THREE ESSAYS ON EDUCATION IN EGYPT

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ABSTRACT

Private tutoring is prevalent in Egypt and other developing countries. Nonetheless, the literature on tutoring is still small. The purpose of the first paper in this thesis is to gain an understanding of the determinants of tutoring in Egypt using micro-level data and to investigate whether gender bias exists in tutoring decisions. It is expected that since labor market outcomes are less favorable to girls and gender disparities are present in educational investments in general, parents would be less willing to invest in tutoring for girls. Surprisingly, however, no gender bias is detected with respect to tutoring. The absence of bias is a puzzling finding.

Tutoring is used to enhance children's education performance and give them a competitive edge. Socioeconomic level was found to be an important predictor of tutoring investment in the first paper. This poses equity concerns. Therefore, it is important to examine whether tutoring pays off in terms of better educational outcomes. The literature on tutoring effects mostly does not take into account the potential endogeneity of tutoring. I estimate the effect of taking tutoring on the likelihood of joining the secondary level stream that leads to university in the second paper of the thesis. I use a proxy for the supply of tutors as an instrument for taking tutoring. Without instrumenting, tutoring has a statistically significant positive effect. After introducing the instrumental variable, this effect disappears. However, the estimate of the tutoring coefficient is imprecise and there is some evidence that the instrument variable does not have sufficient power to get a reliable estimate of the tutoring effect.

The expectation of better marriage prospects for an educated woman may influence parental educational investment decisions and this can be the answer to the puzzle of apparently equal tutoring investment by gender as found in the first paper of the thesis. The third paper examines how female education improves marriage characteristics in Egypt. Findings show that highly educated women are more likely to marry a highly educated husband. They are also more likely to marry a husband with a high pre-marital wealth level and to live independently upon marriage. Higher levels of female education are negatively associated with marrying a relative. Female education plays an insignificant role with respect to the share of marriage costs borne by a bride and her family.

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Lastly, and most importantly, I thank my parents for being a constant source of emotional, moral and financial support. They encouraged me to pursue this degree and to complete it. To them I dedicate this thesis.

PREFACE

The first essay of this thesis is the product of a research fellowship, the ERF-University of Minnesota fellowship on Gender, Work, and the Family in Arab countries, which took place in the year 2004. The essay was prepared with the intention of joint publication with three of the fellowship's faculty advisors at the University of Minnesota: Dr. Ragui Assaad, Dr. Dennis Ahlburg (currently at the University of Colorado at Boulder), and Dr. Deborah Levison. I had primary responsibility for the literature review, computer work and writing-up of the paper.

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Chapter 4: Education Returns in the Marriage Market:

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LIST OF ACRONYMS

CAPMAS	Central Agency for Public Mobilization And Statistics (Egypt)
ELMPS 06	Egypt Labor Market Panel Survey (2006)
ELMS 98	Egypt Labor Market Survey (1998)
ERF	Economic Research Forum for Arab Countries, Turkey, and Iran
GDP	Gross Domestic Product
IIEP	International Institute of Educational Planning
IV	Instrumental Variable
LFSS 88	(Egypt) Labor Force Special Survey (1988)
MENA	Middle East and North Africa
MOE	Ministry of Education (Egypt)
PSU	Primary Sampling Unit

CHAPTER 1

INTRODUCTION

This thesis consists of three papers that deal with education-related issues in Egypt. The first and second papers (Chapters 2 and 3) focus on tutoring issues. The first and third papers (Chapters 2 and 4) focus on women's education issues. Chapter 2 examines the determinants of tutoring, an important educational investment in Egypt and also looks at whether gender differences exist with respect to it. Chapter 3 investigates whether tutoring as an educational investment has payoffs as measured by a critical education outcome in Egypt, the secondary track attended in the secondary (high-school) level. Chapter 4 examines whether a young woman's education outcomes have returns in the marriage market.

I use quantitative methods in all chapters. I rely on two nationally-representative household/labor surveys. The first survey is the Egypt Labor Market Survey (ELMS 98). The second survey, the Egypt Labor Market Panel Survey (ELMPS 06), is a follow-up to the first one and is the first longitudinal dataset available in Egypt. For more information on both datasets, please see the thesis appendix. ELMS 98 and ELMPS 06 have rich modules on education and marriage allowing for the examination of the research questions addressed in the thesis. In Chapter 2, I use ELMS 98. In Chapter 3, I use information from both datasets, exploiting the panel nature of ELMPS 06. In Chapter 4, I mainly use ELMPS 06. When needed, I use information from other data sources such as the Egyptian Census of 1996 and education indicators from the Egypt Ministry of Education. In carrying out the analysis, I use the statistical software STATA in all chapters.

Tutoring is becoming a large industry in Egypt and in other developing countries. It may be crucial to academic performance and, therefore, to future

education outcomes and income. Hence, it is important to understand the factors shaping its demand. In addition to examining these factors, Chapter 2 extends the literature on gender gaps in education in developing countries by looking at whether gaps exist in tutoring. Tutoring can be an additional educational dimension along which girls are discriminated against especially given its discretionary nature. Using multivariate statistical techniques that control for other child, household, and community characteristics, no gender differences are found in either the likelihood of taking tutoring or in the level of spending on it. It is socioeconomic variables such as parents' education and household wealth that strongly affect the likelihood of taking tutoring.

Given the result that children from more affluent backgrounds are more likely to take tutoring, it is important to assess if tutoring has real effects on education outcomes and, consequently has equity implications. In Chapter 3, exploiting the longitudinal nature of ELMPS 06, I look at whether those who received tutoring in the first data round in 1998 were more likely to have joined the high school stream leading to university, as observed in 2006. To do so, an endogeneity problem had to be overcome. Tutoring may be endogenous because there may be unobservable variables that affect both the tutoring decision and the education outcomes. For example, a student's innate ability may affect his/her need for tutoring as well as which track he/she joins. Also, a student who is more motivated or whose parents are more concerned about their children's education outcomes is more likely to take tutoring and is also more likely to join the more prestigious track for reasons other than taking tutoring. Therefore, being unable to control for unobservable characteristics such as innate ability, student motivation, and parents' level of concern about education, can contaminate the tutoring coefficient and lead to misleading results.

One way to overcome this problem is to use an instrumental variable estimator, where the instrumental variable is one that affects tutoring but does not

directly affect high school streaming. I use the percentage of working-age population that works in the education sector at the local level -- a proxy for the supply of tutors -- as an instrument for tutoring in my analysis. This variable was constructed using data from the Census of 1996. Disregarding endogeneity, taking tutoring is found to significantly increase the likelihood of joining the secondary track leading to university. However, after using the instrument variable to account for endogeneity, the sign of the tutoring variable changes and it becomes statistically insignificant. There is some evidence that the instrument has insufficient predictive power as suggested by the large standard errors on the tutoring variable and a weak instrument test. The weak instrument test seems to imply that a better instrument is needed in order to get a more reliable tutoring estimate. The bottom line is that the possible endogeneity of tutoring is a potentially important issue that needs to be dealt with.

The lack of gender difference result found in Chapter 2 was puzzling: why do parents invest in tutoring equally for sons and daughters when female labor force participation is low and labor market outcomes are unfavorable for women in Egypt? An answer to the puzzle may be that investment in female education is motivated by non-market payoffs that are primarily marriage-related. This motivated the Chapter 4, which examines whether female education improves marital outcomes. It is found that female education does play a significant role after controlling for other variables. It significantly increases the likelihood of marrying a more educated man, to live independently at the time of marriage (i.e., not in an extended-household setting) and to marry a husband that belonged to a wealthier household before marriage. Female education also reduces the likelihood of marrying a relative. However, female education does not significantly affect the share of marriage costs that a bride and her family have to bear.

The three papers in this thesis are closely connected. Chapter 2 examines factors shaping the educational investment of tutoring. Chapter 3 then examines how effective is investing in tutoring in terms of achieving better education outcomes. Chapter 4, inspired by findings in Chapter 2, explores how women's education outcomes affect their non-labor-market outcomes namely marriage outcomes.

CHAPTER 2

PRIVATE AND GROUP TUTORING IN EGYPT: WHERE IS THE GENDER INEQUALITY?

2.1. INTRODUCTION

Private tutoring[1] is an activity where a tutor provides instruction for students in return for a fee. The term tutoring is used to denote help with academic subjects and excludes extra-curricular classes such as music. In this chapter, we focus on pre-university tutoring that provides help with school syllabuses[2]. Over the last few decades, tutoring has become a significant and growing industry across much of the developing world. Despite some efforts to document the phenomenon, it remains significantly under-researched. Particularly, more rigorous quantitative research on the determinants and implications of tutoring needs to be undertaken.

Tutoring can be effective if it is remedial in the sense that it provides weaker students with access to teaching tailored to their level (de Silva 1994). It can also be a necessary learning supplement to low-quality schooling. However, in developing countries, tutoring has been predominantly an exam-preparation activity. Hence, while it can improve scores, it may not necessarily improve learning especially if it becomes a substitute to formal schooling.

Tutoring may have important equity implications as it can exacerbate education and income gaps because children from well-off families are more likely to afford tutoring. They are, therefore, more likely to obtain higher scores

[1] There are two forms of tutoring used in this chapter: private and group tutoring. Group tutoring (in Egypt) is a form of tutoring provided by public schools as an inexpensive alternative to private tutoring (more details are provided in Section 3.3).

[2] In some settings, tutoring is customized to institution-specific admission exams (e.g., university admission exams that vary from one university to another) and therefore needs not follow school syllabuses.

leading to better career and higher future income (Bray 2005)[3] [4]. Even when the poor are as likely to get tutored, they may only afford lower-quality tutoring (e.g., larger-group tutoring) and/or tutoring for shorter periods of time (e.g., before-exam tutoring as opposed to tutoring throughout the year), de Silva (1994). Moreover, if tutoring becomes an essential education cost, it can affect enrollment and dropout decisions especially of liquidity-constrained households. "Seeing that schooling has major costs which escalate at each step, families may decide simply to abandon schooling because they perceive that their children will never get far enough in the system for the investment to yield returns" (Bray 2005).

In addition to income inequality effects, tutoring can augment gender inequality in education. Gender gaps in tutoring can even be more pronounced than gaps in education aspects such as enrollment and dropout rates given its optional nature. Resource-constrained families can be more likely to invest in tutoring for their sons. Similarly, it is expected that tutoring effects on school entry and dropout decisions would be more profound on girls. In the case of Kenya, Buchmann (2002) notes that "lingering gender stereotypes regarding job prospects and gender biases in children's expected contributions to housework may mean that parents are less willing to provide *additional* educational resources to their daughters, especially in cases where family resources are severely limited (i.e. in poor families or those with many children)".

In Egypt, education gender differentials exist. Furthermore, reliance on tutoring is a central feature of the education system in Egypt. Based on the Egypt Labor Market Survey of 1998 (ELMS 98), 45% of pre-university students receive private tutoring. Among pre-university students, secondary level students are most likely to take tutoring (62%). Private tutoring is widespread geographically, across different income groups, and school types (see Tables 2.1-2.4). In addition

[3] Bray also points out that tutoring can augment urban/rural stratification since it is more prevalent in urban areas.

[4] Kim and Lee (2004) add that, in addition to being inequitable, such a scenario is inefficient.

to prevalence, tutoring absorbs substantial amounts of resources making it of considerable importance to study[5]. According to World Bank (2002 p. 26), aggregate household spending on tutoring at the pre-university level is estimated to represent 1.6 percent of GDP. It also represents the largest household education expense (even compared to spending on private school tuition and fees). Private lessons also constitute a significant part of total household spending and are known to be financially burdensome. According to the Economist Intelligence Unit (1996), it is not uncommon for households with children in the secondary education level to spend up to 25% of annual income on tutoring.

The purpose of this chapter is to gain an understanding of the nature and determinants of both private and group tutoring in Egypt in order to investigate whether gender bias exists in tutoring. Tutoring decisions examined are (1) the decision to receive tutoring and (2) the amounts to spend on it. We expected that since gender disparities are present in educational investments in general, they would be more prominent with respect to tutoring. However, we did not find any sign of gender disparities in the likelihood of taking private or group tutoring or in the level of spending on them.

The remainder of this chapter is organized as follows. In Section 2.2, the literature on tutoring is reviewed. In Section 2.3, we describe the education system and discuss gender differences with respect to education in Egypt. We also provide a description of tutoring in Egypt. The data sources and methodology are discussed in Section 2.4. Finally, we present the empirical results and conclusions in Section 2.5.

[5] Additionally, studying tutoring in Egypt adds to the tutoring literature in the Middle-East and North Africa (MENA) region which is small relative to the scale of tutoring in these countries and relative to the literature on Asian countries.

2.2. LITERATURE REVIEW

Tutoring was initially under-researched due to data shortage given that tutoring is not as observable as is mainstream schooling. For instance, it is hard to monitor its volume as tutors in many cases are not ready to declare the scale of their activity for tax reasons and sometimes because tutoring is not welcomed by authorities. A large body of the literature remains descriptive. Nonetheless, some attempts have been made to examine the determinants of receiving or spending on tutoring using multivariate statistical techniques. Bray (1999a, 1999b, 2005) provides an extensive cross-national documentation and compilation of work done on tutoring patterns[6]. Aspects he covered include the scale of tutoring, its forms and its causes.

A set of factors was believed to cause the spread of tutoring in the literature. First, tutoring, being a "shadow" or "parallel" form of education as many authors describe it, is linked to the nature of the mainstream education system. It tends to be more evident in education settings where the score acquired in a standardized exam is the criteria by which a student is promoted into a higher level of education and subsequently on which his career path and future income depends[7]. Competition to secure a place into a higher education level (especially university) and into a prestigious stream/field has induced students to demand and invest in tutoring to facilitate obtaining higher marks. The above is consistent with tutoring being more prevalent in end-of-cycle years which represent transition points to higher education levels. The connection between tutoring and exams being the education and career gateway has been noted by several researchers with reference to many countries, e.g., in Japan by Stevenson and Baker (1992), in Sri Lanka by de Silva (1994), in Mauritius by Foondun (2002) and in Turkey by Tansel and Bircan (2005).

[6] Summary tables can be found in Bray 1999a (Table 1 p. 24-25) and Bray 2005 (Table 1 p. 3).
[7] Moreover, the examination arrangement affects tutoring details. For example, when university admission depends on the score acquired on high school exams, tutors would tend to be teachers. However, if every university sets its own admission test, tutors may be university students.

Second, tutoring may be supply-related. In developing countries where school teachers earn low salaries, tutoring can be the result of teachers' direct or indirect attempts to secure additional income (Bray 1999b, Gunawardena 1994, Montgomery et al. 2000 and Foondun 2002). For instance, teachers can pressure students to hire them as tutors or they can simply shirk thereby creating a need for their tutoring services. Similarly, Biswal (1999) maintains that teacher shirking together with lack of monitoring is the theoretical explanation of why tutoring exists.

Third, inadequacy of school quality is another supply factor that has led to the rise of tutoring (Foondun 2002, Montgomery et al. 2000). Foondun (2002) gives examples of countries where a perception that teaching at school is insufficient creates a need for tutoring. Foondun also points out that large classes and a lack of individual attention contribute to the need for tutoring. Another factor he adds is peer pressure. Kim (2004) finds, using multivariate analysis, that it is school quality that induces tutoring.

Finally, Montgomery et al. (2000) indicate, with reference to tutoring in South Ghana, that as parents' level of education rose compared to earlier generations, they are more concerned over the quality of education their children receive and are hence willing to invest in tutoring.

As already seen, private tutoring has been documented across regions of the developing world. Most of the tutoring studies focused on a single-country[8] and usually did so from a demand-side perspective. Attention has been given to countries in East and South Asia[9]. Tutoring patterns have also been examined in

[8] One exception is Paviot et al. (2005) where cross-national data is used to analyze tutoring in 6 Eastern and Southern African countries.

[9] Examples of Asian countries studied include: Sri Lanka (de Silva 1994), Cambodia (Bray 1999c), Japan (Stevenson and Baker 1992), Korea (Kim 2004, Kim and Lee 2004), Hong Kong (Bray and Kwok 2003) and, Malaysia (Marimuthu et al. 1991).

some African countries[10] and are documented in East and in South Europe. Despite primarily being a developing country phenomenon, tutoring is emerging in Western Europe and North America as well. Davies (2004) examines tutoring in Canada[11]. Glasman (2004) examines tutoring in France. Ireson and Rushforth (2005) look at the nature and extent of private tutoring in England. However, it is less prominent; one reason being that the education system in these countries is less examination-oriented (Kwok 2001).

In the MENA region, Hussein (1987) provides a discussion of tutoring reasons and impacts in Kuwait[12]. Tansel and Bircan (2005) quantitatively examined the determinants of spending on tutoring in Turkey using the 1994 Household Expenditures Survey. They found household total expenditure (a proxy of income) and parents' education to be among the main determinants of spending on tutoring. It is worth noting that the data they used showed total tutoring expenditure per household and hence did not allow for examination of differences in tutoring spending by child characteristics such as gender and education level.

In addition to Tansel and Bircan (2005), there are a few papers that used multivariate quantitative methods to investigate tutoring determinants as mentioned above. Stevenson and Baker (1992) use a logistic regression in the case of Japan[13]. Montgomery et al. (2000) use a probit model to examine the determinants of tutoring in 4 communities in South Ghana. Kim (2004) and Kim and Lee (2004)[14] looked at determinants of tutoring in South Korea. A common finding was that socioeconomic status (represented by variables like parents'

[10] Examples include: Mauritius (Foondun 1992), Ghana (Montgomery et al. 2000) and Kenya (Buchmann 02).
[11] Davies (2004) uses logistic regressions to examine tutoring demand in Canada. He focuses on the characteristics of parents whose children participate in tutoring.
[12] His discussion is based on a survey he conducted of 934 students who too tutoring in at least one subject and who were mostly boys.
[13] They also run regressions to check the effects of tutoring on joining university.
[14] Kim and Lee focused on demonstrating that school quality is a main determinant of tutoring.

education and income) is a significant explanatory variable with which tutoring is positively related.

We are aware of no study whose motivation was the examination of tutoring gender gaps. Nevertheless, gender was sometimes included among the variables used to examine tutoring determinants. Bray (1999a, 2005) refers to several cases where authors make observations about gender differences: (negative) gender bias is observed in Kenya (Buchmann 2002) and in Bangladesh (Ahmad and Nath 2005). On the other hand, gender parity is found in Sri Lanka (de Silva 1994), Malaysia (Marimuthu et al. 1991), Malta (Falzon 1988) and Taiwan (Tseng, 1998).

The findings about gender gaps with respect to tutoring are mixed not only across countries but also within countries. For instance, Stevenson and Baker (1992) found significant gender differences in most of the tutoring types they examined. However, the sign of the difference is not constant across tutoring types. Furthermore, in the case of Korea, in the regressions Kim (2004) uses to model the number of hours spent daily on private tutoring, the "girl" dummy coefficient is negative and is significant[15]: the expected gender effect[16]. On the other hand, Kim and Lee (2004) found that Korean girls enjoy larger spending on tutoring compared to boys. They suggest that this finding may be due to girls being more likely to receive tutoring in music and arts, which tends to be more expensive. This is not however the only case where a *positive* gender bias was discovered. Montgomery et al. (2000), who explicitly included gender as a child characteristic that affects the demand for tutoring, were surprised to find that girls are more likely to participate in shadow education in Ghana. As the results concerning gender gaps in tutoring are inconclusive, there is a need to further study the issue.

[15] This dummy remains negative but becomes less significant in the specification where potentially endogenous variables are removed (Table 2.4).
[16] While Kim (2004) includes gender as a variable in the regression, he does not discuss the interpretation of the gender variable sign and significance in his results.

2.3. EDUCATION IN THE EGYPTIAN CONTEXT

2.3.1 Overview of the Education System[17]

Pre-university education in Egypt consists of three education levels: a five-year primary level[18], a three-year preparatory level, and a three-year secondary level[19]. Primary and preparatory stages (called basic education) are compulsory. There is a standardized examination in the final year of each level[20] that is required for access to higher education levels[21]. Education is mainly publicly-provided and publicly-controlled as school curricula are set by the Ministry of Education (MOE)[22]. School choice is somewhat limited as students have to enroll in a public school located in the corresponding catchment's area and frequently there is only one school especially in rural areas.[23]

Basic education contains only one stream. Beyond the basic phase, education becomes stratified into ranked tracks. The secondary stage branches off to general and technical streams. Admission into streams depends on the score obtained in the final year of the preparatory cycle. Admission into the general secondary stream requires a higher score in the preparatory diploma since it is regarded as the "prestigious" stream and is required for joining university.

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[17] An analysis of education trends and differentials by urban/rural residence and by gender is provided in the appendix.

[18] Starting in the school-year 2004/2005, a sixth-year was re-added to the primary level (after its elimination in 1988). However, the data we use (ELMS 98) applies to an earlier period where the primary level consisted of only five grades.

[19] Primary-level schools tend to be co-ed while post-primary schools tend to be segregated by gender.

[20] The final two years of the secondary level are diploma years.

[21] Primary, preparatory and secondary exams are standardized at the education directorate, governorate and nation levels, respectively.

[22] Private schools constitute only 4% of the total number of schools (based on the dataset we employ). Although private schools teach public curricula, they can have additional subjects/subject content (e.g., languages).

[23] Only students whose score in the standardized exam exceeds 85% can choose which public school to join regardless of where they live.

The general secondary diploma "*thanaweyya aamma*" is more of a bottleneck as students compete to secure seats in prestigious fields in prestigious universities. Admission into universities solely depends on the diploma score. "Egypt's education system is dominated by the secondary leaving certificate" (Hargreaves 1997). Each year, the coordination office determines cutoff scores for admission to each faculty in each university. With population growth pressure and a preference for university education[24], Egypt has been witnessing inflation in university admission scores[25].

2.3.2 Gender Bias in Education

Some aspects of gender bias with respect to educational investments are present in Egypt. Theoretically, a gender differential in educational investments can arise due to two reasons[26]. First, girls can face discrimination because of different weights parents place on the education of their sons and daughters. Parents may invest more in their sons' education because they value their human capital more than that of their daughters'--a pure preference bias. Dominant social norms about gender roles and parents' perceptions about the importance of women education can cause this bias. For example, parents may believe that girls should marry and take care of their families rather than work and, therefore, do not need as much education as boys. In addition, parents may value benefits associated with their daughters' education less because of their primarily non-pecuniary nature. Examples of such benefits include more efficiency in home production and childcare.

Second, girls can receive differential treatment based on pure efficiency grounds. Parents -- even if inequality averse-- can rationally invest more in boys'

[24] Preference for university is partly fuelled by an earlier government guarantee to hire university graduates in the public sector. At the same time, vocational jobs have been looked down upon. Furthermore, parents' aspirations regarding the education of their children rose because parents are more educated than earlier making university education a common aspiration.
[25] For example, in recent years, medical school requires a score above 95%.
[26] The discussion that follows assumes that girls and boys have the same cognitive abilities.

schooling if they expect higher returns on education in the case of boys (Rosenzweig and Schultz 1982). Differing returns to boys and girls can result from gender-related differentials in either the benefits or costs of education. Even if the benefits and costs of education are identical for boys and girls, parents can invest more in boys' education if they expect boys to transfer back a relatively larger part of their future income. However, it is likely that both the benefits and costs streams of education would vary by gender in developing countries. In addition, resource constraints along with imperfect credit markets would reinforce the investment bias against girls.

On the education benefits side, labor market outcomes tend to be more favorable to boys. It is not unusual for women in developing countries to have limited access to paid labor market jobs or to get a lower wage rate. In MENA countries, women face barriers to entry in the private sector (Moghadam 2002). In Egypt, female labor force participation is low and there are considerable wage differentials favoring males in the private sector even after accounting for education and experience (Assaad and Arntz 2002).

Costs can also vary by gender. Costs associated with traveling to school are particularly important. These can be gender specific due to school availability and accessibility constraints. For example, if no school is available in a village, parents can be more reluctant to send a daughter as opposed to a son to a school in another village[27]. The opportunity cost of children's time (an indirect cost) is a major cost of education that parents bear. Boys can help in farm work while girls typically help in house chores and in taking care of younger siblings. If parents value girls' time more than boys', they would be more reluctant to send girls to school.

[27] Alderman et al. (1996), King and Lillard (1987), and Newman and Gertler (1994) find that distance has a stronger negative effect on girls enrollment in Pakistan, Malaysia, Philippines, and Peru.

In the case of Egypt, girls are disadvantaged in terms of school entry (Elbadawy and Assaad 2008) but are not disadvantaged in terms of school progress (Elbadawy and Assaad 2008, Lloyd et al. 2003). In other words while girls are more likely not to join school, they are not more likely to drop out of school than boys conditional on school entry. Table 2.5 shows the percentage of girls and boys who have ever been to school by background characteristic. Overall, the percentage of girls who at some point were in school is 86.3% while the percentage of boys is 95.1%. The disparity is especially evident in rural areas, in Upper Egypt, and for children whose household lies in the lowest wealth quintile.

2.3.3 Tutoring in Egypt

Private tutoring (d*oroos khososeyya*) has long existed in Egypt. However, it has become widespread over the last few decades. Tutoring is largely a by-product of an exam-driven system whose goal is to provide students with credentials and as such tutoring is used to acquire exam-taking skills. Tutoring started as being mainly associated with the general secondary diploma. Since the score on the standardized national-level exam is critical in determining a student's career path and future earnings, families are prepared to invest in tutoring. Even families of lower income are willing to invest in tutoring as an avenue for upward social mobility. Through time, tutoring became a score maximization strategy with respect to primary and preparatory diploma years as well. The relative importance of different diploma years in different education stages is reflected in the percentage of those taking private tutoring. The percentage of tutees is 45%, 60%, 62% for the primary, preparatory and secondary stages, respectively (Table 2.1) [28].

[28] It is worth noting that ELMS 98 does not allow for the identification of students in general versus technical secondary stage. Technical secondary students are not expected to need tutoring as much as general secondary students because their degree tends to be terminal. Therefore, we

Tutors are essentially school teachers. [29] [30] One reason for preferring teachers is that they are perceived to be more experienced with the curriculum on which exams are entirely based. At the same time, teachers' salaries are low creating an incentive for teachers to engage in tutoring to earn additional income[31]. As with other countries where school teachers provide tutoring for their students, there is a potential for teachers abusing their position to blackmail their students. For example, they may deliberately not cover the syllabus fully so that students need extra help. They can also mistreat students to pressure them to hire them as tutors.

In addition to the education system being exam-oriented and the low salary of teachers, schooling quality is another important factor that created a need for supplementary tutoring. Factors adversely affecting the quality of education at school include the high class density. The growth in school-age population in Egypt has intensified the need for tutoring through different channels. On the one hand it has affected the class density and classroom teaching quality. On the other, it has intensified competition for seats in the general secondary stream and in universities.[32]

Private tutoring takes place as an underground activity because private tutoring was banned in 1998 by the MOE. But even before the ban, private tutoring was practiced with some level of secrecy to avoid the punitive measures that the MOE imposed on public school teachers who were participating in private tutoring. Tax evasion was another important factor contributing to the secrecy of

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expect that the percentage of students receiving tutoring in the general secondary stream is significantly larger than 62%.

[29] Teachers can tutor their own students or students in other grades/schools.

[30] In some countries, tutors are full-time professionals working in tutoring centers.

[31] Usually, a teacher keeps his low-paid job as public school teacher while working as a tutor. A school teacher can better market his tutoring services. In addition, despite the low salary, public school teachers enjoy job stability and social security benefits.

[32] Public schools are expected to be of lower quality compared to private schools because public schools tend to have over-crowded classrooms Nonetheless, pupils in private schools are more likely than those in public schools to take tutoring because of an income effect (see Table 2.1). Therefore, it is not entirely to compensate for lower school quality that pupils take tutoring.

private tutoring. Like in other countries where a ban was imposed on tutoring, enforcement of the ban is difficult and tutoring usually remains widespread.

In an effort to offer an alternative to private tutoring, MOE has been providing group tutoring (*magmoo'at taqweya*). Group tutoring is offered in schools, on the premises by school teachers (usually at the end of the school day). Generally speaking, the number of tutees is larger and the fees are much lower than in private tutoring. Therefore, it is viewed as the less expensive substitute to private tutoring. However, group tutoring is not as popular as private tutoring. The percentage of students taking private tutoring is 44% while the percentage of students taking group tutoring is only 19% (Table 2.1 and Table 2.2)[33].

Table 2.1 (2.2) provides details on the percentage of students taking private (group) tutoring in 1998 by gender and by background characteristic. Table 2.3 (2.4) lists the average yearly spending on private (group) tutoring per child (for children who take tutoring) by gender and by background characteristic. The figures in Tables 2.1-2.4 are survey-weight adjusted and are restricted to pre-university students who are 6-18 years of age. From Table 2.1, it is clear that private tutoring is common among children with different characteristics.

While private tutoring is observed in both rural and urban areas, it is more of an urban activity (Table 2.1). Group tutoring, on the other hand, is equally taken in rural and urban areas (Table 2.2). Observing an urban/rural gap in the likelihood of receiving private tutoring may be a result of an income effect: rural households tend to be poorer and therefore may not be able to afford the relatively expensive private tutoring as much as urban households. Households in urban areas spend considerably more per child for both types of tutoring (see Table 2.3 and Table 2.4). The urban/rural difference in the spending level may arise because of the general differences in prices (tutoring fees tend to be lower in rural areas) and because of an income effect.

