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	-.04111**	-.00877
	(.0161)	(.00901)
Mother's working hours per week squared	.00086**	.00019
	(.00034)	(.00019)
Child's age	-.02544***	-.02994***
	(.00343)	(.00116)
Child is girl	-.02771***	-.01577**
	(.0104)	(.00741)
Child lives in rural area	-.02055	.01691
	(.0214)	(.02673)
Household size	-.00162	-.00133
	(.00231)	(.00229)
Number of siblings		-.00578*
		(.00313)
Age of head of household	-.00026	.00017
	(.00062)	(.00049)
Father is present	-.00512	.0156
	(.03428)	(.02098)
Mother's age at first marriage	.00245	.00263**
	(.00171)	(.00126)
Mother has no schooling	-.12905***	-.10611***
	(.04084)	(.02762)
Mother completed primary school	-.00593	-.06118**
	(.04333)	(.02696)
Mother completed secondary school	.15274***	.05625*
	(.05737)	(.03279)
Mother completed intermediate or higher	.35171***	.15909***
	(.07333)	(.04763)
Mother's marital status	.01165	.01262
	(.03871)	(.0238)
Household annual income	-2.6e-07	1.9e-06**
	(7.5e-07)	(9.1e-07)
Observations	5271	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.17: 1998 and 2006 IV Probit results with mother's hours of work squared. Dependent variable is that children aged 12-19 have completed primary school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	-.03435**	-.00606
	(.01752)	(.00945)
Mother's working hours per week squared	.0007*	.00012
	(.00037)	(.00019)
Child's age	.05694***	.06892***
	(.0067)	(.00192)
Child is girl	-.00477	-.00981
	(.0114)	(.00989)
Child lives in rural area	-.01661	-.009
	(.02268)	(.0284)
Household size	-.00537*	-.00591*
	(.00297)	(.00332)
Number of siblings		-.0079*
		(.00428)
Age of head of household	-9.8e-05	.00024
	(.00081)	(.00058)
Father is present	.07564**	.02683
	(.03089)	(.0244)
Mother's age at first marriage	.00565***	.0005
	(.00202)	(.00158)
Mother has no schooling	-.09582***	-.10206***
	(.02359)	(.02959)
Mother completed primary school	.02418	.01415
	(.02853)	(.03001)
Mother completed secondary school	.14042**	.02805
	(.05919)	(.03708)
Mother completed intermediate or higher	.20209***	.03386
	(.07441)	(.04706)
Mother's marital status	-.05257	.01031
	(.03772)	(.0308)
Household annual income	4.9e-08	6.7e-07
	(9.1e-07)	(6.3e-07)
Observations	3962	6178

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.18: 1998 and 2006 IV Probit results with mother's hours of work squared. Dependent variable is that children aged 8-19 are overaged.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	.03433**	.0262***
	(.01733)	(.00832)
Mother's working hours per week squared	-.0007*	-.00053***
	(.00037)	(.00017)
Child's age	.05091***	.04534***
	(.00509)	(.00303)
Child is girl	.01028	-.00504
	(.01175)	(.00934)
Child lives in rural area	.01992	-.05866**
	(.02207)	(.02731)
Household size	.00221	.00545
	(.00295)	(.00356)
Number of siblings		.00545
		(.00454)
Age of head of household	.00089	-.00099
	(.00073)	(.00065)
Father is present	-.04873	-.02656
	(.03532)	(.02756)
Mother's age at first marriage	-.00311	-.0046***
	(.00194)	(.00161)
Mother has no schooling	.10169**	.09471***
	(.04153)	(.03431)
Mother completed primary school	.00569	.0044
	(.04491)	(.03207)
Mother completed secondary school	-.15828**	-.09293***
	(.06151)	(.03298)
Mother completed intermediate or higher	-.20488***	-.17186***
	(.07725)	(.04299)
Mother's marital status	.02241	-.0058
	(.0403)	(.03295)
Household annual income	1.8e-06*	-2.3e-07
	(9.2e-07)	(3.3e-07)
Observations	4516	8078

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.19: 1998 and 2006 Probit results with categorical mother's hours of work: Dependent variable is that children aged 6-19 have ever been enrolled in school.

	1998 Probit	2006 Probit
Mother's hours of work >0 and <=10		.00321
		(.00633)
Mother's hours of work >10 and <=24	-.01518	-.00261
	(.01857)	(.00786)
Mother's hours of work >24 and <=50	-.00957	-.00888
	(.01255)	(.00951)
Mother's hours of work >50	-.04411**	.01304
	(.01817)	(.02054)
Child's age	.00101	.0013**
	(.0008)	(.00064)
Child is girl	-.04089***	-.02694***
	(.00682)	(.00473)
Child lives in rural area	-.0492***	-.01494**
	(.00838)	(.00608)
Household size	-.00262*	-.00322**
	(.00146)	(.00132)
Number of siblings		-.0048***
		(.00162)
Age of head of household	-.00011	5.4e-05
	(.00037)	(.0003)
Father is present	.00376	.00235
	(.01834)	(.01256)
Mother's age at first marriage	.00113	9.6e-05
	(.00115)	(.00082)
Mother has no schooling	-.09085***	-.03378**
	(.03145)	(.01531)
Mother completed primary school	.01361	.0084
	(.04221)	(.01862)
Mother completed secondary school	-.02874	.01377
	(.033)	(.01671)
Mother completed intermediate or higher	.00292	.0248
	(.03759)	(.02049)
Mother's marital status	.01836	.00726
	(.02113)	(.01418)
Household annual income	-3.1e-07	1.1e-06
	(4.1e-07)	(7.9e-07)
Observations	5236	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01
Category hrs of work between 0 and 10 is added to reference category in 1998 due to lack of variation

Table B.20: 1998 and 2006 Probit results with categorical mother's hours of work: Dependent variable is that children aged 6-19 are currently enrolled in school.

