THE EFFECT OF DOMESTIC WORK ON GIRLS' SCHOOLING: EVIDENCE FROM EGYPT

Ragui Assaad, Deborah Levison, and Nadia Zibani

forthcoming in Feminist Economics (2010)

ABSTRACT

In Egypt, girls' work primarily takes the form of domestic tasks, which are not considered in many studies of child labor. This paper investigates the effect of girls' work on their school attendance. It presents evidence that the substantial burden of girls' domestic work leads to lower rates of school attendance. Policies that attempt to ban labor force work of children will have practically no effect on girls' education in Egypt, while interventions reducing the drudgery of household labor through, for example, improved water and sanitation infrastructure, have better prospects for success.

KEYWORDS

Child labor, schooling, domestic work, gender, Egypt, household economics

JEL CODES: D15, I21, J82, N35

THE EFFECT OF DOMESTIC WORK ON GIRLS' SCHOOLING

INTRODUCTION

Human capital enhancement is a critical element of poverty reduction. Therefore, children's participation in primary and secondary schools plays an important role in the development of societal infrastructure in poor countries. Although strong negative correlation between children's market work responsibilities and educational achievement or attainment has been established (e.g., Christopher Heady 2000; David Post and Suet-ling Pong 2000), less attention has been paid to the effect of girls' domestic work on their schooling.[1] However, girls' work falls in both of these domains, and in the case of Egypt, it is primarily domestic work.

Child labor and schooling are mutually determined in a complex web of social and economic factors, including socio-cultural norms, economic shocks, living conditions and access to services, and poverty in general. In this paper we attempt to investigate one of the possible pathways in Egypt between the need for a girl to contribute to domestic work and her parents' decision to either not send her to school or to have her drop out. The relationship between work and schooling is complicated by the fact that there are factors that affect both a child's ability to go to school and her need to work and factors that affect one or the other. Moreover, working affects the ability to attend and succeed in school, while failure in school may lead to a child

[1] The possible exception is the literature on the effect of mother's participation in the labor market on girl children's education, which implies that mothers' and girls' domestic work are potential substitutes (e.g., Benería 1992, Levison, Moe and Knaul 2001) .

being put to work. Infrastructure and access to services are an integral part of this web of relationships. For example, it could very well be that for reasons associated with schooling quality or accessibility, children fail in school (as found by Cynthia Lloyd, Sahar E. Tawila, Wesley Clark, and Barbara Mensch 2003), which leads parents to put them to work. In this situation, reducing the burden of children's work without improving school quality would do little to improving educational attainment. On the other hand, poor water and sanitation services substantially increase the domestic work burden, leading parents to rely heavily on girls' labor, often at the expense of their schooling. This latter pathway, from quality of services to girls' domestic work to schooling, is our focus in this paper.

According to recent survey data there have been substantial improvements in the school enrollment rates of Egyptian children, and substantial reductions in the incidence of child work in the 1990s (Nadia Zibani 2002). From 1988 to 1998, school enrollment of 6–14 year old girls jumped from 75 to 86 percent, while their involvement in market and subsistence labor force activities fell from 11.4 to 8.2 percent.[2] Still, in 1998 in Egypt approximately 886 thousand girls ages 6–14 (14 percent) did not attend school, and approximately 513 thousand girls regularly engaged in labor force work, while another 2.2 million girls (37.7 percent) spent time on household chores and uncounted hours engaged in childcare (Zibani 2002).

The conventional measures of labor force work often ignore a variety of child activities that could potentially jeopardize their schooling. This is especially true for girls, who must often

[2] These figures are obtained from the 1988 Labor Force Sample Survey (LFSS) and the 1998 Egypt Labor Market Survey (ELMS). The labor force participation rates reported here are based on an extended definition of economic activity and a short reference period of one week with a one-hour per week minimum threshold. The 1988 survey did not measure the incidence of domestic work.

do domestic chores, which are not captured in the conventional definitions of work, for many hours each day. When meal production and/or childcare are required, the times at which chores take place may be less flexible than often assumed. In this paper we use a more inclusive measure of work that includes all of girls' work that is captured by our data. While girls' work time in Egypt is primarily spent in domestic tasks, our measure also captures market work and some subsistence work.

We start from the position that all children should have the opportunity to attend school, thus potentially reaping the benefits of increased human capital formation throughout the rest of their lives.[3] Increasing enrollment and education attainment levels are also desirable as mechanisms for reducing fertility and population growth (1.7 percent in Egypt in 2000–5). The population of greatest interest to us includes those girls who are expected to be in school, according to Egyptian law, and who are defined as "children" under most international conventions: those ages 6 to 14 years old. We focus this analysis on girls, who suffer from a persistent gender gap in primary schooling in Egypt. The key question we seek to explore is the following: when does girls' work, broadly defined, put Egyptian girls at risk of not benefiting from education to the extent possible?

[3] This assumption also has its problems. When schools are of poor quality, children may benefit more from other activities. When children are regularly beaten and verbally abused in schools, our assumption is again problematic.

Domestic work

Girls' domestic labor is also regularly ignored in analyses of children's activities. In particular, the child labor literature often overlooks the potential for housework and childcare responsibilities to interfere with educational attainment. Exceptions include Pedro Goulart and Arjun S. Bedi (2008), who distinguish between the impact of domestic work and market work on educational outcomes for children in Portugal, and Gautam Hazarika and Arjun S. Bedi (2003), who examine the effects of schooling costs on both types of child work in rural Pakistan. Deborah Levison and Karine S. Moe (1998) and Deborah Levison, Karine S. Moe, and Felicia Knaul (2001) document that an assessment of whether or not work impedes educational attainment is sensitive to how one defines work, especially for girls. They also show that a traditional definition of work misrepresents the gender differentials in the incidence and determinants of work among children in Peru and Mexico. Although a distinction between market work and domestic work is useful, the traditional definition of market work makes some seemingly arbitrary distinctions between activities that are similar. Performing unpaid work in a family enterprise and preparing food in a market stall are considered work, whereas similar activities done for purposes of household consumption are not. While such distinctions may make sense in the context of national accounts or labor force statistics, they may result in biases when trying to understand the phenomena of child labor and schooling (Deborah Levison 2000). Our data includes information on Egyptian women's and girls' domestic activities, including the three most important activities carried out in the reference week, by order of importance, as well as the total amount of time spent on all domestic activities. While our measure of domestic work is much more inclusive of the work burdens that girls bear, it probably understates that burden because childcare is often understated even when household chores are reported.

Higher school enrollment and improved school attainment have been repeatedly shown to be among the most effective ways to reduce both poverty and fertility. The benefits of schooling accrue not only to the individual him or herself but to the entire society through a variety of spillover effects. There is less consensus on the harmful effects of children's work. Some argue that if children learn important skills and discipline by working, the early onset of work could be beneficial if it does not unduly affect schooling (Jo Boyden, Birgitta Ling, and William Myers 1998). On the other hand, if child work interferes with schooling or exposes children to harmful and hazardous conditions, it clearly has detrimental effects. Because child market work is strongly associated with not being in school – and a small number of studies suggests this holds for domestic work as well (Goulart and Bedi 2008, Hazarika and Bedi 2003, Levison and Moe 1998, Levison, Moe, and Knaul 2001) – it is often assumed that child work causes school dropout. This is not necessarily true, however. It could very well be that for other reasons, some children are at risk of failing at school, and they engage in work because their schooling prospects are poor. Having a better understanding of the pathways that link the social and economic environment to child work and, through work to school, is crucial to implementing the right policies. If work leads to school dropout, then policies to curtail child labor are justified. However, if failure in school is the main reason children are put to work, then policy measures need to focus on addressing the reasons for school failure as a first priority.

The majority of young girls who are not enrolled in school in Egypt have never even started school. The evidence indicates that girls' intensive participation in domestic work does not start until they are about 10 years old. This raises an issue about whether work could be the cause of girls not going to school in the first place. Our argument is two-fold. First, parents, anticipating a girl's contribution to domestic work in later years, may not feel that it is

worthwhile to enroll her in school for a few years. They thus avoid the costs associated with schooling. In examining reported reasons why female adolescents in Egypt have never attended school, Barbara Ibrahim, Sunny Sallam, Sahar El-Tawila, Omaima El-Gibaly, and Fikrat El-Sahn (2000: 69) find that 47 percent of parents in Egypt place a low value on education, 44 percent mention poverty, and 16 percent mention the need for the girl to help with household chores. Second, while young girls may not be engaged in measurable domestic chores, it is likely that they are caring for younger siblings. For example, Homa Hoodfar, writes that "In lower-income families in Cairo elder daughters participate actively in child care. Girls begin child care activities as early as seven years. Some families keep the eldest daughter out of school in order to help with child care and daily housework" (1986). In a later study, Homa Hoodfar documents women's observations that childcare "was becoming increasingly demanding, owing to higher expectations" (1996: 13). Not only did children remain relatively free of responsibilities for many more years, until their late teens, but they could not simply be fed and "sent off to play in some field or street" (1996: 13). They required more supervision.

An enormous literature speaks to the enrollment and educational attainment of children in developing countries, and a more recent and growing literature addresses child labor force work. A number of studies from the last decade and a half explicitly recognize the necessity of considering schooling in conjunction with children's labor force employment and non-labor-force work responsibilities.[4] This comprehensive type of approach is needed to attain an adequate

[4] Examples include Deborah S. DeGraff and Richard Bilsborrow (2003) for the Philippines; Peter Jensen and Helena Skyt Nielsen (1997) for Zambia; Sudharshan Canagarajah and Harold Coulombe (1998) for Ghana; Felicia Knaul (1995) for Mexico and Colombia; Melissa Binder and David Scrogin (1999) for Mexico; Harry Anthony Patrinos and George Psacharopoulos (1997) for Peru; George Psacharopoulos (1997) for Bolivia and

understanding of how to facilitate the educational success of children with multiple responsibilities.

Few analyses, however, have taken account of the simultaneous nature of family (or child) decisions regarding school and work activities due to various estimation difficulties. Some authors use a multinomial logit approach to jointly consider categories: work, work and school, school only, or neither (examples include Levison, Moe and Knaul [2001] and various chapters in Christiaan Grootaert and Harry Anthony Patrinos [1999]). One of the problems of this approach is the assumption of independence of irrelevant alternatives. Others have used ordered probit models (authors of various chapters in Grootaert and Patrinos (1999) employ a shared estimation strategy, including ordered probit models of children's work and school participation). The fundamental problem with such models is that they must assume parents and children always rank order activities in a certain way. For example, analysts assume that school only is preferred to combining school and work, which is preferred to work only. We find this assumption inappropriate, not least because of the lack of empirical evidence to validate its use. Others have used a bivariate probit approach that models work and school enrollment as two interdependent binary decisions (Sudharshan Canagarajah and Harold Coulombe 1998; Samuel Freije and Luis F. Lopez-Calva 2001; Jackline Wahba 2006). None of the above approaches attempt to disentangle the causal effects of child work on school enrollment.

A number of papers have successfully used instrumental variables methods to identify the *causal* impact of child labor on educational outcomes in the context of developing countries, but in each case the focus has been on market work and generally on agricultural work. Michael A.

Venezuela; George Psacharopoulos and Ana Maria Arriagada (1989) for Brazil; Jose Canals-Cerda and Cristobal Ridao-Cano (2004) for Bangladesh; and Emmanuel Skoufias (1994) for India.

Boozer and Tavneet K. Suri (2001), using regional variation in the pattern of rainfall to instrument for monthly variations child work in Ghana, find a negative effect of child labor on schooling. Kathleen Beegle, Rakeev Dehejia, and Roberta Gatti (2005) exploit rice prices and commodity disasters as a source of exogenous variation in child labor in Vietnam. Using panel data, they find statistically significant negative impacts of child labor on school participation and educational attainment. Victoria Gunnarsson, Peter Orazem, and Mario A. Sanchez (2006) use cross-country variation in truancy regulations to identify the (negative) effect of children's labor force work on test scores of third and fourth graders in nine Latin American countries.

There is a substantial literature on the relationship between time at work and school attainment of high school or college students in the United States. These studies have generally found little evidence that part-time work while attending school affects school achievement, with a few exceptions. Ralph Stinebrickner and Todd R. Stinebrickner (2003) make use of unique data from a college that has a mandatory work-study program in which jobs requiring varying levels of effort are randomly assigned in the first semester. John H. Tyler's (2003) identification strategy relies on interstate variations in child labor laws. Goulart and Bedi (2008), mentioned above, tackle the endogeneity of child labor using geographical variation in anti-child labor programs and inspection regimes.

We use a modified bivariate probit approach that allows for the estimation of the effect of work on schooling, while allowing for the simultaneous determination of the two outcomes. To be implemented successfully, the approach requires the availability of instruments that determine the probability of working but do not directly affect schooling decisions.[5]

[5] Canals-Cerda and Ridao-Cano (2004) use a similar approach to determine the effect of working while in school on the probability of progressing to secondary school in rural Bangladesh.

Objectives

This paper has two main objectives. First, it examines the pathway between girls' work and school participation in Egypt. Second, it expands the definition of work for girls to include unpaid domestic work done in the girls' own homes. Girls' involvement in domestic work is extensive and undocumented in standard labor force statistics.

Admittedly, girls' work could have implications for schooling beyond determining current school attendance. It could affect the regularity of school attendance as well as school performance and grade advancement. Ultimately, any negative effects are bound to increase school dropout and thus affect enrollment. Given the limitations of our data sources we are unable to consider these other dimensions of schooling.

DATA

The data for this study are obtained from the Egypt Labor Market Survey (1998 ELMS) (Economic Research Forum 1998), which is a nationally representative household survey carried out on a sample of 5,000 households in late 1998.[6] The survey was conducted under the auspices of the Economic Research Forum, in collaboration with the Central Agency for Public Mobilization and Statistics (CAPMAS), the Government of Egypt's central statistical agency. The 1998 ELMS was designed to be comparable to a special round of the Egyptian Labor Force Sample Survey (LFSS) conducted exactly 10 years earlier in October 1988 (CAPMAS 1988), but

[6] Ragui Assaad was principal investigator, responsible for the sampling design, instrument, training of enumerators, and fielding of the survey.

the 1998 survey included significantly more information on a variety of topics including schooling and domestic work for women and girls. Completed questionnaires were obtained for 4,816 households and 23,997 individuals, of whom 2,458 were girls between the ages of 6 and 14. Due to missing data on some variables, our final sample includes 2,442 girls ages 6–14.

WORK AND SCHOOL IN THE EGYPTIAN CONTEXT

Basic education

There are currently (in 2009) nine years of mandatory basic education in Egypt, made up of six years of primary education and three years of lower secondary education. For a period of nine years, from 1990 to 1999, the years of primary education were reduced to 5 years to allow for the absorption of a larger number of children in the school system.[7] Since all of the girls in our sample would have been below the fifth grade in 1990, they would have been required to take only 5 years of primary schooling and three years of lower secondary schooling. Despite the fact that basic schooling up to and including the lower secondary stage has been mandatory in Egypt since 1991, the law is not strictly enforced and non-enrollment or school dropout before the mandated requirement is not uncommon. Prior to 1984, mandatory schooling was confined to the primary stage.