[33] 3% of students take both private and group tutoring.

Private tutoring is widespread across regions of Egypt. The region with the largest percentage of private tutoring is Lower Egypt (56.3%). Urban governorates come second with Alexandria and Canal governorates having 49.1 percent and Greater Cairo having 47.5 percent of students being tutored. The region with the lowest but still sizeable percentage of tutoring receivers is Upper Egypt (27.3%). This is possibly because of an income effect since this is the poorest area of Egypt. It can also be the result of a supply effect: tutors are not as available as in other regions. Upper Egypt exhibits a larger urban/ rural gap[34]. A contrasting picture is seen with respect to group tutoring: in regions where private tutoring is least prevalent, group tutoring is most common (e.g., in Upper Egypt).[35] In addition, group tutoring is found more in rural areas of Lower and Upper Egypt.

Comparing tutoring across educational levels shows that reliance on private (group) tutoring increases (decreases) as a student progresses through the system. Similarly, more students depend on private tutoring in diploma years while reliance on group tutoring does not increase in those years. In addition, as higher education levels and diploma years are more critical, tutoring spending is larger in higher levels and in diploma years whether students choose to receive private or group tutoring.

The likelihood of receiving private (group) tutoring is slightly higher (lower) in private schools. The spending on private tutoring for a child attending a private school is notably larger relative to a child attending a public school (Table 2.3) despite the general perception that private schools are of higher quality. The higher spending for private schools is expected to result from an income effect.

[34] Students in urban areas of Lower Egypt are 1.25 times as likely to get tutored, while students in urban areas of Upper Egypt are more than twice as likely to get tutored.
[35] The by-region yearly spending in descending order is: Greater Cairo, Alexandria and Canal, Lower Egypt then Upper Egypt. This ranking holds for both private and group tutoring (Table 2.3 and Table 2.4) and can reflect an income effect as well as differences in tutoring fees.

To capture differences across different income groups, we compared the percentage of students receiving tutoring in the lowest and highest urban wealth quintiles as well as the lowest and highest rural wealth quintiles[36]. As expected, students coming from households in the highest quintile are more likely than those in the lowest quintile to receive private tutoring because of the inherent income effect (Table 2.1). The average per-child tutoring expenditure by households falling in the highest urban (rural) quintile is five (three) times greater than by those in the lowest urban (rural) quintile (Table 2.3).[37]

Based on the above, children in urban areas and children who come from richer households tend to participate and spend more on private tutoring. This illustrates the potential equity implications of private tutoring. Parents whose children are in higher education levels and whose children are in diploma years are more willing to invest in private tutoring. The opposing patterns of private and group tutoring reflect their substitutability and that group tutoring is perceived as the inexpensive and lower-quality alternative that is used in less critical years.

Given the differences in the likelihood of receiving tutoring and the level of spending on it, we expected to find different patterns of tutoring by gender. We particularly expected that girls in rural areas, in Upper Egypt and girls belonging to households falling in the lowest wealth quintile are more susceptible to gender bias. However, to our surprise and by examining Table 2.1 through Table 2.4, we found no real gender disparities with respect to tutoring across the various characteristics. Moreover, the level of spending on private tutoring was rather in

[36] The index is based on asset ownership. Since, asset composition differs across rural and urban areas, We constructed a separate wealth index for rural and urban areas. See Filmer and Pritchett (2001) for the factor analysis methodology used to construct the wealth score.

[37] In contrast to private tutoring, the likelihood of taking group tutoring does not really vary by wealth quintiles (Table 2.2). As for group tutoring spending, urban households in the highest urban quintile spend more than twice than those in the lowest urban quintile. However, spending is almost equal in rural areas.

favor of those girls. We use regression models in the next section to see if the pattern of no gender bias persists when controlling for other variables.

2.4. DATA AND METHODOLOGY

This chapter primarily utilizes data from the Egyptian Labor Market Survey (ELMS 98), a nationally representative survey that includes 4,816 households and 23,997 individuals of all ages[38]. We restrict our sample to individuals that are currently in school and are 6 to 18 years of age (6,114 of the 23,997 individuals). We supplement ELMS 98 by locality-level data drawn from the 1996 Egyptian Population Census as well as governorate-level[39] education data from MOE.

In ELMS 98, four questions cover tutoring for each child currently in school. The first two questions are related to private tutoring. The answers to these indicate whether a student received private tutoring in the last school year or not, and how much was spent during the last year on private tutoring. The two questions are repeated for group tutoring[40]. These variables will be used as dependent variables.

Variables representing individual, household, as well as community characteristics serve as explanatory variables. Individual-level variables are gender, age- group dummies (corresponding to different education levels)[41], a dummy for being the eldest child and a dummy for being the son/daughter of the household's head (as opposed to being a step child, grandchild, or other). We also employ variables showing whether the child attended a multiple-shift school at

[38] For more information on the data, please refer to the thesis appendix.
[39] There are 26 governorates in Egypt. ELMS 98 has observations on 22 governorates as it excludes the sparsely populated and mainly nomadic frontier governorates.
[40] The four questions are only concerned with tutoring dealing with school subjects and exclude extra-curricular courses.
[41] While we have data on which education level a student is attending, progress to a given education level can be endogenous given that it can be affected by investment in tutoring.

the primary level[42], whether he/she is in a diploma year, and if he/she is a delayed pupil (i.e., had experienced delayed school entry or repetition)[43].

Household-level variables are parents' years of schooling, whether parents are present or absent (e.g., because of labor migration), and urban and rural wealth quintiles[44]. Dummies showing which region of Egypt the student resides in, and whether it is an urban or rural area, are included to reflect community factors. In addition, a variable indicating the percentage of the local-level working age population employed in the education sector was constructed, using census data, as a proxy for the supply of tutors. Furthermore, in an attempt to capture the effect of schooling quality, the governorate-level teacher-pupil ratio for the different education levels is included.

We use several models: single probit, bivariate probit, govenorate-fixed effects and governorate-random effects. The same set of explanatory variables is used across the different models. The (single) probit model assumes that the private and group tutoring decisions are made separately. The (single) probit model follows the standard form:

$$\Pr(T = 1|X) = \Pr(\varepsilon > -X\beta),$$

where T denotes the tutoring status (1= receiving tutoring), and the error term ε is assumed to follow a normal distribution. X represents the vector of regressors:

[42] Due to school supply constraints, some schools operate in two or three shifts to accommodate larger numbers of students. Each student attends school in one of these shifts e.g., in the morning or the afternoon shift. School quality may be adversely affected in these schools because the school day is shorter.

[43] We did not include a dummy for private school attendance because of its endogeneity. School type (private versus public) and tutoring are related education decisions. Parents can choose to enroll their children in free public schools without supplementing with group or private tutoring at one end of the continuum of education investment choices while they can choose to enroll their children in private schools and to supplement with tutoring at the other end of the continuum. In between, parents can choose free public schools and compensate with tutoring spending.

[44] A wealth score is constructed using factor analysis based on household asset ownership and house characteristics information. A separate score is created for urban and rural areas, as what a wealthy person owns and his/her house characteristics vary across urban and rural areas. Households are then divided into quintiles according to the wealth score. See Filmer and Pritchett (2001) for the factor analysis methodology used to construct the wealth score.

individual, household and community characteristics, as well as other supply side variables (as discussed above).

Since it is possible that the errors of these two equations are not independent, we also use a bivariate probit model where the two equations for private and group tutoring are estimated jointly. With respect to spending on tutoring, we employ two (single) tobit equations -where the dependent variables are spending on private tutoring and spending on group tutoring, respectively (Table 2.11).

To control for within-province variation, we also include in our analysis of private tutoring and group tutoring two additional models: governorate fixed effects and governorate random effects. To account for possible differences in tutoring decisions across different education levels (primary, preparatory and secondary), we estimate separate (single) probits for each level of education (Tables 2.13, 2.14).

In each model, a female dummy variable is included to test for whether there are differences in the likelihood of receiving tutoring based on gender, controlling for other explanatory variables. Additionally, we employed specifications where each regressor is interacted with the female dummy to further test for gender-related differences (detailed results for these specifications are not shown).

2.5. RESULTS

2.5.1 Lack of Gender Differences in Tutoring

The data did not show any sign of gender differences either in the likelihood of taking tutoring (group or private) or in the level of spending on tutoring. The female dummy generally turned out to be insignificant. The female dummy and the interaction terms with "female" were jointly insignificant (P-values for the joint significance test are listed at the bottom of Tables 2.8, 2.9, and 2.11).

For private tutoring, the female dummy was insignificant across the four models (Table 2.8). For group tutoring, the female dummy was significant (at the 10% level) in the governorate fixed effects and random effects specifications. However, the dummy coefficient was positive, indicating favorable treatment for girls (Table 2.9). No bias against girls was detected with respect to tutoring expenditure. The female dummy was insignificant for spending on private tutoring. The female dummy was significant (at the 10% level) and positive for spending on group tutoring (Table 2.11).

Based on the female-interacted specifications (results not shown), the similarity of tutoring patterns by gender holds across household and community characteristics apart from some exceptions. For example, in private tutoring models, the dummy for household being in the third urban wealth quintile, and the dummy for living in Lower Egypt were both significant (at the 10% level) when interacted with the female dummy. However, the coefficients were positive indicating more private tutoring for girls. For the group tutoring specifications (with interactions), significant interactions included the dummy for age 15 to 19, the dummy for being a son/daughter of the head, the dummy for the temporary absence of father, and the proxy for educators at the local level. All except the age 15 to 19 dummy had a negative effect.

As for regressions performed separately for private, preparatory, and secondary levels, the female dummy was significant and positive in sign for the secondary level in both private and group tutoring (at 5% and 1% level of significance, respectively). However, it was significant (at the 10% level) and negative in sign for the primary level regression in the case of private tutoring. This was the only case in which the gender variable had the expected effect.

The absence of gender bias with respect to an optional human capital investment such as tutoring is surprising. We thought that our finding may be a product of selection bias. Tutoring is conditional on child enrollment in school. It

is possible that girls that enter and remain in school belong to the households that do not engage in differential treatment based on gender or that at least have different characteristics. If this is the case then the selection bias would be consistent with finding no gender differences. We ran a maximum-likelihood probit model with sample selection (results not shown) where the variable that identifies the school attendance equation is the local-level percentage of population engaging in manual work. While the female dummy was negative and significant in the schooling equation, the female dummy remained insignificant in the private tutoring equation suggesting our result was not driven by the use of a selective sample.

2.5.2 Tutoring Determinants

While child sex was not found to affect tutoring decisions, this does not apply to other child, family, and community characteristics. Variables significance is generally consistent across the different estimators we used. With respect to private tutoring (Table 2.8), being 12-14 and 15-19 years of age (compared to being 6-11), and being in a diploma year have a highly significant and positive effect on the likelihood of taking private tutoring. This is expected given that the 12-14 and 15-19 age-groups correspond to the preparatory and secondary education levels that are more critical relative to the primary level. Similarly, tutoring is expected to be more prevalent among children in diploma grades to help them get a better score on standardized exams. Being the eldest child was also positive and significant indicating that parents tend to invest more in eldest children.

Socioeconomic status variables are also among the main determinants of private tutoring. Both father and mother years of schooling are important and display an inverted-U pattern that indicates that, at very low and at very high parental education levels, children are less likely to take tutoring. This may result from less educated parents being less willing to invest in tutoring because they

may value education less. Highly-educated parents, on the other hand, may tutor their children themselves. Additionally, household wealth variables are positive and significant especially in urban areas. Children whose father is temporarily absent are more likely to get tutored. Temporary absence is likely to mean that the father is a labor migrant which possibly results in a positive income effect. One unintuitive result is that children whose father is permanently absent are also more likely to participate in private tutoring.

Some community and schooling-related variables play an important role. The variable representing the percentage of the working-age population that is working in the education sector, which we used to proxy the supply of tutors, is positive and significant. The governorate-level teacher-pupil ratio at the secondary level, which we use to proxy for school quality, affects the likelihood of taking tutoring negatively. Another unintuitive result we find is that the teacher-pupil ratio at the primary level, in contrast, has a positive effect. As in bivariate descriptive statistics, children in urban areas are more likely to resort to private tutoring. The region variables were insignificant except for the Lower Egypt dummy which means that private tutoring is more prevalent among children residing there compared to those residing in Greater Cairo.

The regression on private tutoring spending generated similar results (Table 2.11). However, mother's years of schooling and the permanent absence of the father are not among the significant variables. Also, unlike in the regression of the likelihood to take private tutoring, being a delayed student is a significant regressor and it affects the level of spending on private tutoring negatively.

The results in the group tutoring regressions (Table 2.9) were different from those in the private tutoring regressions reflecting that group tutoring is the lower-quality substitute to private tutoring. For example, the coefficient of the 15-19 age-group dummy is negative while that on the diploma year dummy is insignificant. This reflects that group tutoring is not as popular as private tutoring

when children are attending more critical grades / education levels. Moreover, father education and household wealth variables are not important determinants as in the case for private tutoring. However, similar to private tutoring, the mother years of schooling and the father temporary absence and being the eldest child are associated with more group tutoring.

While the proxy for the supply of tutors is statistically significant like in the private tutoring results, it is negatively associated with the likelihood of taking group tutoring. The regional dummies are also significant but are all negative consistent with anecdotal evidence that the provision of group tutoring is more regular in Cairo schools.

Students that are delayed are more likely to invest in group tutoring. This may reflect that late entry students tend to come from poorer households and are more likely to choose the more affordable group tutoring (if household poverty is not entirely captured by the wealth index). This can also explain why being delayed affects the level of spending on private tutoring negatively[45]. The tobit model for group tutoring spending produces comparable findings (Table 2.11). The only exception is that diploma year students spend significantly more on group tutoring. Therefore, conditional on deciding to take group tutoring, diploma students spend more than other students.

2.6. CONCLUDING REMARKS

The persistence of no gender differentials is puzzling given that boys are expected to have better prospects in the labor market. However, an education premium in the labor market may not be the only motive for educating children. An education

[45] One issue we note with respect to this variable is that it may be endogenous to tutoring decisions. Being delayed may result from late school entry or from grade repetition. While it is not a strong possibility that parents decide to send their children to school at an age above the official age and later compensate with supplementary tutoring, it is possible that children taking tutoring are less likely to repeat grades because tutoring helps them to get scores that qualify them for passing.

premium in the marriage market may be the answer to the puzzle. Mensch et al. (2000) argue that the main reason behind parents' willingness to invest in their daughter's education is the expected return in the marriage market. Lloyd et al. (2001, p. 13) make a similar point. Accordingly, parents may be investing in tutoring to ensure that their daughter successfully progresses through the education system so that she finds a richer and/or more educated husband. It can be the case that in addition to upward social mobility, better marriage prospects can result in a smaller contribution by parents towards a daughter's marriage.

A preliminary inspection of the data shows that the higher a girl's education is, the higher the probability that she gets an educated husband. For instance, the probability of having a husband with a university or higher degree goes from 13% for a girl with secondary education to 33% for a girl with an above-intermediate degree to 74% for a girl with a university degree (Table 2.7). A woman tends to match with a man who is at least as educated as she is.

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TABLES

Table 2.1: Percentage of Students Receiving Private Tutoring by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total
Age group			
6-11	32.7	31.3	32.0
12-14	52.3	50.9	51.6
15-18	56.2	63.7	59.6
Urban / Rural			
Urban	53.0	40.6	52.0
Rural	38.9	50.9	39.6
Regions			
Greater Cairo	52.0	43.1	47.5
Alex & Canal	49.9	48.4	49.1
Lower Egypt	55.4	57.4	56.3
Urban	62.9	69.4	66.2
Rural	53.3	53.5	53.4
Upper Egypt	26.9	27.9	27.3
Urban	46.1	45.9	46.0
Rural	21.4	21.8	21.6
Education Level			
Primary	34.3	32.9	33.7
Preparatory	53.8	52.8	53.3
Secondary	58.1	66.4	62.0
Diploma Year			
Primary	45.2	45.4	45.3
Preparatory	60.0	59.7	59.9
Secondary	61.3	69.6	65.2
Total	55.4	58.2	56.7
School Type			
Public	43.8	44.6	44.2
Private	48.5	48.0	48.0
Wealth			
Lowest Urban Quintile	41.1	38.7	39.9
Highest Urban Quintile	60.7	50.8	56.1
Lowest Rural Quintile	25.1	27.8	26.0
Highest Rural Quintile	53.5	54.1	53.8
Total ELMS 98	44.4	45.2	44.7

Source: ELMS 98

Note: Pre-university students, 6-18 years of age.

Table 2.2: Percentage of Students Receiving Group Tutoring by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total
Age group			
6-11	21.5	21.9	21.7
12-14	22.5	21.0	21.8
15-18	10.9	14.8	12.7
Urban / Rural			
Urban	17.1	21.1	19.1
Rural	20.1	18.9	19.6
Regions			
Greater Cairo	26.4	34.9	30.7
Alex & Canal	15.7	19.3	17.5
Lower Egypt	15.8	15.2	15.5
Urban	8.1	8.9	8.5
Rural	18.0	17.2	17.6
Upper Egypt	20.3	18.2	19.4
Urban	11.7	8.7	10.3
Rural	22.7	21.4	22.2
Education Level			
Primary	21.6	21.7	21.6
Preparatory	20.8	20.8	20.8
Secondary	8.5	13.3	10.7
Diploma Year			
Primary	24.6	20.7	22.7
Preparatory	15.1	19.6	17.2
Secondary	10.1	10.0	10.0
Total	16.6	16.5	16.6
School Type			
Public	18.0	16.0	18.0
Private	7.0	13.0	10.0
Wealth			
Lowest Urban Quintile	18.1	20.4	19.2
Highest Urban Quintile	17.8	22.5	20.0
Lowest Rural Quintile	19.8	13.8	17.8
Highest Rural Quintile	16.4	23.1	19.6
Total ELMS 98	18.9	19.9	19.4

Source: ELMS 98

Note: Pre-university students, 6-18 years of age.

Table 2.3: Average Yearly Spending per Child on Private Tutoring by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total
Age group			
6-11	168.1	157.6	163.3
12-14	256.2	316.6	285.0
15-18	521.6	564.2	542.1
Urban / Rural			
Urban	482.2	501.3	491.5
Rural	172.3	208.9	188.9
Regions			
Greater Cairo	731.1	746.8	738.3
Alex & Canal	459.2	473.8	466.4
Lower Egypt	223.4	257.7	239.9
Urban	330.2	359.8	345.7
Rural	188.6	215.4	201.0
Upper Egypt	162.7	236.5	194.9
Urban	227.0	307.9	264.1
Rural	123.4	186.1	149.9
Education Level			
Primary	167.5	165.2	166.5
Preparatory	271.6	336.1	301.9
Secondary	634.3	634.2	634.3
Diploma Year			
Primary	202.9	216.3	209.2
Preparatory	294.6	423.1	353.4
Secondary	740.0	740.7	740.3
Total	316.4	354.4	471.8
School Type			
Public	254.8	292.4	272.5
Private	761.8	1031.0	904.6
Wealth			
Lowest Urban Quintile	190.5	221.4	204.6
Highest Urban Quintile	922.0	1106.7	1000.6
Lowest Rural Quintile	72.2	122.3	90.5
Highest Rural Quintile	270.3	313.2	290.9
Total ELMS 98	316.4	354.4	334.2

Source: ELMS 98

Notes: Pre-university students, 6-18 years of age.
Average is in Egyptian pounds and is based on those receiving private tutoring.

Table 2.4: Average Yearly Spending per Child on Group Tutoring by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total
Age group			
6-11	80.7	86.2	83.3
12-14	106.5	118.9	112.3
15-18	163.3	174.4	169.2
Urban / Rural			
Urban	137.5	152.5	145.7
Rural	82.6	77.9	80.6
Regions			
Greater Cairo	160.4	168.3	165.0
Alex & Canal	112.0	150.3	133.3
Lower Egypt	89.7	76.8	83.8
Urban	123.7	97.8	110.2
Rural	85.5	73.3	80.0
Upper Egypt	80.2	84.2	81.8
Urban	83.8	91.0	86.6
Rural	79.7	83.2	81.1
Education Level			
Primary	86.8	88.5	87.6
Preparatory	111.6	115.6	113.5
Secondary	173.3	215.0	197.6
Diploma Year			
Primary	118.4	93.7	107.8
Preparatory	139.7	121.8	130.3
Secondary	142.7	270.1	201.8
Total	101.9	112.9	135.0
School Type			
Public	98.8	105.4	101.9
Private	145.1	140.9	143.0
Wealth			
Lowest Urban Quintile	105.4	98.1	101.7
Highest Urban Quintile	189.3	247.9	220.3
Lowest Rural Quintile	81.6	51.5	73.6
Highest Rural Quintile	56.6	90.0	75.4
Total ELMS 98	101.9	112.9	107.1

Source: ELMS 98

Note: Pre-university students, 6-18 years of age.

Average is in Egyptian pounds and is based on those receiving group tutoring.

Table 2.5: Percentage of Children Who Have Ever Been to School by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total	Number of Boys	Number of Girls	Sample Size
Age group						
6-11	95.3	88.6	92.1	1,408	1,339	2,747
12-14	94.3	87.0	90.6	926	931	1,857
15-18	95.3	83.1	89.4	1,171	1,103	2,274
Urban / Rural						
Urban	98.0	95.5	96.7	2,065	2,036	4,101
Rural	93.4	80.4	87.1	1,440	1,337	2,777
Regions						
Greater Cairo	98.6	97.4	98.0	510	552	1,062
Alex & Canal	99.1	97.7	98.4	379	405	784
Lower Egypt	96.2	89.0	92.7	1,287	1,212	2,499
Urban	98.2	94.3	96.3	513	504	1,017
Rural	95.7	87.4	91.7	774	708	1,482
Upper Egypt	91.68	75.8	84.1	1,329	1,204	2,533
Urban	95.8	90.6	93.4	663	575	1,238
Rural	90.6	72.1	81.7	666	629	1,295
Wealth						
Lowest Urban Quintile	93.9	86.0	90.1	584	534	1,118
Highest Urban Quintile	100.0	98.2	99.2	333	300	633
Lowest Rural Quintile	84.2	56.9	71.7	255	226	481
Highest Rural Quintile	99.5	97.2	98.4	307	292	599
Total ELMS 98	95.1	86.3	90.8	3,505	3,373	6,878

Source: ELMS 98

Table 2.6: Percentage of Children Attending School by Gender and Background Characteristic

Background Characteristic	Boys	Girls	Total	Number of Boys	Number of Girls	Sample Size
Age group						
6-11	93.9	87.5	90.8	1408.0	1339.0	2747.0
12-14	87.7	80.8	84.2	926.0	931.0	1857.0
15-18	65.0	55.7	60.4	1171.0	1103.0	2274.0
Urban / Rural						
Urban	87.5	85.2	86.3	2065.0	2036.0	4101.0
Rural	79.6	68.4	74.2	1440.0	1337.0	2777.0
Regions						
Greater Cairo	91.0	87.8	89.3	510.0	552.0	1062.0
Alex & Canal	88.0	84.2	86.0	379.0	405.0	784.0
Lower Egypt	81.2	76.5	78.9	1287.0	1212.0	2499.0
Urban	83.2	83.9	83.6	513.0	504.0	1017.0
Rural	80.6	74.3	77.6	774.0	708.0	1482.0
Upper Egypt	80.0	65.5	73.1	1329.0	1204.0	2,533 |
Urban	86.0	82.4	84.3	663.0	575.0	1238.0
Rural	78.5	61.3	70.2	666.0	629.0	1295.0
Wealth						
Lowest Urban Quintile	74.3	68.6	71.5	584.0	534.0	1118.0
Highest Urban Quintile	98.0	97.1	97.6	333.0	300.0	633.0
Lowest Rural Quintile	71.2	44.1	58.8	255.0	226.0	481.0
Highest Rural Quintile	91.7	91.6	91.7	307.0	292.0	599.0
Total ELMS 98	82.5	74.9	78.8	3505.0	3373.0	6878.0

Source: ELMS 98

Table 2.7: Wife and Husband Educational Attainment

	Husband's Educational Attainment						
Woman's Educational Attainment	No Education	Reads & Writes	Less than Secondary	Secondary	Above Secondary	University & Higher	Number of Men
No Education	41.24	15.9	23.38	18.6	0.65	0.23	323
Reads & Writes	29.94	27.19	27.53	8.93	2.83	3.57	51
Less than Secondary	17.08	11.25	36.11	28.49	2.56	4.51	209
Secondary	2.84	3.88	10.99	55.51	13.36	13.43	416
Above Secondary	0	2.22	3.97	31.19	29.22	33.4	97
University & Higher	0	0	0.98	15.86	8.68	74.47	150
Total	18.14	9.55	18.53	31.46	7.77	14.55	
Number of Women	194	112	227	388	106	219	1,246

Source: ELMS 98

Notes:

1. Based on marriages in the last 10 years (i.e., from 1988 to 1998).
2. Each cell represents the probability of a certain level of husband educational attainment given the educational attainment of the wife.