	1998 Probit	2006 Probit
Mother's hours of work >0 and <=10	.08244**	.00916
	(.04006)	(.01011)
Mother's hours of work >10 and <=24	-.0074	.00668
	(.03186)	(.01277)
Mother's hours of work >24 and <=50	-.00873	.01979
	(.01975)	(.01476)
Mother's hours of work >50	-.07603*	.02661
	(.0404)	(.02818)
Child's age	-.02953***	-.03009***
	(.00137)	(.00108)
Child is girl	-.03371***	-.01416**
	(.00946)	(.00714)
Child lives in rural area	-.05718***	-.01035
	(.01288)	(.00942)
Household size	-.00341	-.00222
	(.0022)	(.00214)
Number of siblings		-.00763***
		(.00258)
Age of head of household	5.3e-05	.00016
	(.00056)	(.00049)
Father is present	-.02674	.01362
	(.03149)	(.02098)
Mother's age at first marriage	.00126	.00273**
	(.00159)	(.00124)
Mother has no schooling	-.13231***	-.12406***
	(.04145)	(.02099)
Mother completed primary school	-.00996	-.07221***
	(.04425)	(.02464)
Mother completed secondary school	.04596	.03411
	(.04591)	(.02423)
Mother completed intermediate or higher	.20522***	.12541***
	(.06638)	(.03745)
Mother's marital status	.03397	.00746
	(.03447)	(.02315)
Household annual income	-1.4e-07	1.9e-06**
	(7.4e-07)	(9.2e-07)
Observations	5271	9260

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.21: 1998 and 2006 Probit results with categorical mother's hours of work: Dependent variable is that children aged 12-19 have completed primary school.

	1998 Probit	2006 Probit
Mother's hours of work >0 and <=10	.01029	.02801**
	(.07007)	(.01353)
Mother's hours of work >10 and <=24	-.05002	-.01792
	(.03771)	(.01701)
Mother's hours of work >24 and <=50	-.0155	.00311
	(.01877)	(.01604)
Mother's hours of work >50	-.12377**	.0172
	(.04984)	(.03233)
Child's age	.06322***	.06908***
	(.00207)	(.00166)
Child is girl	-.0071	-.00791
	(.01183)	(.0096)
Child lives in rural area	-.044***	-.02963**
	(.01618)	(.01174)
Household size	-.00691**	-.00655**
	(.00304)	(.00313)
Number of siblings		-.00908**
		(.00366)
Age of head of household	.00032	.00033
	(.00078)	(.00058)
Father is present	.05317*	.02316
	(.02991)	(.02421)
Mother's age at first marriage	.00554***	.00052
	(.00199)	(.00159)
Mother has no schooling	-.0951***	-.11554***
	(.02391)	(.02346)
Mother completed primary school	.02406	.00721
	(.02919)	(.02817)
Mother completed secondary school	.02544	.0089
	(.0267)	(.02488)
Mother completed intermediate or higher	.0517*	.00624
	(.03014)	(.02794)
Mother's marital status	-.02995	.00954
	(.03659)	(.02972)
Household annual income	2.8e-08	6.8e-07
	(9.4e-07)	(6.1e-07)
Observations	3962	6178

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.22: 1998 and 2006 Probit results with categorical mother's hours of work: Dependent variable is that children aged 8-19 are overaged.

	1998 Probit	2006 Probit
Mother's hours of work >0 and <=10	-.0018	.00631
	(.07552)	(.01486)
Mother's hours of work >10 and <=24	.06934*	.01274
	(.0403)	(.01952)
Mother's hours of work >24 and <=50	.048**	.01427
	(.01986)	(.01737)
Mother's hours of work >50	.08877	.01613
	(.05406)	(.04036)
Child's age	.05494***	.04943***
	(.00161)	(.00129)
Child is girl	.01443	-.00918
	(.01166)	(.00961)
Child lives in rural area	.04359***	.01272
	(.01652)	(.01322)
Household size	.0035	.00882***
	(.00299)	(.00325)
Number of siblings		.0111***
		(.00404)
Age of head of household	.00067	-.00099
	(.0007)	(.00065)
Father is present	-.03357	-.02287
	(.03484)	(.02687)
Mother's age at first marriage	-.00248	-.00513***
	(.00196)	(.00164)
Mother has no schooling	.09914**	.15629***
	(.04379)	(.02626)
Mother completed primary school	.01004	.03938
	(.04679)	(.03148)
Mother completed secondary school	-.06774	-.03242
	(.0463)	(.02895)
Mother completed intermediate or higher	-.07854*	-.08215**
	(.04648)	(.03453)
Mother's marital status	.00728	.01003
	(.03939)	(.03195)
Household annual income	1.7e-06*	-3.5e-07
	(9.4e-07)	(3.2e-07)
Observations	4516	8078

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.23: 1998 and 2006 IV Probit results with binary mother's hours of work. Dependent variable is that children aged 6-19 have ever been enrolled in school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	.04255**	-.00766*
	(.02105)	(.00393)
Mother is working	-1.5591**	.15621*
	(.76166)	(.0811)
Child's age	.00034	.00266**
	(.00168)	(.00108)
Child is girl	-.05206***	-.03385***
	(.01816)	(.00695)
Child lives in rural area	-.03817	-.04851***
	(.03154)	(.01858)
Household size	-.00169	-.00552**
	(.00324)	(.00217)
Number of siblings		-.00868***
		(.00283)
Age of head of household	-.0005	.0004
	(.00082)	(.00047)
Father is present	.01776	-.01959
	(.03252)	(.02133)
Mother's age at first marriage	.00069	.00198
	(.00255)	(.00158)
Mother has no schooling	-.11799**	-.06299**
	(.05497)	(.02481)
Mother completed primary school	.02709	-.0051
	(.05931)	(.02751)
Mother completed secondary school	-.10415*	.03695
	(.05567)	(.02764)
Mother completed intermediate or higher	-.04734	.09047*
	(.06432)	(.04657)
Mother's marital status	.03075	.01667
	(.04383)	(.02155)
Household annual income	-7.5e-07	1.3e-06
	(8.0e-07)	(1.1e-06)
Observations	5271	9239

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.24: 1998 and 2006 IV Probit results with binary mother's hours of work. Dependent variable is that children aged 6-19 are currently enrolled in school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	.03124	-.01026***
	(.03396)	(.00316)
Mother is working	-1.1431	.22248***
	(1.2279)	(.06421)
Child's age	-.02518***	-.02687***
	(.00819)	(.00197)
Child is girl	-.03051***	-.00885
	(.01159)	(.00728)
Child lives in rural area	-.03266	-.04866***
	(.03442)	(.01488)
Household size	-.0016	-.00399*
	(.00324)	(.00229)
Number of siblings		-.00992***
		(.00279)
Age of head of household	-.00029	.00061
	(.00075)	(.00051)
Father is present	-.01194	-.0208
	(.03437)	(.02347)
Mother's age at first marriage	.00057	.00531***
	(.00211)	(.0015)
Mother has no schooling	-.1212**	-.13821***
	(.05447)	(.022)
Mother completed primary school	-.00425	-.0907***
	(.04671)	(.0253)
Mother completed secondary school	-.01601	.06199**
	(.08368)	(.02597)
Mother completed intermediate or higher	.12957	.20475***
	(.12242)	(.04274)
Mother's marital status	.03465	.01722
	(.03788)	(.02431)
Household annual income	-4.3e-07	1.6e-06*
	(8.2e-07)	(8.6e-07)
Observations	5271	9239