Children typically enter the education system at age 6. They are generally not allowed to enter before age 6, and some start late at age 7 or 8. By age 14, they should be in their last year of basic education. Thus, all the 6–14 year olds in our sample should be enrolled. Still, we find that 14.1 percent of girls in that age group were out of school in 1998, and of these79 percent had

[7] The sixth year was phased back in starting with the children who entered the first grade in 2000.

never been to school. Among 12–4 year olds, 19.4 percent were out of school, and two-thirds of these had never attended school. In contrast, only 12.3 percent of boys 12–4 were not in school, and less than half of these had never attended school. Thus non-enrollment appears to be a more important reason than dropout for girls' lack of school attendance, and it appears to be a more common reason for girls than for boys.

According to the 1998 ELMS–, most enrolled 6–14 year old girls and boys attend public schools (89.6 percent in 1998), with the remainder split between private schools (7.6 percent) and religious schools (2.8 percent). On average, 6–14 year olds spend 5.9 hours per day in school. Many schools work in shifts: 46 percent of children are in schools with more than one shift, with shifts typically being held in the morning and afternoon. In a school with a given number of shifts, school hours are not flexible, so that school attendance is essentially a zero-one variable.

Enrollment increased substantially between 1988 and 1998. From a comparison of the 1988 LFSS and the 1998 ELMS, we see that rural girls – the group with the lowest enrollment rates – benefited disproportionately. In 1988, 65 percent of rural girls ages 6 to 14 were enrolled, and by 1998 this proportion had risen to 81 percent. In contrast, rural boys' enrollment increased from 88 to 91 percent. Urban children had substantial increases in enrollment as well, albeit from higher initial levels. Urban girls' enrollment rates went from 89 to 93 percent and boys from 93 to 95 percent. Detailed analysis of the determinants of school attainment in Egypt shows that although the proportion of children who have ever enrolled and the retention of enrollees have both increased in Egypt, and the gender gap in these variables was reduced from 1988 to 2005, failure to ever enroll continues to be a serious problem for girls. Analyzing data from Demographic and Health Surveys, Ray Langsten and Tahra Hassan (2007) show that failure to

enroll accounts for 75 percent of girls' failure to complete basic education in Egypt. Retention rates for those who do enroll are similar for boys and girls and exceed 95 percent. Langsten and Hansen also show that failure to enroll is strongly concentrated among poor girls in rural Upper Egypt.

That failure to ever enroll is so clearly associated with poverty raises questions about the affordability of schooling for poor rural families, both in terms of out-of-pocket expenses and the opportunity costs of a girl's time. Although education is ostensibly free at all levels, families must pay school fees that amount to about LE 20 per month (US $3.50), as well as bear the costs of uniforms. Moreover, a majority of parents in Egypt believe that in order for their children to succeed in school, they must provide them with supplemental tutoring. According to data from the 1998 ELMS, 53 percent of students 6–14 take some form of supplementary tutoring, most of which is in the form of private tutoring either in groups or as individuals. Other forms of supplemental tutoring include after-school programs and programs organized by local mosques or voluntary organizations. The average expenditure on tutoring in 1998 was LE 15/month (US $2.80/month). More in-depth analysis of the 1998 ELMS data shows that there were no gender differences in either the incidence of tutoring or expenditure on it (Asmaa Elbadawy, Ragui Assaad, Dennis Ahlburg, and Deborah Levison 2004). One of the main contentions of this paper, however, is that the opportunity cost of a girl's time at home is also a major impediment to girls' schooling. If parents believe that the most valuable use of a girl's time is in the home, they may never enroll her in school, even if her actual involvement in household chores would only start several years later.

Physical access to school could also be a major impediment to ever-enrollment for poor rural girls, especially those living in small hamlets and satellite villages (Ray Langsten and Tahra

Hassan 2009: 35). Although 99 percent of Egyptian villages have primary schools, many girls living in hamlets and satellite villages must walk through fields to get to school, raising parents' concerns about their safety. Girls' access to schooling is one area where considerable progress has been made in Egypt in recent years. Besides the massive school building campaign by the Ministry of Education, which managed to build 11,000 primary and preparatory schools between 1992 and 2001, there have been a large number of special initiatives directed expressly at girls' schooling (Egypt, Ministry of Education 2003).

Work

Until 1996, children were allowed to begin working outside the home at age 12 under certain conditions. The minimum age of work was increased to 15 in 1996 to bring it into line with the age of mandatory schooling. Despite these laws, a sizeable proportion of children continue to work.[8] The interviewers conducting the 1998 ELMS survey were carefully trained to inquire about children's work with a great deal of sensitivity. Instead of simply asking whether an individual was working, a series of screening questions about specific activities, such as participating in family projects or learning a trade in a workshop, were asked. Although the survey instructions generally required that the individual respond to the questions in the individual questionnaires him or herself, an exception was made for children under 15, on whose behalf an adult member of the household could respond. This exception was made to ensure that the respondents understood their right for informed consent. Parents opted to respond on behalf of their children in 80 percent of cases and allowed children to respond for themselves in 20

[8] For an overview of child labor in Egypt, see Kawther Abu Gazaleh, Lamia Bulbul, Soheir Hewala, and Suadad Najim (2004) and Zibani (2002).

percent of cases. When the proportion of children 6 to 14 reported to be working is tabulated against a variable indicating whether there was a proxy respondent, we find that there is no significant difference in activity rates by type of respondent for either boys or girls when we use the market definition of work (defined below). This suggests that proxy respondents were not systematically underreporting child market work. However, there is a substantial difference in reporting of girls' domestic work. Parents' underreporting of this kind of work can probably be attributed to different perceptions between parents and children about what constitutes domestic work (Levison 2000).

In our inclusive definition of work, we incorporate three categories of activities: labor market work, subsistence work, and domestic chores performed by women and girls at home.[9] Although the last is not considered employment according to international definitions of economic activity (International Labour Organization [ILO] 1982)), this kind of work can interfere with school attendance and performance. Labor market work includes productive activities for the purpose of market exchange. Only 106 thousand, or 1.7 percent of girls ages 6–14, performed market work in 1998. Subsistence work includes activities involving the production and processing of primary goods for purposes of household consumption, such as feeding and caring for livestock and poultry, or making butter or cheese. Domestic work includes cooking, errands, house cleaning, collecting water, laundry, and childcare. We suspect, however, that some chores, such as childcare, are underreported. In the most comprehensive study to date measuring child work, Pamela Reynolds (1991) illustrates the difficulties of capturing these kinds of tasks. Indeed, as shown above, the greatest discrepancy between children and their

[9] Similarly, Marcel Fafchamps and Jackline Wahba (2006) examine three types of work, including market work, subsistence work, and household chores.

parents in reporting child work had to do with domestic work. Overall, we find that 2.7 million girls (42.8 percent) are working under the inclusive – market, plus subsistence, plus domestic work – definition of work.[10]

Reference period

Labor statistics including average weekly hours of work are collected for two reference periods: a short reference period of one week and a long reference period of 3 months or one year (3 months in the 1998 ELMS). In light of Deborah Levison, Jasper Hoek, David Lam, and Suzanne Duryea's (2007) findings that short reference periods can result in intermittent child workers being misidentified as being out of the labor force, we opted to use the more inclusive long reference period even though it may include some summer work. This 3-month reference period includes the months of August, September, and October 1998. It turns out that the change in reference period makes very little difference for girls ages 6–14. It appears that if a girl works, she works all year round.

Hours worked cut-off

A further issue in the detection of work among children is the number of hours per week that such work is undertaken. The international recommendations are to consider an individual who is engaged in an economic activity for at least 1 hour per week as employed. Since our interest is in detecting the kind of work that can potentially interfere with a child's schooling, we use a higher threshold of 14 hours per week to identify a working child. A girl is considered

[10] These figures are based on a one-week reference period with a one-hour minimum threshold. The figure is 2 million (32 percent) if a 14-hour per week threshold is used instead.

working according to the inclusive definition if she participates in either domestic, subsistence, or market work for 14 or more hours per week for all the activities combined.[11] We experimented with different hour cut-offs, and results are shown in Figure 1 and Table 1, with a discussion below. Predictably, as the requirement for being considered "working" becomes more demanding, fewer girls fall into the working category. We chose a 14-hour cut-off based on evidence presented below plus the ad hoc assumption that while two hours of work per day (on average) might not greatly hinder schoolwork, more than that could become problematic.[12] In the sensitivity analysis section below, we test the robustness of our regression and simulation results to changes in the hour cut-off.

Interrelated patterns of work and school

Table 1 provides the means and standard deviations for our dependent variables, weighted by the appropriate sampling weights, while Figure 1 shows how school and work patterns change with age. For purposes of comparison, Figure 1 includes school attendance and labor market work of boys as well as girls, and it shows ages 6–17 to provide a broader

[11] Because of the way the questionnaire is designed, we do not observe the number of hours in subsistence work for girls who are engaged in market work; thus, our inclusive measure will understate the total hours of work for the small number of girls engaged in both market work and subsistence work.

[12] Our reasoning is not completely ad hoc. Out of 24 hours, if a child sleeps for 9 hours, spends 2 hours on meals and self-care, 6 hours in school, 1 hour going to and from school, 1 hour studying, 0.5 hours in tutoring sessions (about 53 percent of in-school 6–14 year-olds are tutored in 2006), and 2 hours in various kinds of work activities, that leaves only 2.5 hours for TV-watching, play, and other social activities. William Kandel and David Post (2003) also used a 14-hour cut-off, with similar justifications.

overview of time use patterns in adolescence.[13] Among girls 6–14, 85.8 percent attend school, and 14.2 percent do not (Table 1). In contrast, half as many boys (7.6 percent) are out of school. Girls' work responsibilities increase steadily with age, with 60 percent of 14-year-olds engaged in at least 14 hours of inclusive work. Table 1 and Figure 1 show that the hour cut-off used does make a difference in the measurement of inclusive work. The broadest definition, inclusive work for at least one hour per week, leads to a steep increase in the percentage of girls working as age rises, so that by age 14, 70 percent of girls are included in this group of workers. In contrast, applying higher cut-offs systematically reduces the percentage of girls counted as workers, resulting in a fan-shaped set of trend lines. At age 14, the biggest percentage difference (20 percent) appears when we contrast a 14-hour cut-off (2 hours of work per day on average) with a 21-hour cut-off (3 hours of work per day on average).

Figure 1 shows that as children become adolescents, they take on more adult roles and responsibilities, which are reflected in their activities. School attendance decreases and is replaced by substantial increases in the proportion of children engaged in market work (for boys) and domestic work (for girls); the proportion doing both kinds of work rises as well (not shown).

Since our primary concern is to study how schooling and work interact, Table 1 presents the cross-classification of the schooling and work variables with the 14-hour per week cutoff used throughout the rest of this paper. As part of a sensitivity analysis, we also show these with a number of other possible cut-offs. First, however, we separate out market work. Very few girls participate in market work (1.7 percent), and among those who do, few manage to combine work

[13] The slight dip in school attendance at age 10 is most likely due to age heaping. Lack of precision about age (and, thus, heaping on 10) is more likely for those children who do *not* go to school because parents of children who are out of school are likely to be illiterate and therefore not sure of the ages of their children.

with school. Domestic work, on the other hand, appears to be compatible with schooling to some extent, as captured by the inclusive work variable. This can be seen by examining the proportion of girls both at work and in school, which is never greater than 31 percent but remains above 20 percent when the working group includes those working at least 14 hours per week. It declines substantially (to 9.5 percent) when the cut-off is at 21 hours per week.

According to the market work definition, about 13 percent of girls ages 6–14 are neither in school nor working (so-called "idle"); when the inclusive definition of work is used, it becomes clear that few girls are "idle" (see Table 1). Thus the persistently higher proportion of girls who are typically reported to be neither in school nor at work hinges crucially on how work is defined for girls.

Weekly hours worked are high on average – 49.4 hours – for girls 6–14 engaged in at least one hour of market work. For girls doing at least one hour per week of inclusive work, the average is 12.3 hours worked per week. Applying the 14-hour cut-off to our sample eliminates a number of girls working low hours doing subsistence and household work, and it raises the mean to 25.7 weekly hours. The 28-hour cut-off reduces the sample to those girls who are essentially full-time workers, as indicated by their mean of 41 work hours per week.

Overall, the most striking feature of Table 1 is the extent to which official definitions of work ("market work") understate the work of girls. When work is broadly defined to include domestic and subsistence work, nearly one-third of girls ages 6–14 work for at least 14 hours per week. As seen in Figure 1, there is a shift upward in girls' workload between ages 11–3, simultaneously with a decline in school attendance; this may correspond with the greater restrictions on mobility placed on Egyptian girls at puberty (Barbara S. Mensch, Barbara L. Ibrahim, Susan M. Lee, and Omaima El-Gibaly 2003). Girls' workload increases again at 15–6.

This is likely explained by evidence collected by Mensch, et al. (2003), who document that about half of 10–2-year old boys participate in domestic chores, compared to only about 20 percent of 16–9 year old boys. They write:

> The activity profile that emerges by late adolescence reflects the expected patterns for Middle Eastern societies: boys have considerably more free time than girls, and they tend to spend that time outside the home, with friends, engaged in sports, or visiting friends' homes. Work roles become gradually segregated, with boys more likely to participate in paid labor while girls participate in domestic work within the household (14).

The cultural expectation is that girls are being prepared for roles as homemakers and mothers, and their early involvement in domestic work is seen as part of their preparation for these adult roles. Especially for poor women, this makes a lot of sense, as these women have extremely limited access to the paid labor market in Egypt (Ragui Assaad and Melanie Arntz 2005).

METHODOLOGY

Our econometric model, described below, estimates the effect of work on school enrollment, while allowing for endogenous work status. It also allows for schooling to affect work, but since the measurement of that effect is not the focus of this paper, we specify the work equation as a reduced form.

The two binary dependent variables are described in detail above. In brief, one of the dependent variables indicates whether or not the girl is in school at the time of the survey. (Our schooling variable is based on a question about whether or not the child is currently in school,

which was interpreted as whether or not the child was attending school, and not merely enrolled.) While it would be ideal to have measures of educational outcomes such as grades received, test scores, and grade promotion and repetition rates, these are not available for our sample. Girls who are not currently enrolled have either never been to school or have attended for some time and then dropped out. In the sensitivity analysis we examine alternative specifications of our schooling dependent variable that capture whether a girl had ever been enrolled and, if so, if she had dropped out (current enrollment conditional on having ever been enrolled). The other dependent variable indicates whether or not the girl is engaged in work for at least 14 hours per week on average in the three-month reference period.

Control variables

The control variables discussed here are common to both the work and schooling equations. Additional instruments included in the work equation are discussed in the Identification Strategy section below. We estimate a sequential set of models, adding in each subsequent model control variables that might be argued to be endogenous. Model 1, the most basic model, includes characteristics of the girl (age and her relationship to the head of the household); parental age and education; whether or not they are present in the household, and if a father is absent whether or not this absence is temporary; region; and the household's wealth quintile, separately for urban and rural areas. Model 1 also includes community-level controls: the proportion of male and female populations in the locality with secondary education or

above; and the proportion of girls and boys aged 6–11 and 12–4 enrolled in school.[14] Mindful of the fact that father's employment status, the presence of a family business, and household composition are sometimes considered endogenous to other household decisions, we estimate two additional models. Model 2 adds variables related to the father's employment and the presence of household enterprises. Household composition variables are included only in Model 3. Descriptive statistics for the explanatory variables are presented in Table 2.