Table 2.8: Private Tutoring Probits

	Probit	Bivariate Probit	Governorate Fixed Effects	Governorate Random Effects
	(1)	(2)	(3)	(4)
Individual characteristics				
Female	-0.03	-0.03	-0.028	-0.028
	-0.88	-0.87	-0.8	-0.82
Age group 12-14^	0.616	0.614	0.632	0.628
	(14.50)***	(14.43)***	(14.72)***	(14.65)***
Age group 15-19	0.561	0.558	0.574	0.569
	(11.75)***	(11.70)***	(11.93)***	(11.80)***
Eldest child	0.093	0.097	0.083	0.085
	(2.25)**	(2.33)**	(1.99)**	(2.03)**
Son/daughter of head	0.088	0.085	0.113	0.108
	-1.32	-1.27	(1.66)*	-1.6
Late	-0.059	-0.06	-0.074	-0.073
	-1.01	-1.03	-1.26	-1.25
School operates in shifts	-0.004	-0.005	0.016	0.016
	(-0.1)	(-0.12(	(-0.43)	(-0.44)
Diploma year	0.28	0.279	0.292	0.289
	(6.83)***	(6.81)***	(7.06)***	(6.99)***
Household characteristics				
Father's years of schooling	0.046	0.046	0.043	0.041
	(4.03)***	(4.03)***	(3.78)***	(3.60)***
Square of father's years of schooling	-0.003	-0.003	-0.003	-0.003
	(4.11)***	(4.10)***	(4.05)***	(3.90)***
Mother's years of schooling	0.029	0.028	0.036	0.035
	(2.48)**	(2.43)**	(3.05)***	(2.98)***
Square of mother's years of schooling	-0.003	-0.002	-0.003	-0.003
	(3.14)***	(3.09)***	(3.32)***	(3.33)***
Father absent temporarily	0.18	0.171	0.194	0.186
	(2.15)**	(2.03)**	(2.28)**	(2.19)**
Father absent permanently	0.168	0.165	0.165	0.155
	(2.36)**	(2.32)**	(2.30)**	(2.17)**
Mother absent	0.074	0.071	0.09	0.08
	-0.67	-0.64	-0.79	-0.71
HH in 2nd lowest urban quintile^	0.263	0.26	0.24	0.226
	(3.90)***	(3.87)***	(3.53)***	(3.36)***
HH in third urban quintile	0.325	0.324	0.293	0.269
	(4.49)***	(4.48)***	(4.01)***	(3.75)***
HH in fourth urban quintile	0.43	0.429	0.381	0.35
	(5.64)***	(5.64)***	(4.94)***	(4.67)***
HH in fifth urban quintile	0.486	0.484	0.444	0.401
	(5.53)***	(5.50)***	(5.05)***	(4.80)***
HH in 2nd lowest rural quintile^	0.235	0.227	0.201	0.206

	Probit	Bivariate Probit	Governorate Fixed Effects	Governorate Random Effects
	(1)	(2)	(3)	(4)
	(2.20)**	(2.14)**	(1.84)*	(1.88)*
HH in third rural quintile	0.004	-0.002	0.112	0.114
	-0.04	-0.01	-1.01	-1.05
HH in fourth rural quintile	0.293	0.286	0.372	0.369
	(2.80)***	(2.74)***	(3.42)***	(3.50)***
HH in fifth rural quintile	0.583	0.572	0.719	0.717
	(5.49)***	(5.40)***	(6.46)***	(6.73)***
Community characteristics				
Percentage working in educ. sector at the local level	0.029	0.028	0.029	0.042
	(2.88)***	(2.82)***	(2.75)***	(5.05)***
Alexandria & Canal cities^	-0.017	-0.019		
	-0.21	-0.23		
Upper Egypt	-0.064	-0.06		
	-0.87	-0.81		
Lower Egypt	0.495	0.495		
	(6.23)***	(6.21)***		
Urban	0.366	0.358	0.423	0.381
	(3.69)***	(3.63)***	(4.18)***	(3.88)***
Teacher pupil ratio in general secondary level	-0.06	-0.061		
	(2.42)**	(2.45)**		
Teacher pupil ratio in preparatory level	0.004	0.003		
	-0.38	-0.36		
Teacher pupil ratio in primary level	0.02	0.021		
	(2.83)***	(2.88)***		
Constant	-1.331	-1.303	-1.642	-1.383
	(6.51)***	(6.39)***	(12.90)***	(11.94)***
Observations	6114	6114	6114	6114
- Log likelihood	3965	6022	3627	3665
Test for joint significance of interactions with gender (P-value)	0.26	0.23	0.19	0.18

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

^ **Omitted Categories:**
Age group 6-11
HH in lowest urban quintile
HH in lowest rural quintile
Greater Cairo

Table 2.9: Group Tutoring Probits

	Probit (1)	Bivariate Probit (2)	Governorate Fixed Effects (3)	Governorate Random Effects (4)
Individual characteristics				
Female	0.059	0.059	0.07	0.073
	-1.44	-1.43	(1.66)*	(1.75)*
Age group 12-14^	0.046	0.036	0.051	0.049
	-0.92	-0.72	-1	-0.96
Agegroup15-19	-0.392	-0.383	-0.388	-0.389
	(6.34)***	(6.23)***	(6.17)***	(6.20)***
Eldest child	0.157	0.161	0.161	0.163
	(3.13)***	(3.23)***	(3.17)***	(3.22)***
Son/daughter of head	-0.007	-0.023	-0.049	-0.053
	-0.09	-0.3	-0.62	-0.68
Late	0.188	0.185	0.188	0.188
	(2.70)***	(2.67)***	(2.65)***	(2.67)***
Shifts	0.076	0.075	0.095	0.09
	(1.74)*	(1.72)*	(2.07)**	(2.00)**
Diploma year	0.074	0.064	0.09	0.094
	-1.46	-1.26	(1.75)*	(1.84)*
Household characteristics				
Father's years of schooling	-0.008	-0.007	-0.012	-0.012
	-0.57	-0.53	-0.88	-0.87
Square of father's years of schooling	0	0	0.001	0.001
	-0.57	-0.5	-0.82	-0.86
Mother's years of schooling	0.052	0.051	0.051	0.05
	(3.69)***	(3.65)***	(3.58)***	(3.53)***
Square of mother's years of schooling	-0.005	-0.005	-0.005	-0.005
	(4.95)***	(4.93)***	(4.88)***	(4.94)***
Father absent temporarily	0.194	0.186	0.178	0.189
	(2.06)**	(1.97)**	(1.86)*	(1.97)**
Father absent permanently	-0.071	-0.072	-0.112	-0.099
	-0.82	-0.83	-1.27	-1.13
Mother absent	0.012	0.008	-0.06	-0.047
	-0.09	-0.06	-0.44	-0.35
HH in 2nd lowest urban quintile^	-0.107	-0.108	-0.098	-0.068
	-1.3	-1.31	-1.18	-0.83
HH in third urban wealth quintile	-0.049	-0.045	-0.024	0.01
	-0.56	-0.52	-0.27	-0.11
HH in fourth urban wealth quintile	-0.258	-0.245	-0.212	-0.152
	(2.64)***	(2.52)**	(2.16)**	-1.6
HH in fifth urban wealth quintile	-0.052	-0.042	0.037	0.129
	-0.48	-0.39	-0.34	-1.24
HH in 2nd lowest rural quintile^	0.137	0.128	0.064	0.058

	Probit	Bivariate Probit	Governorate Fixed Effects	Governorate Random Effects
	(1)	(2)	(3)	(4)
	-1.19	-1.11	-0.54	-0.49
HH in third rural quintile	0.173	0.175	0.163	0.152
	-1.49	-1.52	-1.35	-1.28
HH in fourth rural quintile	0.201	0.181	0.003	-0.001
	(1.73)*	-1.57	-0.03	-0.01
HH in fifth rural quintile	0.144	0.138	0.032	0.021
	-1.19	-1.15	-0.25	-0.17
Community characteristics				
Percentage working in educ. sector at the local level	-0.077	-0.078	-0.089	-0.097
	(5.88)***	(6.02)***	(6.30)***	(7.73)***
Alexandria & Canal cities^	-0.575	-0.564		
	(5.92)***	(5.81)***		
Upper Egypt	-0.722	-0.702		
	(8.41)***	(8.18)***		
Lower Egypt	-0.773	-0.754		
	(8.09)***	(7.89)***		
Urban	-0.024	-0.026	-0.043	-0.017
	-0.22	-0.23	-0.38	-0.15
Teacher pupil ratio in general secondary level	-0.042	-0.041		
	-1.42	-1.38		
Teacher pupil ratio in preparatory level	-0.009	-0.01		
	-0.81	-0.87		
Teacher pupil in primary level	0.065	0.064		
	(6.81)***	(6.77)***		
Constant	-1.015	-0.979	-0.186	-0.527
	(4.37)***	(4.25)***	-1.3	(4.11)***
Observations	6114	6114	6114	6114
-Log likelihood	2379	6022	2311	2354
Test for joint significance of interactions with gender (P-value)	0.54	0.55	0.4	0.37

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

^ **Omitted Categories:**
Age group 6-11
HH in lowest urban quintile
HH in lowest rural quintile
Greater Cairo

Table 2.10: Marginal Effects for Probit Models

	Marginal Effects	
	Private Tutoring Probit	**Group Tutoring Probit**
Individual characteristics		
Female	-0.005	0.021
Age group 12-14	0.149	0.016
Agegroup15-19	0.132	-0.120
Eldest child	0.017	0.056
Son/daughter of head	0.016	-0.002
Late	-0.010	0.068
Shifts	-0.001	0.027
Diploma year	0.056	0.026
Household characteristics		
Father's years of schooling	0.008	-0.003
Square of father's years of schooling	0.000	0.000
Mother's years of schooling	0.005	0.018
Square of mother's years of schooling	0.000	-0.002
Father absent temporarily	0.034	0.070
Father absent permanently	0.032	-0.024
Mother absent	0.013	0.004
HH in 2nd lowest urban quintile	0.052	-0.036
HH in third urban wealth quintile	0.067	-0.017
HH in fourth urban wealth quintile	0.094	-0.083
HH in fifth urban wealth quintile	0.110	-0.018
HH in 2nd lowest rural quintile	0.046	0.049
HH in third rural quintile	0.001	0.063
HH in fourth rural quintile	0.059	0.073
HH in fifth rural quintile	0.138	0.052
Community characteristics		
Percentage working in educ. sector at the local level	0.005	-0.027
Alexandria & Canal cities	-0.003	-0.164
Upper Egypt	-0.010	-0.193
Lower Egypt	0.112	-0.202
Urban	0.078	-0.008
Teacher pupil ratio in general secondary level	-0.010	-0.015
Teacher pupil ratio in preparatory level	0.001	-0.003
Teacher pupil in primary level	0.003	0.022

Table 2.11: Spending (Tobit) Models

	(1) Private Tutoring Spending	(2) Group Tutoring Spending
Individual characteristics		
Female	-7.410	14.123
	(0.39)	(1.79)*
Age group 12-14^	338.651	15.764
	(14.11)***	(1.66)*
Agegroup15-19	489.251	-53.804
	(18.34)***	(4.58)***
Eldest child	37.650	30.032
	(1.65)*	(3.16)***
Son/daughter of head	14.405	4.922
	(0.37)	(0.33)
Late	-78.407	29.774
	(2.41)**	(2.25)**
Shifts	-24.657	13.541
	(1.19)	(1.62)
Diploma year	180.955	18.447
	(8.11)***	(1.92)*
Household characteristics		
Father's years of schooling	15.152	-3.373
	(2.36)**	(1.31)
Square of father's years of schooling	-0.686	0.173
	(1.71)*	(1.04)
Mother's years of schooling	9.045	9.973
	(1.39)	(3.74)***
Square of mother's years of schooling	-0.402	-0.906
	(0.91)	(4.81)***
Father absent temporarily	127.040	40.139
	(2.80)***	(2.25)**
Father absent permanently	31.962	-20.086
	(0.82)	(1.20)
Mother absent	7.279	-1.854
	(0.12)	(0.07)
HH in 2nd lowest urban quintile^	108.719	-17.068
	(2.83)***	(1.08)
HH in third urban wealth quintile	116.284	-9.658
	(2.84)***	(0.58)
HH in fourth urban wealth quintile	198.344	-39.094
	(4.66)***	(2.11)**
HH in fifth urban wealth quintile	398.487	13.318
	(8.22)***	(0.65)
HH in 2nd lowest rural quintile^	97.905	18.402
	(1.51)	(0.82)
HH in third rural quintile	9.063	31.223
	(0.14)	(1.38)
HH in fourth rural quintile	125.492	50.934
	(1.98)**	(2.28)**

	(1) **Private Tutoring Spending**	(2) **Group Tutoring Spending**
HH in fifth rural quintile	258.613	31.745
	(4.09)***	(1.36)
Community characteristics		
Percentage working in educ. sector at the local level	21.734	-13.167
	(3.90)***	(5.25)***
Alexandria & Canal cities^	-114.717	-107.481
	(2.57)**	(5.84)***
Upper Egypt	-253.674	-156.982
	(6.14)***	(9.56)***
Lower Egypt	8.105	-159.520
	(0.18)	(8.73)***
Urban	156.315	-1.795
	(2.60)***	(0.08)
Teacher pupil ratio in general secondary level	-23.278	-6.004
	(1.65)*	(1.06)
Teacher pupil ratio in preparatory level	-3.351	-1.383
	(0.64)	(0.66)
Teacher pupil in primary level	9.943	12.353
	(2.44)**	(6.66)***
Constant	-678.718	-248.886
	(5.66)***	(5.58)***
Observations	6114	6114
-Log likelihood	23122	7751
Test for joint significance of interactions with gender (P-value)	0.32	0.39

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

^ **Omitted Categories:**
Age group 6-11

HH in lowest urban quintile
HH in lowest rural quintile
Greater Cairo

Table 2.12: Marginal Effects for Spending Models

	Marginal Effects	
	Private Tutoring Spending	**Group Tutoring Spending**
Individual characteristics		
Female	-7.410	14.123
Age group 12-14	338.651	15.764
Agegroup15-19	489.251	-53.804
Eldest child	37.650	30.032
Son/daughter of head	14.405	4.922
Late	-78.407	29.774
Shifts	-24.657	13.541
Diploma year	180.955	18.447
Household characteristics		
Father's years of schooling	15.152	-3.373
Square of father's years of schooling	-0.686	0.173
Mother's years of schooling	9.045	9.973
Square of mother's years of schooling	-0.402	-0.906
Father absent temporarily	127.040	40.139
Father absent permanently	31.962	-20.086
Mother absent	7.279	-1.854
HH in 2nd lowest urban quintile	108.719	-17.068
HH in third urban wealth quintile	116.284	-9.658
HH in fourth urban wealth quintile	198.344	-39.094
HH in fifth urban wealth quintile	398.487	13.318
HH in 2nd lowest rural quintile	97.905	18.402
HH in third rural quintile	9.063	31.223
HH in fourth rural quintile	125.492	50.934
HH in fifth rural quintile	258.613	31.745
Community characteristics		
Percentage working in educ. sector at the local level	21.734	-13.167
Alexandria & Canal cities	-114.717	-107.481
Upper Egypt	-253.674	-156.982
Lower Egypt	8.105	-159.520
Urban	156.315	-1.795
Teacher pupil ratio in general secondary level	-23.278	-6.004
Teacher pupil ratio in preparatory level	-3.351	-1.383
Teacher pupil in primary level	9.943	12.353

Table 2.13: Private Tutoring, by Education Level

	Primary Level	Preparatory Level	Secondary Level
Individual characteristics			
Female	-0.092	-0.071	0.170
	(1.82)*	(1.09)	(2.02)**
Eldest child	0.124	0.058	0.227
	(1.96)*	(0.71)	(2.36)**
Son/daughter of head	0.163	0.001	0.176
	(1.72)*	(0.01)	(0.97)
Late	-0.011	-0.036	-0.047
	(0.11)	(0.42)	(0.38)
School operates in shifts	-0.006	-0.079	0.224
	(0.11)	(1.14)	(2.48)**
Diploma year	0.394	0.136	0.108
	(6.38)***	(1.90)*	(1.28)
Household characteristics			
Father's years of schooling	0.054	0.082	0.013
	(3.23)***	(3.95)***	(0.47)
Square of father's years of schooling	-0.004	-0.005	-0.000
	(4.02)***	(3.72)***	(0.10)
Mother's years of schooling	0.042	0.004	0.090
	(2.43)**	(0.20)	(3.23)***
Square of mother's years of schooling	-0.004	-0.000	-0.005
	(3.04)***	(0.28)	(2.38)**
Father absent temporarily	0.033	0.397	0.415
	(0.29)	(2.23)**	(1.71)*
Father absent permanently	-0.011	0.357	0.382
	(0.09)	(2.74)***	(2.53)**
Mother absent	0.063	-0.030	0.159
	(0.36)	(0.15)	(0.64)
HH in 2nd lowest urban quintile^	0.376	0.364	-0.256
	(3.87)***	(2.88)***	(1.48)
HH in third urban quintile	0.394	0.466	-0.107
	(3.70)***	(3.51)***	(0.58)
HH in fourth urban quintile	0.548	0.548	-0.008
	(4.83)***	(3.76)***	(0.04)
HH in fifth urban quintile	0.551	0.657	0.059
	(4.10)***	(3.94)***	(0.28)
HH in 2nd lowest rural quintile^	0.158	0.196	0.326
	(1.05)	(1.02)	(1.16)
HH in third rural quintile	0.075	-0.005	-0.225
	(0.49)	(0.03)	(0.82)
HH in fourth rural quintile	0.237	0.303	0.504
	(1.60)	(1.57)	(1.88)*
HH in fifth rural quintile	0.672	0.522	0.522
	(4.45)***	(2.72)***	(1.95)*

	Primary Level	Preparatory Level	Secondary Level
Community characteristics			
Percentage working in educ. sector at the local level	0.010 (0.70)	0.067 (3.42)***	0.057 (2.28)**
Alexandria & Canal cities^	0.182 (1.83)*	0.285 (2.35)**	-0.329 (2.01)**
Upper Egypt	0.185 (1.93)*	-0.001 (0.01)	-0.517 (3.37)***
Lower Egypt	0.833 (8.38)***	0.609 (4.51)***	-0.138 (0.87)
Urban	0.388 (2.77)***	0.262 (1.46)	0.518 (2.00)**
Teacher pupil ratio in general secondary level			-0.066 (2.21)**
Teacher pupil ratio in preparatory level		-0.000 (0.01)	
Teacher pupil ratio in primary level	-0.001 (0.10)		
Constant	-1.561 (6.36)***	-1.041 (3.40)***	-0.045 (0.09)
Observations	2848	1665	1069
- Log likelihood	1706	1023	616
Test for joint significance of interactions with gender (P-value)	0.017	0.12	0.09

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

^ **Omitted Categories:**
HH in lowest urban quintile
HH in lowest rural quintile
Greater Cairo

Table 2.14: Group Tutoring, by Education Level

	Primary Level	Preparatory Level	Secondary Level
Individual characteristics			
Female	0.005	0.044	0.333
	(0.08)	(0.56)	(2.97)***
Eldest child	0.164	0.215	0.204
	(2.23)**	(2.29)**	(1.69)*
Son/daughter of head	-0.010	-0.118	-0.050
	(0.09)	(0.79)	(0.20)
Late	0.039	-0.048	0.026
	(0.35)	(0.48)	(0.15)
School operates in shifts	0.048	0.206	0.100
	(0.79)	(2.48)**	(0.83)
Diploma year	0.046	-0.060	-0.143
	(0.64)	(0.70)	(1.28)
Household characteristics			
Father's years of schooling	0.006	-0.019	0.005
	(0.29)	(0.78)	(0.13)
Square of father's years of schooling	-0.001	0.002	0.001
	(0.66)	(0.99)	(0.24)
Mother's years of schooling	0.045	0.106	0.005
	(2.27)**	(3.95)***	(0.15)
Square of mother's years of schooling	-0.005	-0.008	-0.001
	(3.48)***	(3.97)***	(0.30)
Father absent temporarily	0.241	0.242	0.022
	(1.95)*	(1.29)	(0.08)
Father absent permanently	-0.063	-0.060	-0.163
	(0.47)	(0.39)	(0.80)
Mother absent	-0.143	0.235	-0.019
	(0.72)	(1.00)	(0.06)
HH in 2nd lowest urban quintile^	-0.048	-0.261	-0.181
	(0.42)	(1.63)	(0.81)
HH in third urban quintile	0.046	-0.256	-0.199
	(0.38)	(1.57)	(0.81)
HH in fourth urban quintile	-0.237	-0.261	-0.399
	(1.68)*	(1.44)	(1.56)
HH in fifth urban quintile	0.160	-0.321	-0.147
	(1.02)	(1.56)	(0.54)
HH in 2nd lowest rural quintile^	0.183	-0.194	0.222
	(1.16)	(0.94)	(0.59)
HH in third rural quintile	0.280	-0.009	-0.130
	(1.73)*	(0.05)	(0.33)
HH in fourth rural quintile	0.382	-0.143	-0.456
	(2.42)**	(0.70)	(1.09)
HH in fifth rural quintile	0.294	-0.372	0.026
	(1.77)*	(1.74)*	(0.07)

	Primary Level	Preparatory Level	Secondary Level
Community characteristics			
Percentage working in educ. sector at the local level	-0.072 (4.00)***	-0.077 (3.12)***	-0.080 (2.30)**
Alexandria & Canal cities^	-0.472 (4.44)***	-0.635 (4.57)***	0.012 (0.06)
Upper Egypt	-0.917 (8.51)***	-0.742 (4.76)***	-0.230 (1.17)
Lower Egypt	-0.813 (7.22)***	-1.149 (7.03)***	-0.149 (0.74)
Urban	0.048 (0.31)	-0.518 (2.61)***	0.329 (0.93)
Teacher pupil ratio in general secondary level			0.111 (2.96)***
Teacher pupil ratio in preparatory level		0.020 (1.68)*	
Teacher pupil ratio in primary level	0.046 (5.33)***		
Constant	-1.183 (4.20)***	-0.007 (0.02)	-2.530 (3.92)***
Observations	2848	1665	1069
- Log likelihood	1237	688	324
Test for joint significance of interactions with gender (P-value)	0.89	0.9	0.000

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%.

^ **Omitted Categories:**
HH in lowest urban quintile
HH in lowest rural quintile
Greater Cairo

CHAPTER 3

THE EFFECT OF TUTORING ON SECONDARY STREAMING IN EGYPT

3.1. MOTIVATION

Households in Egypt, like many developing countries, spend substantially on tutoring. According to the World Bank (2002), aggregate household spending on tutoring at the pre-university level represents the largest household education expense (even compared to spending on private school tuition and fees). According to the Economist Intelligence Unit (1996), it is not uncommon for households with children in the secondary education level to spend up to 25% of annual income on tutoring. Observing a lot of parents deciding to invest in tutoring does not necessarily imply that there are corresponding high returns to tutoring. There may be imperfect information on payoffs, especially given that some of the returns are long-term, and that parents' decisions may be affected by peer effects rather than by information on payoffs. It is therefore important to find out if such an investment pays off in terms of better education outcomes or if these resources would be better spent on improving the quality of the formal schooling system. This chapter, therefore, fits in the larger literature on the effectiveness of public versus private educational investment on education achievement and outcomes.

This increased importance of tutoring becoming a crucial form of educational investment in many developing countries can have equity implications, since wealthier households are more likely to afford tutoring (or higher-quality tutoring, in settings where tutoring is nearly universal). Income inequality can be exacerbated as students from richer backgrounds may get better education outcomes, and therefore better future labor outcomes, as a result of their participation in tutoring. The literature on tutoring determinants confirms that

socioeconomic status, represented by variables such as household income and parental education, is consistently a strong predictor of taking tutoring (e.g., in Japan, Kenya and Turkey in Stevenson and Baker (1992), Buchmann (2002), and Tansel and Bircan (2005a), respectively). A similar finding holds in the case of Egypt, where it was found, in Chapter 2, that children in wealthier households are significantly more likely to receive private tutoring. Examining if tutoring really improves education outcomes is one step towards assessing the equity implications of tutoring.

The literature on tutoring effectiveness is still in its infancy and its results are mixed. More importantly, most of the literature does not take into account that tutoring may be endogenous. Unobserved characteristics such as academic ability and household appreciation of education can be linked to both tutoring and education outcomes. This can cause the estimates of the tutoring impact on education outcomes to be biased.

This chapter assesses the effect of taking private tutoring on which secondary (high-school) stream a student joins in Egypt. The panel nature of the dataset allows me to have information on the tutoring status of students in 1998 and their education outcomes as observed in 2006. I use the percentage of the population working in the education sector at the local level as an instrument for tutoring to overcome the problem of endogeneity.

The remainder of this chapter is organized as follows. Section 3.2 reviews the literature looking at tutoring effects. Section 3.2 provides information on the dataset used and a discussion of the adopted methodology. The results are presented in Section 3.4 and finally conclusions follow in Section 3.5.

3.2. BACKGROUND

3.2.1 Tutoring Effects

One possible beneficial effect of tutoring is that it can be remedial. It provides weaker students with access to teaching tailored to their level (de Silva 1994). It can also be a necessary learning supplement in the case of low-quality schooling. Even though the direct effect of tutoring on student achievement is expected to be positive, tutoring benefits may be partially offset by a reduction in student study productivity and a reduction in school attendance. When pupils spend substantial time in tutoring classes after long school days, they are deprived of recreational time and may suffer a reduction in sleeping hours, leading to increased stress and fatigue (de Silva 1994, Fenech and Spiteri 1995, Wijetunge 1994, as cited in Bray 1999a,b). In addition, as their afternoons and evenings are reserved for tutoring, many students need to take days off school in order to study. In other words, tutoring may affect school attendance (Hussein 1987, de Silva 1994) and can become a substitute to education at school. It is also important to note that while tutoring is expected to have positive impacts on test scores, as it is predominantly an exam-preparation activity in developing countries, its effects on cognitive achievement are unclear.

Tutoring can have implications on other students and on the education system as a whole beyond its effects on students receiving it. Bray (1999b) presents a discussion of the effects of tutoring on mainstream schools. For example, students taking tutoring may cause disruption to teaching in school as they are not as in need of in-class teaching. Moreover, when tutoring is widespread, school teachers may compromise on the quality of teaching they provide because of an expectation that their students already receive tutoring. This has a reinforcing effect as students who initially were not planning to take tutoring are led to participate in tutoring. Furthermore, in settings where tutors are primarily school teachers, as in Egypt, spending extended hours in tutoring

activities leaves less time for teachers to prepare for their school classes and, more importantly, less time for professional development (Dessy et al. 1998, Hussein 1987).

As pointed out in the previous section, tutoring may also have important equity implications, as it may be more affordable to children belonging to richer households. Moreover, for poor households that are already resource-constrained, tutoring can affect the enrollment and dropout decisions of their children given that it represents a substantial education cost.

Despite the recognition of tutoring impacts beyond the direct impact on an individual, I will only be able to examine direct impacts on educational outcomes due to data limitations. This is also the case in the literature, where the focus has also been on its effect on short-term academic performance as reflected in test scores.

3.2.2 Evidence on Tutoring Effectiveness

The focus in the literature has been on the effect of tutoring on academic performance as measured by scores, and less often, as measured by the likelihood of being admitted into university (e.g., Papas & Psacharopoulos 1987, Stevenson and Baker 1992, and Tansel and Bircan 2005b). The evidence was initially based on simple bivariate correlations between tutoring and scores (e.g., Kulpoo 1998 and Paviot et al. 2005). It evolved into using multivariate statistical methods such as linear regression to control for child, household, and school factors. The direction of the effect of tutoring in that work is varied. For example, Kulpoo (1998), Buchmann (2002), and Tansel and Bircan (2005b) found tutoring to have a positive effect[46]. In other papers, the effect of tutoring was significant and

[46] Kulpoo (1998) found a positive correlation between private tuition and reading and literacy levels in Mauritius. Buchmann (2002) found tutoring to have a positive and significant effect on self-reported academic performance and a negative and significant effect on grade repetition in Kenya. Tansel and Bircan (2005b) found, using OLS regressions, that tutoring had a strong positive effect on scores obtained in the university entrance examination in Turkey.

positive in some but not all tests, tutoring types, or countries analyzed (e.g., Stevenson and Baker 1992, Fergany 1994, Paviot et al. 2005, Ireson and Rushforth 2005, and Ha and Harpham 2005)[47]. Others found tutoring to have an insignificant effect (Papas & Psacharopoulos 1987, Baker et al. 2001, Lee et al. 2004) or even a negative effect (Cheoh and Quah 2005)[48].

The main issue with the papers above is that they do not take into account the endogeneity of tutoring in estimating its effect. Therefore, the estimates of the tutoring effect are unreliable. Innate academic ability and parents' preference for education represent two sources of endogeneity. Unobserved innate academic ability can affect the tutoring decision. Weaker students may be more likely to need tutoring as a remedial education supplement. The tutoring effect can therefore be underestimated when innate ability is not observed. In contrast to that scenario where parents invest in tutoring to compensate for a child's weak ability, parents may choose to invest in tutoring in their most academically promising child, thereby reinforcing academic ability differences. It may also be that

[47] Stevenson and Baker (1992) found that using practice examinations and correspondence courses while in high school in Japan increases the likelihood of attending university. Attending an after-school class does not have an effect, and hiring a tutor has a negative but insignificant effect. Fergany (1994) found that while private and group tutoring at the primary and preparatory education levels in Egypt increases the chances for completion of the primary education level, they have no significant impact on achievement as measured by scores. Paviot et al. (2005) found that the average reading and mathematics scores are higher for pupils taking tutoring in four African countries (Malawi, Mauritius, Zambia and Zanzibar) and lower in two African countries (Namibia and Kenya). Ireson and Rushforth (2005) found that tutoring has a positive effect on average GCSE scores in the UK only for non-white students while for white students, the coefficients were insignificant. Tutoring in mathematics had a significant effect on the mathematics score while that in English had an insignificant effect on the English score. Ha and Harpham (2005) found that tutoring in Vietnam has a positive effect on reading test scores and an insignificant effect on writing and multiplication test scores.

[48] Papas & Psacharopoulos (1987) found that tutoring did not play a significant role in the likelihood to go to university. However, they included high school grade as a regressor and they suggest that the lack of the tutoring effect may be because its effect is captured by the high school grade. Baker et al. (2001) used cross-national data from the Third International Mathematics and Science Study (TIMSS). They found that national indicators of tutoring use had no significant effect on the national mean math scores. Lee et al. (2004) focused on tutoring taking place before the school year starts in Korea. They found that tutoring hardly helped in getting higher grades. Cheoh and Quah (2005) found a negative link between the time spent with a tutor and scores in high-tier schools in Singapore.

children who are more motivated also are more likely to demand tutoring services. Under that event, the tutoring effect would be overestimated since strong academic ability and motivation are not observed and their effects on education outcomes will be attributed to tutoring instead. Additionally, factors such as the value parents place on their children's education is another channel through which a bias in the tutoring effect can result. Since this is again an unobserved variable, the tutoring variable can pick up its effect thereby resulting in an overestimated tutoring effect.

Endogeneity is essentially a self-selection issue: students do not randomly select into tutoring. They select into tutoring based on the unobservable characteristics discussed above. Accordingly, the endogeneity problem does not arise in a random experiment where students are randomly assigned into tutoring. A few papers relied on such experiments to estimate the effect of tutoring (e.g., Haag 2001 and Mischo and Haag 2002). They found that those assigned into tutoring in Germany had better scores than students of similar academic level. As pointed out in Dang and Rogers (2008), what is estimated in such experiments is the effect of being assigned to receive free tutoring and not the effect of the household deciding to purchase tutoring services.

The work cited above, except for those using random experiments, did not deal with the issue of endogeneity and mostly did not acknowledge it. Some of the papers controlled for previous achievement, e.g., previous scores, which may be correlated with innate ability. Also, many in that body of work controlled for parents education and/or household income, which may be correlated with parents' concern about their children's education[49]. However, this would at best only partly capture the unobserved variables' effects, and therefore would not

[49] Also, Cheo and Quah (2005) limited the analysis to students in high-level schools in Singapore, where selection into schools is based on academic ability reflected by scores. So, in a way, academic ability is controlled for.

fully overcome the bias created by endogeneity. Also, previous achievement may also be endogenous if it is affected by prior tutoring activities.

It was only very recently that attempts were made to estimate the impact of tutoring while accounting for its endogenous nature (Suryadarma et al. 2006, Dang 2007, Kang 2007a). These papers used an instrumental variable approach where a variable that directly affects the tutoring decision, but does not directly affect education outcomes, is used to instrument for tutoring. The tutoring effect in the literature taking into account endogeneity is also mixed. Suryadarma et al. (2006) uses the proportion of classmates taking tutoring as an instrument in his analysis of tutoring effects on scores in Indonesia. It was found that tutoring has no significant effect on scores.

Dang (2007) exploits a government policy in Vietnam whereby fees that can be charged for tutoring services are specified. He uses the fees charged by schools at the community level to instrument for spending on tutoring. He uses a joint Tobit and ordered probit model. He finds tutoring to have a significantly positive effect on student academic performance. It is not clear how tutoring fees vary with tutoring quality which would affect the measurement of the tutoring impact.

Kang (2007a) uses birth order as an instrument for tutoring spending in South Korea. This is on the basis that parents may make different educational investments for different children (e.g., they may favor their first-born). Kang recognizes that this instrument has the weakness that if parents favor a particular child in tutoring investments, they are likely to also favor that child in other investments that are not captured in the data; e.g., parents may provide study help themselves. Therefore, the instrument can affect educational performance via other channels in addition to tutoring and the tutoring effect may be therefore be overestimated. However, Kang finds tutoring to have an insignificant effect

making the bias issue of no concern[50]. Among the interpretations he gives for his finding is that tutors may be providing low-quality services. Also, parents' investments may be driven by peer effects rather than real tutoring returns.