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.25: 1998 and 2006 IV Probit results with binary mother's hours of work. Dependent variable is that children aged 12-19 have completed primary school.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	.02524	-.00736**
	(.03633)	(.00312)
Mother is working	-.94313	.16096**
	(1.3082)	(.06469)
Child's age	.05502***	.06695***
	(.02001)	(.00282)
Child is girl	-.01003	-.00289
	(.01203)	(.00952)
Child lives in rural area	-.02494	-.0569***
	(.03448)	(.01583)
Household size	-.00497	-.008***
	(.00444)	(.003)
Number of siblings		-.01125***
		(.00371)
Age of head of household	-4.6e-05	.0006
	(.00103)	(.00059)
Father is present	.05522*	-.0051
	(.03021)	(.02834)
Mother's age at first marriage	.00481*	.00218
	(.00285)	(.00169)
Mother has no schooling	-.08953**	-.13002***
	(.04083)	(.02443)
Mother completed primary school	.03134	-.01357
	(.03439)	(.02954)
Mother completed secondary school	-.01289	.03188
	(.07163)	(.0285)
Mother completed intermediate or higher	.01171	.06146
	(.0827)	(.03935)
Mother's marital status	-.02287	.02002
	(.04141)	(.03029)
Household annual income	-3.5e-08	5.7e-07
	(9.6e-07)	(5.9e-07)
Observations	3962	6158

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

Table B.26: 1998 and 2006 IV Probit results with binary mother's hours of work. Dependent variable is that children aged 8-19 are overaged.

	1998 IVProbit	2006 IVProbit
Mother's working hours per week	-.02847	.00583
	(.02257)	(.00498)
Mother is working	1.0755	-.11069
	(.80714)	(.10321)
Child's age	.04713***	.04759***
	(.0108)	(.00292)
Child is girl	.01658	-.01284
	(.01091)	(.00971)
Child lives in rural area	.02535	.03389
	(.02351)	(.02268)
Household size	.00158	.01001***
	(.00338)	(.00324)
Number of siblings		.01259***
		(.00406)
Age of head of household	.00095	-.00122*
	(.0008)	(.00067)
Father is present	-.03716	-.00313
	(.03103)	(.03179)
Mother's age at first marriage	-.00188	-.00645***
	(.00213)	(.00197)
Mother has no schooling	.08995**	.16551***
	(.04554)	(.02734)
Mother completed primary school	-.00183	.05045
	(.04614)	(.03333)
Mother completed secondary school	-.00952	-.04642
	(.06637)	(.03162)
Mother completed intermediate or higher	-.02866	-.1264**
	(.06319)	(.05141)
Mother's marital status	.00249	.00325
	(.03941)	(.03285)
Household annual income	1.8e-06*	-3.0e-07
	(9.7e-07)	(3.1e-07)
Observations	4516	8060

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

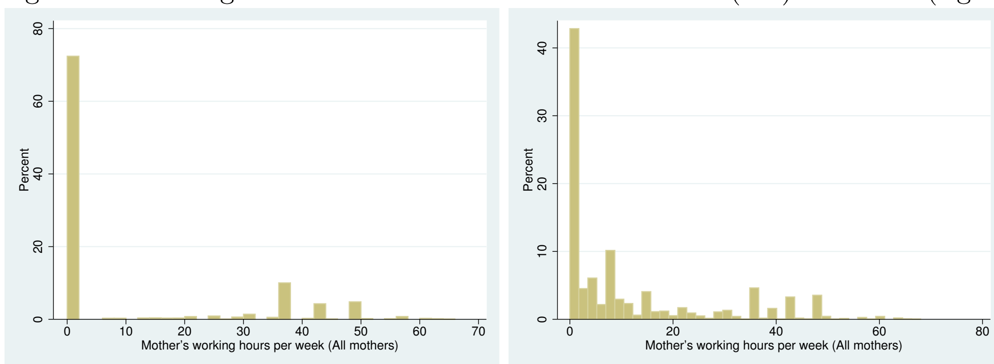
Table B.27: 2006 Probit results: Dependent variable: Child labor (age 6-14)

	Probit
Child's age	.01408***
	(.00142)
Child is girl	-.01152*
	(.00633)
Child lives in rural area	.04307***
	(.00978)
Household size	3.6e-06
	(.00188)
Number of siblings	.00428*
	(.00222)
Age of head of household	-8.9e-05
	(.00043)
Father is present	.00839
	(.01781)
Mother's age at first marriage	-.00135
	(.0012)
Mother has no schooling	.03391*
	(.01983)
Mother completed primary school	.02587
	(.02198)
Mother completed secondary school	-.00358
	(.02203)
Mother completed intermediate or higher	-.04384
	(.03585)
Mother's marital status	-.00951
	(.02065)
Household annual income	-1.0e-06
	(6.9e-07)
Unemployment rate (age 15-64)	-.00013
	(.00152)
Female employment rate (age 15-64)	-.00043
	(.00093)
Average per capita annual income	-9.8e-06*
	(5.9e-06)
Female labor force in hundreds (age 15-64)	9.1e-07
	(3.7e-06)
Observations	5615

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* p<.10, ** p<.05, *** p<.01

B.2 Figures

Figure B.1: Histogram of mothers' hours of work in 1998 (left) and 2006 (right)



Appendix C

Tables and Figures of Chapter 4

C.1 Tables

Table C.1: Enrollment rates in New Jersey, 1840-1880

Year	Percentage of Enrollment to White Population 5-19*
1840	43.69
1850	53.36
1860	57.64
1870	51.06**
1880	67.01***

Data source: United States Census of Population and Housing for years 1840, 1850, 1860 , 1870 and 1880
**Total number of students in primary, academy, and college divided by white population 5-19*
***White population 5-18*
****White population 5-17*

Table C.2: 1850 and 1860 Summary statistics

	1850		1860	
	Mean/SD	N	Mean/SD	N
School attendance as a percentage school-age population	74.234	88	90.150	183
	(34.578)		(54.285)	
No. of children taught as a percentage school-age population	67.318	172		
	(26.829)			
Length of school session (months)	8.785	158	9.336	188
	(2.105)		(1.889)	
Percentage of the population foreign-born	9.431	182	13.377	213
	(8.929)		(10.147)	
Percentage of the population employed in manufacturing	5.911	182	6.416	213
	(5.808)		(5.612)	
Improved Farmland-per-family (acres)	22.295	182	18.732	213
	(10.837)		(10.613)	
Percentage of the population living in towns 2,500 and over	4.046	182	6.655	213
	(14.054)		(20.044)	
Percentage of churches that are Roman Catholic	2.644	182	4.987	213
	(2.251)		(3.129)	
Total no. of churches in each county	46.484	182	60.455	213
	(19.859)		(25.195)	
Amount of money appropriated for school purposes (dollars)	838.564	182	2,644.720	203
	(958.466)		(5,021.429)	
Average tuition per quarter for each student (dollars)	2.439	158	1.705	138
	(5.867)		(1.098)	