As a result, Model 1 is our most defensible model. We include Models 2 and 3 despite some misgivings about the possible endogeneity of the father's employment status and household composition variables because of our conviction that these are potentially important factors in household decision making.

Controls were included because they have been shown to be relevant to child work and school in either theory or previous empirical research, or both. Virtually all empirical work on child labor has indicated that the age and gender of the child are important determinants of the child's educational and work activities. The child's relationship to the household head might also have an effect. In many countries, children who are not sons or daughters of the reference person are distant relatives who are filling the role of domestic servants. In the Egyptian case, most of them are grandchildren of the head; in fact, we find that they tend to work less than girls who are daughters of the head of household.

We hypothesize that parents' ages affect child activities. Younger parents are likely to be at a more resource-constrained point in their lifecycle and may have less ability to pay school-

[14] We include a cluster correction to take into account that these variables are not independent across observations in the same primary sampling unit (PSU). There are 200 PSUs in the sample. A village or neighborhood was typically represented by at most one PSU, with the exception of one or two that had two PSUs.

related fees, as well as a greater need for their children's labor. We include measures of the father's age and the mother's age when the child was age 6 to capture this effect.

There is ample empirical evidence in the literature that the education of the parents decreases the probability of working and increases the probability of schooling for children in developing countries (Christiaan Grootaert 1998; Christiaan Grootaert and Ravi Kanbur 1999; Sonia Bhalotra and Christopher Heady 2003; Zafiris Tzannatos 2003). In our models, father's and mother's education are specified as continuous variables; sets of dummy variables were tried as well but were found to provide similar results.

When fathers are absent from the household in Egypt, it often implies that they have migrated to an oil-rich Arab country to work; such fathers generally are in contact with their families and may send remittances to them. We therefore distinguish between the temporary absence of the father and his permanent absence, as would be the case for widowed and perhaps also divorced mothers; our expectation is that a father's permanent absence has more negative consequences for his children than his temporary absence. If a mother is found to be married and her spouse not present, we deem the father's absence temporary. We suspect that children living with their father and a stepmother or with a single father may be treated differently than children living with their father and their birth mother; four dummy variables describe these various possibilities. Because child fostering is not common in Egypt, the presence or absence of parents is unlikely to be endogenous to decisions about child schooling.

Mark R. Rosenzweig (1977) and others argue that the substitutability between the work of girl children and that of her mother makes the mother's employment status endogenous. When mothers work outside the home, girls may stay home to take over their duties, and a mother who

has a daughter who is old enough to care for her siblings is more able to engage in labor force work. Because of this we omit the mother's employment status from the explanatory variables.

Father's employment, however, is arguably exogenous to decisions about child activities. Whether the father is employed or not and the nature of the father's employment both matter. If the father is unemployed or in irregular employment, income from a girls' market work may be considered a substitute for the father's labor income, increasing the probability that she does not go to school. Furthermore, the effect of the father being an employer or self-employed as opposed to an employee is important because it raises the probability that the girl will be an unpaid family worker. To allay concerns about endogeneity, we capture the father's employment status at the time the girl was 6 years of age rather than at the time of the survey. A series of dummy variables describes the father's sector, type of employment, and employment status.[15]

To measure wealth, we use an asset index, constructed separately for urban and rural areas to determine how the position of the girl's household in the wealth distribution affects her work and schooling status. The construction of these wealth indices is described in the appendix.

---

[15] Irregular private sector work is the omitted category. "Regular private sector" jobs consist of permanent and temporary but continuous jobs in the private sector, while "irregular private sector" jobs consist of intermittent and seasonal jobs. Public sector work is typically regular. Non-wage workers are either employers, self-employed workers, or, in some rare cases, unpaid workers for a family enterprise. Non-working fathers are either unemployed or out of the labor force. We expect that fathers in some types of positions are more likely to be able or willing to take their sons (but not daughters) to work with them. Non-working fathers may stay home and generate more household work for daughters.

Since child labor is a phenomenon that primarily affects poor children, the top three quintiles of wealth were combined into a single category.

For purposes of this analysis, we identify six regions in Egypt. The Greater Cairo region, which includes the entire Cairo urban agglomeration, is the reference region. Alexandria and the Suez Canal cities are lumped together as the other metropolitan region. The non-metropolitan urban regions include urban Lower Egypt, which comprises the cities of the Nile Delta, and urban Upper Egypt, which comprises the cities of the Nile Valley south of Cairo. The rural components of Lower and Upper Egypt are the fifth and sixth regions we consider. Upper Egypt, and especially its rural component, is generally considered to be the poorest and most socially conservative region in Egypt. Community-level controls are derived from 1996 population census data at the village and neighborhood level. They include the percentages of the adult male and female populations with secondary schooling and above and the percentages of children of both sexes in the age groups 6–11 and 12–4, who are enrolled in school.

Detailed age/sex categories for household members were included in Model 3 to examine the effects of household composition on children's work and schooling. Although these variables are potentially endogenous, Janet S. Netz and Jon D. Haveman (1999) argue strongly for their inclusion in labor force models. Many other researchers have found that children and adolescents' responsibilities depend on who else is available in the household to do labor force work, household tasks, and childcare (e.g., Freije and Lopez-Calva 2001; Deborah S. DeGraff and Richard Bilsborrow 2003). Child activities may act as complements or substitutes for the activities of these other household members.

In preliminary analyses, we included two variables to control for the accessibility of schooling in the child's community: walking time to the nearest age-appropriate school and a

dummy indicating that there is no school within walking distance. In addition, a variable indicating whether or not the child attended a school with multiple shifts was included to proxy for school quality. The walking time to school variable and the school shifts variables were never statistically significant in any of the model specifications. The dummy for "school not in walking distance" seems to have been mis-measured. These three variables were dropped from all models.

Estimation

Our full-information maximum-likelihood estimation approach relies on a model of binary choice with work as a binary endogenous regressor. The general framework for examining the effect of endogenous treatments on discrete outcomes is laid out in Arild Aakvik, James Heckman, and Edward Vytlacil (2005). They develop a model to study the impact of interventions on discrete outcomes when responses to treatment vary among observationally identical individuals. The model offers a way to control for selection in determining the effect of the treatment and to estimate an average treatment effect, as well as an effect of the treatment on the treated. The model potentially allows the effect of observables *and* unobservables on the outcome to differ for the treated and untreated sub-samples. In our case, the "treatment" is child work and the "outcome" is school attendance. A similar model is applied to the effect of working while in school on school progress in a paper on Bangladesh by Jose Canals-Cerda and Cristobal Ridao-Cano (2004). Canals-Cerda and Ridao-Cano estimates a switching probit model, where a separate schooling equation is estimated for working and non-working children. The switching probit model was also applied in a study of the effect of fertility on women's labor force participation in the US by Raquel Carrasco (2001).

The model

We assume there are two potential binary schooling outcomes (S_1 and S_0) for the working (W=1) and non-working (W=0) states, respectively, where S_k=1 if the child is attending school and S_k=0 if s/he is not (k = 0, 1). The observed schooling outcome is given by S= W S_1 + (1-W)S_0; the subscript indexing an individual child is suppressed. The observed binary outcomes are generated according to underlying latent index structure as follows:

$$W = \mathbf{1}(W^* \geq 0) = \mathbf{1}(Z\beta_w + \varepsilon_w \geq 0)$$
$$S_1 = \mathbf{1}(S_1^* \geq 0) = \mathbf{1}(X\beta_1 + \varepsilon_1 \geq 0) \text{ iff } W = 1$$
$$S_0 = \mathbf{1}(S_0^* \geq 0) = \mathbf{1}(X\beta_0 + \varepsilon_0 \geq 0) \text{ iff } W = 0$$

where $W^*, S_0^* \text{ and } S_1^*$ are latent variables indicating the difference in the household's utility between putting and not putting the child to work and sending and not sending the child to school, respectively. These decisions are not necessarily sequential; the methodology used allows for the two decisions to be simultaneous. *Z* and *X* are vectors of regressors, with the need to have at least one regressor in *Z* that is not in *X* for purposes of identification. Given the relatively small number of working children in our sample, we refrain from estimating a full set of schooling equation parameters for the working subsample by imposing the restriction $X\beta_1 = \alpha + X\beta_0$, so that the effect of work on schooling introduces an additive shift in the schooling equation. The disturbances $\varepsilon_w, \varepsilon_1, \varepsilon_2$ are assumed to be normally distributed with zero mean and covariance matrix as follows

$$\Sigma = \begin{pmatrix} 1 & \rho_{10} & \rho_{1w} \\ & 1 & \rho_{0w} \\ & & 1 \end{pmatrix}$$

Since S_1 and S_0 are never jointly observed, ρ_{10} is not identified. We started by estimating models that did not impose the restriction that $\rho_{1w} = \rho_{0w}$ and tested whether the restriction can be upheld. Since the restriction was upheld in all cases where we obtained convergence, we only present results for models where the restriction is imposed.[16] The restriction $\rho_{1w} = \rho_{0w}$ implies that pooling working and non-working girls into a single schooling equation does not introduce selectivity bias. Since the restriction is upheld, the model we estimate reduces to a bivariate probit model with work as a dummy endogenous variable in the schooling equation.

Consistent estimates of the parameters $\beta_w, \alpha, \beta_0, \rho_{1w}, \rho_{0w}$ can be obtained using full information maximum likelihood methods. The log-likelihood function is given by:

$$L = \sum_{W=1,S=1} \log P_{11} + \sum_{W=1,S=0} \log P_{10} + \sum_{W=0,S=1} \log P_{01} + \sum_{W=0,S=0} \log P_{00}$$

The joint probabilities of working and attending school are given by:

$$P_{11} = \Pr[W=1, S=1] = \Phi_2(Z\beta_w, (\alpha + X\beta_s), \rho)$$
$$P_{10} = \Pr[W=1, S=0] = \Phi_2(Z\beta_w, -(\alpha + X\beta_s), -\rho)$$
$$P_{01} = \Pr[W=0, S=1] = \Phi_2(-Z\beta_w, X\beta_s, -\rho)$$
$$P_{00} = \Pr[W=0, S=0] = \Phi_2(-Z\beta_w, -X\beta_s, \rho)$$

where Φ_2 is the bivariate normal distribution function and the individual subscripts *i* are suppressed for clarity.

---

[16] We obtained the following test statistics for a Wald test of the equality of the two correlation coefficients: Model 1 had $\chi^2(1) = 0.05$, p-value=0.821; Model 2 had $\chi^2(1) = 0.07$, p-value=0.793; and the unrestricted Model 3 did not converge. An insignificant test statistic upheld the restriction.

Identification strategy

To identify the structural schooling equation we need instruments that can be excluded from the schooling equation but that have some explanatory power in the work equation. Since we are examining both market work and household work, our instruments need to proxy for the demand for such work and be exogenous to household decisions on child work and schooling.[17] To proxy for demand for market work, we use instruments that indicate the prevalence in the local community (village or neighborhood) of the occupations in which children are most often found. We conjecture here that most girls work close to home, so that it is local labor market conditions that will determine the demand for their market labor. Given the structure of labor markets for educated workers in Egypt, we suggest that decisions on schooling are made on the basis of returns to schooling in a much broader regional or national labor market and will thus not be affected by local labor market conditions. The instruments we use to proxy for the demand for market work are the percentages, among the working age population of the locality, of workers in service and trade occupations, and in agriculture. These percentages are obtained from the 1996 population census for the village or neighborhood in which the girl lives.

To proxy for the demand for domestic work, we use the household's access to basic public services: piped water, piped sewage disposal, and garbage collection. The absence of such services is expected to substantially increase the domestic burden of women and girls. It is often the job of girls and young women to go fetch water from the closest source; and children typically are in charge of carrying waste to the closest dumping area for disposal (Kawther Abu

[17] Victor Levy (1985) relies on changes in cropping patterns to identify the effect of child labor in agriculture on the total fertility rate in Egypt.

Gazaleh, Limia Bulbul, Soheir Hewala, and Suadad Najim 2004: 9–10). A frequent image in rural Egypt is one of girls and women washing dishes and clothing along canals and waterways; the absence of running water also makes these regular tasks more onerous and time-consuming. To ensure that the absence of such services is not affecting the girl's schooling status through some correlation with the quality of schooling in the community, we include in both the work and schooling equations direct measures of access to schooling in the girl's community: the percentages of the adult male and female populations with secondary schooling and above and the percentages of children of both sexes in the age groups 6–11 and 12–4, who are enrolled in school. We also correct for the urban and rural status of the community through the region dummies, which are for the most part highly statistically significant. Having done this, we find that the access to service variables are jointly insignificant in the schooling equation, in an unrestricted version of the model. (See the overidentification test in the section entitled "Simulation results and sensitivity analysis".) This implies that variations in home infrastructure are independent of the availability and quality of schools once we control for location and community-level enrollment rates. We maintain that variables indicating access to urban services in Egypt are for the most part exogenous to household decisions since they are a function of where the household resides rather than the result of a separate decision-making process about whether or not to purchase the service in question. Given the rigidity of the housing market in Egypt, and the resulting relative immobility of households, decisions about where to reside are at the very least pre-determined if not completely exogenous.[18]

[18] According to the 1998 ELMS, only 6.3 percent of adults who ever worked changed their place of residence in the ten years previous to the survey.

ESTIMATION RESULTS

The endogenous work and schooling variables take on the value of one when a girl is in school and when a girl is working, respectively. Girls are defined as working if they work at least 14 hours per week in the labor force and/or on subsistence production and/or on domestic tasks. The results are shown in Table 3. Recall that we estimate a sequential set of models, adding in each subsequent model variables that might be argued to be endogenous (see Variables section). As a general rule, our results on the coefficients of variables entered in Model 1 are robust to the inclusion of variables entered in Models 2 and 3, implying that if there is a simultaneity problem, it does not bias the estimates of other statistically significant explanatory variables. For binary outcome models, marginal effects are necessary to allow us to speak to the magnitudes of particular effects. In bivariate probit models, marginal effects need to be evaluated in relation to the predicted probability of each work/school state for the reference girl. The marginal effects shown in Table 4 are based on the Model 1 specification.

The effect of work on schooling

Perhaps the most significant finding of this research is that girls' inclusive work has a substantial direct effect on schooling. As shown in Table 3, the coefficient of the "currently working" variable, which indicates the effect of work on the probability of schooling, is negative and highly statistically significant for all models. As shown in Table 4, the predicted unconditional probability of work for the 14-year-old reference girl is 46.1 percent and the

unconditional probability of schooling is 83.3 percent.[19] Because many girls are responsible for household work, the probability of going to school and not working is only 37.6 percent. She is more likely to combine work and schooling, with a probability of 45.7 percent of doing so, but she also has a very small probability – 0.4 percent – of working and not going to school. The reference girl has a relatively high probability – 16.3 percent – of neither working nor going to school.

A 10 percentage point increase in the probability of work reduces the marginal probability of schooling by six percentage points. This results in an estimate of -0.33 for the elasticity of the probability of school attendance with respect to work for the reference girl. It also reduces the joint probability of being in school and not working by 4.6 percentage points and increases the joint probability of being in school and working by 1.5 percentage points.