3.3. DATA AND METHODOLOGY

3.3.1 Data

In this chapter, I employ the Egypt Labor Market Survey (ELMS 98) and the Egypt Labor Market Panel Survey (ELMPS 06). The ELMPS 06 is the first longitudinal survey in Egypt. It follows on the Egypt Labor Market Survey of 1998 (ELMS 98). 72% of the individuals interviewed in 1998 were successfully re-interviewed in 2006, forming a panel that can be used for longitudinal analysis[51]. I exploit the longitudinal nature of the data in examining the effects of taking private tutoring on the secondary branch in which an individual is streamed[52]. I use tutoring information based on ELMS 98 for those who were students in the preparatory level (before secondary streaming) in 1998[53]. The secondary stream that an individual has joined is identifiable using ELMPS 06, whether or not the individual is still a student[54].

ELMPS 06 also contains retrospective questions on the education experience of an individual that were not included in ELMS 98. I use these to derive extra information corresponding to the education experience of individuals in my sample prior to and during 1998. For example, information about school

[50]Kang's results are robust. He checked for heterogeneous effects by sex, pre-tutoring ability and family income and found the lack of tutoring effect to still hold. He also found tutoring to be insignificant using a non-parametric bounding method (Kang 2007b).

[51] For information on ELMPS 06 and ELMS 98, please refer to the thesis appendix.

[52] I do not look at the effect on university outcomes because the field/discipline joined at the university level is only identifiable for university graduates and not for university students, thereby resulting in a small sample that may generate unreliable estimates if an instrument variable estimation procedure is used. In addition, there are some methodological issues with the construction of a university rank variable particularly that there is no information on which university an individual graduated from.

[53] For information on tutoring patterns based on ELMS 98, please refer to chapter 2.

[54] ELMPS 06 does not have information on scores obtained in standardized tests held at the end of each education level.

characteristics (such as frequency of computer use, degree of reliance on corporal punishment at school, and whether the school operated in multiple shifts) was collected for schools attended in the primary, preparatory and secondary levels[55]. In addition, ELMPS 06 contains information on grade repetition that took place in each of the three pre-university education levels.

Pre-university education in Egypt consists of three education levels: the primary, preparatory and secondary levels. After the end of the preparatory level, education branches off into two secondary-level streams: general and vocational. Admission into streams depends solely on the score obtained in the standardized examination held in the final grade of the preparatory level[56]. The general secondary stream requires a higher score in the preparatory diploma. It is an academic stream and is regarded as the "prestigious" stream as it is leads to university. The vocational stream is mainly a terminal degree[57]. Based on ELMPS 06, the breakdown of the general secondary track graduates whose age is below or equal to 30 is such that 3% do not continue to higher education, 88% go to university and 9% go to above intermediate institutes[58]. As for the technical track graduates: 87% do not proceed to higher education while 6% join university and 7% join above intermediate institutes. 95% of those who were admitted to universities (aged 30 or below) attended the general track. Therefore, looking at which branch a student joins at the secondary level is essentially like looking at whether or not they will join university.

I restrict the sample I use in the analysis to those who (1) were preparatory students in 1998 and (2) based on ELMPS 06, have progressed in the education

[55] ELMS 98 has information on whether the school operated in multiple shifts only for the school attended in the primary level.
[56] This examination is standardized at the governorate level.
[57] It is possible for graduates of the vocational track to join university if their scores on the standardized exam held at the final year are higher than a particular cutoff, in which case they can only join a university field related to their vocational specialization. However, this does not occur frequently.
[58] Above intermediate institutes are similar to 2-year colleges.

system to the point of having to go into one of the secondary streams (i.e., either students in the secondary level or higher or graduates whose highest education level is secondary or above[59]. The sample contains 1,116 observations.

The sample captures students at different grades in the preparatory level in 1998. The tutoring question applies to their grade in 1998 and not to the final (third) grade in the preparatory level. This creates an asymmetry where if a student took tutoring in the first or second (less critical) grades in 1998, it is likely that he/she also took tutoring in the more critical third grade. However, a student not receiving tutoring in the first and second grade does not necessarily mean they did not take tutoring in the third grade. This can potentially create a bias in the estimate of the tutoring effect. On one hand, assuming a tutoring has a positive effect on scores, we can observe cases which in reality were tutored in the third grade and that helped them get a higher score but because they were observed in the first or second grade when they did not get tutored, the tutoring effect in their case will be underestimated. On the other hand, it may be the case that those who took tutoring in the first and second year were more likely to be weak students or were more likely to belong to families that are keener on education outcomes. Also, the tutoring effect for the students who took tutoring in the first and second year may be higher, if they will also be tutored in the third year, because of a cumulative tutoring effect. Therefore, the tutoring effect for those taking tutoring in the first and second grades may be over or underestimated.

3.3.2 Methodology

As explained above, two countervailing sources of non-random selection into tutoring may occur. One source of bias derives from the selection of academically weak students into tutoring. The other derives from the selection of children that

[59] The sample excludes those who did not continue education beyond the preparatory level, since they left the system without joining either streams.

are more motivated or that belong to households that are more appreciative of education.

The two sources of selection have opposing effects. Thus, the direction and magnitude of bias in the OLS models is unknown, and depends on the relative effect, as well as the importance of these factors in determining students' outcomes. Least squares estimates of the private tutoring effect will be biased if tutoring is correlated with unobserved factors that determine performance on the preparatory diploma examination and hence on the secondary tracking outcome. I expect both sources of bias to exist in the case of Egypt. However, given the prevalence of tutoring in Egypt, it appears to be more of an investment than a remedial educational activity. If endogeneity is not properly controlled for, I expect that the tutoring effect obtained will be overestimated and hence should be treated as an upper-limit estimate subject to its standard error.

To address concerns regarding bias due to non-random sorting of students into tutoring, I use an instrumental variable approach,

$$\Pr(Y_i = 1 \mid X_i, Z_i) = \Pr(\alpha_0 + \alpha_1 X_i + \alpha_2 Z_i + \varepsilon_i < 0) \qquad (1)$$

$$\Pr(Z_i = 1 \mid X_i, IV) = \Pr(\beta_1 + \beta_2 X_i + \beta_3 IV_i + \delta_i < 0) \qquad (2)$$

for all i =1,2,...n individuals. Y is the binary dependent (outcome) variable taking a value equal to zero if a student joins the vocational stream and a value equal to one if a student joins the general stream. Y depends on a vector of characteristics (X) and the private tutoring binary variable (Z) which takes the value zero if the student did not take tutoring in 1998 and one if he/she did take tutoring. Endogeneity is reflected in Z and ε potentially being correlated. To overcome endogeneity, equation (2) is used where IV is an instrument variable for tutoring and the error terms (ε and δ) are allowed to be correlated.

I employ a measure of the local availability of potential tutors as an instrument for participation in tutoring[60]. In particular, I use as an instrument the percentage of the working age population that work in the education sector at the local level (village/*shyakha*), based on Census 96[61]. Since both the dependent and the tutoring variables are binary, I use an IV probit estimation. I also run probit estimation to get the results without accounting for endogeneity.

The limitation of the instrument I use is that those working in the education sector include not only teaching staff but also administrative staff. In addition, the measure includes those working in the education sector and which are *residing* in the same locality as the student, and not necessarily where they work. However, this issue may be alleviated since they may give tutoring in the locality where they reside rather than the locality where they work.

The vector of independent variables (X) consists of student, household, preparatory school, and regional characteristics[62]. Child characteristics include: age in 1998, squared-age in 1998, sex, ever-repeating a grade in the primary level, and being the eldest child in the 1998 household[63]. The age variables are meant to help in reducing the bias caused by the fact that students are observed in different grades in the sample. They can also help in capturing a cohort effect resulting from students in different grades experiencing the outcome: secondary streaming

[60] Tutors in Egypt are more likely to be school teachers.
[61] This variable was used as a regressor in the private tutoring determinant regressions in chapter 2 and it was found to be significant. In the sample used in the analysis there are 185 localities with an average working-age population size of 28,610.
[62] Table 3.1 provides mean and standard deviation of these variables for the sample used in the analysis.
[63] The eldest child variable indicates that a student is the oldest child (son or daughter) of the household head that was present in the household in 1998. Therefore, a student will be considered the eldest if he/she had older siblings that moved out of the household before 1998. The eldest child is constructed using the 1998 data because this was the time the tutoring decision was made and in 2006, the student may have moved out of the parental household making it not possible to know if he/she was the eldest child.

in different periods. Grade repetition in the primary level should proxy for past weak achievement[64].

The household characteristics consist of father's and mother's education, household wealth in 1998, and father's and mother's presence in the household in 1998. Education is represented by a group of dummy variables, each denoting a given level of education attainment: illiterate, reads and writes, less than intermediate, intermediate, above intermediate and university and above[65]. Each dummy is set to equal one if the education level attained is equal to or exceeds a given level of education. This configuration is followed in order to reflect the incremental effect of each education level compared to its previous level. The illiterate or above group is the omitted group. A wealth score is constructed using factor analysis based on household asset ownership and house characteristics information. Based on the score, households are divided into five quintiles[66]. The omitted category is the lowest wealth quintile.

The preparatory school quality controls are very important. Even though these correspond to the schooling experience in 1998, the information was actually collected in ELMPS 06 as mentioned above. These controls are: whether the preparatory school operated in shifts (i.e., multiple school sessions); the computer use frequency in the school; and whether corporal punishment was used. The schools operating in multiple sessions are generally thought to be of less quality because each school session tends to be shorter than the school-session in a single-shift school. The computer use and the corporal punishment

[64] Only 3% in the preparatory level repeated grades while in the primary level.
[65] I follow the education categories used by the Central Agency for Public Mobilization and Statistics CAPMAS. The "reads and writes" category denotes someone who can read and write but who does not have any diploma. Intermediate education means secondary (high-school) level education. Therefore the less than intermediate category means those with a primary or preparatory degree. The "intermediate" category denotes someone with a secondary diploma. The "above intermediate" category denotes those who graduated from an above-intermediate institute (similar to a 2-year college).
[66] See Filmer and Pritchett (2001) for the factor analysis methodology used to construct the wealth score.

variables reflect school quality as computer use reflects the state of physical facilities and corporal punishment reflects negative teaching practices.

Community variables used are the teacher-pupil ratio at the governorate level in the school-year 1997/1998 and the region where the student resided in 1998. The regional categorization incorporates an urban/rural breakdown[67]. The Greater Cairo region is the omitted category. The regional dummies can capture differences in the schooling side or in the tutoring demand side.

3.4. RESULTS

3.4.1 Tutoring Effect

Estimation results are provided in Tables 3.2 and 3.3[68]. The probit model estimates (Table 3.2), in which endogeneity is not taken into account, are listed in column 1. The IV-probit results are in column 2 and 3 which report the coefficient estimates from equations (1) and (2), respectively (as presented in Section 3.2). It can be seen that, without taking endogeneity into account (column 1), receiving tutoring in the preparatory level significantly increases the probability of joining the general stream at the secondary level[69]. However, upon using the instrument variable approach, tutoring becomes insignificant (column 2). This may reflect that, as pointed out earlier, the tutoring effect bias in the case of Egypt is expected to be upward. Therefore, upon controlling for endogeneity, the tutoring effect is reduced. However, the coefficient is imprecisely estimated (note the larger standard error on the tutoring coefficient in column 2). This suggests that even

[67] The regional breakdown used in this chapter is as follows: Greater Cairo, Alexandria and Suez Canal governorates, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt and Rural Upper Egypt.

[68] I used STATA in the estimation as well as in the generation of descriptive statistics.

[69] In related work in which I took part, a similar regression was used, and endogeneity was not controlled for (Mohie et al. 2008). Tutoring was found not to have a significant effect. However, important controls were not used as regressors (e.g., parents' education and presence, school characteristics, grade repetition, and being an eldest child were not included).

though the instrument is significant in the first-stage probit (column 3), it may not be powerful enough to identify the tutoring effect.

I used the test of exogeneity introduced by Smith and Blundell (1986)[70]. Under the null hypothesis, the tutoring indicator is exogenous. The residuals from the tutoring equation, using the instrumental approach, are used as an additional regressor. If the null-hypothesis holds, the residuals should have no explanatory power. The p-value for the test was 0.9235. Therefore, the null-hypothesis that tutoring is exogenous cannot be rejected[71]. One issue to take into consideration is that the exogeneity test hinges on the validity of the instrument. If the instrument is not a strong enough predictor in the tutoring equation, the standard errors are large making the test fail to reject the null-hypothesis of exogeneity. This makes it unclear if the result of a positive tutoring effect based on the probit model is more appropriate than the result of an insignificant tutoring effect based on the IV-probit.

In an attempt to see if the large standard errors of the tutoring estimate resulted from using a non-linear instrumental model instead of a linear instrumental model, I compare the two-stage least squares (2SLS) estimates (Table 3.3) to the IV-probit estimates (Table 3.2). In addition, ordinary least squares (OLS) estimates are given (Table 3.3, column 1) to see how the standard errors of the tutoring estimate compare to those in the 2SLS model, which instruments for tutoring. While the variables of interest are binary, making an IV-probit model appear suitable for analysis, the use of 2SLS is not improper. Angrist (2001) argues that as long as the purpose of estimation is the identification of the causal effect of treatment, 2SLS can be used as an estimation strategy when dealing with limited dependent variables. Even if the actual second-stage relationship is nonlinear, 2SLS is useful as it captures an effect similar to a

[70] This is implemented using the "probexog" user-written routine in STATA. It was created by Christopher F. Baum.

[71] Exogeneity of the tutoring variable was also not rejected based on the Wald test of exogeneity provided by STATA with the "ivprobit" command.

local average treatment effect (LATE) (Angrist and Imbens, 1995, Heckman and Vytlacil, 1998).

Comparing results in the linear models to the non-linear ones (OLS to probit and 2SLS to IV-probit) shows that while the coefficient sizes are smaller in absolute terms in the linear models, the sign of the coefficients and their statistical significance levels are generally the same. The large increase in the standard errors of the tutoring effect does not appear to be a result of using a non-linear model but rather a result of using an instrumental approach; the standard errors go up considerably when going from an OLS to a 2SLS model (Table 3.3) and from a probit to an IV-probit model (Table 3.2).

It is recognized in the literature that the standard errors in instrumental variable models are much larger if the instrumental variable is only weakly correlated with the endogenous regressors. Despite the IV variable turning out to be significant at the 5% level in the first stage (tutoring) equation in both the IV-probit and 2SLS, it may not be strong enough to explain a lot of variation in tutoring. Therefore, since both estimators correct for endogeneity using fitted values, efficiency is lost resulting in large standard errors. Therefore, formal tests of IV weakness were employed following the 2SLS estimation (as such tests are currently not available for non-linear model in STATA)[72].

The test of the weakness of instruments is based on the Cragg Donald minimum eigenvalue statistic created by Cragg and Donald (1993). The value of the statistic is compared to critical values in Table 3.2 of Stock and Yogo (2005). This test uses an F-statistic to test the hypothesis that the coefficients on the instrument equals zero in the structural equation. The test statistic value is 5.033 (below the threshold of 10 suggested by Staiger and Stock (1997) and which is often used in the literature). Comparing the value of the test statistic to the critical

[72] In particular, the tests are obtained using the "estat firstage" command after running an "ivregress" (2SLS) command in STATA.

values leads to the acceptance of the null hypothesis that the instrument is weak, because the statistic is smaller than the critical values even up to a rejection rate of 25% of a Wald test with a nominal size of 5%[73]. A weak instrument reduces the power of the exogeneity test. Therefore, a better instrument is needed, not only to get more reliable results, but also to construct a more powerful exogeneity test.

A recent literature has emerged in which parameter tests and confidence sets that are robust to weak instruments were developed. Among these is the Conditional Likelihood Ratio (CLR) test introduced by Moreira (2003). The basic idea is to construct correct significance levels that overcome the size distortions resulting from weak instruments by using critical values for likelihood ratio tests that are conditioned rather than constant, i.e., values that are based on the conditional distribution of nonpivotal statistics. Given the acceptance of the hypothesis that the instrument is weak, I used the "condivreg" command in STATA to conduct the CLR and the corresponding confidence sets[74]. The coverage-corrected confidence set based on CLR is

[-2.020407, 1.295237] (the tutoring coefficient p-value is still 0.963)[75]. This is compared to a confidence set associated with the 2SLS [-.7953941, .7579207]. As expected, the corrected confidence interval is wider[76].

[73] The 2SLS size of nominal 5% Wald test is 16.38, 8.96, 6.66 and 5.53 for the rejection rates of 5%, 15%, 20% and 30% respectively. For more details, refer to Stock and Yogo (2005).

[74] The "condivreg" version I use was developed by Mikusheva and Poi (2006) as a newer version of an earlier "condivreg" command that was created by Moreira and Poi (2003). The newer version uses a simpler and improved computation method. Both deal with linear models with a single endogenous regressor.

[75] The coverage-corrected confidence set based on the Anderson-Rubin statistic is [-2.020408, 1.295237] while that based on the Lagrange Multiplier is [-2.020408, 1.295237].

[76] I also constructed 95% confidence intervals for the marginal effect of tutoring on joining the general secondary stream in the probit and IV-probit models. For the probit model, the confidence interval is [.049464, .192915] while for the IV-probit, it is [-1.17754, .98953]. For the OLS model, the confidence interval is: [.0348761, .1391957]. Note that in models controlling for endogeneity (i.e., IV-probit and 2SLS), the confidence intervals contain zero.

3.4.2 Other Variables

Focusing now in the probit and IV-probit estimates in Table 3.2, the results for the secondary streaming outcome equation (columns 1 and 2) indicate that grade repetition in the primary level has a significantly negative effect on joining the general stream, which is reasonable since that stream requires higher test scores. Father's education, especially the intermediate education level, and household wealth are positively linked to joining the secondary stream. Father's presence has a negative effect, which is most likely to be related to father's migration for work. Father's presence misses significance when the IV approach, is used. Mother's presence, on the other hand, increases the likelihood that a student joins the general stream and is significant even when using the IV approach but only at the 10% level. Students in rural Upper Egypt are less likely to go to the general stream, but the effect is not significant under the IV method.

As for preparatory school characteristics, the multiple-shift and the corporal punishment variables have a negative impact as one would expect, but their impact is statistically insignificant. However, the computer use variable has a significant positive impact on joining the general stream.

Turning to the tutoring equation (column 3), I find that the results are generally consistent with results obtained in Chapter 2. For example, the wealth variables are playing an important role with respect to taking tutoring. Father's absence, which is often caused by labor migration, has a positive effect on taking tutoring which is expected to be brought about by a positive migration income effect that is not fully captured by the wealth variables. Living in rural Upper Egypt has a negative effect on the probability of taking tutoring.

Unlike Chapter 2, this chapter has the grade repetition and the preparatory school quality variables which were available from ELMPS 06. Grade repetition in the primary level does not significantly affect tutoring in the preparatory level.

This seems to indicate that the tutoring effect on streaming will not be distorted by having weaker students more likely to receive remedial tutoring or less likely to get tutoring if their parents prefer to invest in academically promising siblings. The indicator on the use of corporal punishment in the school attended at the preparatory level has a significantly positive effect on the likelihood of participating in private tutoring classes. This may be related to a school environment where students are pressured by teachers to employ them as tutors.

3.5. CONCLUSION

As seen above, without controlling for endogeneity, the tutoring effect is positive. The effect is mitigated when the instrumental variable estimation is used and becomes statistically indistinguishable from zero. While it is not unequivocal that tutoring is endogenous, I give more weight to the insignificant effect as it is better to control for endogeneity than not. One improvement to the instrument variable, which can help with its power, is to have it distinguish between teaching and administrative staff. If the staff is not evenly distributed, e.g., if administrative staff is proportionally more likely to be in large urban areas in a setting like Egypt where education is largely centralized, the instrument variable used in the analysis may be distorted. Having a variable that only includes teaching staff is possible if using the individual-level Census 96 data where the sector of work variables are more detailed. However, this data is confidential and doing such analysis is conditional on being able to acquire the data.

One limitation to the analysis is that it cannot identify the different tutoring effects. Tutoring participation may be cumulative, and participation is some grades may be more critical than others. Ideally, a tutoring measure would reflect the whole history of tutoring in different grades. This would have the benefit of distinguishing between students who never take tutoring, those who take it in particular grades and those who take it in all grades. However, what is

available is an imperfect snapshot indicator of tutoring that only measures tutoring participation in the grade attended by a student at the time of the survey.

Another limitation is that the analysis only looks at the effect of taking tutoring and not the effect of tutoring quality or tutoring spending. Even though information is available on tutoring spending, I was unable to examine its effect on secondary streaming. This is because I do not expect that the variable used to instrument for the likelihood of taking tutoring would be a good instrument for spending on it. While it can capture the supply of tutors, it does not capture the tutoring fees charged by tutors or the tutoring quantity demanded by households. Also, tutoring fees, which affect the level of tutoring spending, can vary by quality and a proper instrument would require being able to adjust for quality, something not possible giving the available data. I am deferring the examination of the effect of tutoring spending to the future.

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TABLES:

Table 3.1: Variable Means and Standard Deviations in the Sample[77]

Variables	Unweighted		Weighted	
	Mean	Standard Deviation	Mean	Standard Deviation
Dummy for ever-joining the general stream	0.44	0.50	0.44	0.50
Dummy for taking tutoring in 98	0.60	0.49	0.55	0.50
Percentage pop. in edu. sector in locality	4.53	2.24	N/A	N/A
Female	0.48	0.50	0.46	0.50
Age in 98	13.59	1.35	13.66	1.35
Age in 98, squared	186.50	37.80	188.46	37.78
Eldest child	0.25	0.43	0.23	0.42
Repeated grades in primary level	0.03	0.16	0.03	0.16
F.* At least reads and writes	0.73	0.44	0.68	0.46
F. At least lower intermediate	0.55	0.50	0.50	0.50
F. At least intermediate	0.37	0.48	0.32	0.47
F. At least above intermediate	0.19	0.40	0.17	0.37
F. At least university and above	0.15	0.36	0.13	0.34
M.* At least reads and writes	0.49	0.50	0.42	0.49
M. At least lower intermediate	0.39	0.49	0.32	0.47
M. At least intermediate	0.25	0.43	0.20	0.40
M. At least above intermediate	0.11	0.31	0.09	0.28
M. At least university and above	0.07	0.26	0.06	0.23
HH* in second lowest quintile	0.19	0.39	0.20	0.40
HH in third quintile	0.21	0.41	0.21	0.41
HH in fourth quintile	0.19	0.39	0.19	0.39
HH in fifth quintile	0.23	0.42	0.24	0.43
F. present in HH in 98	0.89	0.32	0.89	0.31
M. present in HH in 98	0.98	0.14	0.98	0.14
Prep. School operated in shifts	0.38	0.48	0.40	0.49
Computer use	0.46	0.50	0.45	0.50
Use of corporal punishment	0.91	0.28	0.91	0.28
Prep. teacher-pupil ratio in the gov.	21.44	3.74	N/A	N/A
Alexandria and Suez Canal	0.13	0.34	0.09	0.28
Urban Lower Egypt	0.17	0.38	0.11	0.32
Urban Upper Egypt	0.19	0.40	0.08	0.28
Rural Lower Egypt	0.20	0.40	0.33	0.47
Rural Upper Egypt	0.15	0.36	0.25	0.43

[77] Sample = was a preparatory student in 1998 and in 2006 has been to either of the secondary streams. F.: father, M.: mother, HH: household wealth index.

Table 3.2: Effect of Private Tutoring on Secondary Streaming[1]

		1	2	3
			IV-Probit	
Variable Name	**Variable Description**	**Probit**	**Outcome Eqn.**	**Tutoring Eqn.**
tut_98	Dummy for taking tutoring in 98	0.308***	-0.237	
		(0.0940)	(1.397)	
peduc (IV variable)	% working in educ. at the local level			0.0183**
				(0.00805)
Child Characteristics				
female	Female	0.173**	0.153	-0.0275
		(0.0869)	(0.106)	(0.0273)
age_98	Age in 98	0.0946	0.196	0.209
		(0.468)	(0.523)	(0.147)
age_98sq	Age in 98, squared	-0.00572	-0.00913	-0.00719
		(0.0167)	(0.0184)	(0.00525)
eldeschild	Eldest child in 98	0.0898	0.0972	0.0213
		(0.104)	(0.103)	(0.0322)
repeat_prim	Repeated grades in primary level	-1.013***	-0.932**	0.0854
		(0.389)	(0.475)	(0.0848)
HH Characteristics				
Father Education	**(omitted=illiterate or above)**			
f_RW_atl98	F. At least reads and writes	0.209	0.244*	0.0755*
		(0.128)	(0.145)	(0.0422)
f_linterm_atl98	F. At least lower intermediate	-0.257*	-0.244	0.0107
		(0.140)	(0.148)	(0.0463)
f_interm_atl98	F. At least intermediate	0.400***	0.375**	-0.0211
		(0.146)	(0.172)	(0.0491)
f_abvinterm_atl98	F. At least above intermediate	0.559**	0.572**	0.0541
		(0.248)	(0.244)	(0.0738)
f_univabv_atl98	F. At least university and above	0.350	0.262	-0.150**
		(0.279)	(0.370)	(0.0761)

		1	2	3
			IV-Probit	
Variable Name	**Variable Description**	**Probit**	**Outcome Eqn.**	**Tutoring Eqn.**
Mother Education	**(omitted=illiterate or above)**			
m_RW_atl98	M. At least reads and writes	0.0377	0.0547	0.0344
		(0.147)	(0.150)	(0.0487)
m_linterm_atl98	M. At least lower intermediate	0.119	0.124	0.0153
		(0.169)	(0.167)	(0.0573)
m_interm_atl98	M. At least intermediate	0.153	0.177	0.0369
		(0.163)	(0.168)	(0.0543)
m_abvinterm_atl98	M. At least above intermediate	0.743**	0.636	-0.149*
		(0.301)	(0.441)	(0.0819)
m_univabv_atl98	M. At least university and above	0.0612	0.0876	0.0494
		(0.430)	(0.424)	(0.0934)
Wealth Quintiles	**(omitted=lowest quintile)**			
qw98_2	HH in second quintile	0.0729	0.171	0.176***
		(0.149)	(0.282)	(0.0461)
qw98_3	HH in third quintile	0.465***	0.553**	0.177***
		(0.148)	(0.235)	(0.0468)
qw98_4	HH in fourth quintile	0.430***	0.550*	0.228***
		(0.159)	(0.309)	(0.0506)
qw98_5	HH in fifth quintile	0.570***	0.717*	0.287***
		(0.173)	(0.368)	(0.0545)
f_pres98	F. present in HH in 98	-0.251*	-0.322	-0.147***
		(0.140)	(0.211)	(0.0443)
m_pres98	M. present in HH in 98	0.607*	0.598*	0.00727
		(0.343)	(0.345)	(0.103)

		1	2	3
			IV-Probit	
Variable Name	**Variable Description**	**Probit**	**Outcome Eqn.**	**Tutoring Eqn.**
Preparatory School Characteristics				
shift_prep06	Prep. School operated in shifts	-0.138	-0.130	0.00634
		(0.0913)	(0.0949)	(0.0287)
comp_prep	Computer use	0.270***	0.254**	-0.0152
		(0.0898)	(0.109)	(0.0283)
punish_prep	Use of corporal punishment	-0.184	-0.116	0.108**
		(0.164)	(0.246)	(0.0499)
Community Characteristics				
tchr_pupl_prep	Prep. teacher-pupil ratio in the gov.	0.0122	0.00867	-0.00219
Regions	**(omitted=Greater Cairo)**	(0.0134)	(0.0164)	(0.00450)
region2_98	Alexandria and Suez Canal	-0.0166	0.0487	0.116**
		(0.167)	(0.233)	(0.0521)
region3_98	Urban Lower Egypt	-0.00272	0.111	0.145**
		(0.167)	(0.330)	(0.0583)
region4_98	Urban Upper Egypt	-0.0974	-0.0212	0.0611
		(0.171)	(0.261)	(0.0609)
region5_98	Rural Lower Egypt	-0.201	-0.136	0.0846*
		(0.160)	(0.238)	(0.0513)
region6_98	Rural Upper Egypt	-0.324*	-0.422	-0.217***
		(0.180)	(0.284)	(0.0560)
Constant	Constant	-1.854	-2.329	-1.186
		(3.288)	(3.402)	(1.039)
Observations		1161	1161	1161

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

1 Sample restriction: was a preparatory student in 1998 and in 2006 has progressed beyond the secondary branching point. Dependent variable = 1 if joined the general secondary stream

Table 3.3: Effect of Private Tutoring on Secondary Streaming, Linear Models[1]