Table C.3: 1850 Correlation Matrix

	perc_chtaught	avgschmths	perc_foreign	perc_manuf	impacre_fam	moneyapp	perc_urb25	share_rchurch	avgtuition
perc_chtaught	1.000								
avgschmths	-0.066	1.000							
perc_foreign	-0.243	0.364	1.000						
perc_manuf	-0.204	0.221	0.738	1.000					
impacre_fam	0.100	-0.079	-0.629	-0.610	1.000				
moneyapp	0.003	0.267	0.163	0.097	-0.126	1.000			
perc_urb25	-0.078	0.263	0.583	0.831	-0.448	0.125	1.000		
share_rchurch	-0.135	0.157	0.582	0.489	-0.634	0.119	0.287	1.000	
avgtuition	-0.003	-0.018	-0.095	-0.073	0.069	-0.012	-0.050	-0.023	1.000

perc_chtaught: No. of children taught as a % of school-age population. avgschmths: Length of school session in months. perc_foreign: % of the population foreign-born. perc_manuf: % of the population employed in manufacturing. impacre_fam: Improved Farmland-per-family, in acres. moneyapp: Amount of money appropriated for school purposes. perc_urb25: % of the population living in towns 2,500 and over. share_rchurch: % of churches that are Roman Catholic. avgtuition: Average tuition per quarter for each student

Table C.4: 1860 Correlation Matrix

	perc_schatt	avgschmths	perc_foreign	perc_manuf	impacre_fam	moneyapp	perc_urb25	share_rchurch	avgtuition
perc_schatt	1.000								
avgschmths	-0.138	1.000							
perc_foreign	-0.230	0.322	1.000						
perc_manuf	-0.191	0.191	0.717	1.000					
impacre_fam	0.154	-0.045	-0.689	-0.626	1.000				
moneyapp	-0.081	0.233	0.332	0.310	-0.233	1.000			
perc_urb25	-0.047	0.114	0.740	0.699	-0.545	0.382	1.000		
share_rchurch	-0.087	0.324	0.781	0.499	-0.543	0.242	0.479	1.000	
avgtuition	0.253	-0.179	-0.274	-0.197	0.375	-0.277	-0.296	-0.189	1.000

perc_schatt: School attendance as a % of school-age population. avgschmths: Length of school session in months. perc_foreign: % of the population foreign-born. perc_manuf: % of the population employed in manufacturing. impacre_fam: Improved Farmland-per-family, in acres. moneyapp: Amount of money appropriated for school purposes. perc_urb25: % of the population living in towns 2,500 and over. share_rchurch: % of churches that are Roman Catholic. avgtuition: Average tuition per quarter for each student

Table C.5: Dependent variable is the change in the length of school session between 1860 and 1850 (in months)

	(1)	(2)	(3)	(4)	(5)	(6)
Change in % of population foreign-born	.03	.101	.119	.134*	.11	.128
	(.356)	(1.4)	(1.53)	(1.77)	(1.23)	(1.18)
Change in % of population employed in manufacturing	-.0288		-.0529	-.0552	-.0571	-.0558
	(-.525)		(-.99)	(-1.04)	(-1.01)	(-1.2)
Change in improved farmland per family in acres	.0222	.0589	.0639	.068	.0526	.0427
	(.439)	(1.19)	(1.18)	(1.25)	(1.01)	(.81)
Change in % of population living in towns 2,500 and over		-.0264**	-.0295**	-.0255**	-.0362**	-.062***
		(-2.79)	(-2.75)	(-2.68)	(-2.39)	(-3.94)
Change in amount of money appropriated				-.000029*	-.000035**	-.00002
				(-1.75)	(-2.31)	(-1.31)
Change in number of churches					.0261	.0258*
					(1.06)	(1.74)
Change in average tuition per quarter						-.0233***
						(-5.08)
Constant	.627**	.533*	.528*	.539*	.263	.218
	(2.29)	(2.01)	(2)	(2.06)	(.801)	(.714)
Observations	141	141	141	141	141	96
R^2	.00141	.01	.0126	.0171	.0243	.0481

t statistics in parentheses
* $p<.10$, ** $p<.05$, *** $p<.01$

Table C.6: 1850 OLS Results: Dependent variable is the length of school session in months in 1850

	(1)	(2)	(3)	(4)	(5)	(6)
Percentage of the population foreign-born	.133***	.113***	.135***	.13***	.136***	.149***
	(4.98)	(4.14)	(4.77)	(5.54)	(5.44)	(5.18)
Percentage of the population employed in manufacturing	-.0179		-.105**	-.0903***	-.0942***	-.115***
	(-.413)		(-2.68)	(-2.94)	(-3.34)	(-3.56)
Improved Farmland-per-family, in acres	.0456**	.0508**	.0416*	.0462**	.0433**	.0412*
	(2.13)	(2.35)	(1.83)	(2.36)	(2.11)	(1.92)
Percentage of the population living in towns 2,500 and over		.0152	.0399***	.0326***	.0234**	.0266**
		(1.48)	(3.98)	(4.11)	(2.13)	(2.31)
Amount of money appropriated for school purposes				.000466***	.000457***	.000431***
				(3.45)	(3.4)	(3.4)
Total no. of churches in each county					.0103	.00729
					(1.06)	(.763)
Average tuition per quarter for each student						.00372
						(.559)
Constant	6.62***	6.52***	7.05***	6.53***	6.14***	6.37***
	(9.51)	(10)	(9.62)	(10.4)	(9.01)	(8.36)
Observations	158	158	158	158	158	150
R^2	.17	.175	.191	.237	.242	.243

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.7: 1860 OLS Results: Dependent variable is the length of school session in months in 1860