Large positive and statistically significant estimates of ρ indicate that unobservables that raise the probability of work also raise the probability of schooling, after the impact of work itself is controlled for. Girls who work (mostly in their own homes) appear to be those who would otherwise be more likely to remain in school.

[19] Because work is endogenous to the schooling decision, some value has to be set for the probability of work to calculate the marginal probability of schooling and the joint probabilities of work and school. We use a value of 0.46, the unconditional probability of work of the reference girl. For the other characteristics of the reference girl, see note to Table 4.

Simulation results and sensitivity analysis

In this section, we conduct simulations for girls of various profiles while examining the sensitivity of our results to model specification, the use of different hour thresholds for defining work, and an alternative way of defining the schooling variable. In each case, to estimate the effect of work on schooling, we use the estimated coefficients from the models to predict the conditional probability of school attendance for a girl of given characteristics if she works or does not work. The effect is evaluated at the values of the explanatory variables that correspond to the characteristics of a reference girl, a "most-vulnerable" girl, and a "least-vulnerable" girl. The reference girl is 14 years old, has both parents living at home and with mean years of schooling. She lives in Greater Cairo and belongs to a household in the lowest urban wealth quintile in a neighborhood with the mean percentage of service, trade, and agricultural workers, the mean percentage of men/women with secondary education and above, and the mean enrollment rates for children 6–11 and 12–4. In addition, in Model 2, her father is an irregular private sector worker, and her household has no farm or non-farm enterprises. In Model 3, she is in a household that has no other members besides parents. The most vulnerable girl is similar to the reference girl but her father has no formal schooling and her mother is absent. In Model 3, she lives in a household with one child under two, another between 6 and 9, and a sister between 10 and 14. The least vulnerable girl lives in a household in the top three urban wealth quintiles, has a father with 12 years of schooling and a mother with 9, and, in Models 2 and 3, her father is a public sector worker. In other respects she is similar to the reference girl.

The simulation results shown in Table 5 are consistent with the scenarios corresponding with the assigned characteristics of the reference girl, most vulnerable girl, and least vulnerable girl. In each column, the probabilities of being in school conditional on not working *and*

conditional on working are generally highest for the least vulnerable girl and lowest for the most vulnerable girl. In addition, the relative effect of work on schooling is generally smallest for the least vulnerable girl and largest for the most vulnerable girl, with the reference child somewhere in between. These patterns hold for Models 1, 2, and 3. Not only are the most vulnerable girls least likely to go to school irrespective of work responsibilities, but work also places them at an even greater disadvantage than it does other children. Even when she does not work, the probability of schooling for the most vulnerable girl is substantially lower than that of the reference girl, and the impact of work on school attendance for the most vulnerable girl is immense: the probability of attending school is reduced to almost zero.

Shifting the hour threshold from 7 to 28 hours per week affects the magnitude of the effect of work on schooling in predictable ways. Because higher hour thresholds imply increasing intensity of work among the sample of working girls, the impact of work on their schooling is consistently larger. For example, a reference girl who works under the 7-hour cut-off (Model 1) has a 57 percent decline in her likelihood of attending school, whereas under the 28 hour cut-off the decline is 90 percent. Note that, for the most vulnerable girl, the probability of schooling declines with increasing hour cut-offs even when the girl is not working. This is because the non-working sample includes an increasing share of girls who are working, although their work hours are below the threshold. This provides additional support for our decision to use a lower, 14-hour, cut-off.

We ran additional specifications of the model (regression results not shown) to determine the mechanism by which working reduces girls' school attendance. There are two routes whereby girls' work may affect their school attendance. First, parents who intend their daughters to contribute substantially to household production and their sons to engage in market work may

decide that it is not worthwhile to send their daughters to school at all. Second, girls who are in school may find work interfering with their ability to maintain their studies – or may find school impeding their work – and then drop out of school. Our main model does not distinguish between these reasons.

We examine the effect of work on initial school entry by changing the dependent schooling variable from "currently enrolled or not" to "ever enrolled in school or not." We also try a model that captures school dropout among those who have ever enrolled, using the same dependent variables as in our main model but with the sample limited to those children who have ever been in school. Due to the small number of 6–14 year-olds in the sample who started school then dropped out, the school dropout model did not converge. In the ever-in-school model, the effect of work is significant under all three model specifications. Thus, the future prospect of work affects school entry. As shown in the last column of Table 5, the effect of work on the probability of ever attending school is smaller than its effect on current school attendance. For the reference girl (Model 1), the relative decline in the probability of ever-attending school due to work is 35 percent, as compared to a 62 percent decline in the probability of currently attending school. This result suggests that some parents see the role of girls as being limited to the home, and they will not send a girl to school, even if her work responsibilities begin well beyond the age of school entrance.

Our final simulations are based on varying the level of service infrastructure available to girls and their families, thus endogenously shifting the girls' work burdens and, in turn, affecting their likelihood of attending school. In these simulations, we continue to examine the impact of using different hour cut-offs to define work. As shown in Figure 2, eight different combinations of the access to service variables (piped water, sewer, garbage collection) ranging from all three

services present (on the left side) to all three services absent (on the right side) are used to exogenously shift the probability of work. Clearly, the variable with the largest impact is the availability of piped water, which seems to particularly affect the likelihood of work when work is defined using the higher hour thresholds.

In Figures 3 through 5, the different bundles of services provide the variation that drives the predicted probability of work plotted on the *x*-axis. The left-most end of each curve corresponds to the left-most bundle in Figure 2 (all services present). Each additional movement to the right corresponds with the next bundle in Figure 2, with the right-most being no services present. The *y*-axis shows the resulting change in the predicted probability of attending school. In Figure 3, each of the curves represents the relationship between the predicted probabilities of work and schooling when work is defined using a particular hours cut-off. Although the level of work implied by each cut-off is quite different, the slopes of the curves are very similar, implying that the effect of work on schooling is robust to changes in definition.

Effects of control variables on work and schooling

The most interesting effects of control variables on work and schooling outcomes are as follows:[20] Parental education is typically regarded as a primary determinant of child activities. We find that a father's but not a mother's education has a negative effect on whether a girl works. Both parents' education has a positive effect on a girl's schooling. For a 14-year-old reference girl, parental education levels increase the predicted probability of schooling by 0.8

[20] A more detailed discussion of the control variables can be found in Ragui Assaad, Deborah Levison, and Nadia Zibani (2007).

percentage points per year of her father's schooling and by 1.3 percentage points for each additional year of her mother's schooling (Table 4).[21]

The absence of parents appears to substantially increase a girl's likelihood of working. As shown in Table 4, the unconditional probability of work for a 14-year-old reference girl increases by 39.7 percentage points when both her parents are absent. The estimated effects of the mother-absent dummy variable is indeed very interesting. Girls living with their fathers but not with their birth mothers have a lower participation in school: the unconditional probability of school for a 14-year-old reference girl falls by 44.3 percentage points (Table 4).

In Figure 4, we simulate the effect of work on girls' schooling for different types of parental absence, again with the eight different bundles of services underlying the variation in the probability of work. Girls with absent mothers – whether or not a stepmother is present – have much lower predicted probabilities of both work and schooling, compared to girls with both parents present. This suggests that a third unmeasured activity might be interfering with school attendance for these girls. Our conjecture is that childcare as a domestic work responsibility is substantially underestimated. Girls with absent mothers might be engaging in substantial amounts of unmeasured childcare, leading to this result. Girls with both parents absent have much higher levels of work and, as a result of that work, lower school attendance. Whether these girls are living with foster parents or other relatives, they are clearly expected to work no matter how many services are available to the household.

---

[21] In the absence of controls for the father's income, the father's education variable may partially capture the effect of income on a girl's work and schooling. We address this to some extent by including the wealth quintiles, which should be highly correlated with family income.

With respect to region, it appears that the large schooling disadvantage of girls in rural Upper Egypt compared to the metropolitan regions that showed up in the descriptive statistics disappears once other variables, including work, are controlled for. This suggests that the low rates of girls' schooling in Upper Egypt can be attributed more to the fact that they are more likely to work rather than to the social conservatism of the region, as is often assumed.

Wealth has the expected positive effect on schooling of girls, but it is only statistically significant in urban areas. Girls' work is quite responsive to wealth: declines relative to the lowest quintiles are found in all but the second lowest urban quintile. Still, even in the top three urban quintiles, a 14-year-old reference girl has a 36.8 percent unconditional probability of working, compared to 46.1 percent in the lowest urban quintile (Table 4). Thus, by the time the top three quintiles of wealth are reached, a 14-year-old reference girl has had a fall in her probability of working of only 9.3 percentage points in urban areas. In rural areas, the corresponding decline is 13.4 percentage points. Domestic work appears to be part of girls' responsibilities even in middle class households.[22]

Effects of household wealth and region are simulated in Figure 5. We contrast Greater Cairo, an urban area, with rural Upper Egypt, the most disadvantaged region in Egypt. Girls in the rural region clearly work more, regardless of services available, but they are not intrinsically less likely to go to school than their urban counterparts. To the extent that their schooling levels are observed to be lower, it is because they work more. The absence of services appears to have a bigger impact on increasing work burdens for girls in urban areas: the poorest urban girls with no services fare worse than the poorest rural girls with no services, in terms of school attendance.

[22] Eva Mueller (1984) documents that rural children in Botswana are more likely to work if their families are wealthy enough to own complementary assets, such as land, farming implements, and livestock.

Girls' work and schooling are affected by the composition of their households. Their school attendance is hindered by the presence of children under the age of 2 and between the ages of 6 and 9, as well as by the presence of other girls ages 10–4. They are more likely to attend school the more women above age 18 there are in the household. Perhaps because childcare is not captured very well even by our inclusive definition of work, girls' work is not affected by the presence of young children. We are encouraged by the fact that the statistically significant coefficients of other variables in the model remain significant and their magnitudes are robust to within a standard error to the inclusion of the household composition variables. The presence of some household members seems to matter most to the extent that they generate household work to be accomplished.

Specification tests

In addition to the test for whether the working and non-working girls could be pooled into a single schooling equation described above, we conducted other tests to examine the robustness of our model specification. These include (i) an overidentification test to assess the validity of the exclusion of the instruments from the schooling equation; (ii) a test of the joint significance of the instruments in the work equation; (iii) a comparison of our model results with a model that treats work as exogenous; and (iv) a comparison of our results with a reduced form model that does not explicitly include work as a determinant of schooling. Additionally, sensitivity analyses described above include three alternative sets of explanatory variables; alternative definitions for the schooling variable; and simulations for girls with different profiles.

We test the exclusion of the instruments from the schooling equation using an overidentification test appropriate for non-linear simultaneous equation models. This is a

likelihood ratio test that is valid under the maintained assumption of normality of the error terms. The test consists of not imposing any exclusion restrictions and relying on the non-linear functional form to obtain a just-identified model.[23] We then carry out a likelihood ratio test of this just-identified version of the model against the over-identified version, which imposes the exclusion restrictions on the schooling equation. A statistically insignificant test statistic indicates that the instruments can be safely excluded from the schooling equation. Our instruments passed the over-identification test in all the specifications we estimate.[24]

Our second specification test assesses the joint significance of the five instrumental variables in the work equation. The tests indicate that the instruments are jointly strongly significant.[25] Among our instruments, those that are designed to measure the burden of domestic work are jointly statistically significant at the 1 percent level, whereas those designed to measure market work are not, presumably because of the very low incidence of market work among girls.

---

[23] Brian McCall (1992) shows that a binary choice model with a binary endogenous regressor is just identified without exclusion restrictions if the underlying dependent variable is linearly related to the explanatory variables and if two of the explanatory variables are continuous. The error terms are also assumed to be continuous. Lung Fei Lee (1992) shows that this overidentification test statistic is distributed as χ^2 with degrees of freedom equal to the number of excluded instruments.

[24] The overidentification test has 5 degrees of freedom, one for each of the five instruments. We obtain the following test statistics: Model 1 had $\chi^2(5) = 3.49$, p-value = 0.625; Model 2 had $\chi^2(5) = 3.65$, p-value = 0.601; and Model 3 had $\chi^2(5) = 4.07$, p-value = 0.539. Thus, the results are as we had hoped, and exclusion of the instruments from the schooling equation is upheld. Since the likelihood ratio test does not allow for a cluster correction, this test was carried out without it.

[25] We obtain the following test statistics for a Wald test of joint significance: Model 1 had $\chi^2(5) = 28.46$, p-value = 0.0001; Model 2 had $\chi^2(5) = 25.83$, p-value = 0.0001; and Model 3 had $\chi^2(5) = 22.33$, p-value = 0.0005.

To test what difference it makes to treat work as endogenous, we used an alternative model specification where work is considered exogenous to the schooling decision and simply entered as a dummy variable in a probit equation for schooling. In this specification, the effect of work on schooling is negative and statistically significant at the 1 percent level, as expected, but the magnitude of the effect is different from that obtained when work is considered endogenous. When work is not endogenized, the estimate of the impact of work on schooling for girls is understated. For a 14-year-old reference girl, a 10 percent increase in the probability of work reduces the probability of being in school by 6 percentage points in the endogenous work model, compared to only 2 percentage points in the exogenous work model (Model 1). The fact that the effect strengthens when work is endogenized suggests that there is positive selection, meaning that girls who work are those who are more likely to succeed in school. That is, the frequent assumption that academically less-able children are more likely to work is not supported for girls' domestic work in Egypt. Tyler (2003) and Stinebrickner and Stinebricker (2003), like us, also find positive selection into work, but Goulart and Bedi (2008) find negative selection. When we run the same models for boys' market work, we also find mild evidence of negative selection, suggesting that boys who are more likely to fail in school are more likely to work. Thus, the issue of positive versus negative selection is context specific and probably depends on both gender and the type of work. In our case, the majority of girls who are not in school never attended school, so their parents did not observe their academic abilities. In contrast, boys who are not in school are, for the most part, drop-outs. Presumably they did less well in school than boys who did not drop out, thus explaining the observed negative selection.

How does our approach compare with the approach common to this literature, which acknowledges that work and schooling are interrelated but does not attempt to identify the effect

of work on schooling? This approach is essentially the reduced form version of our model, where the work variable is excluded from the schooling equation but the correlation between work and schooling is captured through the correlation coefficient of the two error terms (ρ) in the bivariate probit model. In the reduced form, ρ is negative and statistically significant at the 1 percent level, reflecting the known negative association between work and school. When the effect of work on schooling is explicitly modeled, ρ turns positive, suggesting further evidence of positive selection.

CONCLUSION

Our primary objective in this study was to ascertain the effect of girls' work on their school attendance. Since most of girls' work in Egypt takes the form of domestic work, we highlight this particular relationship in this paper. We find a substantial effect of work (broadly defined, with a 14-hour threshold) on girls' school attendance: a 10 percentage point increase in the probability of work results in a 6 percentage point decrease in the probability of school attendance. Our estimation method allows us to determine the net impact of work on schooling, correcting for both observable and unobservable characteristics of the child and her household. The results indicate that many girls who work would have been in school had they not been expected to work 14+ hours per week. Thus work seems to have a direct and detrimental effect on girls' schooling.