		1	2	3
			2 SLS	
Variable Name	**Variable Description**	**OLS**	**Outcome Eqn.**	**Tutoring Eqn.**
tut_98	Dummy for taking tutoring in 98	0.0870***	-0.0187	
		(0.0266)	(0.396)	
peduc (IV variable)	% working in educ. at the local level			0.0183**
				(0.0082)
Child Characteristics				
female	Female	0.0500**	0.0472*	-0.0275
		(0.0248)	(0.0267)	(0.0276)
age_98	Age in 98	0.00296	0.0238	0.2087
		(0.134)	(0.154)	(0.1493)
age_98sq	Age in 98, squared	-0.000721	-0.00144	-0.0072
		(0.00476)	(0.00544)	(0.0053)
eldeschild	Eldest child in 98	0.0242	0.0261	0.0213
		(0.0292)	(0.0298)	(0.0327)
repeat_prim	Repeated grades in primary level	-0.193**	-0.182**	0.0854
		(0.0768)	(0.0860)	(0.0860)
HH Characteristics				
Father Education	**(omitted=illiterate or above)**			
f_RW_atl98	F. At least reads and writes	0.0671*	0.0753	0.0755*
		(0.0384)	(0.0487)	(0.0428)
f_linterm_atl98	F. At least lower intermediate	-0.0778*	-0.0767*	0.0107
		(0.0420)	(0.0419)	(0.0469)
f_interm_atl98	F. At least intermediate	0.152***	0.150***	-0.0211
		(0.0446)	(0.0452)	(0.0498)
f_abvinterm_atl98	F. At least above intermediate	0.165**	0.171**	0.0541
		(0.0670)	(0.0701)	(0.0748)
f_univabv_atl98	F. At least university and above	0.0824	0.0668	-0.1499**

		1	2	3
			2 SLS	
Variable Name	**Variable Description**	**OLS**	**Outcome Eqn.**	**Tutoring Eqn.**
		(0.0692)	(0.0902)	(0.0772)
Mother Education	**(omitted=illiterate or above)**			
m_RW_atl98	M. At least reads and writes	0.00809	0.0117	0.0344
		(0.0442)	(0.0459)	(0.0494)
m_linterm_atl98	M. At least lower intermediate	0.0502	0.0516	0.0153
		(0.0520)	(0.0519)	(0.0581)
m_interm_atl98	M. At least intermediate	0.0538	0.0594	0.0369
		(0.0489)	(0.0529)	(0.0550)
m_abvinterm_atl98	M. At least above intermediate	0.198***	0.182*	-0.1489*
		(0.0744)	(0.0954)	(0.0830)
m_univabv_atl98	M. At least university and above	-0.110	-0.105	0.0494
		(0.0848)	(0.0863)	(0.0947)
Wealth Quintiles	**(omitted=lowest quintile)**			
qw98_2	HH in second quintile	0.00975	0.0292	0.1762***
		(0.0420)	(0.0839)	(0.0467)
qw98_3	HH in third quintile	0.139***	0.158*	0.1771***
		(0.0426)	(0.0853)	(0.0475)
qw98_4	HH in fourth quintile	0.132***	0.158	0.2284***
		(0.0458)	(0.107)	(0.0513)
qw98_5	HH in fifth quintile	0.166***	0.198	0.2869***
		(0.0495)	(0.130)	(0.0552)
f_pres98	F. present in HH in 98	-0.0654	-0.0811	-0.1469***
		(0.0404)	(0.0712)	(0.0449)
m_pres98	M. present in HH in 98	0.168*	0.170*	0.0073
		(0.0932)	(0.0926)	(0.1041)

Variable Name	Variable Description	1 OLS	2 2 SLS Outcome Eqn.	3 2 SLS Tutoring Eqn.
Preparatory School Characteristics				
shift_prep06	Prep. School operated in shifts	-0.0380	-0.0374	0.0063
		(0.0260)	(0.0260)	(0.0291)
comp_prep	Computer use	0.0815***	0.0798***	-0.0152
		(0.0256)	(0.0263)	(0.0287)
punish_prep	Use of corporal punishment	-0.0454	-0.0335	0.1080**
		(0.0454)	(0.0633)	(0.0506)
Community Characteristics				
tchr_pupl_prep	Prep. teacher-pupil ratio in the gov.	0.00357	0.00297	-0.0022
		(0.00385)	(0.00442)	(0.0046)
Regions	**(omitted=Greater Cairo)**			
region2_98	Alexandria and Suez Canal	0.000745	0.0134	0.1160**
		(0.0474)	(0.0667)	(0.0529)
region3_98	Urban Lower Egypt	0.00445	0.0266	0.1451**
		(0.0467)	(0.0948)	(0.0591)
region4_98	Urban Upper Egypt	-0.0152	-0.00130	0.0611
		(0.0477)	(0.0703)	(0.0617)
region5_98	Rural Lower Egypt	-0.0575	-0.0462	0.0846
		(0.0458)	(0.0621)	(0.0520)
region6_98	Rural Upper Egypt	-0.0860*	-0.108	-0.2170***
		(0.0509)	(0.0953)	(0.0568)
Constant	Constant	0.0683	-0.0369	-1.1859
		(0.940)	(1.013)	(1.0533)
Observations		1161	1161	1161

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses

1 Sample restriction: was a preparatory student in 1998 and in 2006 has progressed beyond the secondary branching point. Dependent variable = 1 if joined the general secondary stream

CHAPTER 4

EDUCATION RETURNS IN THE MARRIAGE MARKET: DOES FEMALE EDUCATION IMPROVE MARITAL OUTCOMES IN EGYPT?

4.1. INTRODUCTION

This chapter is motivated by a result found in Chapter 2, which examined gender differentials with respect to tutoring investment decisions in Egypt. Using the Egypt Labor Market Survey ELMS 98, I found no gender bias in the context of tutoring even though education gender bias is generally thought to exist in Egypt. This finding was puzzling given the discretionary nature of such an investment: why would parents decide to bear the additional educational costs of tutoring when the labor market payoff for females is expected to be limited?

It was concluded that while investment in male education is primarily motivated by market returns, investment in female education may have non-market-oriented motives. It may be the marriage market returns that justify investments in female education. This chapter aims to examine how female education improves female marriage prospects, in terms of husband characteristics such as education and pre-marital wealth in order to test the hypothesis that one of the main motives for investing in female education in Egypt is marriage returns. The effect of female education on other marital outcomes that are relevant in the case of Egypt and developing countries in general is also examined.

Particularly, I look at the effect on the likelihood of living independently upon marriage and the likelihood of marrying a relative. I also look at the effect of education on the share of marriage costs that is borne by the bride and her family. I found that female education is strongly linked to marital outcomes even after

controlling for a woman's socioeconomic background as reflected in her parents' education. Highly educated women are more likely to marry highly educated men, more likely to live in a separate household, less likely to be married to a relative and more likely to marry a husband from a wealthier background. However, highly educated women do not seem to be more likely to have their grooms and their families contribute relatively more to marriage costs.

The remainder of the chapter is organized as follows. In Section 4.2, the literature is reviewed. Section 4.3 elaborates on the chapter hypothesis. Section 4.4 provides institutional details about marriage in Egypt and presents some descriptive marriage patterns. Section 4.5 describes the methodology and results. Finally, concluding remarks are shown in Section 4.6.

4.2. BACKGROUND

In this section I review work recognizing the links between education and marriage-related outcomes including the likelihood to marry, marriage stability and husband characteristics. Other relevant branches of the literature such as the dowry literature are also described.

Even though the education returns literature has predominantly focused on market returns, some efforts have been made to take into account non-market returns (Behrman and Stacey 1997, Michael 1973, Michael 1982, Wolfe and Haveman 1982 & 2001, Wolfe and Zuvekas 1997). Wolfe and Haveman (1982, 2001) review non-market benefits examined in the literature[78]. They refer to two marriage-related benefits: spouse-cross-productivity and marital choice efficiency. Spouse-cross-productivity denotes the relation found between wife education and husband earnings[79]. Marital choice efficiency is linked to the result

[78] Non-market returns to education in Wolfe and Haveman (1982, 2001) include the relation between own-education and own-health. Also highlighted is the relation between mother's education and fertility as well as children quality (e.g. child education and health).

[79] There is a considerable literature on cross-productivity effects. Examples include Benham (1974) and Tiefenthaler (1997).

in Becker et al. (1977) where education is found to improve sorting in the marriage market and hence make marriage more stable.

Becker et al. (1977) analyze factors negatively affecting the gains from marriage[80] with the purpose of examining factors leading to marital instability. They indicate that, theoretically, education has an ambiguous effect on the gains from marriage and the probability of marriage dissolution: on the one hand it has a positive impact that arise because of an optimal sorting effect while on the other it affects the gains from marriage adversely because it may lead to less (spousal) specialization.[81] Empirically, they find that the simple correlation between education and divorce rates is negative. However, using multivariate regressions they find that education has a statistically insignificant effect.

The theoretical argument about how education relates to marital instability is in line with Becker's seminal work on marriage (for example see Becker 1973, 1974, 1991). The basic premise in Becker's theory is that the decision to marry is based on an individual's perceived gains from entering marital union (compared to remaining single) subject to the constraint of time and resources (households are endowed with production functions of nonmarket household commodities)[82]. Specialization within the household and assortative mating come as direct behavioral implications of his theory. Positive assortative mating will take place along traits considered as complements in the production of the household good. Negative assortative mating will take place along traits that are substitutable[83].

[80] In the economics literature on marriage, gains of marriage can arise because of economies of scale, division of labor based on comparative advantage, sharing of (household level) public goods and insurance.

[81] As the wife is more educated, she is less likely to specialize in household production and more likely to engage in market activities. In other words, there would be less division of labor.

[82] In his analysis, the production of nonmarket goods employs market goods and labor time of household members as inputs.

[83] A key example is the negative sorting by wage rate and labor market productivity, in which case, high-wage males specialize in market activities and marry low-wage females who specialize in household activities.

Education, given a certain division of labor, improves productivity in both the labor market and the household[84] thereby bringing about positive assortative mating and at the same time specialization. On the other hand, if educated women are more likely to join the labor market, the marriage gains resulting from division of labor would not arise and therefore the direction of assortative mating would be negative. Thus, based on economic theory, it is unclear whether highly educated women will necessarily marry highly educated men. Empirically, however, positive sorting by education was systematically found (e.g., Rockwell 1976, Boulier and Rosenzweig 1984, Kalmijn 1991, Mare 1991 and Pencavel 1999). One issue with this literature is that it takes education as given i.e., it does not take into account that the effects on marriage outcomes are internalized at the time education decisions are made.

In the sociological literature, education was believed to affect the likelihood of marriage. In particular, the independence hypothesis was adopted to explain the observed retreat from marriage in the US and in developed countries. Under this argument, female education attainment and work are thought to be the driving cause of the decrease in marriage prevalence since educated women have weaker incentives to marry because they can afford not to marry or at least can afford marriage delays (i.e., they have lower gains from entering marital union relative to remaining single). In addition, educated women are expected to have a restricted pool of marriageable men because they have higher standards when it comes to mate selection (Fossett and Kiecolt 1993).

Despite initially finding some evidence supporting the independence argument (largely using aggregate-level data)[85], subsequent studies found that female attainment was actually positively related to the propensity to marry (e.g., Fossett and Kiecolt 1993, Goldscheider and Waite 1986, Lichter et al. 1992, Qian

[84] In Becker's work, the more educated can be of higher productivity in the household sector because of higher efficiency given a certain production function. Alternatively, the more educated can be of higher productivity because they use different production techniques.
[85] Oppenheimer (1997 p.437) discusses the drawbacks of the methods used in those papers.

and Preston 1993). One explanation was that economically independent females were becoming attractive potential mates because of their capacity to contribute to household spending especially in a time where economic and male employment conditions were not promising.

In earlier sociological work, it was found that educated females enjoyed better marital matches. In particular, it was found that female education plays a positive role in attaining upward social mobility through marrying high-status or potentially high-status males. Elder (1969) examined the effect of education and level of attractiveness on marrying high-status males (where status is based on occupation). He found using multivariate analysis that education helps in achieving mobility through marriage especially for females from the middle-class. Taylor and Glenn (1976) undertook similar analysis and found that education has a moderately significant effect on marrying a high-potential husband while the attractiveness effect is close to zero.

The results found by Elder (1969) and Taylor and Glenn (1976) are consistent with Goldin (1992) where she maintains that around mid twentieth century, college attendance allowed women to meet and marry college-educated men thereby improving their marital outcomes. Ge (2007) provides evidence that marriage market considerations drove women's human capital acquisition even into the 1980s. Using simulations based on a dynamic decision model of college attendance, labor supply and marriage, she estimates that female college attendance would drop from 61% to 56% had there not been expected benefits in the marriage market.

In a paper to which this chapter is most related, Lefgren and McIntyre (2006) examine the relationship between women's education and their marital outcomes. They find that high-school and college-educated women are more likely to be married using the 2000 census data. These women are more likely to be married because they have more stable marriages and not because they are

more likely to ever marry. The authors also find female education to be strongly and positively associated with husband's income. They roughly estimate that 60%-70% of the association between female education and family income is through the association between female education and husband income. They argue that there are 3 mechanisms through which female education can be linked to high-quality husbands: (1) education institutions provide an opportunity to meet such husbands[86] (2) educated women get into occupational circles where they can meet high quality men and (3) educated women can be preferred by high quality mates for having better prospects in the labor market or being more effective in household production.

The papers by Ge (2007) and Lefgren and McIntyre (2006) are part of recent work in which the education returns in the marriage market is analyzed, incorporated or at least acknowledged. Lafortune (2008) examines the effect of sex ratios on education measures in order to study the effect of marriage market conditions on pre-marital investments. She argues that finding such an effect means that there are marriage returns to education. By calibrating these returns, she estimates that they represent 40%-60% of total returns to education. She concludes that this can explain why women can be educated as much as men even where labor force participation is low.

In a related paper, Iyigun and Walsh (2007) find that sex ratios affect pre-marital investment such as education. They argue that it is competition for males that are relatively in short supply because women marry younger that may be driving the increase in female education that lead to the closing or even reversal of gender gaps in education. Chiappori, Iyigun, and Weiss (2006), on the other hand, argue that women can surpass men in schooling as a means to avoid wage discrimination assuming that gender wage discrimination decreases by education level. They model the determination of pre-marital schooling of men and women

[86] The idea that education institutions can serve as a meeting place is acknowledged by Mare (1991), Goldin (1992), Pencavel (1999) and Ge (2007).

jointly taking into account that returns to schooling can be divided into returns in the labor market and returns in the marriage market (arising from greater marital surplus shares).

In addition to the literature above, there is a body of literature where the link between female education and marriage is examined in the context of developing countries. Some differences exist between marriage customs and patterns in developed and developing countries. To begin with, marriage is more prevalent in developing countries. Additionally, parents in the developing world are often directly involved in the choice of their children's spouse and in many cases parents contribute towards marriage-related costs as marriage represents a major occasion for intergenerational transfer of assets and can be a major avenue for achieving upward social mobility for daughters. As a result, marriage often entails large transfer payments (such as dowry and less frequently brideprice).

In this literature branch, several papers recognize that female education has returns in the marriage market (e.g., Boulier and Rosenzweig 1984, Fafchamps and Quisumbing 2007, and Mukherjee and Mondal 2006). Boulier and Rosenzweig (1984) find that educated women in the Philippines are more likely to marry educated men but they are more likely to marry later.

Some papers model institutional details of marriage and the interplay with education is emphasized. Lahiri and Self (2007) show that the combination of patrilocal residence and dowry systems can reduce the incentive of parents to educate their daughters since it is their in-laws that will recuperate the returns to their education. Dasgupta et al. (2008) show that patrilocal residence coupled with the practice of arranged marriage result in a disincentive to educate daughters as well. However, they argue that this is because parents prefer to choose an uneducated bride for their son (unless a more educated bride pays a higher dowry) because they are more likely to maintain parental control and keep their son living

with them (and enjoy the associated benefits) when the bride is uneducated. This in turn discourages parents from investing in educating daughters.

Significant attention was given to dowry issues in South Asia. Many papers came up with theoretical arguments to account for the existence of dowry[87]. Furthermore, a substantial part of the dowry literature was trying to explain the observed inflation in dowry payments in South Asia[88]. The dowry literature is relevant to this chapter since dowry, like education, can serve as a pre-marital investment that can be used to manipulate matching and marital outcomes. In addition, I examine how the costs borne by the bride and her family in Egypt vary with bride education. Therefore, looking at dowry as a marriage cost and how it relates to education in the literature is worthwhile.

For the most part, dowry and education are considered substitutes. Keeping groom traits and other variables constant, a more educated bride can pay a smaller dowry. This is recognized in Rao (1993), Dalmia (2004), Mukherjee and Mondal (2006). However, the negative relation was not established empirically (Anderson 2007, 2004). There is no consensus on the direction of the relation between dowry and bride education (Amin 2008). For example, Dalmia (2004) finds that bride education is positively related to the dowry paid[89]. Iyigun and Walsh (2007) indicate that human capital investment and dowries are two margins of pre-marital investments that will move in the same direction.

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[87] Traditionally, dowry was considered a market-clearing or a compensatory transfer (Becker 1991). It can be used to get a husband with better traits and to achieve upward social mobility (e.g., in Fafchamps and Quisumbing 2007, Mukherjee and Mondal 2006). Others consider dowry to be a pre-mortem inheritance or an intergenerational transfer that is used to attain a better bargaining position (Zhang and Chan 1999). Botticini and Siow (2003) argue that dowry serves as a solution to a free-riding problem in patrilocal settings.

[88] Rao (1993) showed evidence of a "marriage-squeeze" scenario brought about by population growth and the fact that women marry older men. Edlund (2000), however, couldn't replicate Rao's results using the same data. She argues that the rise in dowry, a pre-mortem inheritance, was a result of an increase in parental wealth. Anderson (2000) shows using a theoretical dynamic model that a surplus of brides should actually lead to a decline in dowries.

[89] To explain this unintuitive result, she points out that it is possible that the parental landholdings variable she is employing is not perfectly capturing parental wealth and hence bride education may be proxying for wealth.

unemployment entails a more limited pool of marriageable males. The above factors would generate more competition among females thereby pushing for profile-improving investments such as education.

The above discussion describes how female education can improve marriage prospects, an end parents may hope to achieve by investing in their daughter's education. Another incentive may be related to the contribution they will have to make towards their daughter's marriage in the future[93]. It is possible that the share of the costs borne by parents is negatively associated with the level of education of the daughter. Higher female education may result in the groom and his family contributing more (because of an improved bargaining position of the bride) and/or the daughter herself contributing more (because she can work and save for their marriage). However, higher female education can also increase the contribution expected from the bride and her family. Therefore, the direction of the final effect of female education on the relative contribution of each partner is not unambiguous.

4.4. MARRIAGE IN EGYPT: INSTITUTIONS AND DATA

4.4.1 Institutional details

Marriage in Egypt is generally viewed as a partnership between two families more than between two individuals. While marriage follows a bride-wealth system, a bride and her family are expected to contribute based on pre-defined traditions. A groom-to-be (and/or his family) is liable to offer his bride *mahr* (bride-wealth or dower) before marriage.[94] There is also an option of deferring part of the *mahr,* a *mu'akhar,* to a date later than the marriage contract date. Traditionally, a

[93] As will be explained in the next section, families of the bride and the groom usually share in the costs of marriage.

[94]Ideally, a *mahr* is meant to be a gift for the bride that serves to ensure her financial independence. However, in reality, the *mahr* is usually used towards purchasing items needed for the household such as furniture.

mu'akhar is to be paid only in the case of divorce and hence serves as an insurance payment. Grooms-to-be are also responsible to present a jewelry gift *shabka*, to arrange for housing and to buy some of the furniture and appliances needed for the marital household. The bride-to-be (and/or her family) is responsible for providing the *gihaz* (furnishings and trousseau[95]) and for acquiring part of the furniture. Other costs to be shared by both parties are the engagement and wedding ceremonies' costs.

The exact items and their quality vary by region and urban/rural residence and are thoroughly discussed in the pre-marital bargaining process in which the exact contributions of each partner towards the costs of marriage are determined. The bargaining position of each party can depend on factors such as relative socioeconomic status, spousal age gap, consanguinity, relative education levels and female work. Female education can increase the bargaining power of a bride and the mahr she receives.

Marriage is usually preceded by an engagement period (which in turn can be subdivided into informal and formal engagement). This is the period in which the contribution of each party is determined (in addition to getting to know each other). There could possibly be a *katb-el-ketab* period where the couple is legally married but the couple does not live together yet.

4.4.2 Data

The dataset employed in this chapter is the nationally-representative Egypt Labor Market Panel Survey ELMPS 06. It is a longitudinal survey that follows on the Egypt Labor Market Survey ELMS 98[96]. ELMPS 06 includes detailed information on education and labor market variables. In ELMPS 06, the marital

[95] Examples of *gihaz* items include china, small kitchen appliances and carpets.
[96] For more information on ELMPS 06 and ELMS 98, please refer to the thesis appendix.

status of all individuals surveyed as well as the year and age at first marriage of individuals that were ever-married are known[97].

The ELMPS 06 individual questionnaire has a section eliciting more information on marriage characteristics[98]. Respondents to this section are ever-married women aged 16-49. Marriage-related information includes duration of pre-marriage stages (i.e., engagement stages and *katb-el- kitab*) in months, whether the husband is a relative (consanguineous marriage), and living arrangements upon marriage (i.e., whether the couple lived separately at the time of marriage or whether they were living as part of an extended-family household)[99].

The marriage section also has a detailed set of questions on the costs of marriage. The value of each cost component (*mahr, mu'akhar, shabka,* marriage ceremonies, housing, *gihaz*, and furniture/durables) is recorded. Moreover, the percentage contribution of each of the four involved parties: the bride, the bride's family, the groom and the groom's family, towards each cost component is identified. There is also a question on the percentage contributions towards total marriage costs (i.e., considering all cost components).

4.4.3 Marriage patterns based on ELMPS 06

This section presents some summary statistics concerning marriage patterns. Aspects discussed are marriage prevalence, female and male age at marriage, spousal age-gap, the extent of living independently upon marriage, the prevalence of consanguineous marriages and the duration of pre-marriage stages. Furthermore, patterns of the costs of marriage are explored. Another important element examined is the distribution of husband education conditional on wife

[97] This information is also available in ELMS 98.
[98] No equivalent section exists in ELMS 98.
[99] Further details are gathered if the couple did not live independently at the time of marriage: which relatives they lived with, whether they shared living costs with the extended family and for how long they lived with the extended family.

education and how this distribution was affected by changes taking place with respect to the non-conditional educational distribution of women and men. All figures provided are based on sampling weights[100].

4.4.3.1 Basic Marriage patterns

Variation in the different aspects of marriage is analyzed by urban/rural residence, by region[101] and by female (wife's) education, when relevant. In this chapter, the focus is on marriages taking place in the last twenty years (1985-2006). Therefore, trends in marriage-related variables are examined within this time frame and often the 5-year marriage cohorts within 1985-2006 are compared.

The legal age of marriage for females in Egypt is 16 while that for males is 18. Figure 4.1 shows the percentage of men and women who are ever-married by age, based on ELMS 98 and ELMPS 06. Marriage is practically universal in 1998 and 2006. Therefore, there is not a retreat from marriage accompanying the trend of increasing female education. Women approach universality at an earlier age than men but by their mid-thirties, almost all men and women have ever-married. At younger ages, ever-marrying is higher in rural than urban areas but there is a convergence in the percentage of ever-married individuals beyond the mid-thirties.

Looking at the percentage of ever-married women by education level and age-group (Figure 4.2) shows that women with a university degree are less likely to be married, especially in their twenties. At older ages, the probability of ever-marrying among university graduates is closer to, though slightly lower than, other education groups. Similarly, university graduate males are less likely to be married for the younger age groups.

[100] The weight adjustment is used to offset an over-representation of urban areas.

[101] The regional breakdown used in this chapter is as follows: Greater Cairo, Alexandria and Suez Canal governorates, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt and Rural Upper Egypt. For the purpose of this section, the regions of Greater Cairo and Alexandria and Suez Canal are lumped into an "Urban Governorates" category.

Divorce rates based on ELMS 98 and ELMPS 06 are very low. When the divorce rate is based on the ratio of divorced individuals to ever-married individuals, it is around 2%. A person who had divorced but re-married by the time of the survey would not be counted as divorced. No consistent difference in divorce rates by education level is observed.

Based on ELMPS 06, the mean female age at marriage for marriages taking place between 1985 and 2006 is 21. Looking at 5-year marriage cohorts shows that the average age at marriage for females rose from 20 years in the case of the 1985-1989 cohort to 22 in the 2000-2006 cohort (Figure 4.3). The increase in female age at marriage is larger for illiterate women and for those residing in Upper Egypt [102](Figure 4.4)[103].

For the marriage cohort of 1985-2006 as a whole, there are disparities in the age at marriage for females by education level, by urban/rural residence and by region. For example, the mean age at marriage is 19 for illiterate women and 24 for university graduate females. This is not surprising given that attending higher education institutions naturally delays marriage.

There is an average difference of 3 years between urban and rural areas for those married between 1985 and 2006: female age at marriage in urban areas is 23 while it is only 20 in rural areas. The urban/rural difference at each education level, however, only ranges from 1 to 2 years. This is because of the different educational composition where there are relatively more educated females (that tend to marry at a higher age) in urban areas. As for regional disparities, the female age at marriage is highest in the urban governorates region and lowest in Rural Upper Egypt. On average, regional differences can account for about 4

[102] Upper Egypt is the Southern part of Egypt. This region generally has less developed infrastructure and a more conservative society.

[103] Conditioning on education level in Upper Egypt, the increase in female age at marriage becomes smaller suggesting that it may be caused by a compositional change where female education increased.

years of difference in female age at marriage (for marriages taking place between 1985 and 2006).

Male age at marriage has not gone up as much as female age at marriage. For the 1985-2006 marriages, the mean age at marriage for males is 27 and it has not really been increasing when comparing 5-year marriage cohorts within that period[104] (Figure 4.5). Within those marriage cohorts, however, there are disparities by wife education[105], by urban/rural residence and by region. Male age at marriage rises by wife education level: the mean age at marriage is 25 for those married to illiterate women and 30 for those married to university graduate women. There is also an average difference of 2-3 years between urban and rural areas: male age at marriage is 26 in urban areas and 29 in rural areas. As for regional differences, like in the case for females, the age at marriage is highest in the urban governorates region and lowest in Rural Upper Egypt.

Looking at the spousal age gap reveals that on average husbands are 6 years older than wives. There is no noticeable difference among 5-year marriage cohorts with respect to the spousal age-gap (4.6). In addition, there are no consistent differences by urban/rural areas or across regions or by female education levels.

Consanguineous marriages (where the husband and wife are relatives) are not uncommon in Egypt; 30% of marriages in the period 1985-2006 were consanguineous and 60% of these were marriages among cousins. Looking at 5-year marriage cohorts within that period shows that consanguineous marriages went down from 33% in 1985-1989 to 27% in 2000-2006 (Figure 4.7). This decrease took place in both urban and rural areas but was greater in urban areas. Another group witnessing a strong decline is the university and above education

[104] This is not in line with the anecdotal evidence that the male age at marriage has been rising.
[105] I am using variation by wife education since the focus of the chapter is on marriage characteristics and how they relate to female education. Examining male age at marriage by (male) education gave similar results (not surprisingly so because of positive sorting by education).

group where the likelihood of consanguineous marriages went down from 24% to 15%.

Within marriage cohorts, there are disparities by female education level, by urban/rural residence and by region. Apart from a spike at the R&W level, consanguineous marriages generally decrease as female education increases. For example 37% of illiterate women are married to a relative while only 16% of women with a university degree are married to a relative. This is expected given that attending higher education institutions increases the opportunities of getting to know potential spouses that are not relatives. Marrying a relative is more likely in rural areas (35%) compared to urban areas (22%). Consanguineous marriages are particularly common in rural Upper Egypt (46%).

Overall, 54% of couples married between 1985 and 2006 lived independently upon marriage. 95% of those who did not live independently at the time of their marriage lived with the husband's family[106] and also close to 90% of them did not separate in their living facilities. The percentage of couples living independently went up from 45% in the 5-year marriage cohort of 1985-1989 to more than 60% in the cohort of 2000-2006.

As with other marriage characteristics, there are differences by female education level, by urban/rural residence and by region (Figure 4.8). The probability of living independently increases with female education: only 30% of illiterate women live independently upon marriage while around 84% of women with university degrees and above do so. Living with an extended family is a more common practice in rural areas. Only 38% (76%) of women in rural (urban) areas live independently upon marriage. The urban/rural difference gets smaller for women with higher education levels. There are also differences by region (Figure 4.9). Looking closely, the differences are mainly along urban/rural lines.

[106] Close to 5% of those who did not live independently at the time of their marriage lived with the wife's family.

The rural parts of Lower and Upper Egypt are regions where the likelihood of independent living is the lowest. The urban parts of Lower and Upper Egypt are closer to the urban governorates. This is again linked to the extended family system being more prevalent in rural areas.

Finally, with respect to the pre-marital stages, their average duration for marriages between 1985 and 2006 is 15 months. There is no remarkable change over time, by education level, by urban/rural or by region.

4.4.3.2 Patterns of Costs of Marriage

The rank from highest to lowest contributor to the total costs of marriage between 1985 and 2006 is as follows: the groom (38%), the groom's family (30%), the bride's family (30%), and the bride (2%)[107,108]. Overall, the bride's family and the groom's family contributions are close[109]. In rural areas, the groom's family contribution to total costs exceeds that of the bride's family whereas in urban areas the bride's family contribution exceeds that of the groom's family (Figure 4.10). It is worth noting that, in rural areas, the groom's family contributes more than in urban areas and that it slightly exceeds the groom's own contribution.