	(1)	(2)	(3)	(4)	(5)	(6)
Percentage of the population foreign-born	.101***	.128***	.121***	.118***	.132***	.139***
	(5.21)	(5.38)	(6.12)	(5.76)	(5.4)	(7.47)
Percentage of the population employed in manufacturing	.0159		.0359	.0301	.0201	.0263
	(.316)		(.756)	(.647)	(.473)	(.595)
Improved Farmland-per-family, in acres	.0587*	.0541**	.0593**	.0595**	.058**	.081**
	(1.98)	(2.12)	(2.17)	(2.19)	(2.45)	(2.5)
Percentage of the population living in towns 2,500 and over		-.0207**	-.0232**	-.0289***	-.0416***	-.0437***
		(-2.79)	(-2.59)	(-3.26)	(-4.79)	(-4.93)
Amount of money appropriated for school purposes				.000067*	.000065*	.000046*
				(1.93)	(1.96)	(1.9)
Total no. of churches in each county					.0153**	.0156*
					(2.68)	(2.01)
Average tuition per quarter for each student						-.355*
						(-1.98)
Constant	6.85***	6.78***	6.56***	6.47***	5.53***	5.7***
	(7.34)	(8.79)	(7.37)	(7.41)	(6.7)	(5.27)
Observations	188	188	188	188	188	135
R^2	.154	.17	.174	.203	.232	.276

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.8: Dependent variable is the change in percentage of school attendance between 1860 and 1850

	(1)	(2)	(3)	(4)	(5)
Change in % of population foreign-born	-11.5*	-14.1**	-14.9***	-14.9***	-15.3***
	(-2.08)	(-2.72)	(-3.05)	(-2.96)	(-3.25)
Change in % of population employed in manufacturing	1.97		3	2.96	2.93
	(1.05)		(1.66)	(1.65)	(1.23)
Change in improved farmland per family in acres	-8.13**	-9.4**	-9.75***	-9.98***	-10.7***
	(-2.22)	(-2.63)	(-3)	(-2.93)	(-3.7)
Change in % of population living in towns 2,500 and over		1.36***	1.52***	1.58***	1.95**
		(2.92)	(3.06)	(3)	(2.35)
Change in share of churches that are Roman Catholic				-.544	
				(-.21)	
Change in average tuition per quarter					8.86
					(.914)
Constant	26.1**	30.1**	28.8**	29.1**	24.1
	(2.11)	(2.51)	(2.66)	(2.73)	(1.55)
Observations	80	80	80	80	55
R^2	.122	.145	.156	.156	.199

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.9: 1850 OLS Results: Dependent variable is the percentage of school-age (5-16) population being taught in 1850

	(1)	(2)	(3)	(4)	(5)
Percentage of the population foreign-born	-.661*	-.926**	-.638*	-.668*	-.616
	(-1.97)	(-2.15)	(-1.8)	(-1.78)	(-1.63)
Percentage of the population employed in manufacturing	-.32		-1.39***	-1.42***	-1.19**
	(-.564)		(-3.46)	(-3.32)	(-2.71)
Improved Farmland-per-family, in acres	-.106	-.0357	-.161	-.122	-.112
	(-.405)	(-.143)	(-.632)	(-.457)	(-.423)
Percentage of the population living in towns 2,500 and over		.198	.524***	.541***	.438***
		(1.28)	(6.84)	(5.76)	(5.22)
Percentage of churches that are Roman Catholic				.401	
				(.428)	
Average tuition per quarter for each student					-.0955*
					(-2.05)
Constant	76.2***	74.5***	81.5***	80***	80.9***
	(8.04)	(8.49)	(9.22)	(8.6)	(8.52)
Observations	172	172	172	172	152
R^2	.119	.129	.166	.168	.153

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.10: 1860 OLS Results: Dependent variable is the percentage of school-age (5-18) population attending school in 1860

	(1)	(2)	(3)	(4)	(5)
Percentage of the population foreign-born	-1.11*	-2.1***	-1.85***	-3.26***	-1.44**
	(-2)	(-3.59)	(-3.23)	(-3.64)	(-2.56)
Percentage of the population employed in manufacturing	-.79		-1.44*	-1.2	-1.28
	(-.669)		(-1.87)	(-1.61)	(-1.32)
Improved Farmland-per-family, in acres	-.0497	.105	-.0803	-.0188	.0304
	(-.0914)	(.214)	(-.158)	(-.0437)	(.0568)
Percentage of the population living in towns 2,500 and over		.708***	.811***	.969***	.931***
		(3.16)	(3.7)	(4.13)	(3.2)
Percentage of churches that are Roman Catholic				4.7*	
				(1.75)	
Average tuition per quarter for each student					10.2*
					(2.08)
Constant	109***	111***	120***	112***	89.3***
	(7.23)	(7.77)	(7.44)	(7.82)	(5.86)
Observations	183	183	183	183	129
R^2	.0554	.0753	.0831	.111	.14

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.11: Summary statistics for both samples of townships with missing and non-missing data on number of children taught for year 1850

	Missing		Non-Missing	
	Mean/SD	N	Mean/SD	N
Percentage of the population foreign-born	11.368	94	7.363	88
	(9.896)		(7.267)	
Percentage of the population employed in manufacturing	7.158	94	4.579	88
	(6.809)		(4.140)	
Improved Farmland-per-family, in acres	20.571	94	24.136	88
	(11.268)		(10.099)	
Percentage of the population living in towns 2,500 and over	6.155	94	1.793	88
	(16.997)		(9.599)	
Amount of money appropriated for school purposes	952.104	94	717.282	88
	(1,248.523)		(464.876)	
Average tuition per quarter for each student	2.887	75	2.035	83
	(8.509)		(0.469)	

Table C.12: 1850 OLS Results: Dependent variable is the percentage of school-age (5-16) population attending school in 1850

	(1)	(2)	(3)	(4)	(5)
Percentage of the population foreign-born	-1.13***	-1.19***	-1.14***	-1.16***	-.847**
	(-3.97)	(-3.64)	(-3.49)	(-3.5)	(-2.27)
Percentage of the population employed in manufacturing	.987		-.342	-.327	-.602
	(1.52)		(-.501)	(-.466)	(-.93)
Improved Farmland-per-family, in acres	.0562	.0241	.00186	.0217	.0583
	(.138)	(.0607)	(.00474)	(.0505)	(.147)
Percentage of the population living in towns 2,500 and over		.573***	.668**	.667**	.652**
		(4.44)	(2.81)	(2.75)	(2.82)
Percentage of churches that are Roman Catholic				.192	
				(.135)	
Average tuition per quarter for each student					9.82**
					(2.61)
Constant	74***	78.7***	80.3***	79.4***	59***
	(6.54)	(8)	(8.09)	(6.21)	(4.38)
Observations	88	88	88	88	83
R^2	.0895	.115	.116	.116	.168

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

Table C.13: 1850 OLS Results: Dependent variable is the percentage of school-age (5-16) population being taught in 1850 for the sample that has non-missing attendance data