Is it believable that domestic tasks affect schooling? In fact, households' need for "chores" – including chores accomplished at particular times of day – can be large and relatively inelastic. Water and/or fuel may have to be gathered from great distances, wastewater and garbage may require disposal, the day's primary meal may have to be produced from

unprocessed materials and made ready in the middle of the day, the household may include infants or young children requiring constant watching and regular tending, and laundry may need to be washed in the morning – at the closest waterway – so that it will dry before nightfall. The drudgery of everyday life, especially among the poor, should not be underestimated. Kathy R. Kamphoefner, who conducted interviews among low-income women in Cairo, writes,

> Without home appliances, supermarkets, and the prepared foods that are taken for granted in the developed world, basic housework, laundry, and food purchase and preparation make for a full-time occupation. Labor-saving devices, such as major household appliances, are rare in lower-class households. Cairo's winds blow in a new layer of dust every day…. Shopping is very time-consuming, as items must be purchased from many different small shops…. All cooking is done from scratch. Vegetables have to be scrubbed and rice has to be sifted through by hand to pick out dirt and small stones. Dishes are commonly washed in cold water and hauled upstairs to the apartment from the common water faucet. Clothes are laboriously washed by hand in washtubs and hung off balconies to dry. Basic housework is far more than an exhausting day's work. (1996: 95)

The typical image evoked by the words "child labor" is one of a factory worker, toiling long hours, day after day. In fact, such children are extremely rare in Egypt; according to one estimate, based on surveys in over 30 low-income countries, only 2.4 percent of children ages 5–14 work outside of their household for pay (Eric Edmonds and Nina Pavcnik 2005). The majority of child labor force workers are engaged in agricultural production, which may or may not involve long hours or hours likely to conflict with school, depending on the type of production involved – weeding versus harvesting, for example. Neither weeding nor fetching water has anything inherently wrong with it; most parents will assert that doing small jobs is good for

children. The problem, in our view, is when children's jobs, be they officially labor force work or not, interfere substantially with human capital production that will benefit both the children themselves and their society. Our findings indicate the importance of considering non-labor-force work alongside labor force work in studies of child labor, keeping in mind the differences that may exist between them in terms of exposing the child to abuse and health hazards.

Our conclusions on the effect of work on schooling rest on how well we are able to identify the structural schooling equation through appropriate exclusion restrictions. Because girls are involved mostly in domestic work, we rely upon instruments that proxy for the demand for domestic work by indicating household access to basic services, namely access to piped water, piped sewarage, and garbage collection. These infrastructure variables are therefore assumed to affect a girl's domestic work burden, but not to have a direct effect on her school attendance. The fact that poor infrastructure is often associated with poor access to schools at the community level is addressed by community and regional level variables that explicitly control for access to schooling. While these instruments are not ideal, they are effective and withstand the standard empirical tests. We view this analysis as one contribution to a body of evidence in which different approaches are taken, with the goal of eventually shedding light on these larger social science questions (Robert Moffitt 2005).

Why is it interesting to know whether child work leads to a reduction in school attendance? It matters because it is important to know whether interventions should target a reduction in the domestic work burden of girls or focus exclusively on improving the attractiveness of schooling. Our approach does not investigate the pathway that goes from schooling to work, so we cannot address the relative merits of these two approaches, although we suspect that both are important. Lloyd, et al. (2003) provide convincing evidence that improving

school quality would result in better school retention and grade attainment. Our results provide complementary evidence that interventions to reduce girls' work would also increase school attendance. The question is: how should such a reduction be achieved?

An approach that bans labor force work, and attempts to enforce such a ban, will have practically no effect for girls in Egypt. Since girls doing subsistence work and market work tend to work on family farms or in family enterprises, a legal approach is unlikely to affect them – in general, children are legally allowed to work in family businesses, and even if not, enforceability would be difficult in such circumstances. Families resort to hiring their own children when they face high transaction costs in hiring outside labor (Yoram Ben-Porath 1980). Policy changes that reduce such transaction costs may reduce the use of children's labor in family enterprises. For example, the recent changes in Egypt's labor law that reduced barriers to hiring and firing workers may have implications with respect to children's family labor by making it easier to hire outside workers and therefore reducing the reliance of small enterprise on family labor.

An approach targeting labor market work, even if successful in reducing unpaid family work for children, is unlikely to do much for girls' school attendance given that only a tiny fraction of girls participate in such work. Approaches that reduce the drudgery of household work or that compensate families for the opportunity cost of a girl's time at home would be much more effective in increasing their school attendance. Some programs currently being implemented in Egypt pursue the compensation approach. For instance, the Girl's Education Initiative includes a conditional food aid component sponsored by the World Food Program (WFP). Under this program, children (mostly girls) attending girl-friendly schools receive a daily dry meal made up of commercially produced snacks as well as a take-home ration for their families (Ronald G. Sultana 2007: 51). Another program along the same lines is the Girls'

Scholarship Program implemented by the Center for Development and Population Activities with funding from USAID. This is essentially a conditional cash transfer (CCT) program targeting girls from low-income families who were not attending school or were at risk of dropping out in four Upper Egyptian governorates (Center for Development and Population Activities [CEDPA] 2005).

While these programs clearly attempt to change parental calculus regarding whether or not to send a girl to school, they do not directly contribute to reduce the domestic work burden. Our research suggests that access to better infrastructural services, such as piped water, sewerage, and garbage collection would go a long way toward reducing girls' domestic work burdens. Among these, lack of access to piped water imposes the greatest work burden on women and girls by forcing them to use canals and other waterways to wash dishes and clothes and to spend time and effort fetching drinking water from public taps. We find that poor urban girls living in unserviced informal settlements might even be more vulnerable to not attending school than poor girls from rural Upper Egypt, who have traditionally been flagged as the most vulnerable (Sahar El-Tawila, Omaima El-Gibaly, Barbara Ibrahim, Fikrat El Sahn, Sunny Sallam, Susan M. Lee, Barbara S. Mensch, Hind Wassef, Sarah Bukhari, and Osman Galal 1999; Langsten and Hassan 2007). Families in these informal settlements have fewer options to fetch drinking water, get rid of wastewater and garbage, and wash their dishes and clothing, leading to a heavier burden on girls. Other interventions to reduce girls' domestic work burdens include the provision of adequate energy sources for cooking, reducing marketing time via refrigeration, and providing solid waste and sewage disposal services.

Another implication of our work is the importance of parental presence in protecting girls from non-attendance in school and involvement in domestic work. Girls with absent mothers

were particularly vulnerable to not being in school, although their visible involvement in work was lower, presumably because they are engaged in more childcare as substitute care takers for their siblings, an activity that is not adequately captured even by our expanded work measure. Girls with both parents absent, that is, girls in fostering situations, are highly vulnerable to both increased work and decreased school attendance because of their high work burdens. While there is only a limited amount government policies can do to alter the pattern of parental presence, these parenting situations can be used to target girls at risk.

While girls' work reduces their schooling via both non-entry and dropout, it may be that reducing non-entry would be an easier initial policy objective than reducing dropout, given the fact that the majority of girls not currently in school in Egypt have actually never been to school. Many efforts to reduce non-entry are currently underway in Egypt, and a massive school building campaign of the Ministry of Education has made schools more physically accessible to girls. These interventions have clearly had some positive effects as indicated by the decline in the gender gap in ever enrollment in recent years. Other policy levers to reduce non-entry include linking birth registrations to local school entry lists, subsidization of school-entry-related expenses, and positive, persuasive outreach to parents and stepparents. Young girls, of school-entry age, are relatively unproductive workers, and parents face a small opportunity cost of schooling. Once girls are enrolled, it is then easier to keep track of them as part of the process of reducing dropouts via monitoring school attendance and performance.

Ragui Assaad, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota

301 19th Avenue South, Minneapolis, MN 55455, USA

e-mail: assaad@umn.edu

Deborah Levison, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota

301 19th Avenue South, Minneapolis, MN 55455, USA

e-mail: dlevison@umn.edu

Nadia Zibani, Poverty, Gender, and Youth Program, Population Council

59, Misr Helwan Agricultural Road, Cairo, Egypt

e-mail: nzibani@popcouncil.org

BIOGRAPHIES

Ragui Assaad is Professor at the Hubert H. Humphrey Institute of Public Affairs at the University of Minnesota. On leave, he recently spent three years heading the Population Council's regional office in Cairo. He studies and advises on labor markets in Egypt, the Middle East, and North Africa, with a focus on women and youth.

Deborah Levison is Professor at the Hubert H. Humphrey Institute of Public Affairs at the University of Minnesota. She is an economist with a BA from Smith College and a PhD from the University of Michigan. Her recent research focuses on children's work and education in poor countries, with an emphasis on gender, family, and labor market interactions.

Nadia Zibani is a technical advisor at the Poverty, Gender and Youth program at the Population Council's Middle East and North Africa regional office in Cairo, Egypt. She is currently involved in projects related to out-of-school adolescents girls in Egypt and child labor in small and micro enterprises).

.

ACKNOWLEDGMENTS

We thank Cristobal Ridao-Cano for allowing us to adapt his Stata program for a switching probit model. We are grateful to Dennis Ahlburg, Ray Langsten, Brian McCall, David Post, and Insan Tunali for detailed and valuable comments. Sara Kaufman, Pingkang Yu, Yi Zheng, and Hongliang Zhang provided competent research assistance. We gratefully acknowledge financial assistance and technical support from the International Center for Economic Growth (ICEG) through its Economic Policy Initiative Consortium project in Egypt, which is funded by USAID.

Table 1: Weighted Proportions of Girls (6-14) Working and Attending School and Average Hours Worked, Egypt 1998

	Proportion attending school	Proportion working	Proportion in school only	Proportion both at work and in school	Proportion at work only	Proprotion neither at work nor in school	Hours worked/week	
							Mean	Std. Dev
Market Work (>=1 hour/week)	0.858	0.017	0.856	0.002	0.016	0.126	49.4	22.4
Inclusive Work								
>=1 hour/week	0.858	0.426	0.549	0.309	0.117	0.025	21.3	16.2
>=7 hours/week	0.858	0.417	0.554	0.304	0.113	0.029	21.4	16.2
>=14 hours/week	0.858	0.319	0.646	0.212	0.107	0.035	25.7	16.1
>=21 hours/week	0.858	0.192	0.763	0.095	0.097	0.045	33.4	16.9
>=28 hours week	0.858	0.116	0.820	0.038	0.078	0.064	41.4	17.6

Table 2: Means and Standard Deviations of Explanatory Variables, Girls Ages 6-14

	All	School only	Work and School**	Work Only**	Neither
Child Characteristics					
age	10.379	9.807	11.818	11.650	9.014
	(2.471)	(2.415)	(1.883)	(2.037)	(2.805)
age squared/100	1.138	1.020	1.432	1.399	0.890
	(0.503)	(0.480)	(0.420)	(0.445)	(0.535)
not daughter of household head*	0.087	0.093	0.071	0.087	0.071
	(0.282)	(0.291)	(0.258)	(0.283)	(0.259)
Parental and HH Characteristics					
father's age when girl was age 6	36.149	36.239	35.690	36.034	37.900
	(14.636)	(14.377)	(14.965)	(15.767)	(14.780)
mother's age when girl was age 6	32.470	32.856	32.278	30.998	31.017
	(8.667)	(7.974)	(8.157)	(11.326)	(13.018)
father's years of schooling	7.249	8.241	6.696	1.903	4.043
	(5.862)	(5.884)	(5.444)	(2.792)	(4.880)
mother's years of schooling	5.434	6.394	4.822	0.641	1.814
	(5.715)	(5.870)	(5.211)	(1.707)	(3.987)
both parents absent*	0.015	0.007	0.015	0.063	0.043
	(0.121)	(0.085)	(0.122)	(0.244)	(0.204)
father absent permanently*	0.052	0.051	0.060	0.044	0.014
	(0.221)	(0.221)	(0.238)	(0.205)	(0.120)
father absent temporarily*	0.045	0.049	0.039	0.024	0.043
	(0.207)	(0.216)	(0.195)	(0.154)	(0.204)
mother absent *	0.030	0.020	0.026	0.083	0.143
	(0.170)	(0.139)	(0.160)	(0.276)	(0.352)
father irregular private wage worker (reference)*	0.139	0.111	0.133	0.359	0.171
	(0.346)	(0.315)	(0.340)	(0.480)	(0.377)
father public sector worker when girl was age 6*	0.422	0.465	0.417	0.150	0.271
	(0.494)	(0.499)	(0.493)	(0.358)	(0.448)
father regular private sector wage worker when girl was age 6*	0.177	0.173	0.182	0.189	0.200
	(0.382)	(0.379)	(0.386)	(0.393)	(0.403)
father nonwage worker when girl was age 6*	0.226	0.214	0.235	0.277	0.314
	(0.419)	(0.410)	(0.424)	(0.448)	(0.468)
father not working or work data missing when girl was age 6*	0.035	0.037	0.034	0.024	0.043
	(0.184)	(0.188)	(0.181)	(0.154)	(0.204)
HH has farm enterprise*	0.131	0.113	0.137	0.233	0.214
	(0.338)	(0.316)	(0.344)	(0.424)	(0.413)
HH has nonfarm enterprise*	0.226	0.244	0.225	0.112	0.143
	(0.418)	(0.429)	(0.418)	(0.316)	(0.352)
Wealth					
HH in the lowest urban quintile (reference) *	0.157	0.142	0.160	0.228	0.286
	(0.364)	(0.349)	(0.366)	(0.420)	(0.452)
HH in 2nd lowest urban quintile*	0.127	0.130	0.139	0.083	0.086
	(0.333)	(0.336)	(0.346)	(0.276)	(0.282)
HH in top three urban quintiles*	0.333	0.400	0.272	0.039	0.100
	(0.471)	(0.490)	(0.445)	(0.194)	(0.302)
HH in the lowest rural quintile (reference)*	0.105	0.065	0.079	0.315	0.345
	(0.307)	(0.247)	(0.271)	(0.466)	(0.479)
HH in 2nd lowerst rural quintile*	0.077	0.064	0.073	0.180	0.129
	(0.267)	(0.244)	(0.261)	(0.385)	(0.337)
HH in top three rural quintiles*	0.246	0.231	0.306	0.214	0.214
	(0.431)	(0.421)	(0.461)	(0.411)	(0.413)

Table 2: Means and Standard Deviations of Explanatory Variables, Girls Ages 6-14 (Contn'd)