The bride's own contribution is minimal and is larger in urban areas. Also, in urban areas, even though university graduate brides still contribute a small amount, they contribute more than brides with less education. Another important thing to note is that the bride's family contribution does *not* decrease with their daughter's education. This provides initial descriptive evidence that parents are not really motivated by expected reductions in the contribution they have to make

[107] This same ranking also applies for the contribution to each cost component except for the contribution to furnishings which is largely a bride side obligation.
[108] The breakdown of contributions is similar across the 1985-1989 and the 2000-2006 marriage cohorts. However, there is a similar but slight decrease in what the groom contributes and a slight increase in what the families on both sides contribute (in both rural and urban areas).
[109] This applies to individual costs as well, except housing, which is largely a groom (and/or his family) obligation, and furnishings, which is largely a bride (and/or her family) obligation as mentioned above.

towards their daughter's marriage when they are formulating the education investment decisions.

Looking at individual cost components shows that 65% of women married between 1985 and 2006 did not receive any *mahr*[110] (dower). In addition, by comparing the 1985-1989 to the 2000-2006 marriage cohorts, the mean value of *mahr* has increased but by less than the other cost components. *Mahr* is more important in rural areas. Unlike urban areas, the *mahr* increased in rural areas across the 1985-1989 to 2000-2006 marriage cohorts (Figure 4.11). Generally speaking, *mahr* increases by female education but there is also a bit of a u-shape where illiterate women receive a higher mahr111.

As for the rest of marriage costs (jewelry, furniture, housing, ceremony), the spending on each component almost doubled across the 1985-1989 to 2000-2006 marriage cohorts. The spending is higher in urban areas and is positively related to the bride's education level. The two components requiring the most spending are furniture and housing. This is followed by the spending on furnishings, then by that on jewelry and ceremony costs. *Mahr* is the lowest in value. The *muakhar* (deferred dower) is close to double the amount of *mahr*. The mean values of individual costs components for marriages between 1985 and 2006 are 9867 L.E. for furniture, 9443 L.E. for housing, 4049 for furnishing, 2409 for the jewelry gift, 1518 L.E. for the ceremony costs, 1363 L.E. for *mahr*, 2734 for the *muakhar*.

Variations in the relative contributions to the different components were generally found to be in line with the marriage traditions outlined earlier (Figure

[110] *Mahr* is the cost item with a large number of missing values. This is may be because of a coding problem where zero values were recorded as missing. These missing values are especially prevalent in the Lower Egypt region.

[111] This may be the case because that at lower levels of education, there is also low level of income making these women demand more mahr so that they are able to fund their part of the marriage cost obligations.

4.10). For example, housing is mainly a groom side expense (it was found that the bride and her family contribute less than 10% of housing costs). Similarly, the bride and her family contribute only about 20% to marriage ceremonies. In contrast, the spending on furnishings is largely a bride's family obligation: close to 70% of spending is borne by the bride and her family. Generally, the bride's family contribution does *not* go down with the bride's education.

It is worth noting that those who do not live independently upon marriage tend to have smaller spending on marriage cost components. This is because they are not expected to bring in as much furniture or other things related to the house. Therefore, the relative difference by living independently is largest for housing and furniture costs and smallest for the *mahr* and *shabka*.

4.4.3.3 Husband and wife education

In this sub-section, the focus is on comparisons between 1985-2006: the "recent marriage cohort and 1965-1984: the "older" marriage cohort. There is clear positive sorting by education in matching (Figure 4.14). In addition, men are more likely to marry down and women are more likely to marry up as a result of men tending to be more educated. This is reflected in the observation that for a given level of education for a man (Figure 4.13), the adjacent cell down tends to be larger than the adjacent cell up whereas the opposite occurs for women (Figure 4.12).

Figure 4.12 also shows the advantage a highly educated female has over less educated females. For example, women in the recent (older) cohort with an intermediate degree only are 14% (34%) likely to marry a university graduate man in the recent (old) marriage cohort whereas women with a university degree are 74% (86%) likely to marry a university graduate man.

Looking at the distribution of education by gender across the 2 cohorts (Figure 4.14), shows that there is a general increase in education levels. For

instance, the percentage of illiterate individuals has gone down and the percentage of individuals with intermediate and university degrees has gone up. The intermediate group increased by 40% for men and more than doubled for women. University graduates increased for men and women in both urban and rural areas. While the levels remain higher in urban areas, the rate of growth was larger in rural areas. Also, within both urban and rural areas, while the levels remain higher for males, the rate of growth was larger for females.

Given positive sorting, the higher improvement for females has affected the patterns of matching by changing a woman's probability of matching with a man of a given level of education; men are now matching with women that are more educated than before. A woman with a given level of education is now less likely to match with a highly educated man.

This is reflected in the following observations: (1) a university graduate woman in the recent cohort is less likely to marry a university graduate man (Figure 4.12) because of the higher increase in the proportion of female university graduates. Still, compared to other females, a university graduate woman has the highest probability of marrying a university man.[112]. (2) In the recent cohort, a woman with intermediate education is more likely to marry an intermediate educated man and less likely to marry a university educated man because in the recent cohort there is a relatively higher increase in the supply of women with intermediate education.

Comparing the recent to the old cohort, both illiterate men and women in the recent cohort are more likely to marry up[113]. This is primarily driven by the decrease in the pool of illiterate men and women as the population share of the illiterate group has gone down by about 55% for both men and women.

[112] The trend of higher growth of female university graduates continue across the 1985-1989 and the 2000-2006 cohorts. The probability of a university woman to marry a university graduate man did not go down further (see Figure 15).
[113] A similar observation holds when comparing the 1985-1989 to 2000-2006 cohorts.

4.5. METHODOLOGY AND RESULTS

4.5.1 Methodology

This chapter examines, using multivariate statistical analysis, the association between female education and spousal and marital characteristics. While the previous section looks into the variation in several marriage variables by wife education, the results do not control for the wife's other background variables, and therefore, her education may be partly capturing the effect of her socioeconomic background. Extra independent variables used in this section - mainly the mother and father education variables - help to isolate the effect of wife's education.

$$Y = f(X\beta, \varepsilon)$$

The function above relates (Y), the vector of outcomes (dependent variables) to (X), the vector of independent variables and (ε), the vector of error terms. A separate regression equation is fitted for each of the dependent variables[114]. While the same set of independent variables is used across all regressions, the regression model used (and the mathematical form of the function above) depends on the nature of the dependent variable examined. (Y) consists of the following variables: husband education level, whether the couple lived independently at the time of their marriage, whether the marriage is consanguineous, and the pre-marital wealth level of the husband. In addition, it also includes the share of marriage costs that the bride and her family bear.

The husband education categories are: illiterate, reads and writes, less than intermediate, intermediate, above intermediate and university and above[115]. Since

[114] Table 3.1 provides the means and standard deviations of the dependent and independent variables used in the regressions.

[115] The read and write category is for those who never attended school but learnt how to read and write outside formal schooling or those who attended school and dropped out before finishing the

this variable is ordinal, an ordered probit model is used. A categorical education variable is superior to a continuous variable such as years of schooling because it captures the non-linearity in the effect of an extra year of education. For example, it makes a difference whether the year is a credential or a non-credential year- the so-called *sheepskin effect.*

The indicator variable used in the living independently regression takes the value zero if the couple did live with the husband or the wife's family at the time of their marriage[116] and the value of one if they lived separately from their parents. A probit model is used. A marriage where a couple is living independently is thought to be better for a wife since it potentially implies greater participation in decision-making relative to living with in-laws. In addition, as husbands are responsible for providing housing, being able to afford separate housing indicates a higher economic standing of the husband.

As for the consanguinity regression, the dependent variable is an indicator variable taking a value of one if the spouses are relatives and the value zero otherwise. Therefore, a probit model is estimated. If higher female education is associated with a lower probability of marrying a relative, it could reflect that education expands the pool of potential spouses.

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primary (elementary) level. The less than intermediate category comprises those who got a primary (elementary) or preparatory (middle-school) certificate. Beyond the preparatory level, the secondary (high-school) level is branched off into general and technical streams. The general stream is usually for those who would continue on to university while the technical stream is usually terminal. The intermediate category is for those individuals whose highest attained level is the secondary level (high-school) and they are mostly graduates of the technical stream (since most of the general stream graduates eventually have a university degree). The above intermediate category corresponds to holders of a 2-year post-secondary degree that is of vocational/technical focus. The university and above category includes those with a Bachelor or post-graduate degrees. While the above intermediate and university and above categories are not sequential, the university and above category is considered to be of higher status.

[116]As mentioned in the previous section, 95% of those who did not live separately upon marriage lived with the husband's family while 5% lived with the wife's family.

An ordinary least squares regression (OLS) is used in the models where the share of total marriage costs borne by the bride's family and the bride herself are dependent variables.

Another model measures female education returns in terms of the husband's pre-marital wealth. ELMS 06 cannot be used for the construction of a pre-marital wealth variable because if such variable is constructed, it would reflect the household post-marital state (as it is the marital household that is observed at the time of the survey). To get around this issue, I am using the sub-sample of couples where the husband's family was interviewed in ELMS 98 prior to his marriage.

A wealth score is constructed using factor analysis based on household asset ownership and house characteristics information[117]. A separate score is created for urban and rural areas, as what a wealthy person owns and his/her house characteristics vary across urban and rural areas. Households are then divided into quintiles according to the wealth score. An ordinal variable showing to which quintile the husband's pre-marital household belongs serves as the dependent variable. An ordered probit model is used.

As mentioned above, a uniform set of explanatory variables (X) is used across the all regressions. Wife education is represented by a group of dummy variables, each denoting a given level of education attainment: illiterate, reads and writes, less than intermediate, intermediate, above intermediate and university and above. A set of the wife's father and mother education dummies identical to those used for the wife's education are also included as explanatory variables to capture the socioeconomic status of the pre-marital household of the wife.

For all education variables (the wife and her parents), each dummy is set to equal one if the education level attained is equal to or exceeds a given level of

[117] See Filmer and Pritchett (2001) for the factor analysis methodology used to construct the wealth score.

education. This configuration is followed in order to reflect the incremental effect of each education level compared to its previous level. The illiterate or above group is the omitted group. In addition to the education variables, dummies for different regions[118] are included in all regressions. The omitted region is Greater Cairo.

The sample is restricted to married couples: (1) who are in their first marital union, (2) where the wife is age 16-49, (3) whose year of marriage is between 1985 and 2006, (4) where both spouses are part of the household[119]. The sample excludes 33 records where the wife was still a student at the time of the survey.[120] The sample consists of 4441 observations (couples).

For the pre-marital wealth regression, these same sample selection rules were applied along with an additional restriction, that the husband's pre-marital family was interviewed in ELMS 98, reducing the sample size to 1024 observations (couples).

4.5.2 Results

Regression results are presented in Table 4.2. In the husband education regression, all wife education variables are positive and significant at the 1% level. Father education variables are positive and jointly significant at the 1% level of significance but not all are individually significant. None of the mother education variables is significant but they are jointly significant at the 5% level, and all positive.

[118] The regions are: Greater Cairo, Alexandria & Suez Canal governorates, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt and Rural Upper Egypt.
[119] Spouse information is not collected if the spouse is not part of the household. 5.51 % of currently married 16-49 year old women's husbands are not part of the household.
[120] However, it includes women whose husband was a student at the time of the survey (16 cases). It also includes husbands who finished their education after marriage but before the survey time (48 cases representing 1.3% of the sample) and wives who finished after marriage but before the survey time (205 cases representing 5.6% of the sample).

As for the regression pertaining to living independently upon marriage, some of the wife education variables are significant and they are jointly significant at the 1% level. Similarly, father education variables are jointly significant at the 5% level. Mother education variables are not individually or jointly significant. With regard to the consanguineous marriages regression, being a university graduate significantly decreases the likelihood of marrying a relative. It is the mother's rather than the father's education that plays a significant role for that aspect of marriage.

With respect to the bride's family share in marriage costs, the education variables of the wife and her parents by and large are not playing any role whether individually or jointly. This confirms the descriptive evidence that female education does not really affect the share of costs borne by a family. It is worth noting, however, that while being statistically insignificant, the higher education variables of the wife are negative in value, while the university-graduated father variable is positive in value, presumably because of an income effect. It is living in Upper Egypt (whether in the rural or urban areas) that is significantly associated with the bride's family contributing less. This indicates, therefore, that it is variations in regional traditions that are more important in determining contributions. As for the bride's own contribution, apart from the university graduate variable which increases the relative share of the bride, female education does not seem to play a role. Father education variables, however, are jointly significant at the 5% level and the father being a university graduate has a negative impact on the bride's contribution, presumably because of an income effect, through which he is more able to fund his daughter's marriage. The region variables are again important. Brides in all other regions contribute less than those in Cairo.

Looking at the results of the husband's pre-marital wealth, it can be seen that, while not all education variables are individually significant, the wife

education and parental education variables are all jointly significant at the 1% level. Finally, there is an additional regression (results not shown) with the dependent variable combining husband education, living independently, consanguinity and the share of costs into a single marital outcome using factor analysis. In this regression, all wife education variables are positive and significant. In addition, parental education variables are jointly significant.

4.6. CONCLUDING REMARKS

The above results indicate that higher female education plays a significant role in having a marriage with better characteristics. The regional dummies and parental education dummies are also significant. The father education effect is stronger than the mother education effect (except with respect to consanguineous marriages).

ELMPS 06 has the advantage of containing information on parents' education, whether or not they are part of the household. This is valuable since it allowed for controlling for a wife's socioeconomic background. However, because the analysis here relies on observational data, one might not be able to interpret the findings as causal effects of female education on marriage, e.g., if there still are omitted variables or if there is measurement error in education. One unobservable variable that may belong in the model is attractiveness/beauty. Not including this variable can create bias if women do not randomly select into education based on attractiveness. For example, parents may think that a less attractive daughter has lower marital prospects and that she needs more education investment compared to more attractive sisters to compensate for her level of beauty. An opposite scenario may also take place if parents reinforce differences between siblings by preferring to invest in the education of more attractive daughters. To the extent that one does not

control for a woman's attractiveness, the estimated impact of her education on marriage outcomes may be biased.

The work in this chapter can be developed in several directions. First, the determinants of relative contributions need to be carefully examined. The finding that a bride's education does not significantly affect the share borne by her and her family may result from the fact that assortative matching is already taking place i.e., more educated women are matched with more educated men (as validated in model 1). Therefore, more educated women need not be rewarded by having to bear a smaller portion of marriage costs. It would be interesting to see how relative contributions vary with relative spousal education levels (note that model 4 and 5 do not control for husband education). It would also be interesting to know whether there is substitutability or complementarity between human capital and monetary contributions brought into the marriage.

Second, I focused on non-monetary marital outcomes that are expected to result in a better bargaining position for women within marriage (e.g., living independently and not marrying a relative). Therefore, it is important to look at the effect of female education on a set of financial well-being outcomes, such as husband labor market characteristics, that are related to income. This extension would be limited to the sub-sample of paid wage workers, and therefore would exclude a significant part of the population in Egypt. Other outcomes could also be considered, such as husband's employment status. This is an ordinal variable: formal wage worker, informal regular worker, employer, informal and irregular wage worker, self-employed, and unpaid family worker. In addition, ELMPS 06 has detailed information on job characteristics, allowing for the construction of a job quality index that

could be used as a dependent variable. Additionally, the data has detailed information on occupation. Following an occupation classification manual, this information can be transformed into a broad category ordinal occupation variable.

Third, the analysis on returns to female education in the marriage market examines the returns to education at the time only of the survey data collection. It would be helpful to assess such returns over a longer period of time, e.g., the improvement in a husband's lifetime income. This could be done by integrating the husband's estimated wage profile with respect to his age.

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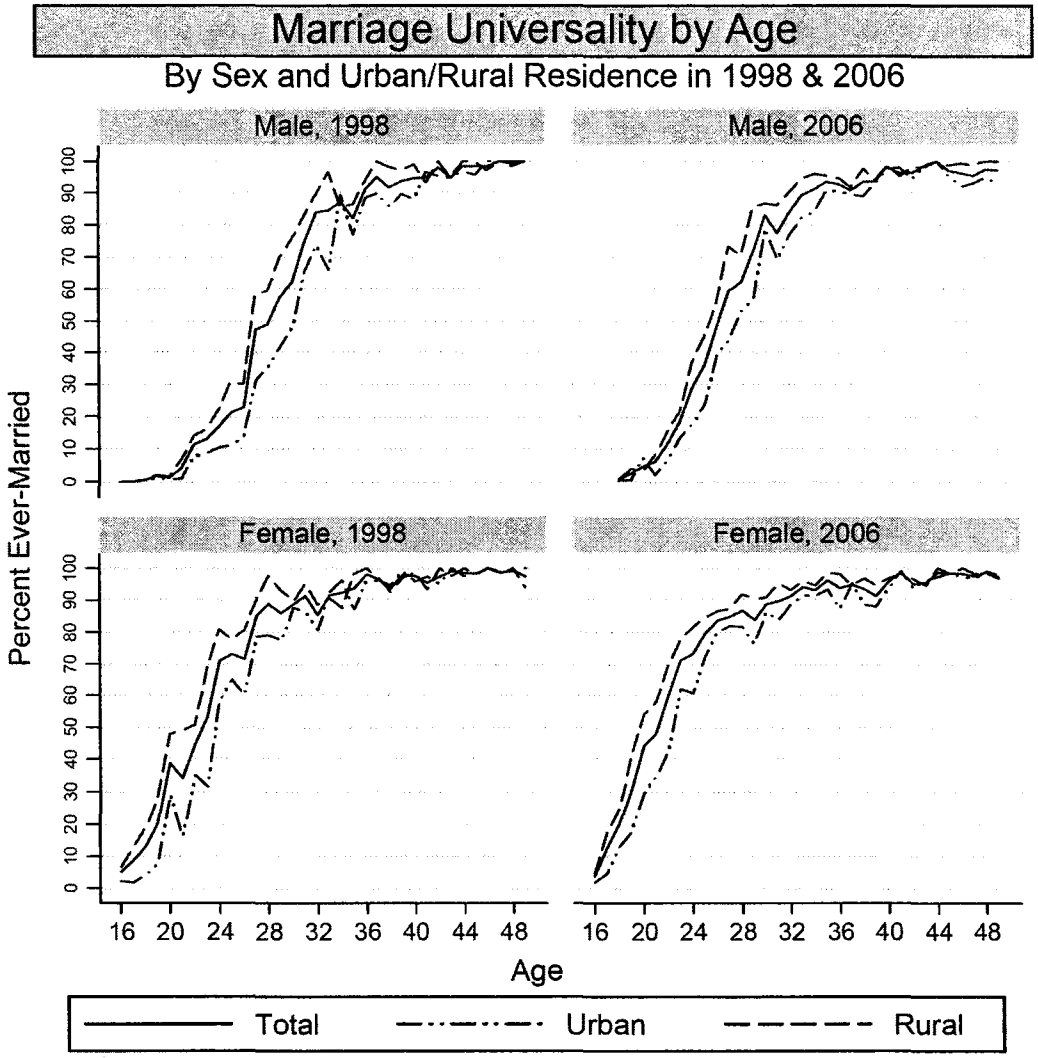
FIGURES:

Figure 4.1.



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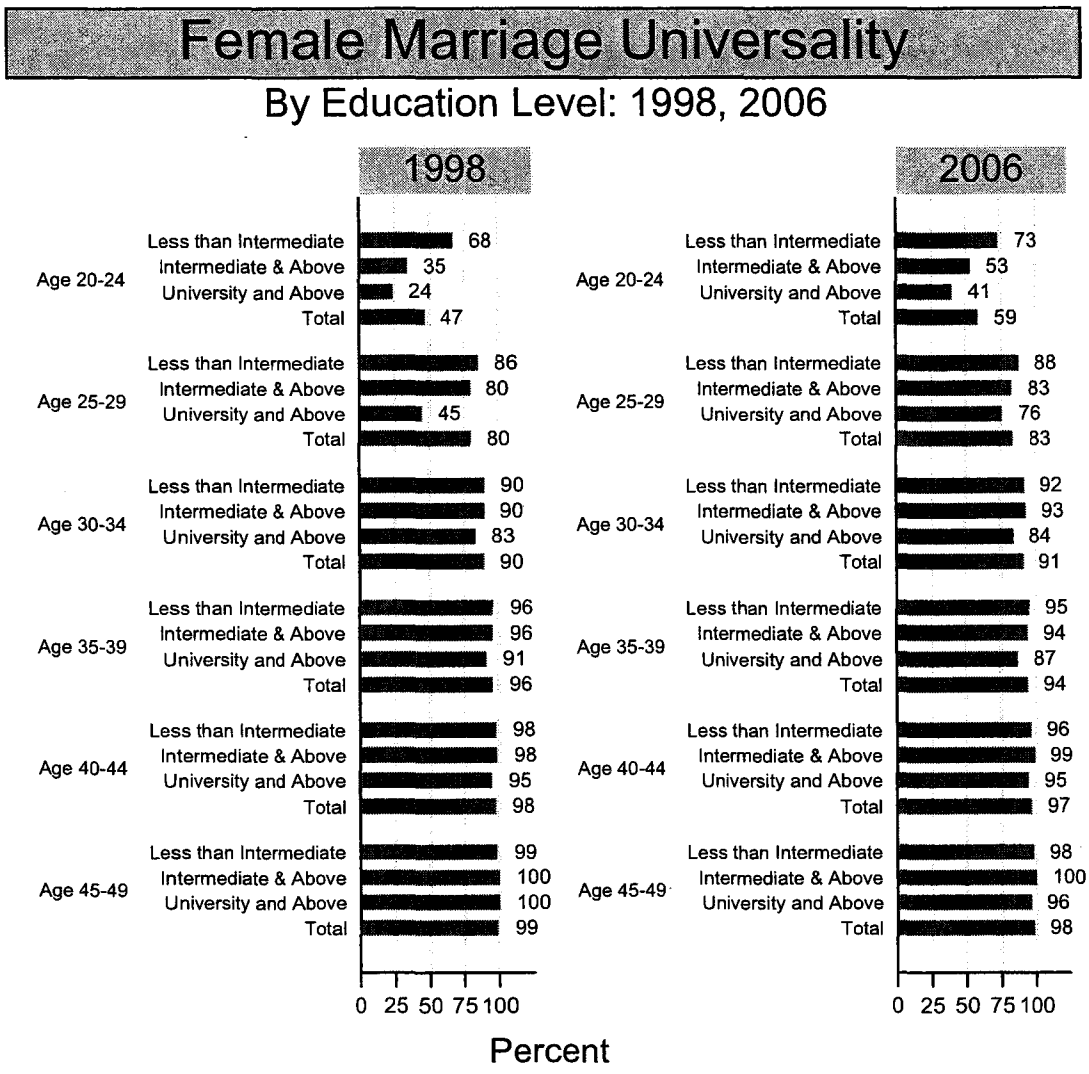

Female Marriage Universality
By Education Level: 1998, 2006
1998
2006
Age 20-24
Age 25-29
Age 30-34
Age 35-39
Age 40-44
Age 45-49
Less than Intermediate
Intermediate & Above
University and Above
Total
68
35
24
47
86
80
45
80
90
90
83
90
96
96
91
96
98
98
95
98
99
100
100
99
73
53
41
59
88
83
76
83
92
93
84
91
95
94
87
94
96
99
95
97
98
100
96
98
0 25 50 75 100
Percent

Figure 4.3.

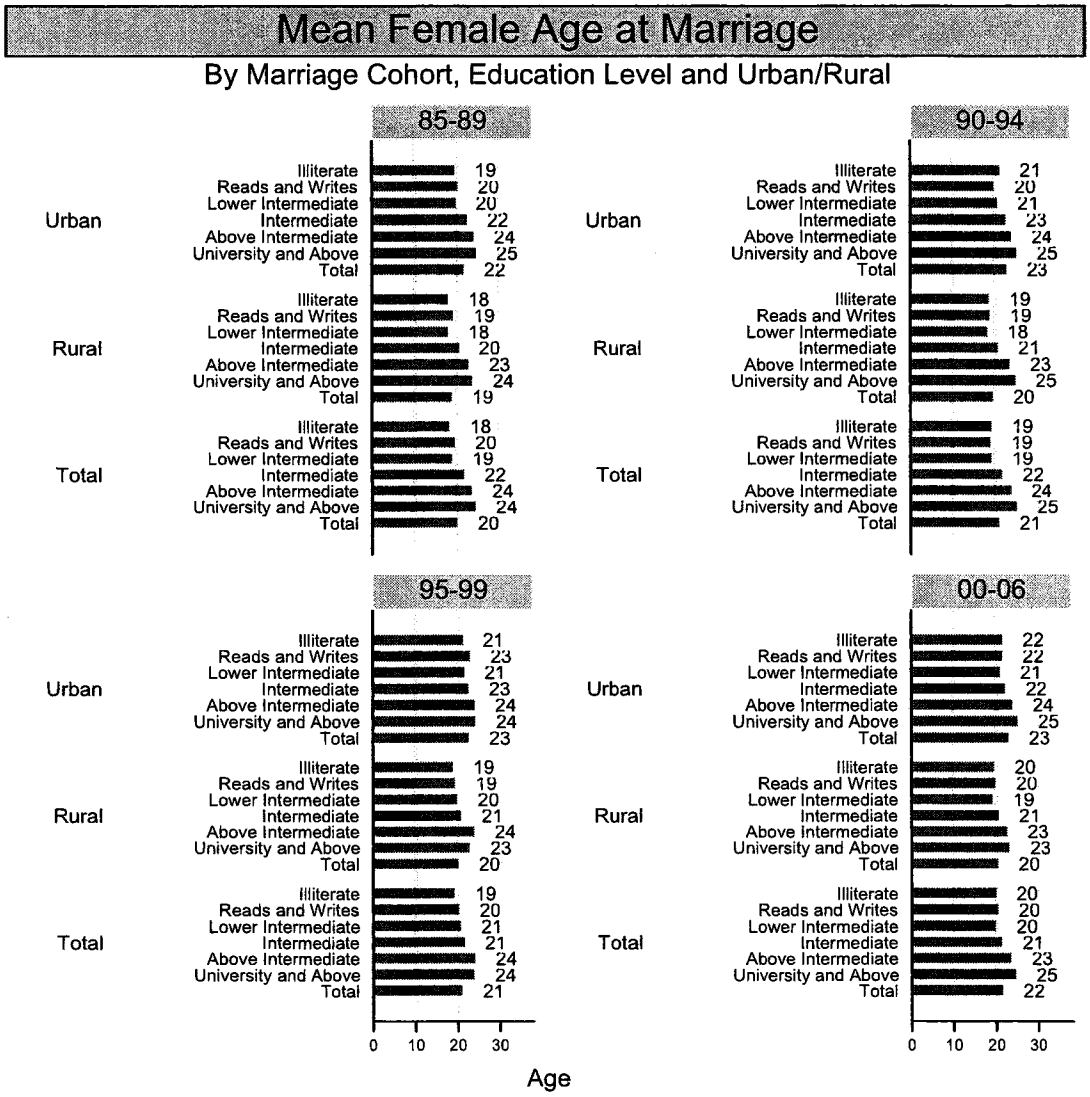

Mean Female Age at Marriage
By Marriage Cohort, Education Level and Urban/Rural
85-89
90-94
95-99
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
0 10 20 30
Age

Figure 4.4.

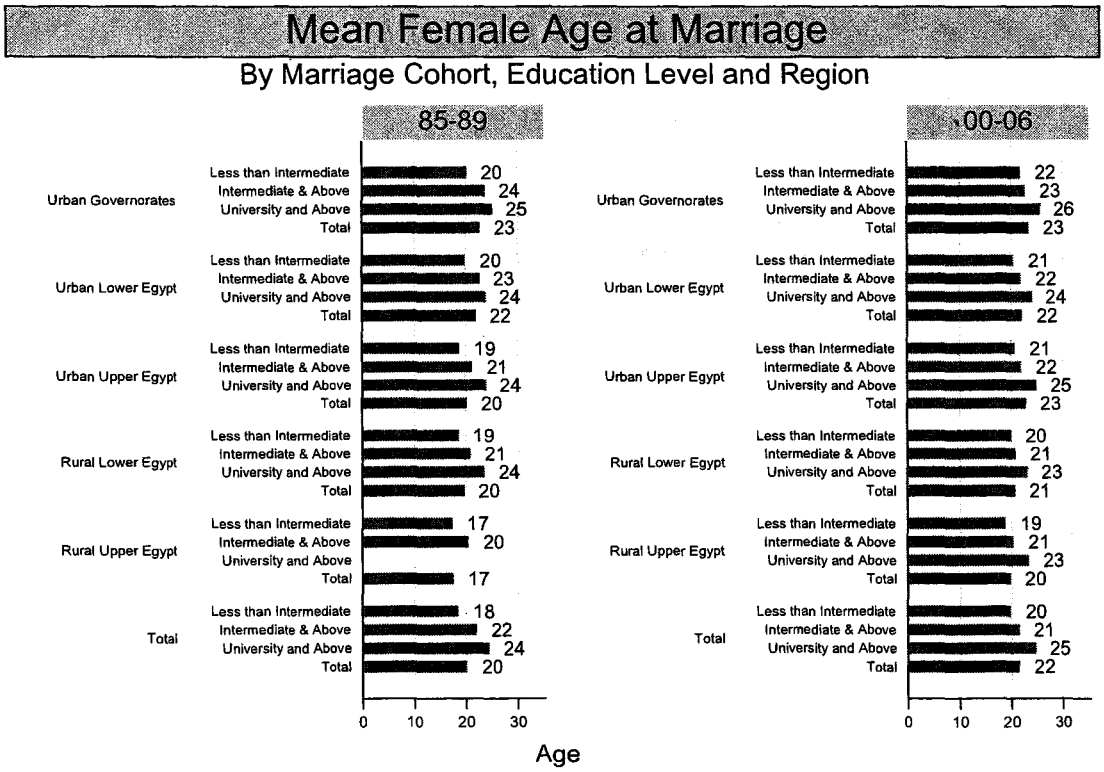

Mean Female Age at Marriage
By Marriage Cohort, Education Level and Region
85-89
00-06
Urban Governorates
Urban Lower Egypt
Urban Upper Egypt
Rural Lower Egypt
Rural Upper Egypt
Total
Less than Intermediate
Intermediate & Above
University and Above
Total
20
24
25
23
20
23
24
22
19
21
24
20
19
21
24
20
17
20
17
18
22
24
20
22
23
26
23
21
22
24
22
21
22
25
23
20
21
23
21
19
21
23
20
20
21
25
22
0
10
20
30
Age

Figure 4.5.