	(1)	(2)	(3)	(4)	(5)
Percentage of the population foreign-born	-.625*	-.772*	-.629*	-.658*	-.287
	(-1.99)	(-2)	(-1.81)	(-1.77)	(-.745)
Percentage of the population employed in manufacturing	-.349		-1.09	-1.07	-1.37
	(-.673)		(-1.39)	(-1.29)	(-1.7)
Improved Farmland-per-family, in acres	-.25	-.21	-.281	-.247	-.224
	(-.843)	(-.718)	(-.961)	(-.746)	(-.791)
Percentage of the population living in towns 2,500 and over		.0683	.374	.372	.345
		(.448)	(1.5)	(1.44)	(1.41)
Percentage of churches that are Roman Catholic				.321	
				(.253)	
Average tuition per quarter for each student					11.3***
					(3.23)
Constant	84.6***	83***	88.1***	86.6***	63.4***
	(9.47)	(9.93)	(10.4)	(8.04)	(5.22)
Observations	88	88	88	88	83
R^2	.0733	.0706	.0868	.0877	.198

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

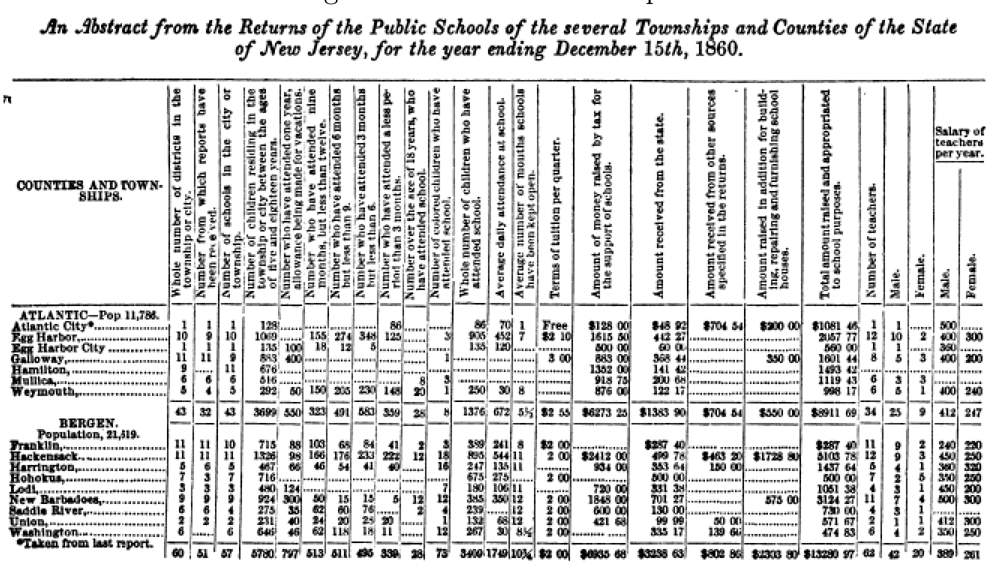
Table C.14: Dependent variable is the difference between % of school attendance in 1860 and % of children taught in 1850

	(1)	(2)	(3)	(4)	(5)
Change in % of population foreign-born	-8.59*	-10.5*	-9.96*	-10.1*	-11.5*
	(-1.75)	(-2.06)	(-1.77)	(-1.85)	(-1.91)
Change in % of population employed in manufacturing	-2.85		-2.52	-2.38	-.128
	(-1.64)		(-1.27)	(-1.12)	(-.0701)
Change in improved farmland per family in acres	-5.51*	-6.4*	-6.2*	-5.63*	-7.13*
	(-1.78)	(-2)	(-1.81)	(-1.88)	(-1.78)
Change in % of population living in towns 2,500 and over		.657	.541	.347	1.42**
		(1.52)	(1.12)	(.792)	(2.24)
Change in share of churches that are Roman Catholic				1.94	
				(.897)	
Change in average tuition per quarter					.437
					(1.15)
Constant	38.4***	39.8***	39.9***	38.5***	28*
	(3.35)	(3.42)	(3.36)	(3.72)	(1.99)
Observations	152	152	152	152	95
R^2	.0604	.0578	.0645	.0692	.0862

t statistics in parentheses
* p<.10, ** p<.05, *** p<.01

C.2 Figures

Figure C.1: 1860 School Report



An Abstract from the Returns of the Public Schools of the several Townships and Counties of the State of New Jersey, for the year ending December 15th, 1860.

COUNTIES AND TOWNSHIPS.	Whole number of districts in the township or city.	Number from which reports have been received.	Number of schools in the city or township.	Number of children residing in the township or city between the ages of five and eighteen years.	Number who have attended one year, allowance being made for vacations.	Number who have attended nine months, but less than twelve.	Number who have attended 6 months but less than 9.	Number who have attended 3 months but less than 6.	Number who have attended a less period than 3 months.	Number over the age of 18 years, who have attended school.	Number of colored children who have attended school.	Whole number of children who have attended school.	Average daily attendance at school.	Average number of months schools have been kept open.	Terms of tuition per quarter.	Amount of money raised by tax for the support of schools.	Amount received from the state.	Amount received from other sources specified in the returns.	Amount raised in addition for building, repairing and furnishing school houses.	Total amount raised and appropriated to school purposes.	Number of teachers.	Male.	Female.	Salary of teachers per year. Male.	Salary of teachers per year. Female.
ATLANTIC—Pop 11,786.																									
Atlantic City*	1	1	1	128					86			86	70	1	Free	$128 00	$48 92	$704 54	$200 00	$1081 46	1	1		500	
Egg Harbor,	10	9	10	1069		155	274	348	125		3	905	452	7	$2 10	1615 50	412 27			2057 77	12	10	2	400	300
Egg Harbor City	1	1	1	135	100	18	12	5				135	120			500 00	60 00			560 00	1	1		360	
Galloway,	11	11	9	583	400						1				3 00	883 00	368 44		350 00	1601 44	8	5	3	400	200
Hamilton,	9		11	676												1352 00	141 42			1493 42					
Mullica,	6	6	6	516						8	3					918 75	200 68			1119 43	6	3	3		
Weymouth,	5	4	5	292	60	150	205	230	148	20	1	250	30	8		876 00	122 17			998 17	6	5	1	400	240
	43	32	43	3699	550	323	491	583	359	28	8	1376	672	5½	$2 55	$6273 25	$1383 90	$704 54	$550 00	$8911 69	34	25	9	412	247
BERGEN. Population, 21,519.																									
Franklin,	11	11	10	715	88	103	68	84	41	2	3	359	241	8	$2 00		$287 40			$287 40	11	9	2	240	220
Hackensack	11	11	11	1326	98	166	176	233	222	12	18	895	544	11	2 00	$2412 00	499 78	$463 20	$1728 80	5103 78	12	9	3	450	250
Harrington,	5	6	5	467	66	46	54	41	40		16	247	135	11		934 00	353 64	150 00		1437 64	5	4	1	360	320
Hohokus,	7	3	7	716								675	275		2 00		500 00			500 00	7	2	5	350	250
Lodi,	3	3	3	480	124						7	180	106	11		720 00	331 38			1051 38	4	3	1	450	200
New Barbadoes,	9	9	9	924	300	50	15	15	5	12	12	385	350	12	2 00	1848 00	701 27		575 00	3124 27	11	7	4	500	300
Saddle River,	6	6	4	275	35	62	60	76		2	4	239		12	2 00	600 00	130 00			730 00	4	3	1		
Union,	2	2	2	231	40	24	20	25	20		1	132	68	12	2 00	421 68	99 99	50 00		571 67	2	1	1	412	300
Washington	6		6	646	46	62	118	18	11		12	267	30	8½	2 00		335 17	139 66		474 83	6	4	2	350	250
*Taken from last report.	60	51	57	5780	797	513	511	495	339	28	73	3409	1749	10¾	$2 00	$6935 68	$3238 63	$802 86	$2303 80	$13280 97	63	42	20	389	261