	All	School only	Work and School**	Work Only**	Neither
Region of Residence & Community Characteristics					
Greater Cairo (reference) *	0.169	0.198	0.124	0.087	0.071
	(0.375)	(0.399)	(0.329)	(0.282)	(0.258)
Alexandria and Suez Canal*	0.120	0.141	0.079	0.063	0.100
	(0.325)	(0.349)	(0.270)	(0.244)	(0.302)
Urban Lower Egypt*	0.146	0.141	0.188	0.073	0.157
	(0.353)	(0.349)	(0.391)	(0.260)	(0.367)
Urban Upper Egypt*	0.181	0.190	0.180	0.126	0.143
	(0.385)	(0.393)	(0.385)	(0.333)	(0.352)
Rural Lower Egypt*	0.199	0.178	0.257	0.223	0.186
	(0.399)	(0.382)	(0.437)	(0.417)	(0.392)
Rural Upper Egypt*	0.184	0.151	0.173	0.427	0.343
	(0.388)	(0.358)	(0.378)	(0.496)	(0.478)
% female w/ secondary school or above in locality	20.98	22.47	20.32	13.74	12.70
	(12.12)	(12.09)	(10.01)	(13.72)	(11.13)
% male w/ secondary school or above in locality	30.08	31.62	28.77	23.78	22.76
	(11.55)	(11.61)	(9.36)	(13.06)	(10.43)
% of girls ages 6-11 enrolled in school in locality	89.90	91.30	91.40	78.60	78.90
	(11.50)	(9.90)	(8.80)	(17.50)	(17.30)
% boy ages 6-11 enrolled in school in locality	94.70	95.20	95.10	90.30	90.90
	(5.90)	(5.00)	(4.90)	(9.40)	(10.70)
% girls ages 12-14 enrolled in school in locality	78.10	80.60	79.40	60.60	60.80
	(17.60)	(15.60)	(15.80)	(21.20)	(22.50)
% boys ages 12-14 enrolled in school in locality	85.10	86.20	84.90	79.40	79.00
	(9.40)	(8.90)	(8.50)	(11.90)	(12.40)
Instruments					
% agricultural workers in locality	9.910	8.626	10.240	17.045	16.354
	(10.294)	(9.750)	(9.701)	(11.632)	(11.758)
% service & trade workers in locality	4.233	4.306	4.181	3.921	3.849
	(1.525)	(1.527)	(1.454)	(1.582)	(1.666)
HH without piped water*	0.090	0.050	0.099	0.340	0.229
	(0.287)	(0.218)	(0.300)	(0.475)	(0.423)
HH without piped sewage disposal*	0.438	0.381	0.478	0.723	0.629
	(0.496)	(0.486)	(0.500)	(0.448)	(0.487)
HH without garbage collection*	0.557	0.499	0.612	0.811	0.757
	(0.497)	(0.500)	(0.488)	(0.393)	(0.432)
Household Composition					
# of children ages 0-2 in HH	0.327	0.310	0.304	0.379	0.757
	(0.561)	(0.549)	(0.557)	(0.525)	(0.788)
# of children ages 3-5 in HH	0.520	0.527	0.445	0.641	0.571
	(0.677)	(0.679)	(0.622)	(0.757)	(0.714)
# of children ages 6-9 in HH	0.552	0.522	0.525	0.786	0.757
	(0.706)	(0.694)	(0.662)	(0.840)	(0.731)
# of girls ages 10-14 in HH	0.457	0.449	0.394	0.621	0.629
	(0.636)	(0.637)	(0.574)	(0.700)	(0.765)
# of boys ages 10-14 in HH	0.458	0.440	0.482	0.597	0.300
	(0.641)	(0.631)	(0.665)	(0.631)	(0.645)
# of females ages 15-17 in HH	0.274	0.255	0.296	0.325	0.371
	(0.528)	(0.506)	(0.561)	(0.606)	(0.516)
# of males ages 15-17 in HH	0.257	0.237	0.285	0.286	0.414
	(0.489)	(0.473)	(0.514)	(0.494)	(0.602)
# of females ages 18-59 in HH	0.429	0.419	0.422	0.519	0.457
	(0.809)	(0.815)	(0.802)	(0.795)	(0.755)
# of males ages 18-59 in HH	0.537	0.481	0.615	0.743	0.657
	(0.886)	(0.853)	(0.932)	(0.951)	(0.946)
# of females age 60 and over in HH	0.132	0.135	0.131	0.121	0.100
	(0.346)	(0.349)	(0.344)	(0.342)	(0.302)
# of males age 60 and over in HH	0.064	0.066	0.062	0.058	0.057
	(0.245)	(0.249)	(0.241)	(0.235)	(0.234)
Number of Observations	*2442*	*1633*	*533*	*206*	*70*

Standard deviations in parentheses

* Denotes a dummy variable

****** Work is defined using the 14 hour/week threshold

Table 3: Parameter Estimates from Bivariate Probit Model, Girls 6-14.

	Model 1		Model 2		Model 3	
Variables	work	school	work	school	work	school
working		-2.378***		-2.367***		-2.473***
		(0.164)		(0.156)		(0.144)
Child Characteristics						
age	0.460***	0.561***	0.454***	0.569***	0.470***	0.616***
	(0.121)	(0.135)	(0.122)	(0.135)	(0.121)	(0.137)
age squared/100	-0.980+	-2.125**	-0.951	-2.160***	-1.000+	-2.389***
	(0.579)	(0.654)	(0.582)	(0.651)	(0.575)	(0.667)
not daughter of household head	-0.236+	0.104	-0.246+	0.108	-0.347*	0.02
	(0.124)	(0.128)	(0.128)	(0.132)	(0.173)	(0.180)
Parental and HH Characteristics						
father's age when girl was age 6	0.004	0.006	0.005	0.006	0.006	0.005
	(0.006)	(0.007)	(0.006)	(0.008)	(0.006)	(0.007)
mother's age when girl was age 6	-0.013+	-0.017+	-0.013+	-0.017+	-0.012	-0.023*
	(0.008)	(0.009)	(0.008)	(0.010)	(0.008)	(0.010)
father's years of schooling	-0.025**	0.031*	-0.023*	0.030*	-0.025*	0.033**
	(0.009)	(0.013)	(0.010)	(0.013)	(0.010)	(0.012)
mother's years of schooling	-0.005	0.050**	-0.004	0.050**	-0.005	0.052**
	(0.009)	(0.017)	(0.009)	(0.017)	(0.009)	(0.016)
both parents absent	1.171**	0.292	1.159**	0.299	1.244**	0.006
	(0.411)	(0.496)	(0.414)	(0.485)	(0.426)	(0.480)
father absent permanently	0.173	0.702+	0.178	0.690+	0.236	0.599
	(0.293)	(0.402)	(0.293)	(0.410)	(0.307)	(0.405)
father absent temporarily	0.11	0.238	0.08	0.262	0.141	0.205
	(0.276)	(0.358)	(0.281)	(0.363)	(0.285)	(0.353)
mother absent (w/ or w/o stepmother present)	-0.635+	-1.246**	-0.656+	-1.235**	-0.553	-1.363**
	(0.353)	(0.472)	(0.358)	(0.469)	(0.359)	(0.467)
father public sector worker when girl was 6			-0.146	0.067	-0.158	0.044
			(0.110)	(0.148)	(0.110)	(0.149)
father regular private sector wage worker when girl was 6			-0.056	-0.051	-0.063	-0.058
			(0.108)	(0.133)	(0.108)	(0.136)
father nonwage workers when girl was 6			-0.092	-0.048	-0.096	-0.001
			(0.109)	(0.141)	(0.110)	(0.145)
father not working or work data missing when girl was 6			-0.095	0.053	-0.104	0.098
			(0.156)	(0.222)	(0.157)	(0.229)
farm enterprise			0.039	0.062	0.049	0.056
			(0.116)	(0.138)	(0.117)	(0.139)
non-farm enterprise			-0.149	0.169	-0.153	0.098
			(0.091)	(0.133)	(0.093)	(0.128)
Wealth						
HH in 2nd lowest urban wealth quintile	0.078	0.218	0.087	0.225	0.066	0.204
	(0.131)	(0.147)	(0.132)	(0.152)	(0.131)	(0.141)
HH in top three urban wealth quintiles	-0.239*	0.378*	-0.219+	0.364*	-0.222+	0.24
	(0.118)	(0.180)	(0.121)	(0.180)	(0.121)	(0.154)
HH in 2nd lowest rural wealth quintile	-0.442**	0.07	-0.417**	0.059	-0.420**	0.056
	(0.141)	(0.184)	(0.143)	(0.182)	(0.143)	(0.172)
HH in top three rural wealth quintiles	-0.349*	0.17	-0.304*	0.144	-0.306*	0.158
	(0.143)	(0.147)	(0.144)	(0.157)	(0.144)	(0.149)
Region of Residence and Community Characteristics						
Alexandria and Suez Canal	-0.302+	-0.268	-0.299+	-0.253	-0.307*	-0.304
	(0.156)	(0.255)	(0.154)	(0.255)	(0.156)	(0.245)
Urban Lower Egypt	0.16	0.229	0.189	0.243	0.186	0.263
	(0.169)	(0.233)	(0.170)	(0.227)	(0.168)	(0.213)
Urban Upper Egypt	0.238+	0.651*	0.248+	0.671*	0.240+	0.683**
	(0.138)	(0.258)	(0.138)	(0.265)	(0.137)	(0.245)
Rural Lower Egypt	0.541*	0.570*	0.514*	0.610*	0.495*	0.549*
	(0.246)	(0.275)	(0.248)	(0.286)	(0.244)	(0.267)
Rural Upper Egypt	0.788***	0.681*	0.756***	0.710*	0.747***	0.681*
	(0.221)	(0.292)	(0.220)	(0.306)	(0.220)	(0.272)

Table 3: Parameter Estimates from Bivariate Probit Model, Girls 6-14 (Contn'd)

	Model 1		Model 2		Model 3	
Variables	work	school	work	school	work	school
% female w/ secondary school or above	0.058***	0.012	0.057**	0.013	0.057***	0.011
	(0.017)	(0.018)	(0.017)	(0.018)	(0.017)	(0.017)
% male w/ secondary school or above	-0.055***	-0.024	-0.054**	-0.025	-0.054***	-0.025
	(0.016)	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)
% of girls ages 6-11 enrolled in school in locality	-0.003	0.023*	-0.002	0.022*	-0.001	0.026**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
% of boys ages 6-11 enrolled in school in locality	0.028*	-0.016	0.027*	-0.017	0.026*	-0.018
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
% of girls ages 12-14 enrolled in school in locality	-0.005	0.020**	-0.005	0.020**	-0.005	0.018**
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)
% of boys ages 12-14 enrolled in school inlocality	-0.004	-0.011	-0.005	-0.009	-0.006	-0.013
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.010)
Instruments						
% agricultural workers in locality (X)	-0.005		-0.005		-0.004	
	(0.007)		(0.007)		(0.007)	
% service & trade workers in locality (X)	0.001		0.007		0.005	
	(0.027)		(0.028)		(0.028)	
households without piped water (X)	0.528***		0.514***		0.475***	
	(0.112)		(0.111)		(0.113)	
households without piped sewage disposal (X)	0.154		0.146		0.152	
	(0.100)		(0.102)		(0.102)	
households without garbage collection (X)	0.128		0.131		0.121	
	(0.087)		(0.088)		(0.084)	
Household Composition						
# of children age 0-2 in HH					0.058	-0.204*
					(0.067)	(0.084)
# of children age 3-5 in HH					0.021	-0.012
					(0.046)	(0.057)
# of children age 6-9 in HH					-0.048	-0.193***
					(0.046)	(0.057)
# of girls age 10-14 in HH					0.022	-0.130+
					(0.060)	(0.071)
# of boys age 10-14 in HH					0.097+	0.055
					(0.051)	(0.069)
# of females age 15-17 in HH					0.014	-0.08
					(0.067)	(0.064)
# of males age 15-17 in HH					-0.062	-0.088
					(0.064)	(0.088)
# of females age 18-59 in HH					-0.055	0.111+
					(0.043)	(0.062)
# of males age 18-59 in HH					0.014	0.008
					(0.047)	(0.057)
# of females age 60 and over in HH					-0.092	0.220+
					(0.103)	(0.122)
# of males age 60 and over in HH					0.258	-0.002
					(0.176)	(0.194)
Constant	-5.252***	-2.504*	-5.064***	-2.607**	-5.288***	-1.980*
	(0.976)	(0.973)	(0.988)	(0.949)	(0.984)	(0.951)
Correlation of errors (rho)	0.805		0.799		0.838	
Chi2-test (1) for rho=0	31.515		35.708		40.583	
p-value for likelihood ratio test of rho=0	0.000		0.000		0.000	
Log Likelihood	-1676.10		-1669.35		-1643.94	
Log likelihood without regressors	-2226.39		-2226.39		-2226.39	
Number of observations	2442		2442		2442	

Standard errors in parentheses. (X) indicates that the variable
Significant coefficients at 0.1% (***) ,1% (**), 5% (*) and

- A cluster correction was used to adjust standard errors for the fact that some observations on community-level variables are not independent across girls in the same PSU.

Table 4: Marginal Effects on the Joint Probabilities of Work and School Based on Model (1), Reference Girl