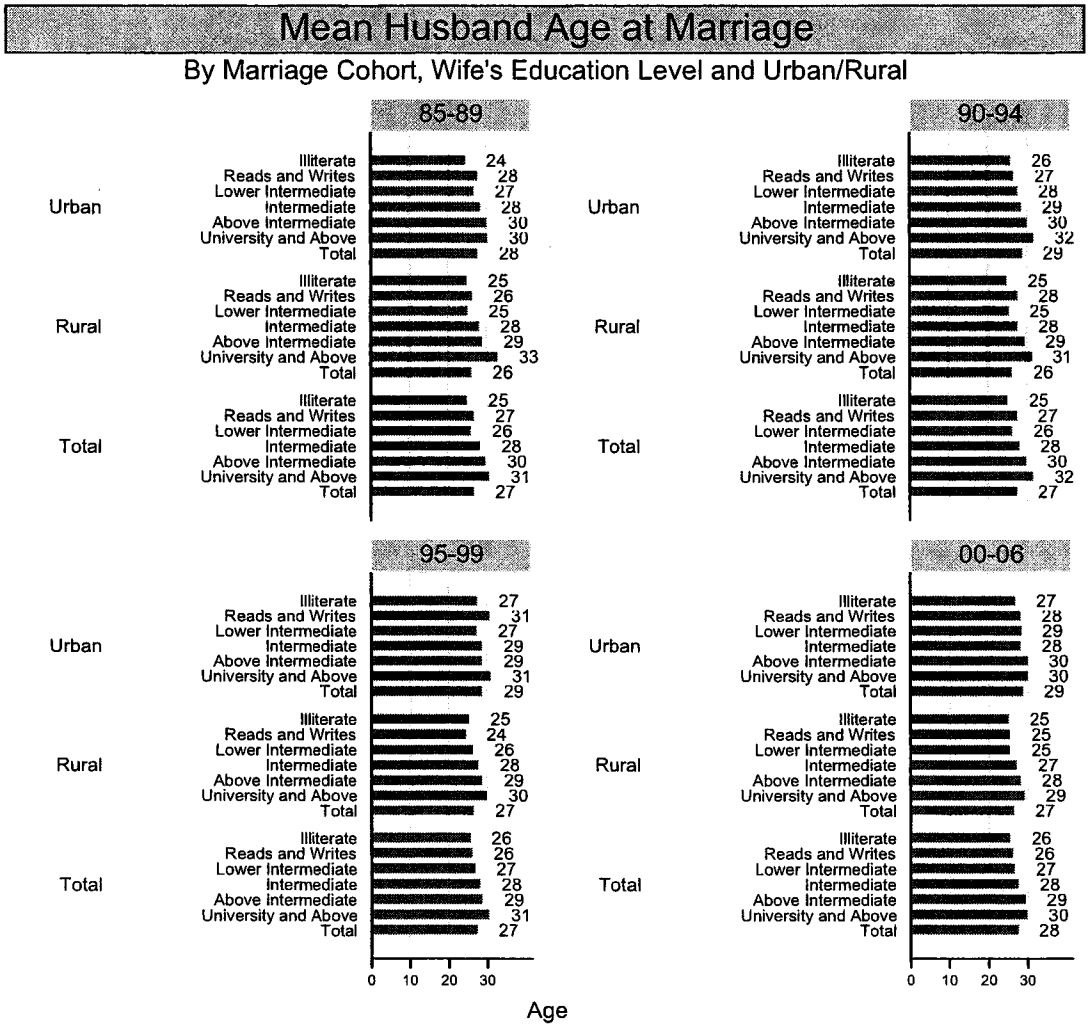

Mean Husband Age at Marriage
By Marriage Cohort, Wife's Education Level and Urban/Rural
85-89
90-94
95-99
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
0 10 20 30
Age

Figure 4.6.

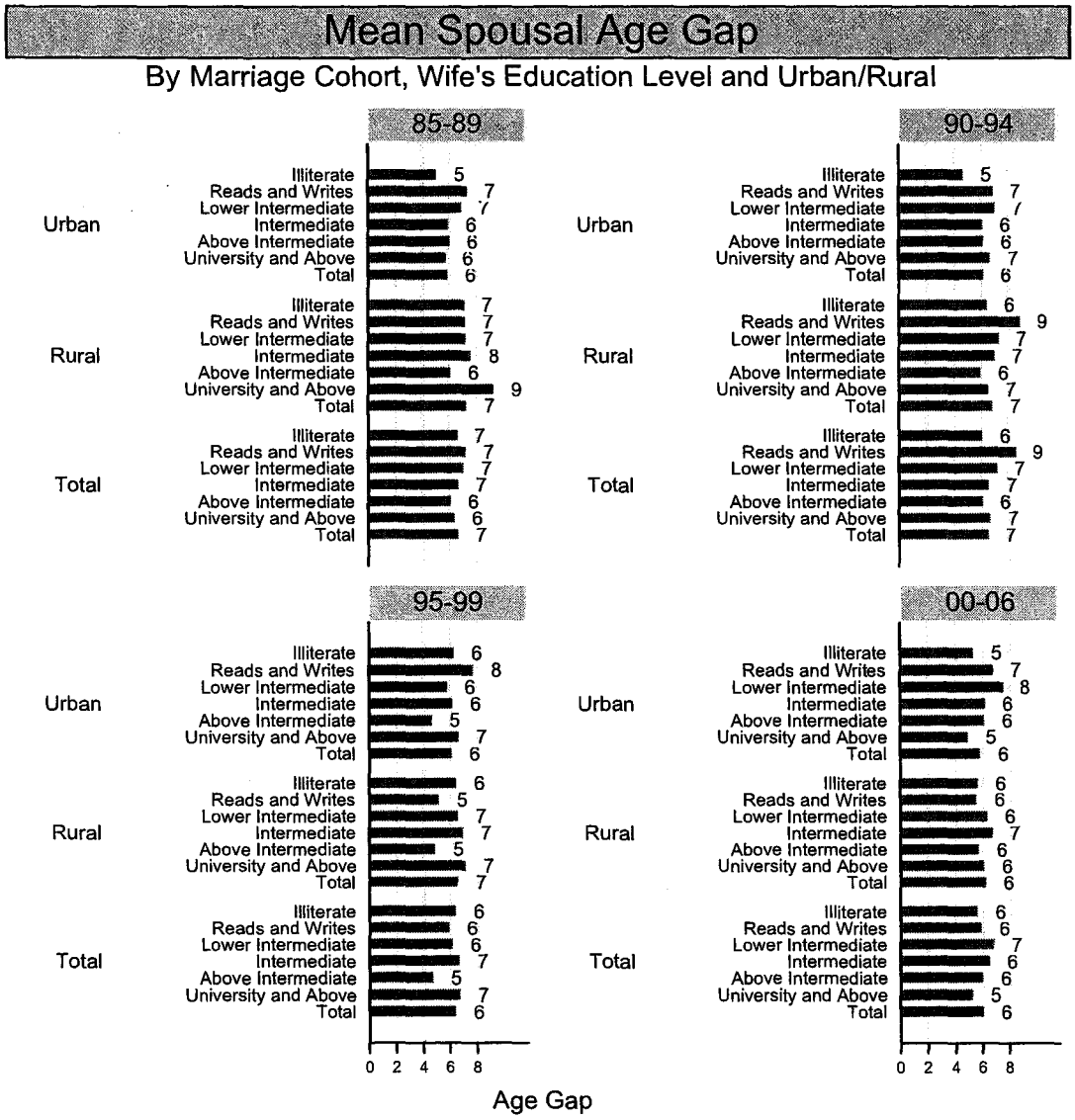

Mean Spousal Age Gap
By Marriage Cohort, Wife's Education Level and Urban/Rural
85-89
90-94
95-99
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
0 2 4 6 8
Age Gap

Figure 4.7.

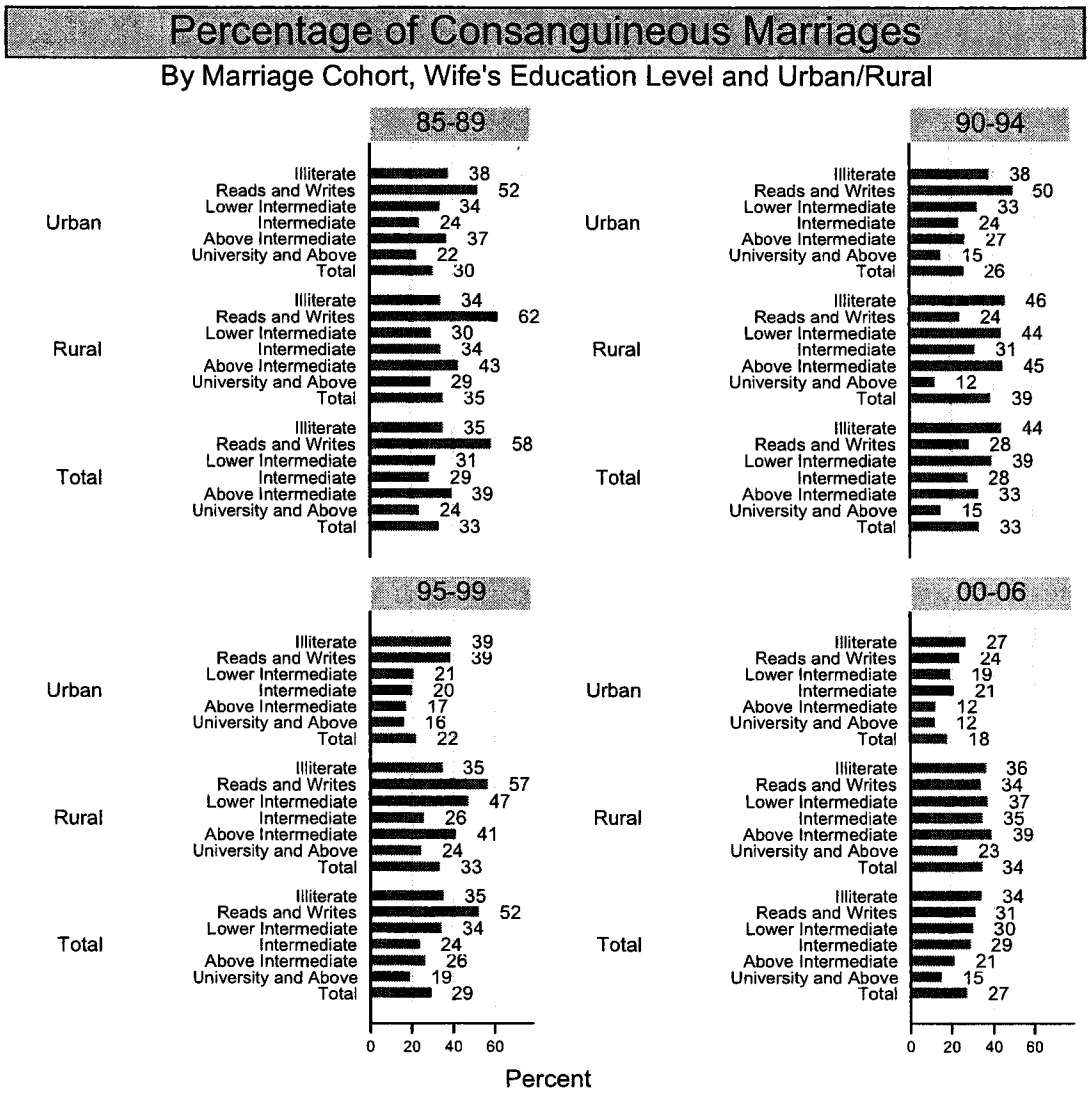

Percentage of Consanguineous Marriages
By Marriage Cohort, Wife's Education Level and Urban/Rural
85-89
90-94
95-99
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
38
52
34
24
37
22
30
34
62
30
34
43
29
35
35
58
31
29
39
24
33
38
50
33
24
27
15
26
46
24
44
31
45
12
39
44
28
39
28
33
15
33
39
39
21
20
17
16
22
35
57
47
26
41
24
33
35
52
34
24
26
19
29
27
24
19
21
12
12
18
36
34
37
35
39
23
34
34
31
30
29
21
15
27
0
20
40
60
Percent

Figure 4.8.

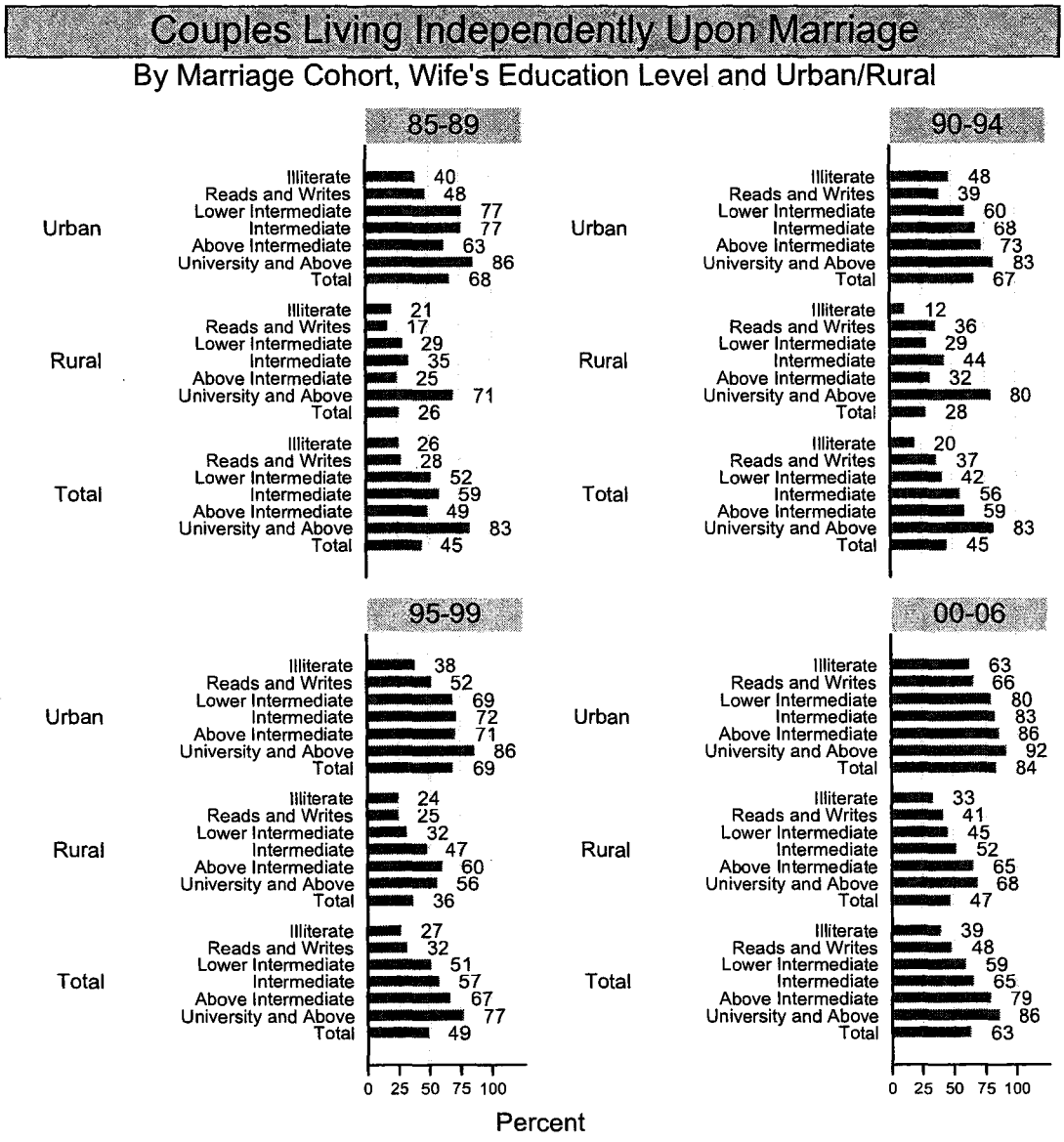

Couples Living Independently Upon Marriage
By Marriage Cohort, Wife's Education Level and Urban/Rural
85-89
90-94
95-99
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
0 25 50 75 100
Percent

Figure 4.9.

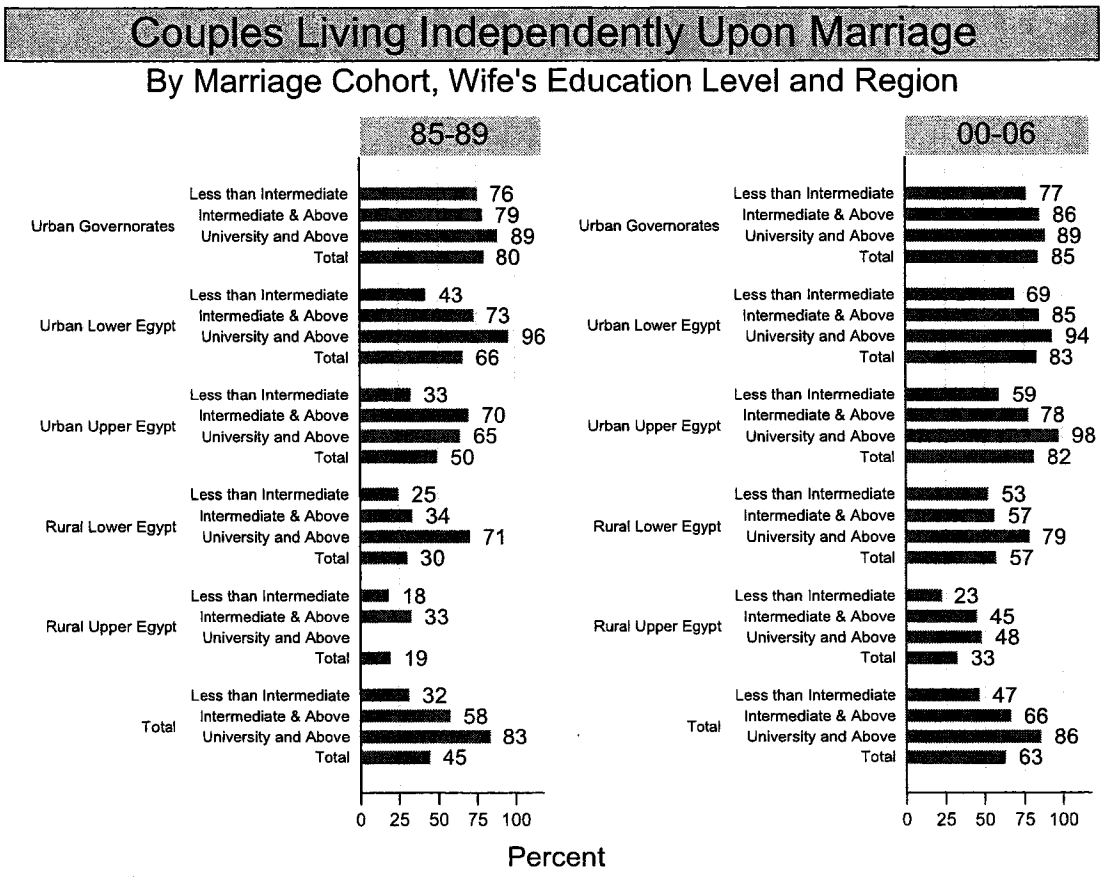

Couples Living Independently Upon Marriage
By Marriage Cohort, Wife's Education Level and Region
85-89
00-06
Urban Governorates
Urban Lower Egypt
Urban Upper Egypt
Rural Lower Egypt
Rural Upper Egypt
Total
Less than Intermediate
Intermediate & Above
University and Above
Total
76
79
89
80
43
73
96
66
33
70
65
50
25
34
71
30
18
33
19
32
58
83
45
77
86
89
85
69
85
94
83
59
78
98
82
53
57
79
57
23
45
48
33
47
66
86
63
0 25 50 75 100
Percent

Figure 4.10.

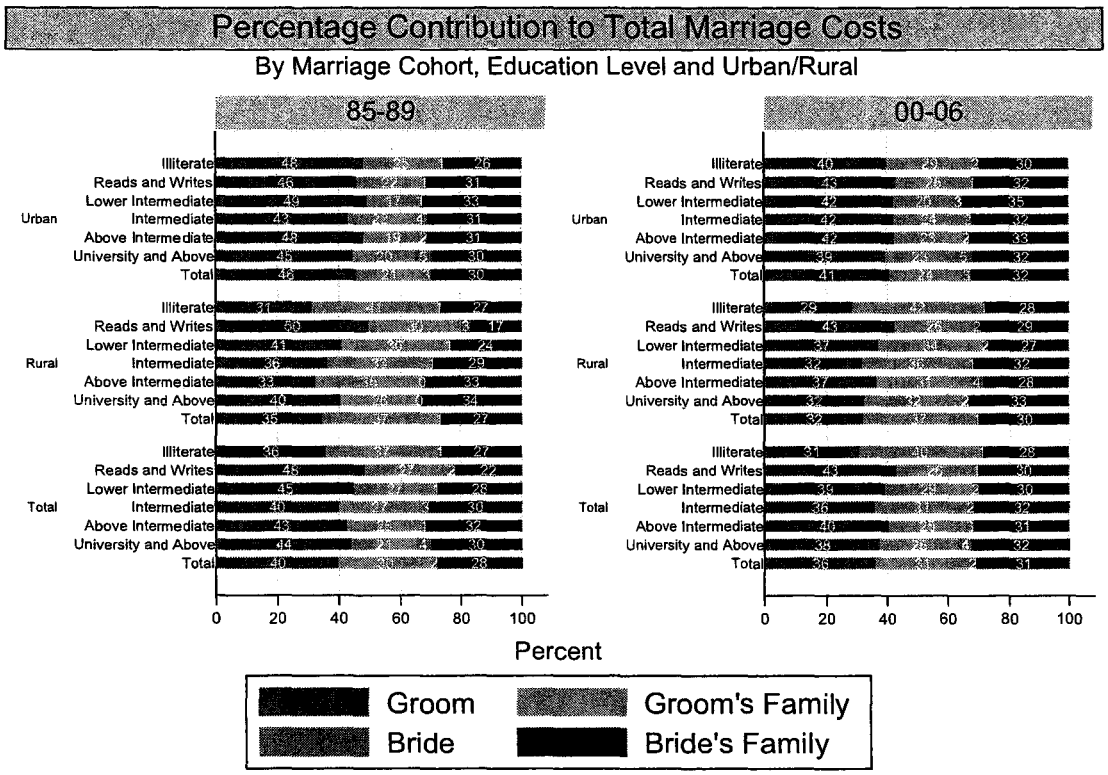

Percentage Contribution to Total Marriage Costs
By Marriage Cohort, Education Level and Urban/Rural
85-89
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
0
20
40
60
80
100
Percent
Groom
Bride
Groom's Family
Bride's Family

Figure 4.11.

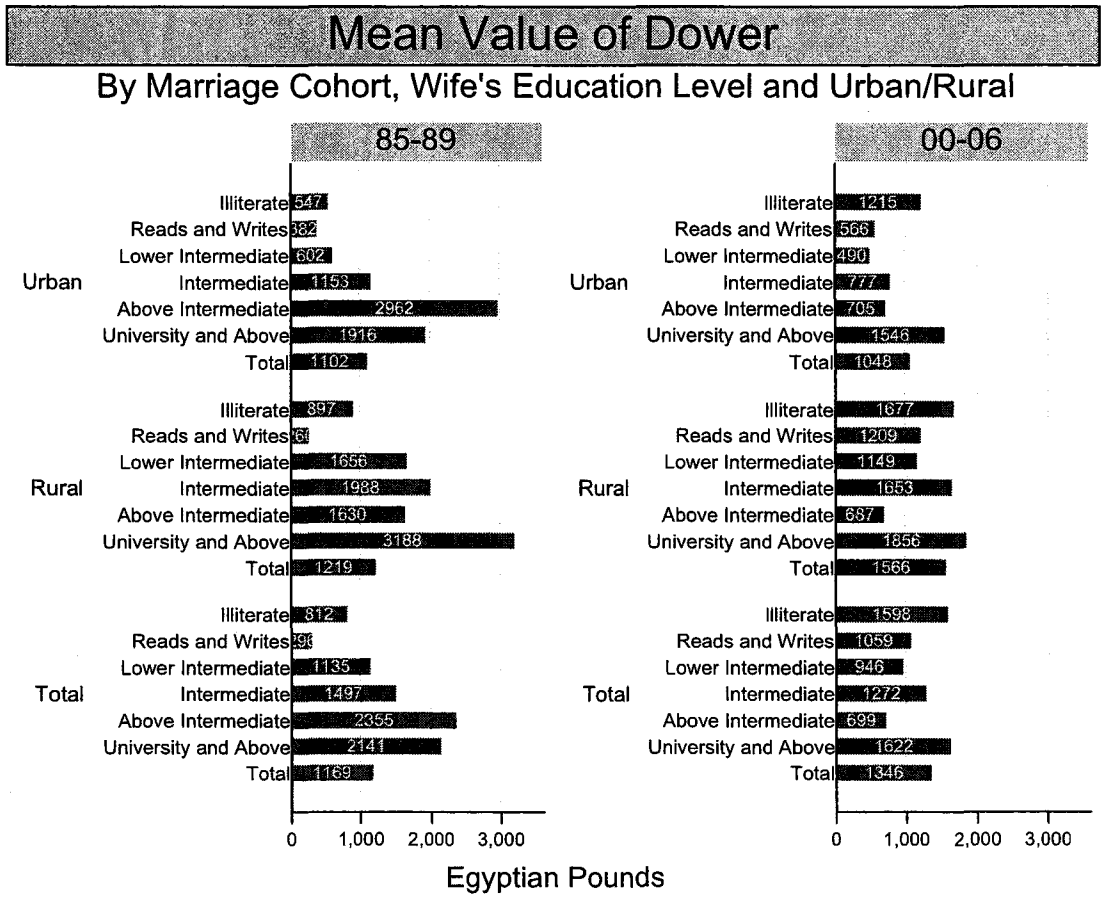

Mean Value of Dower
By Marriage Cohort, Wife's Education Level and Urban/Rural
85-89
00-06
Urban
Rural
Total
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Total
547
382
602
1153
2962
1916
1102
897
1656
1988
1630
3188
1219
812
1135
1497
2355
2141
1169
1215
566
490
777
705
1546
1048
1677
1209
1149
1653
687
1856
1566
1598
1059
946
1272
699
1622
1346
0
1,000
2,000
3,000
Egyptian Pounds

Figure 4.12.