Source: New Jersey, 1861

Bibliography

Assaad, Ragui and Ghada Barsoum (2000), "Egypt Labor Market Survey 1998: Report on Data Collection, Preparation, and Appraisal." *Economic Research Forum.*

Assaad, Ragui and Fatma ElHamidi (2009), "Women in the Egyptian Labor Market: An Analysis of Developments, 1988-2006." *In The Egyptian Labor Market Revisited, ed. Ragui Assaad, Chapter 7*, 259–284.

Azam, Mehtabul and Vipul Bhatt (2012), "Like Father, Like Son? Intergenerational Education Mobility in India." *Institute for the Study of Labor (IZA) No. 6549.*

Bajracharya, Ashish (2010), "The Nature of Maternal Work and Children's Schooling in Nepal: The Influence of Income and Time Effects." *Poverty, Gender, and Youth Working Papers No. 21. New York: Population Council.*

Bank, World (2012), "Arab Republic of Egypt: Inequality of Opportunity in Educational Achievement." Technical Report 70300, Human Development Sector Unit. Middle East and North Africa Region. The World Bank.

Barsoum, Ghada (2007), "Egypt Labour Market Panel Survey 2006: Report on Methodology and Data Collection." *Economic Research Forum Working Papers No. 0704.*

Bauer, Philipp and Christoph Schaltegger (2011), "Income Equality, School Performance and Educational Mobility." *Center for Research in Economics, Management and the Arts.*

Baum, Charles L. (2003), "Does Early Maternal Employment Harm Child Development? An Analysis of the Potential Benefits of Leave Taking." *Journal of Labor Economics*, 21 (2), 409–448.

Becker, Gary S. (1965), "A Theory of the Allocation of Time." *The Economic Journal*, 75 (299), 493–517.

Becker, Gary S. (1981), *A Treatise on the Family*. Cambridge, MA: Harvard University Press.

Behrman, Jere, Alejandro Gaviria, Miguel Székely, Nancy Birdsall, and Sebastian Galiani (2001), "Intergenerational Mobility in Latin America." *Economia*, 2 (1), 1–44.

Bernal, Raquel (2008), "The Effect of Maternal Employment and Child Care on Children's Cognitive Development." *International Economic Review*, 49 (4), 1173–1209.

Binzel, Christine and Jean-Paul Carvalho (2013), "Education, Social Mobility and Religious Movements: A Theory of the Islamic Revival in Egypt." *Institute for the Study of Labor (IZA) No. 7259.*

Black, Sandra and Paul Devereux (2011), "Recent Developments in Intergenerational Mobility." *Handbook of Labor Economics*, 4 (11), 1487–1541.

Blanden, Jo (2013), "Cross-country Rankings in Intergenerational Mobility: A Comparison of Approaches from Economics and Sociology." *Journal of Economic Surveys*, 27 (1), 38–73.

Blau, Francine D. and Adam J. Grossberg (1992), "Maternal Labor Supply and Children's Cognitive Development." *The Review of Economics and Statistics*, 74 (3), 474–481.

Burr, Nelson R. (1942), *Education in New Jersey, 1630-1871*. Princeton History of New Jersey Series, Princeton University Press.

Burtless, Gary and Christopher Jencks (2003), "American Inequality and Its Consequences." In *Agenda for the Nation* (Henry Aaron, James Lindsay, and Pietro Nivola, eds.), chapter 3, Brookings Institutions Press, Washington DC.

Cawley, John and Feng Liu (2007), "Mechanisms for the Association Between Maternal Employment and Child Cognitive Development." *National Bureau of Economic Research (NBER) Working Papers No. 13609.*

Checchi, Daniele, Andrea Ichino, and Aldo Rustichini (1999), "More Equal But Less Mobile? Education Financing and Intergenerational Mobility in Italy and in the US." *Journal of Public Economics*, 74 (3), 351–393.

Dancer, Diane and Anu Rammohan (2007), "Determinants of Schooling in Egypt: The Role of Gender and Rural/Urban Residence." *Oxford Development Studies*, 35 (2), 171–195.

Durlauf, Steven (1996), "Theory of Persistent Income Inequality." *Journal of Economic Growth*, 1 (1), 75–93.

Ersado, Lire (2005), "Child Labor and Schooling Decisions in Urban and Rural Areas: Comparative Evidence from Nepal, Peru, and Zimbabwe." *World Development*, 33 (3), 455–480.

Field, Alexander J. (1976), "Educational Expansion in Mid-Nineteenth-Century Massachusetts: Human-Capital Formation or Structural Reinforcement?" *Harvard Educational Review*, 46 (4).

Field, Alexander J. (1979), "Economic and Demographic Determinants of Educational Commitment: Massachusetts, 1855." *The Journal of Economic History*, 39 (2), 439–460.

Fishlow, Albert (1966), "The American Common School Revival: Fact or fancy?" *In Henry Rosovsky, ed., Industrialization in Two Systems: Essays in Honor of Alexander Gerschenkron. New York: Wiley.*

Forum, Economic Research (Date accessed Sep 21st, 2010), "Egypt Labor Market Surveys 1998 and 2006 Online Databases." *http://www.erf.org.eg/cms.php?id=Labor_Market_Panel_Sur*.