In School (S=1) or not in school (S=0) Working (W=1) or not working (W=0)	W=1	S=1	S=1 & W=0	S=1 & W=1	S=0 & W=1	S=0 & W=0
Probability for reference individual	0.461	0.833	0.376	0.457	0.004	0.163
Change in probability due to change in :						
probability of work by 10 percentage points		-0.060 ***	-0.046 ***	-0.015 **	0.015 **	0.046 ***
		(0.08)	(0.061)	(0.053)	(0.053)	(0.061)
Child Characteristics						
age	0.183 ***	0.141 ***	-0.045	0.185 ***	-0.003	-0.138 ***
	(0.047)	(0.044)	(0.055)	(0.046)	(0.004)	(0.042)
age squared/100	-0.389 +	-0.532 **	-0.121	-0.411	0.022	0.510 **
	(0.228)	(0.200)	(0.246)	(0.221)	(0.029)	(0.184)
not daughter of household head	-0.0919 +	0.025	0.113 *	-0.089 +	-0.003	-0.021
	(0.047)	(0.030)	(0.048)	(0.047)	(0.004)	(0.029)
Parental and HH Characteristics						
father's age when age 6	0.002	0.002	0.000	0.002	0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.002)
mother's age when age 6	-0.005 +	-0.004	0.001	-0.005 +	0.000	0.004
	(0.004)	(0.003)	(0.004)	(0.003)	(0.000)	(0.003)
father's years of schooling	-0.010 **	0.008 *	0.017 ***	-0.009 *	-0.001	-0.007 *
	(0.004)	(0.003)	(0.004)	(0.004)	(0.001)	(0.003)
mother's years of schooling	-0.002	0.013 **	0.014 *	-0.001	-0.001	-0.012 **
	(0.003)	(0.004)	(0.005)	(0.004)	(0.001)	(0.004)
both parents absent	0.397 ***	0.063	-0.305 ***	0.368 ***	0.029	-0.092
	(0.098)	(0.094)	(0.077)	(0.103)	(0.045)	(0.069)
father absent permanently	0.069	0.119 *	0.046	0.073	-0.004	-0.115 *
	(0.116)	(0.059)	(0.12)	(0.116)	(0.005)	(0.057)
father absent temporarily	0.0438	0.053	0.007	0.046	-0.002	-0.051
	(0.110)	(0.072)	(0.111)	(0.109)	(0.005)	(0.069)
mother absent	-0.229 *	-0.443 *	-0.188	-0.256 **	0.026	0.417 *
	(0.108)	(0.194)	(0.152)	(0.094)	(0.047)	(0.169)
Wealth						
HH in 2nd lowest urban wealth quintile	0.031	0.049	0.016	0.033	-0.002	-0.047
	(0.052)	(0.034)	(0.052)	(0.052)	(0.003)	(0.033)
HH in top three urban wealth quintiles	-0.093 *	0.078	0.166 ***	-0.089 +	-0.004	-0.074 +
	(0.047)	(0.045)	(0.046)	(0.046)	(0.005)	(0.042)
HH in 2nd lowest rural wealth quintile	-0.167 ***	0.017	0.180 ***	-0.163 ***	-0.004	-0.013
	(0.049)	(0.043)	(0.051)	(0.050)	(0.005)	(0.043)
HH in top three rural wealth quintiles	-0.134 **	0.039	0.169 ***	-0.13 *	-0.004	-0.035
	(0.052)	(0.033)	(0.047)	(0.053)	(0.005)	(0.031)
Region of Residence and Community Characteristics						
Alexandria and Suez Canal	-0.116 *	-0.075	0.041	-0.116 *	0.000	0.076
	(0.059)	(0.073)	(0.072)	(0.059)	(0.004)	(0.070)
Urban Lower Egypt	0.064	0.051	-0.014	0.065	-0.001	-0.050
	(0.067)	(0.049)	(0.066)	(0.067)	(0.004)	(0.05)
Urban Upper Egypt	0.095 +	0.114 *	0.016	0.099 +	-0.004	-0.110 *
	(0.055)	(0.055)	(0.069)	(0.054)	(0.005)	(0.052)
Rural Lower Egypt	0.210 *	0.105 +	-0.107	0.212 *	-0.002	-0.103 +
	(0.092)	(0.057)	(0.089)	(0.090)	(0.004)	(0.054)
Rural Upper Egypt	0.294 ***	0.117 *	-0.178 *	0.295 ***	-0.001	-0.116 *
	(0.078)	(0.059)	(0.078)	(0.077)	(0.005)	(0.055)
% female w/ secondary school or above	0.023 ***	0.003	-0.019 ***	0.022 **	0.001	-0.004
	(0.007)	(0.005)	(0.006)	(0.007)	(0.001)	(0.005)
% male w/ secondary school or above	-0.022 ***	-0.006	0.015 **	-0.021 ***	0.000	0.007
	(0.006)	(0.003)	(0.005)	(0.006)	(0.001)	(0.004)
% female children ages 6-11enrolled in school in locality	-0.001	0.006 *	0.007	-0.001	0.000	-0.005 *
	(0.004)	(0.003)	(0.004)	(0.004)	(0.001)	(0.003)
% male children ages 6-11 enrolled in school in locality	0.011 *	-0.004	-0.014 ***	0.010 *	0.001	0.003
	(0.005)	(0.003)	(0.004)	(0.005)	(0.001)	(0.003)
% of female children ages 12-14 enrolled in school in locality	-0.002	0.005 *	0.007 **	-0.002	0.000	-0.005 *
	(0.002)	(0.002)	(0.002)	(0.002)	(0.000)	(0.002)
% male children ages 12-14 enrolled in school in locality	-0.002	-0.003	-0.001	-0.002	0.000	0.003
	(0.003)	(0.002)	(0.003)	(0.003)	(0.000)	(0.002)
Instruments						
% agricultural workers in locality	-0.002		0.002	-0.002	0.000	0.000
	(0.003) .		(0.003)	(0.003)	(0.000)	(0.000)
% service & trade workers in locality	0.001		0.000	0.000	0.000	0.000
	(0.011) .		(0.010)	(0.010)	(0.000)	(0.000)
household without piped water	0.205 ***		-0.188 ***	0.188 ***	0.017	-0.017
	(0.041) .		(0.038)	(0.038)	(0.014)	(0.014)
household without piped sewage disposal	0.061		-0.058	0.058	0.003	-0.003
	(0.040) .		(0.038)	(0.038)	(0.004)	(0.004)
household without garbage collection	0.051		-0.048	0.048	0.002	-0.002
	(0.035) .		(0.032)	(0.033)	(0.003)	(0.003)

*Based on marginal change for continuous variables and change from 0 to 1 for dummy variables

**A cluster correction was used to adjust standard errors for the fact that some observations on community level variables are not independent across girls in the same PSU.

^The reference individual is a 14 year old girl whose father and mother are present and have mean years of schooling. She lives in Greater Cairo and belongs to a household in the lowest urban wealth quintile that has no household enterprise. She lives in a neighborhood with the mean percentage of agricultural, service and trade workers, the mean percentage of males/females with secondary education and above and the mean school enrollment rates.

*** significant at 0.1%,** significant at 1%; *significant at 5%, + significant at 10%

Table 5: Simulation of Effect of Inclusive Work on Schooling, with Sensitivity Analysis Regarding Hours Cut-Off and Specification of Schooling Variable

		Specification of Schooling Variable				
		Currently in school or not				Ever in school or not
		Sensitivity to work hours cut-off				
		≥ 7 hours	Base Run ≥ 14 hours	≥ 21 hours	≥ 28 hours	≥ 14 hours
*Reference girl**						
Model 1	Pr[S=1 | W=0]	0.985	0.980	0.962	0.932	0.998
	Pr[S=1 | W=1]	0.426	0.376	0.180	0.097	0.651
	Abs Change due to work	-0.559	-0.604	-0.782	-0.835	-0.347
	Rel Chg due to work	-57%	-62%	-81%	-90%	-35%
Model 2	Pr[S=1 | W=0]	0.986	0.977	0.961	0.921	0.997
	Pr[S=1 | W=1]	0.447	0.358	0.184	0.095	0.629
	Abs Change due to work	-0.539	-0.619	-0.777	-0.826	-0.368
	Rel Chg due to work	-55%	-63%	-81%	-90%	-37%
Model 3	Pr[S=1 | W=0]	0.995	0.990	0.976	0.944	0.999
	Pr[S=1 | W=1]	0.544	0.436	0.224	0.103	0.688
	Abs Change due to work	-0.451	-0.553	-0.752	-0.840	-0.311
	Rel Chg due to work	-45%	-56%	-77%	-89%	-31%
*Most vulnerable girl***						
Model 1	Pr[S=1 | W=0]	0.783	0.624	0.539	0.383	0.718
	Pr[S=1 | W=1]	0.059	0.020	0.005	0.001	0.030
	Abs Change due to work	-0.724	-0.604	-0.534	-0.382	-0.688
	Rel Chg due to work	-92%	-97%	-99%	-100%	-96%
Model 2	Pr[S=1 | W=0]	0.790	0.610	0.523	0.355	0.685
	Pr[S=1 | W=1]	0.064	0.018	0.005	0.001	0.025
	Abs Change due to work	-0.726	-0.592	-0.518	-0.354	-0.660
	Rel Chg due to work	-92%	-97%	-99%	-100%	-96%
Model 3	Pr[S=1 | W=0]	0.719	0.461	0.298	0.157	0.770
	Pr[S=1 | W=1]	0.032	0.005	0.001	0.000	0.018
	Abs Change due to work	-0.687	-0.456	-0.297	-0.157	-0.651
	Rel Chg due to work	-96%	-99%	-100%	-100%	-85%
*Least vulnerable girl****						
Model 1	Pr[S=1 | W=0]	0.998	0.997	0.994	0.992	1.000
	Pr[S=1 | W=1]	0.702	0.652	0.422	0.344	0.839
	Abs Change due to work	-0.296	-0.346	-0.572	-0.647	-0.160
	Rel Chg due to work	-30%	-35%	-58%	-65%	-16%
Model 2	Pr[S=1 | W=0]	0.998	0.997	0.993	0.991	1.000
	Pr[S=1 | W=1]	0.704	0.651	0.421	0.357	0.853
	Abs Change due to work	-0.294	-0.346	-0.572	-0.634	-0.147
	Rel Chg due to work	-29%	-35%	-58%	-64%	-15%
Model 3	Pr[S=1 | W=0]	0.999	0.998	0.995	0.992	1.000
	Pr[S=1 | W=1]	0.736	0.679	0.442	0.334	0.863
	Abs Change due to work	-0.263	-0.319	-0.554	-0.658	-0.137
	Rel Chg due to work	-26%	-32%	-56%	-66%	-14%

Notes:

* The reference girl is 14 years old, has both parents living at home and has parents with the mean years of schooling. She lives in Greater Cairo and belongs to a household in the lowest urban wealth quintile. She lives in a neighborhood with the mean percentage of service, trade and agricultural workers, the mean percentage of males/females with secondary education and above, and the mean enrollment rates for children 6-11 and 12-14. In addition, in Model 2, her father is an irregular private sector worker and her household has no farm or non-farm enterprises. In model 3, she is in a household that has no other members besides her parents.

** The most vulnerable girl is similar to the reference girl but has a father with no schooling, and her mother is absent. In Model 3 she lives in a household with additional children: one child under 2, another between 6 and 9, and a sister age 10-14.

*** The least vulnerable girl is similar to the reference girl except for the following: she lives in a household in the top 3 urban wealth quintiles, her father has 12 years of schooling and her mother has 9 years of schooling, and her father is a public sector worker in Models 2 and 3.

Figure 1
Percentage of Girls and Boys Attending School and Engaged in Work According to Various Definitions by Age, 1998

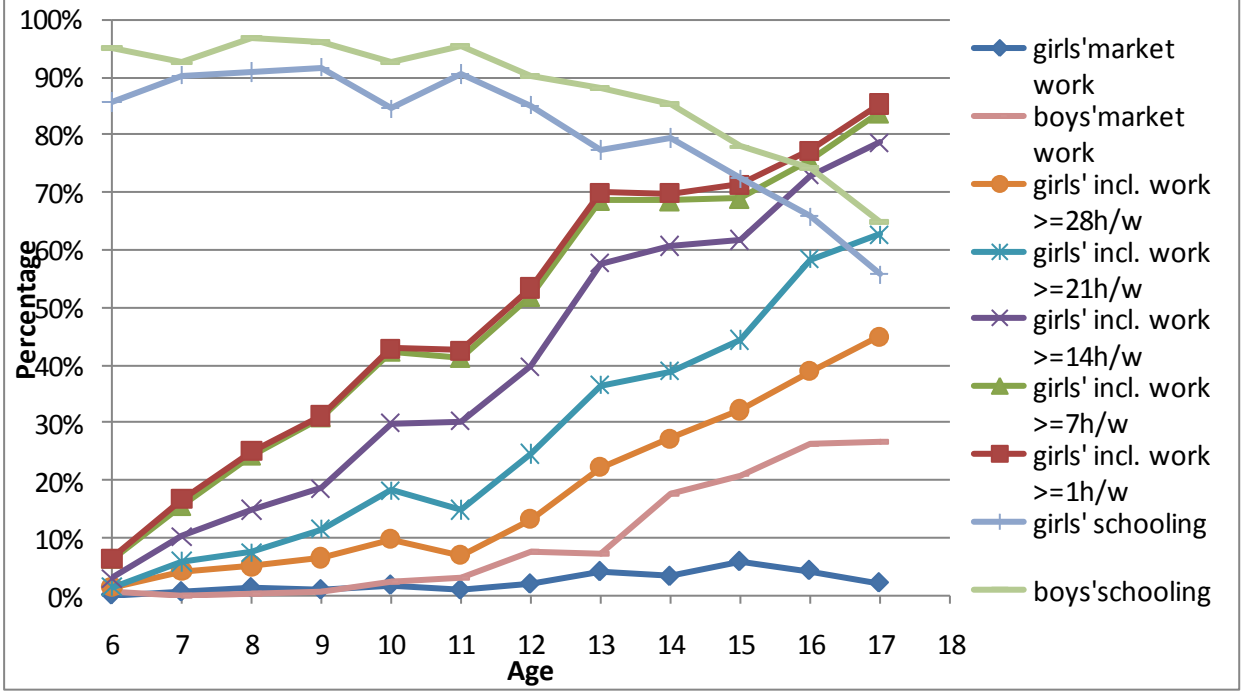


Figure 2

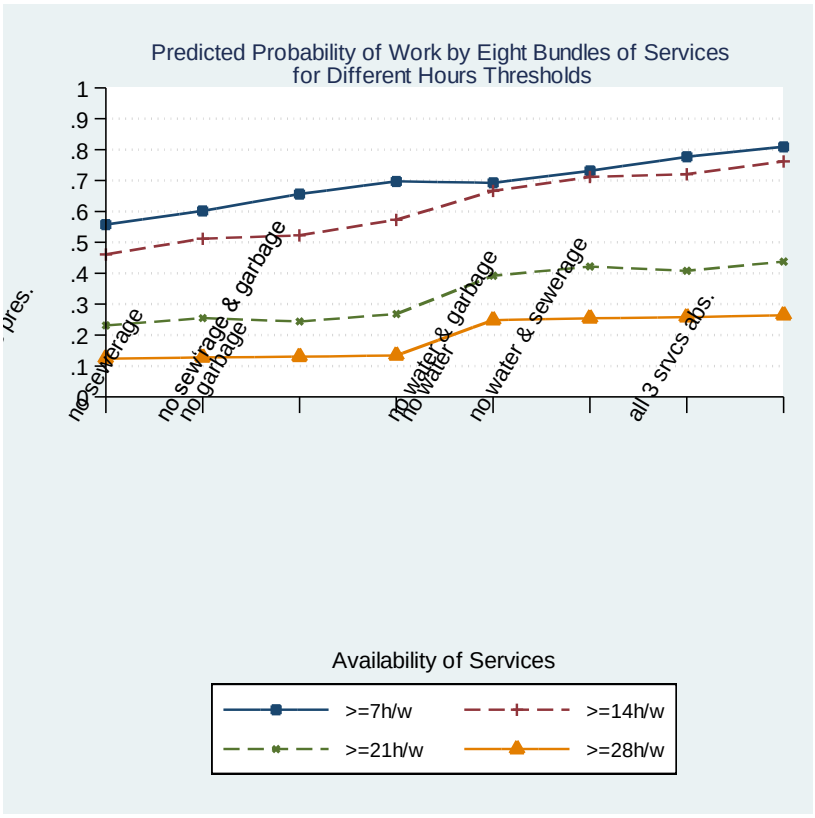

Predicted Probability of Work by Eight Bundles of Services
for Different Hours Thresholds
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
no sewerage
no sewrage & garbage
no garbage
no water
no water & garbage
no water & sewerage
all 3 srvcs abs.
Availability of Services
>=7h/w
>=14h/w
>=21h/w
>=28h/w

Figure 3

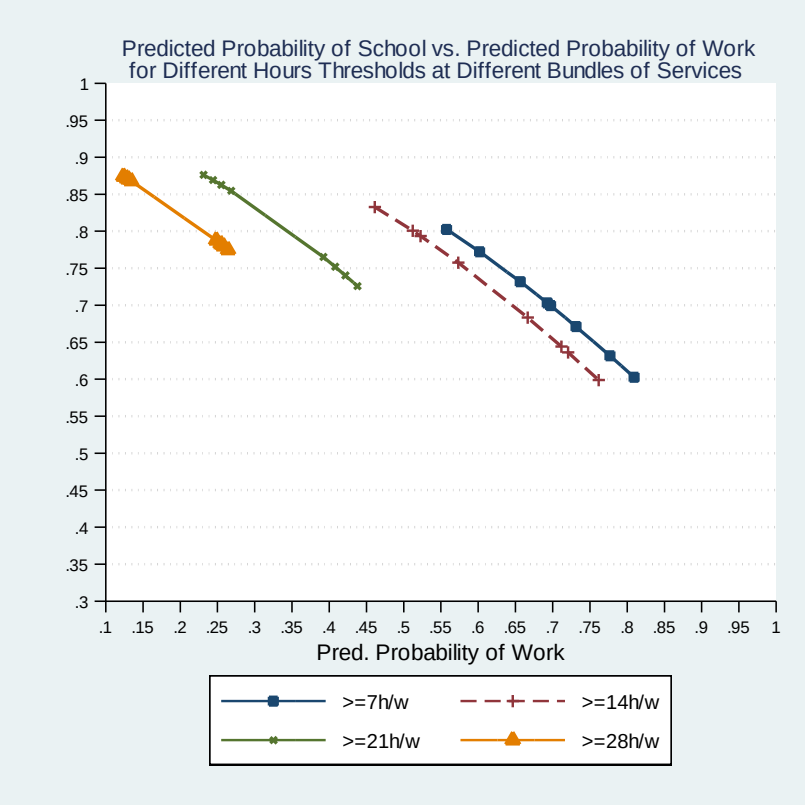

Predicted Probability of School vs. Predicted Probability of Work
for Different Hours Thresholds at Different Bundles of Services
1
.95
.9
.85
.8
.75
.7
.65
.6
.55
.5
.45
.4
.35
.3
.1 .15 .2 .25 .3 .35 .4 .45 .5 .55 .6 .65 .7 .75 .8 .85 .9 .95 1
Pred. Probability of Work
>=7h/w
>=14h/w
>=21h/w
>=28h/w