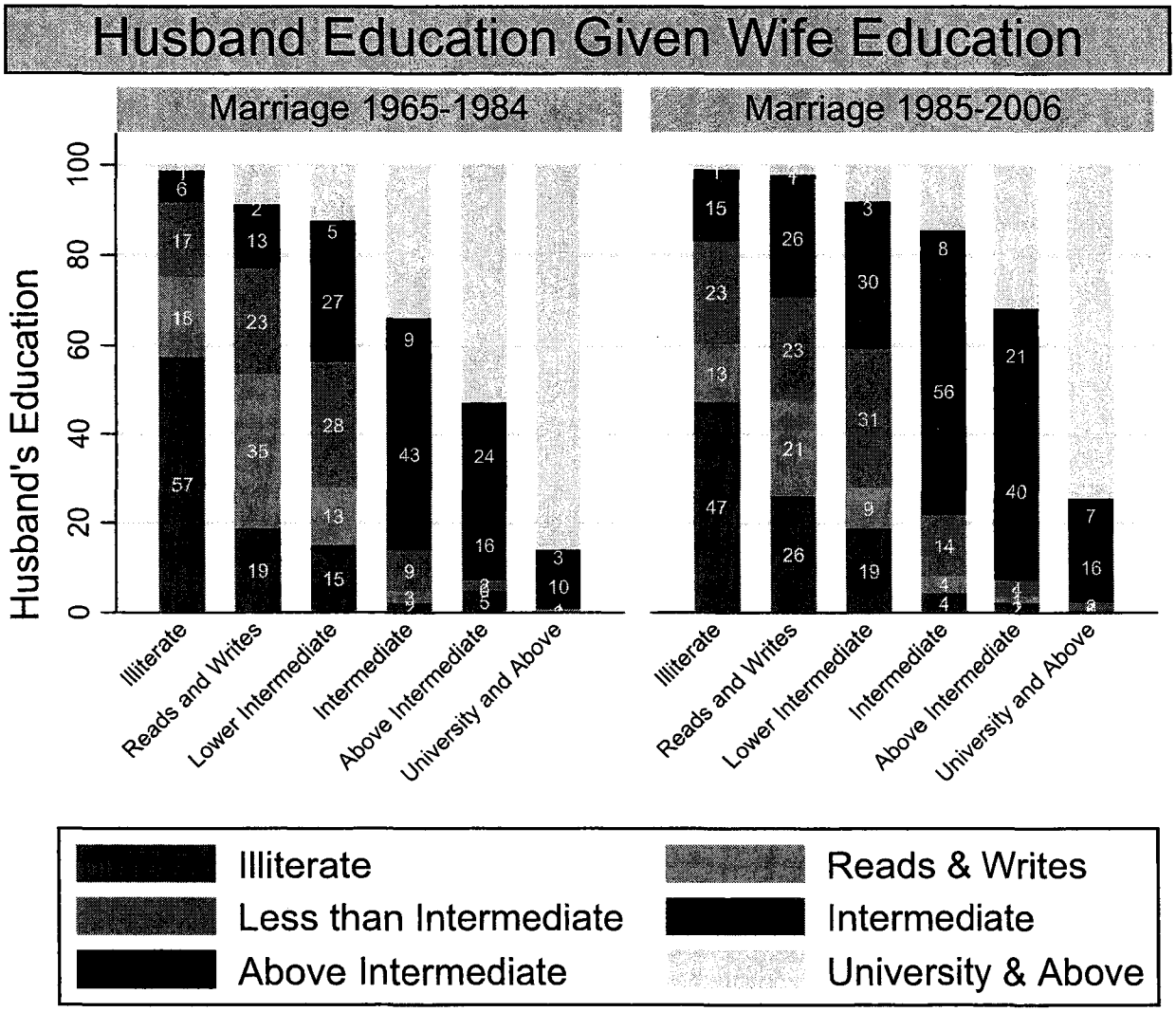

Husband Education Given Wife Education
Marriage 1965-1984
Marriage 1985-2006
Husband's Education
0
20
40
60
80
100
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Illiterate
Less than Intermediate
Above Intermediate
Reads & Writes
Intermediate
University & Above

Figure 4.13.

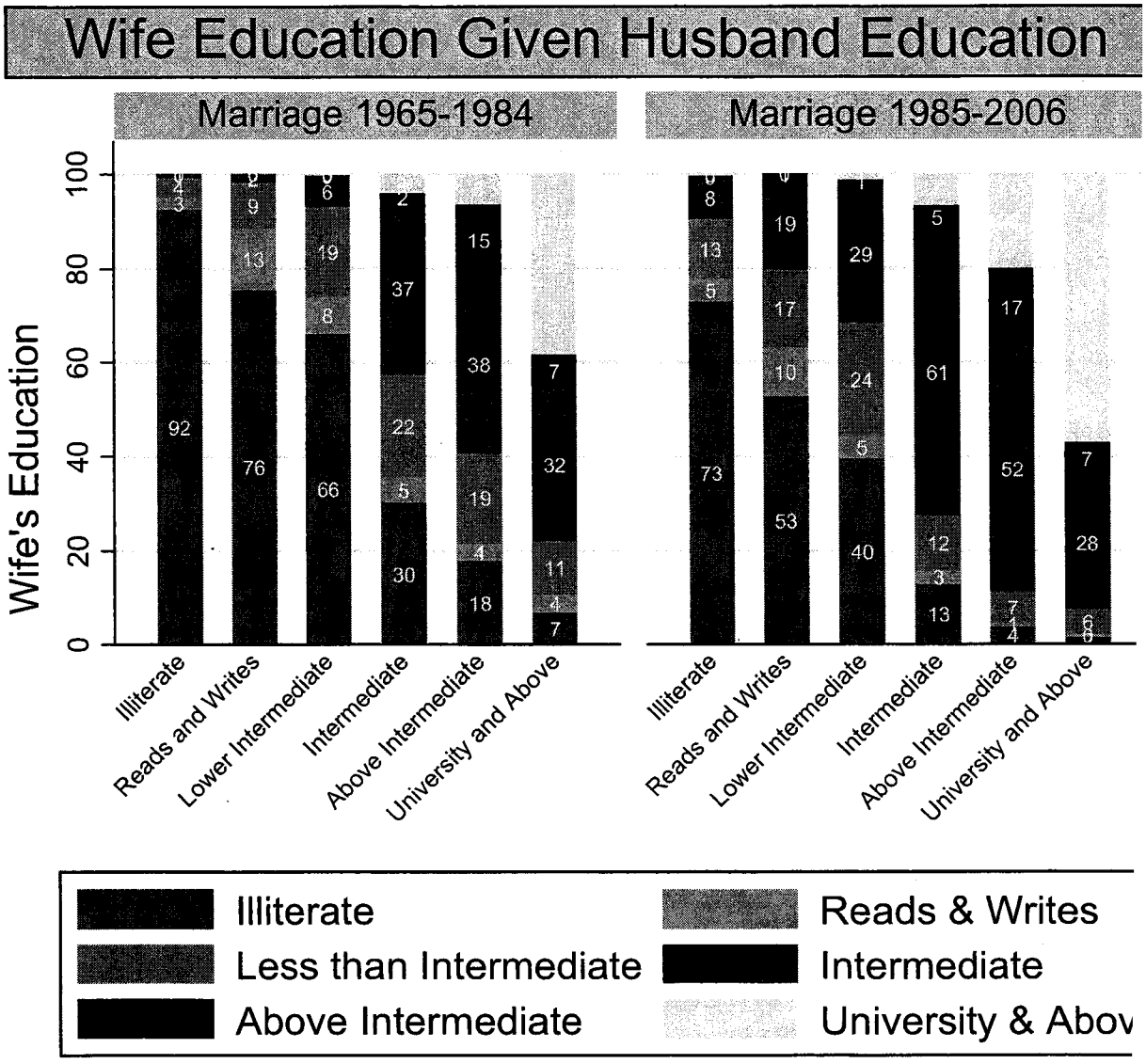

Wife Education Given Husband Education
Marriage 1965-1984
Marriage 1985-2006
Wife's Education
0
20
40
60
80
100
92
76
66
30
18
7
73
53
40
13
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Illiterate
Less than Intermediate
Above Intermediate
Reads & Writes
Intermediate
University & Abov

Figure 4.14.

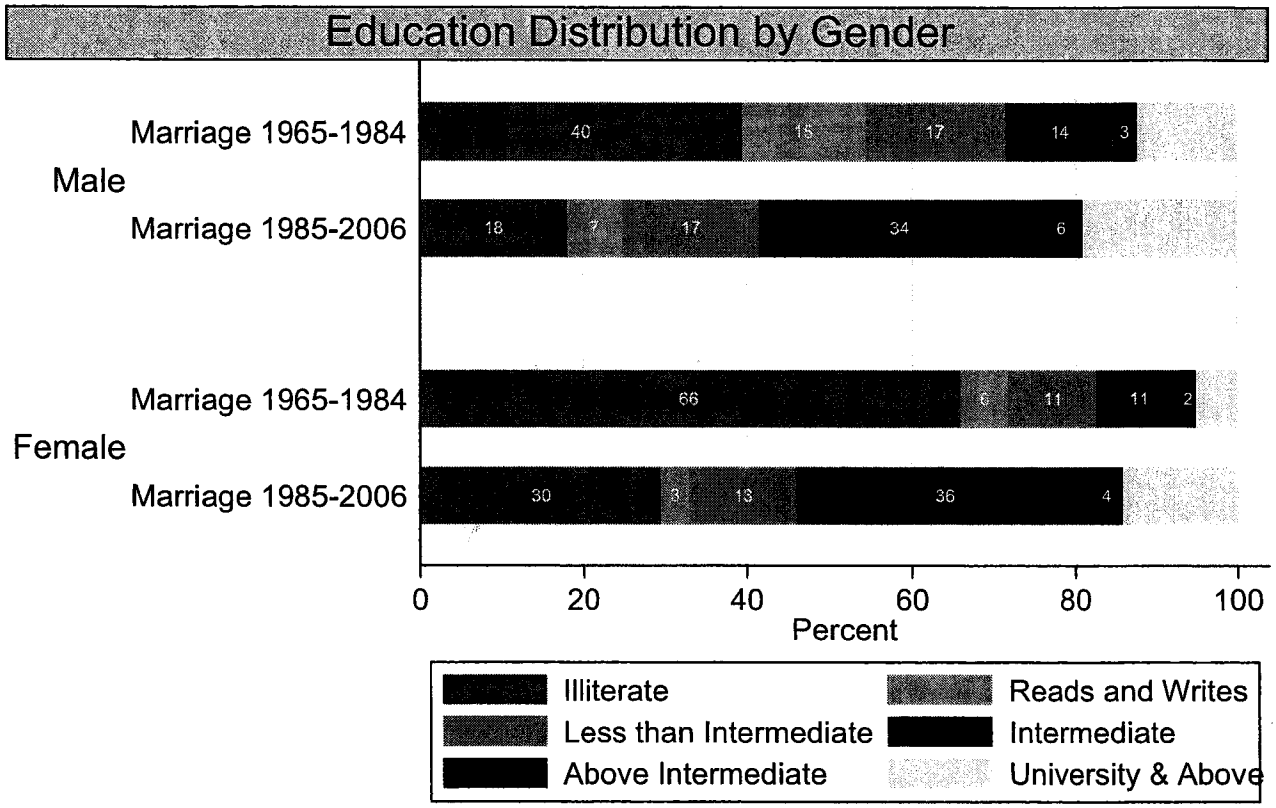
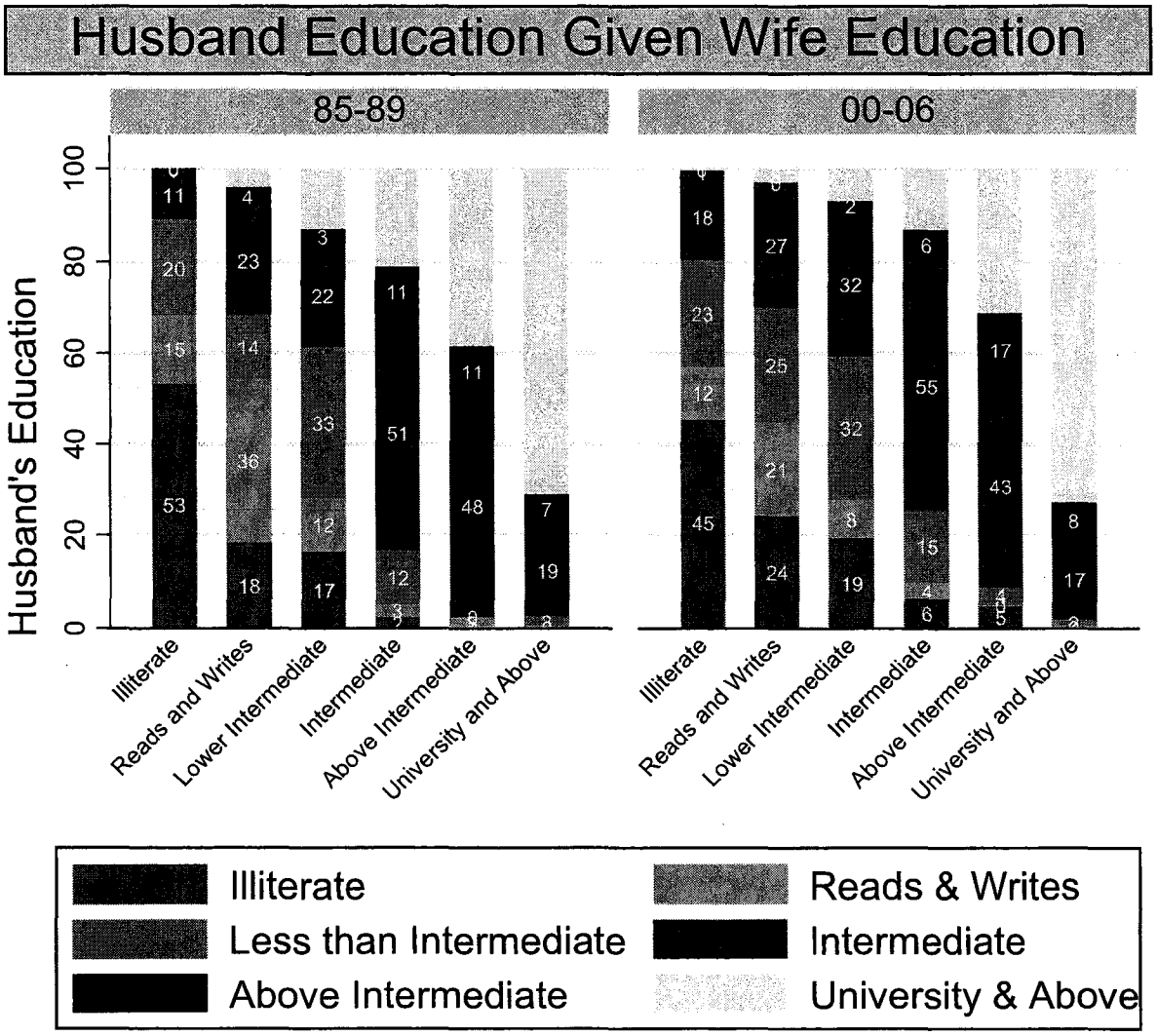

Education Distribution by Gender
Male
Marriage 1965-1984
40
15
17
14
3
Marriage 1985-2006
18
7
17
34
6
Female
Marriage 1965-1984
66
6
11
11
2
Marriage 1985-2006
30
8
13
36
4
0
20
40
60
80
100
Percent
Illiterate
Reads and Writes
Less than Intermediate
Intermediate
Above Intermediate
University & Above

Figure 4.15.


Husband Education Given Wife Education
85-89
00-06
Husband's Education
0
20
40
60
80
100
Illiterate
Reads and Writes
Lower Intermediate
Intermediate
Above Intermediate
University and Above
Illiterate
Less than Intermediate
Above Intermediate
Reads & Writes
Intermediate
University & Above

TABLES:

Table 4.1: Variable Means and Standard Deviations (Marriages 1985 – 2006)

	Unweighted		Weighted	
	Mean	Standard Deviation	Mean	Standard Deviation
Independent Variables				
Wife at least illiterate	1.00	0.00	1.00	0.00
At least reads and writes	0.75	0.44	0.72	0.45
Wife at least lower intermediate	0.71	0.45	0.69	0.46
Wife at least intermediate	0.58	0.49	0.56	0.50
Wife at least above intermediate	0.21	0.41	0.19	0.39
Wife at least university and above	0.16	0.37	0.15	0.35
Father at least illiterate	1.00	0.00	1.00	0.00
Father at least reads and writes	0.52	0.50	0.50	0.50
Father at least lower intermediate	0.25	0.44	0.24	0.42
Father at least intermediate	0.16	0.36	0.15	0.35
Father at least above intermediate	0.08	0.27	0.07	0.26
Father at least university and above	0.06	0.23	0.06	0.23
Mother at least illiterate	1.00	0.00	1.00	0.00
Mother at least reads and writes	0.24	0.43	0.23	0.42
Mother at least lower intermediate	0.12	0.33	0.11	0.32
Mother at least intermediate	0.07	0.25	0.06	0.24
Mother at least above intermediate	0.03	0.16	0.02	0.15
Mother at least university and above	0.02	0.13	0.02	0.12
Greater Cairo	0.13	0.33	0.13	0.33
Alexandria & Suez Canal	0.11	0.31	0.08	0.27
Urban Lower Egypt	0.13	0.34	0.10	0.30
Urban Upper Egypt	0.17	0.37	0.11	0.32
Rural Lower Egypt	0.27	0.44	0.33	0.47
Rural Upper Egypt	0.20	0.40	0.24	0.43
Dependent Variables				
Husband illiterate	0.17	0.38	0.18	0.39
Husband reads & writes	0.07	0.25	0.07	0.25
Husband less than intermediate	0.16	0.37	0.16	0.37
Husband intermediate	0.34	0.48	0.34	0.47
Husband above intermediate	0.06	0.23	0.06	0.23
Husband university & above	0.20	0.40	0.19	0.39
Live independently	0.58	0.49	0.54	0.50
Consanguineous marriage	0.30	0.46	0.29	0.46
Bride's family contribution	29.70	15.07	29.50	15.18
Bride's contribution	1.99	7.35	2.04	7.52
Husband in lowest wealth quintile in 98	0.19	0.40	0.18	0.39
Husband in second wealth quintile in 98	0.23	0.42	0.24	0.43
Husband in third wealth quintile in 98	0.19	0.39	0.20	0.40
Husband in fourth wealth quintile in 98	0.20	0.40	0.21	0.40
Husband in highest wealth quintile in 98	0.18	0.39	0.17	0.37

Table 4.2: Marital Outcomes Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	Husband Education	**Living Independently**	**Consanguinity**	**Bride's Family Contribution**	**Bride Contribution**	**Husband Pre-marital Wealth**
	Ordered Probit	**Probit**	**Probit**	**OLS**	**OLS**	**Ordered Probit**
Wife's Education (omitted=illiterate or above)						
At least reads and writes	0.370	0.243	0.127	-0.873	-0.168	0.411
	(3.92)***	(2.10)**	(1.12)	(0.67)	(0.26)	(1.81)*
At least lower intermediate	0.374	0.193	-0.133	1.561	0.303	-0.075
	(3.78)***	(1.59)	(1.11)	(1.15)	(0.45)	(0.32)
At least intermediate	0.685	0.162	-0.095	0.271	0.656	0.304
	(12.99)***	(2.51)**	(1.46)	(0.38)	(1.88)*	(2.76)***
At least above intermediate	0.601	-0.005	0.033	-0.133	-0.315	0.222
	(7.42)***	(0.05)	(0.33)	(0.12)	(0.60)	(1.35)
At least university and above	0.727	0.430	-0.331	-0.704	2.328	0.179
	(7.94)***	(3.77)***	(2.91)***	(0.60)	(4.04)***	(1.05)
Wife's Father Education (omitted=illiterate or above)						
At least reads and writes	0.206	0.113	-0.092	0.516	-0.008	0.295
	(4.92)***	(2.21)**	(1.78)*	(0.92)	(0.03)	(3.31)***
At least lower intermediate	0.133	0.094	0.035	0.576	0.317	0.087
	(2.12)**	(1.19)	(0.44)	(0.69)	(0.78)	(0.68)
At least intermediate	0.132	-0.034	0.022	-0.936	-0.474	0.091
	(1.57)	(0.32)	(0.21)	(0.86)	(0.89)	(0.59)
At least above intermediate	0.099	0.150	0.014	-0.750	2.017	0.126
	(0.67)	(0.82)	(0.08)	(0.42)	(2.29)**	(0.51)
At least university and above	0.358	-0.194	0.052	2.598	-2.971	0.009
	(2.15)**	(0.98)	(0.27)	(1.35)	(3.16)***	(0.04)
Wife's Mother Education (omitted=illiterate or above)						
At least reads and writes	0.081	0.006	-0.034	0.921	0.274	0.352
	(1.48)	(0.09)	(0.50)	(1.26)	(0.77)	(3.09)***
At least lower intermediate	0.025	0.122	-0.199	-0.226	-0.323	-0.255

	(1)	(2)	(3)	(4)	(5)	(6)
	Husband Education	**Living Independently**	**Consanguinity**	**Bride's Family Contribution**	**Bride Contribution**	**Husband Pre-marital Wealth**
	Ordered Probit	**Probit**	**Probit**	**OLS**	**OLS**	**Ordered Probit**
	(0.28)	(1.06)	(1.73)*	(0.19)	(0.57)	(1.54)
At least intermediate	0.161	-0.023	-0.148	-0.138	-0.917	0.510
	(1.30)	(0.15)	(0.97)	(0.09)	(1.29)	(2.71)***
At least above intermediate	0.151	0.092	0.116	5.966	-1.658	-0.207
	(0.58)	(0.32)	(0.42)	(2.25)**	(1.28)	(0.53)
At least university and above	0.213	0.594	-0.778	-3.531	1.390	0.466
	(0.63)	(1.56)	(2.08)**	(1.17)	(0.94)	(1.08)
Regions (omitted=Greater Cairo)						
Alexandria & Suez Canal	-0.221	0.270	-0.098	0.921	-0.943	-0.261
	(3.16)***	(2.94)***	(1.10)	(1.01)	(2.11)**	(1.97)**
Urban Lower Egypt	-0.255	0.094	-0.258	1.530	-3.540	-0.546
	(3.80)***	(1.11)	(2.97)***	(1.75)*	(8.29)***	(4.39)***
Urban Upper Egypt	0.030	-0.299	0.311	-5.641	-3.311	-0.612
	(0.47)	(3.83)***	(3.99)***	(6.84)***	(8.20)***	(4.99)***
Rural Lower Egypt	-0.144	-0.447	0.035	0.219	-3.639	0.382
	(2.44)**	(6.21)***	(0.47)	(0.28)	(9.60)***	(3.22)***
Rural Upper Egypt	-0.013	-1.018	0.533	-6.923	-3.528	0.176
	(0.20)	(13.02)***	(6.95)***	(8.32)***	(8.66)***	(1.37)
Constant		-0.021	-0.515	30.542	4.076	
		(0.28)	(6.92)***	(38.33)***	(10.45)***	
Observations	4441	4439	4439	4439	4439	1024
R-squared				0.06	0.05	
Joint Significance of Education Variables						
Wife's Education	***	***	***	-	-	***
Father Education	***	**	-	-	**	***
Mother Education	**	-	***	-	-	***

Absolute value of z statistics in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%, - not significant

CHAPTER 5

CONCLUSION

This thesis contains three papers that are presented in Chapters 2, 3 and 4. Each paper explores an education-related issue in Egypt using multivariate statistical techniques. Chapter 2 examines the determinants of tutoring with an emphasis on gender as a tutoring determinant. Contrary to expectations, student gender is not found to play any role in the likelihood of taking tutoring (group or private) or in the yearly expenditure on tutoring. In contrast, regional variables and socioeconomic variables such as parents' education and household wealth are found to be the important factors.

Interestingly, the similarity of tutoring patterns by gender holds for all regions (rural and urban) and all education levels. After adding a series of interaction terms of gender with all regressors, the female dummy and the interaction terms were still insignificant even jointly. This lack of disparity also holds after controlling for sample selection into schooling. The analysis in Chapter 2 used ELMS 98. Based on a descriptive analysis of ELMPS 06, girls are also not less likely to go to tutoring classes. It may be worthwhile in the future, however, to undertake multivariate analysis using ELMPS 06 to see if there are changes in the determinants of tutoring compared to 1998. ELMPS 06 has the advantage of including more information on school quality, thereby allowing for a more thorough exploration of the effect of school quality on participation in tutoring.

Chapter 3 examines the effect of taking private tutoring on the track that students join at the secondary level and therefore if they are likely to go to university in the future. To do so, I made use of the longitudinal nature of the surveys employed in the thesis: I looked at whether taking private tutoring in

1998 (based on ELMS 98) affected the track students eventually joined based on retrospective information from ELMPS 06. One estimation difficulty was the likely endogeneity of participation in tutoring. Two sources of self-selection bias of opposite signs are possible; the selection of academically weak students into tutoring on the one hand, and selection of more motivated students and into tutoring on the other. Simple regression analysis may produce a biased and inconsistent estimator of the tutoring effect if tutoring is correlated with unobserved factors affecting education outcomes such academic ability and motivation.

To overcome this issue, I employed an IV approach where a measure of the local availability of teachers (potential tutors) is used as an instrument for participation in private tutoring. Without using the IV approach, tutoring has a significantly positive effect on joining the more prestigious general secondary track. Upon using an instrument variable, the tutoring variable sign changes and its value becomes statistically indistinguishable from zero. However, the tutoring variable is imprecisely estimated. In addition, a weak instrument test cannot reject the hypothesis that the instrument is weak. This makes it questionable if the instrumental variable is generating reliable results. However, it does not mean that the results disregarding endogeneity are better. One future improvement to the instrumental variable is to have it isolate teaching from administrative staff in the education sector. This is, however, conditional on being able to obtain the data making that distinction.

Chapter 4 is motivated by the lack of gender differences in tutoring as found in Chapter 2. This was puzzling given the discretionary nature of tutoring investments and the lower returns to education in the labor market for females. This suggested that there are non-market returns that shape parental investments in girls' education. The hypothesis is that while parents mainly invest in their sons' education with a labor-market motivation, they invest in their daughters'

education with improved marriage prospects in mind. The chapter investigates the linkage between female education and some marital outcomes to test this hypothesis. The marriage outcomes examined here include husband's education, his pre-marital household's wealth level and living arrangements of the couple upon marriage (i.e., living in an extended-household setting versus living independently). Marrying a relative was also one of the marriage outcome indicators.

Results show that female education plays a positive and significant role in marrying a highly educated husband and a husband with high pre-marital wealth. It also increases the likelihood of living independently upon marriage. It reduces the likelihood of marrying a relative. Another marriage aspect that may be affected by a bride's level of education is marriage costs. The relative contribution of the bride and the groom may also vary with their relative education levels. However, I found that bride's education does not significantly affect the share of marriage costs that she and her family have to bear. The analysis can be expanded in several directions in the future. First, marriage costs' sharing deserves a closer look. In particular, it is interesting to know whether there is a substitutability/complementarity between contribution in terms of human capital and contribution in terms of physical assets. Second, the effect of female education on monetary outcomes, such as husband labor outcomes and income, can be examined. Third, an analysis of female education returns over a longer period of time is worthwhile.

One note of caution relevant to all three papers is that, like with any observational data analysis, one may not be able to interpret findings as causal effects due to the possible presence of unobserved factors, thereby resulting in an omitted variables bias. Nevertheless, the datasets used in the thesis are remarkably rich in background variables thereby allowing for more confidence in the obtained results.

APPENDIX

The Egypt Labor Market Panel Survey ELMPS 06 is the third survey of the Egypt Labor Market survey series. The three rounds (Labor Force Special Survey LFSS 88[121], Egypt Labor Market Survey ELMS 98 and Egypt Labor Market Panel Survey ELMPS 06[122]). The ELMSs are nationally representative[123] household surveys that collect detailed information on the Egyptian labor market. In addition, the surveys collect data on household socioeconomic characteristics including education.

The Survey activities for ELMS 98 and ELMPS 06 were carried out by the Central Agency for Public Mobilization and Statistics (CAPMAS), the main statistical agency of the Egyptian government, in cooperation with Economic Research Forum for Arab Countries, Turkey and Iran (ERF). LFSS 88 and ELMS 98 are cross-sectional surveys where comparable questionnaires were used to collect information in 1988 and 1998 from different households. While ELMPS 06 follows a comparable (and significantly expanded) set of questionnaires, it is a longitudinal survey[124] that tracks and re-interviews ELMS 98 households. For more information on ELMS 98 and ELMPS 06, please refer to Assaad (2002a, b), Assaad (forthcoming) and Barsoum (2006). This appendix draws on information from these sources.

ELMS 98 and ELMPS 06 used a probability sample that is based on a stratified two-stage design following CAPMAS' master sampling frames. The

[121] LFSS 88 does not contain information on tutoring or marriage and therefore is not used in the thesis.
[122] Dr. Ragui Assaad was the project director and Dr. Ghada Barsoum was the project coordinator for both ELMS 98 and ELMPS 06. The data files for the two datasets are now publicly available in STATA format (http://www.erf.org.eg).
[123] The five border governorates of Matruh, New Valley, Red Sea, North and South Sinai were not included in the sample due to their remoteness and sparse populations.
[124] ELMPS 06 is the first Egyptian longitudinal survey.

cross-sectional two-stage sample is based on each governorate being allocated a number of primary sampling units PSUs in the master sample that is proportional to its size. The first stage divides each governorate into urban and rural clusters. The second stage of sampling consists of selecting dwellings from within each selected cluster.

The ELMPS 06 sample contains 8,351 households. 3,685 of these households are original ELMS 98 survey households. 2,168 households split from original ELMS 98 households (for example, due to marrying and forming a separate household). In addition, 2,498 new households were added to the sample to form a refresher sample.

72% of individuals interviewed in 1998 were successfully re-interviewed in 2006, forming a panel that can be used for longitudinal analysis. The attrition that occurred in the original 1998 sample was mostly random in nature and it resulted from the loss of records containing identifying information for the 1998 households at CAPMAS. Of the 1,115 households that could not be re-interviewed, 615 are due to loss of records and the remainder is made up of expected losses due to total relocation of the household, death of all household members, or refusal to participate in the survey. A detailed analysis of these two sources of attrition was undertaken in Assaad and Roushdy (forthcoming). They show that attrition was mainly caused by the random loss of identifying records rather than by a systematic attrition process. They found no significant association between the probability of attrition and household and individual characteristics in 1998. Weights based on the probability of non-response were used to correct for attrition.

The work in this thesis uses information from the household and individual questionnaires of the surveys. The household questionnaire is administered to the head of household (or the head's spouse). It contains information on basic demographic characteristics of household members,

movement of household members in and out of the household since 1998, ownership of durable goods and assets, and housing conditions. The individual questionnaire is administered to the individual him/herself. It contains information on parental background, detailed education histories, among other things. For details about questionnaire content, please refer to Barsoum (2006).

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