Glick, Peter (2002), "Women's Employment and Its Relation to Children's Health and Schooling in Developing Countries: Conceptual Links, Empirical Evidence, and Policies." *Cornell Food and Nutrition Policy Program Working Paper No. 131.*

Glick, Peter and David E. Sahn (2006), "The Demand for Primary Schooling in Madagascar: Price, Quality, and the Choice between Public and Private Providers." *Journal of Development Economics*, 79 (1), 118–145.

Goldin, Claudia (1999), "A Brief History of Education in the United States." *National Bureau of Economic Research (NBER) Historical Paper*.

Goldin, Claudia and Lawrence F. Katz (2000), "Education and Income in the Early Twentieth Century: Evidence from the Prairies." *The Journal of Economic History*, 60 (3), 782–818.

Gregg, Paul, Elizabeth Washbrook, Carol Propper, and Simon Burgess (2005), "The Effects of a Mother's Return to Work Decision on Child Development in the UK." *Economic Journal*, 115 (501), 48–80.

Haines, Michael R. (2010), "Historical, Demographic, Economic, and Social Data for the United States, 1790-2000." *Ann Arbor, MI: Inter-university Consortium for Political and Social Research*, ICPSR Study No. 2896.

Hanushek, Eric A. (1992), "The Trade-Off between Child Quantity and Quality." *Journal of Political Economy*, 100 (1), 84–117.

Haveman, Robert and Barbara Wolfe (1995), "The Determinants of Children's Attainments : Findings and Review of Methods." *Journal of Economic Literature*, 33 (4), 1829–1878.

Huisman, Janine and Jereon Smits (2009), "Effects of Household- and District-Level Factors on Primary School Enrollment in 30 Developing Countries." *World Development*, 37 (1), 179–193.

Imbens, Guido W. and Joshua D. Angrist (1994), "Identification and Estimation of Local Average Treatment Effects." *Econometrica*, 62 (2), 467–475.

James-Burdumy, Susanne (2005), "The Effect of Maternal Labor Force Participation on Child Development." *Journal of Labor Economics*, 23 (1), 177–176.

Kabbani, Nader and Ekta Kothari (2005), "Youth Employment in the MENA Region: A Situational Assessment." *Social Protection Discussion Paper, the World Bank, Washington, DC.*

Kaestle, Carl F. (1983), *Pillars of the Republic: Common Schools and American Society, 1780-1860*. American Century Series, Hill and Wang.

Kaestle, Carl F. and Maris A. Vinovskis (1974), "Quantification, Urbanization, and the History of Education: An Analysis of the Determinants of School Attendance in New York State in 1845." *Historical Methods Newsletter*, 8 (1), 1–9.

Kaghoma, Christian (2012), "Education Mobility and Poverty Dynamics in Tanzania." *CSAE Conference 2012: Economic Development in Africa.*

Lillard, Lee and Robert Willis (1994), "Intergenerational Educational Mobility: Effects of Family and State in Malaysia." *Journal of Human Resources*, 29 (4).

Margo, Robert A. (2000), *Wages and Labor Markets in the United States, 1820-1860*. NBER Books, National Bureau of Economic Research, Inc.

McLoyd, Vonnie C., Toby E. Jayaratne, Rosario Ceballo, and Julio Borquez (1994), "Unemployment and Work Interruption among African American Single Mothers: Effects on Parenting and Adolescent Socioemotional Functioning." *Child Development*, 65 (2), 562–589.

Moore, Kristin A. and Anne K. Driscoll (1997), "Low-Wage Maternal Employment and Outcomes for Children: A Study." *The Future of Children*, 7 (1), 122–127.

Namoro, Soiliou D. and Rania Roushdy (2009), "Intrahousehold Resource Allocation in Egypt: Women Empowerment and Investment in Children ." *Middle East Development Journal*, 1 (1).

New Jersey, State Superintendent of Public Schools (1848), *Annual Report of the State Superintendent of Public Schools of New Jersey for the Year 1847*. Printed by Sherman and Harron.

New Jersey, State Superintendent of Public Schools (1851), *Annual Report of the State Superintendent of Public Schools of New Jersey for the Year 1850*. Trenton: Printed by Phillips and Boswell.

New Jersey, State Superintendent of Public Schools (1861), *Annual Report of the State Superintendent of Public Schools of New Jersey for the Year 1860*. Trenton: Printed at the "True American" Office.

Nugent, Jeffrey and Mohamed Saleh (2009), "Intergnerational Transmission of and Returns to Human Capital and Changes Therein Over Time: Empirical Evidence from Egypt." *Economic Research Forum Working Papers No. 468*.

Organization, International Labor (1982), "Resolution Concerning Statistics of the Economically Active Population, Employment, Unemployment, and Underemployment." *Thirteenth International Conference of Labour Statisticians, October, International Labour Organisation, Geneva.*

Pepper, John (2002), "Robust Inferences from Random Clustered Samples: An Application Using Data from the Panel Study of Income Dynamics." *Economics Letters*, 75 (3), 341–345.

Psacharopoulos, George and Harry A. Patrinos (1997), "Family Size, Schooling and Child Labor in Peru - An Empirical Analysis." *Journal of Population Economics*, 10 (4), 387–405.

Ruhm, Christopher J. (2004), "Parental Employment and Child Cognitive Development." *The Journal of Human Resources*, 39 (1), 155–192.

Ruhm, Christopher J. (2008), "Maternal Employment and Adolescent Development." *Labour Economics*, 15 (5), 958–983.

Sieverding, Maia (2011), "Intergenerational Social Mobility and Educational Expansion in Egypt." *University of California Berkeley.*

Solon, Gary (2004), "A Model of Intergenerational Mobility Variation over Time and

Place." In *Generational Income Mobility in North America and Europe* (Miles Corak, ed.), 1979, 38–47, Cambridge University Press, Cambridge.

Stafford, Frank P. (1987), "Women's Work, Sibling Competition, and Children's School Performance." *American Economic Review*, 77 (5), 972–980.

The Institute of National Planning, Egypt (1998-1999), "Egypt - Human Development Report 1998-1999. Human Development Report on Education." Technical report.

The Institute of National Planning, Egypt and The United Nations Development Programme (2004), "Egypt - Human Development Report 2004. Choosing Decentralization for Good Governance." Technical report.

Tuttle, Timothy N. (1970), *Social Mobility in a Nineteenth Century New Jersey Community: Perth Amboy 1850-1880*. Ph.D. thesis.

Vandell, Deborah L. and Janaki Ramanan (1992), "Effects of Early and Recent Maternal Employment on Children from Low-Income Families." *Child Development*, 63 (4), 938–949.

West, Roscoe (1964), *Elementary Education in New Jersey : A History*. Van Nostrand, Princeton, NJ.