Figure 4

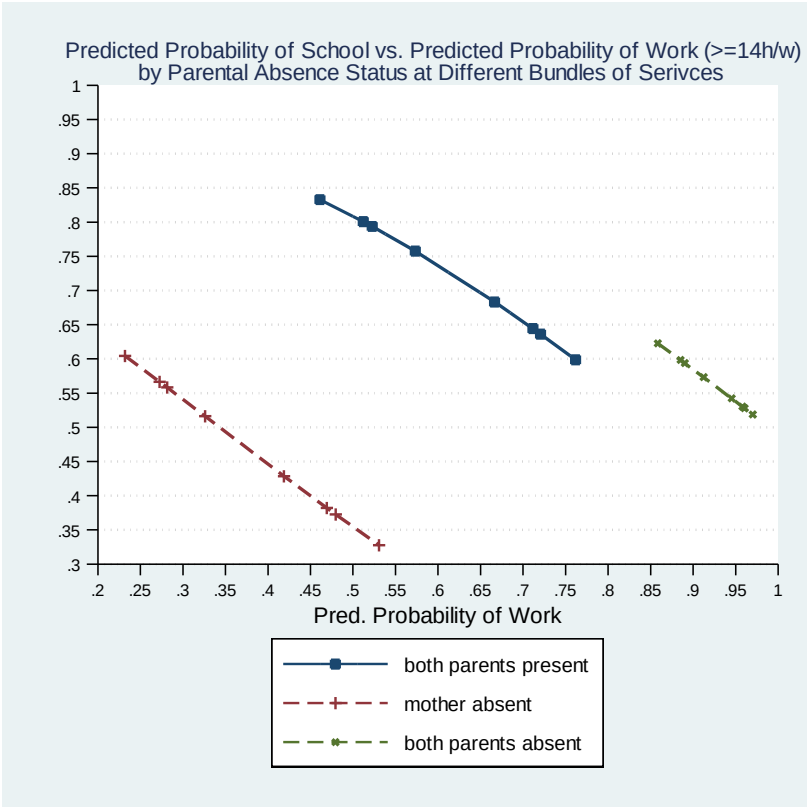
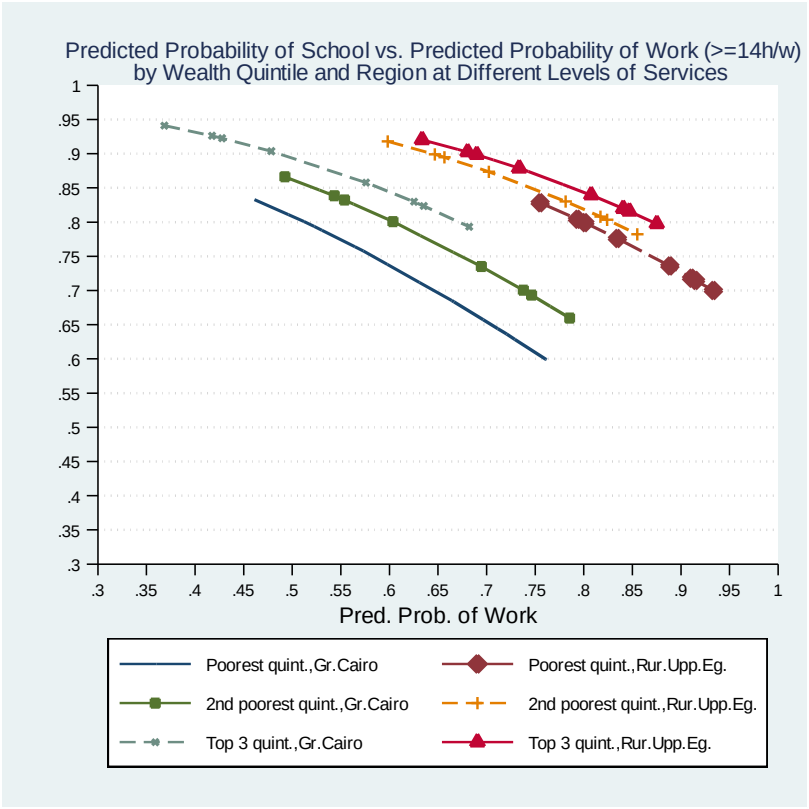

Predicted Probability of School vs. Predicted Probability of Work (>=14h/w)
by Parental Absence Status at Different Bundles of Serivces
1
.95
.9
.85
.8
.75
.7
.65
.6
.55
.5
.45
.4
.35
.3
.2
.25
.3
.35
.4
.45
.5
.55
.6
.65
.7
.75
.8
.85
.9
.95
1
Pred. Probability of Work
both parents present
mother absent
both parents absent

Figure 5


Predicted Probability of School vs. Predicted Probability of Work (>=14h/w)
by Wealth Quintile and Region at Different Levels of Services
1
.95
.9
.85
.8
.75
.7
.65
.6
.55
.5
.45
.4
.35
.3
.3
.35
.4
.45
.5
.55
.6
.65
.7
.75
.8
.85
.9
.95
1
Pred. Prob. of Work
Poorest quint.,Gr.Cairo
Poorest quint.,Rur.Upp.Eg.
2nd poorest quint.,Gr.Cairo
2nd poorest quint.,Rur.Upp.Eg.
Top 3 quint.,Gr.Cairo
Top 3 quint.,Rur.Upp.Eg.

REFERENCES

Aakvik, Arild, James Heckman, and Edward Vytlacil. 2005. "Estimating Treatment Effects for Discrete Outcomes When Responses to Treatment Vary: An Application to Norwegian Vocational Rehabilitation Programs." *Journal of Econometrics* 125(1–2): 15–51.

Abu Gazaleh, Kawther, Lamia Bulbul, Soheir Hewala, and Suadad Najim. 2004. *Gender, Education and Child Labour in Egypt*. Geneva, Switzerland: International Labour Organization (ILO).

Assaad, Ragui and Melanie Arntz. 2005. "Constrained Geographical Mobility and Gendered Labor Market Outcomes under Structural Adjustment: Evidence from Egypt." *World Development* 33(3): 431–54.

Assaad, Ragui, Deborah Levison and Nadia Zibani. 2007. "The Effect of Child Work on Schooling: Evidence from Egypt." Minnesota Population Center Working Paper 2007-4, University of Minnesota. http://www.pop.umn.edu/research/mpc-working-papers-series/2007-working-papers-1 (accessed August 2009)

Beegle, Kathleen, Rakeev Dehejia, and Roberta Gatti. 2005. "Why Should We Care About Child Labor? The Education, Labor Market, and Health Consequences of Child Labor" Working Paper 3479, National Bureau of Economic Research, Cambridge MA.

Benería, Lourdes. 1992. "The Mexican Debt Crisis: Restructuring the Economy and the Household," Chapter 4 in Unequal Burden: Economic Crisis, Persistent Poverty, and Women's Work, ed. Lourdes Benería and Shelly Feldman, Westview: Boulder CO.

Ben-Porath, Yoram. 1980. “The F-Connection: Families, Friends, and Firms and the Organization of Exchange.” *Population and Development Review* 6(1): 1–30.

Bhalotra, Sonia and Christopher Heady. 2003. “Child Farm Labor: The Wealth Paradox.” *World Bank Economic Review* 17(2): 197–222.

Binder, Melissa and David Scrogin. 1999. “Labor Force Participation and Household Work of Urban Schoolchildren in Mexico: Characteristics and Consequences.” *Economic Development and Cultural Change* 48(1): 123–54.

Boozer, Michael A. and Tavneet K. Suri. 2001. “Child Labor and Schooling Decisions in Ghana.” Labor and Population Workshop Paper, Yale University, New Haven, Connecticut.

Boyden, Jo, Birgitta Ling, and William Myers. 1998. *What Works for Working Children*. Stockholm: Radda Barnen and UNICEF.

Canagarajah, Sudharshan and Harold Coulombe. 1998. “Child Labor and Schooling in Ghana.” Policy Research Working Paper 1844. The World Bank, Washington, D.C.

Canals-Cerda, Jose and Cristobal Ridao-Cano. 2004. “The Dynamics of School and Work in Rural Bangladesh.” World Bank Policy Research Working Paper No. 3330. The World Bank, Washington D.C.[http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/07/06/000090341_20040706151558/Rendered/PDF/WPS3330.pdf] (Accessed September 2009).

CAPMAS 1988. *The Ocotber 1988 Round of the Labour Force Sample Survey (LFSS).* Cairo: Central Agency for Public Mobilization and Statistics.

Carrasco, Raquel. 2001. "Binary Choice with Binary Endogenous Regressors in Panel Data: Estimating the Effect of Fertility on Female Labor Participation." *Journal of Business and Economic Statistics* 19(4): 385–94.

Center for Development and Population Activities (CEDPA). 2005. "Girls' Access to Education." *New Horizons and New Visions: Mobilizing Communities for Girls' Education in Egypt*. , Washington, D.C.: CEDPA. www.cedpa.org/files/715_file_FACT_SHEET_Overview_Improving_Girls_Lives_in_Egypt.pdf (Accessed July 2007).

DeGraff, Deborah S. and Richard Bilsborrow. 2003. "Children's School Enrollment and Time at Work in the Philippines." *Journal of Developing Areas* 37(1): 127–58.

Economic Research Forum (ERF) 1998. *Egypt Labor Market Survey of 1998.* Data available from http://www.erf.org.eg.

Edmonds, Eric and Nina Pavcnik. 2005. "Child Labor in the Global Economy." *Journal of Economic Perspectives* 19(1): 199–220.

El-Tawila, Sahar, Omaima El-Gibaly, Barbara Ibrahim, Fikrat El-Sahn, Sunny Sallam, Susan M. Lee, Barbara S. Mensch, Hind Wassef, Sarah Bukhari, and Osman Galal. 1999. *Transitions to Adulthood: A National Survey of Egyptian Adolescents.* Cairo: Population Council.

Elbadawy, Asmaa, Ragui Assaad, Dennis Ahlburg and Deborah Levison. 2004. "Private and Group Tutoring in Egypt: Where is the Gender Inequality?" *Economic Research Forum Working Paper* No. 200429, Economic Research Forum, Cairo, Egypt [www.erf.org.eg]

Fafchamps, Marcel and Jackline Wahba. 2006. “Child Labor, Urban Proximity and Household Composition.” IZA Discussion Paper 1966, Institute for the Study of Labor (IZA) and University of Bonn.

Filmer, Deon and Lant Pritchett. 2001. “Estimating Wealth Effects without Income or Expenditure Data – or Tears: Education Enrollment in India.” *Demography* 38 1: 115–32.

Freije, Samuel and Luis F. Lopez-Calva. 2001. *Child Labor, School Attendance, and Poverty in Mexico and Venezuela.* Mexico City: Centro de Estudios Económicos, El Colegio de México.

Goulart, Pedro and Arjun S. Bedi. 2008. “Child Labour and Educational Success in Portugal.” *Economics of Education Review* 27(5): 575–87.

Grootaert Christiaan. 1999. “Child Labor in Cote-d’Ivoire,” in Christiaan Grootaert and Harry Anthony Patrinos, eds. *The Policy of Child Labor: A Comparative Study*, pp. 23–62. New York: St. Martin’s Press.

Grootaert, Christiaan and Ravi Kanbur. 1999. “Child Labor: A Review.” Policy Research Working Paper 1454, The World Bank, Washington, D.C.

Grootaert, Christiaan, and Harry Anthony Patrinos, eds. 1999. *The Policy Analysis of Child Labor: A Comparative Study*. New York: St. Martin’s Press.

Gunnarsson, Victoria, Peter Orazem, and Mario A. Sánchez. 2006. “Child Labor and School Achievement in Latin America.” *World Bank Economic Review* 20(1): 31–54.

Hazarika, Gautam and Arjun S. Bedi. 2003. “Schooling Costs and Child Work in Rural Pakistan.” *Journal of Development Studies* 39(5): 29–64.

Heady, Christopher. 2000. "What is the Effect of Child Labour on Learning Achievement? Evidence from Ghana." Innocenti Working Paper 79, UNICEF Innocenti Research Centre, Florence.

Hoodfar, Homa. 1986. *Child Care and Child Survival in Low-Income Neighborhoods of Cairo*. MEAwards Working Paper, No. 29. Cairo: The Population Council.

———. 1996. "Survival Strategies and the Political Economy of Low-Income Households in Cairo," in Diane Singerman and Homa Hoodfar, eds. *Development, Change, and Gender in Cairo: A view from the Household*, pp. 1–26. Bloomington IN: Indiana University Press.

Ibrahim, Barbara, Sunny Sallam, Sahar El-Tawila, Omaima El-Gibaly, and Fikrat El-Sahn. 2000. *Transitions to Adulthood: A National Survey of Egyptian Adolescents*. New York: The Population Council.

International Labour Organization (ILO). 1982. Resolution concerning statistics of the economically active population, employment, unemployment and underemployment, adopted by the Thirteenth International Conference of Labour Statisticians (October 1982). [http://www.ilo.org/public/english/bureau/stat/download/res/ecacpop.pdf] Accessed August 12, 2009.

International Labour Organization (ILO). 2002. *Current International Recommendations on Labour Standards*. Geneva, Switzerland: International Labour Office.

Jensen, Peter and Helena Skyt Nielson. 1997. "Child Labor or School Attendance? Evidence from Zambia." *Journal of Population Economics* 10: 407–24.

Kamphoefner, Kathy R. 1996. “What’s the Use? The Household, Low-Income Women, and Literacy,” in Diane Singerman and Homa Hoodfar, eds. *Development, Change, and Gender in Cairo*, pp. 80–109. Bloomington IN: Indiana University Press.

Kandel, William and David Post. 2003. “After School Work in Mexico: Competing for Children’s Time Success.” *International Journal of Educational Development* 23(3): 299–314.

Knaul, Felicia. 1995. “Young Workers, Street Life and Gender: The Effect of Education and Work Experience on Earnings in Colombia.”, PhD diss., Harvard University.

Langsten, Ray and Tahra Hassan. 2007. “Basic Education Attainment in Egypt: Trends and Determinants.”Paper presented at the 2007 Annual Meeting of the Population Association of America (PAA). New York, March 29-31.

Langsten, Ray and Tahra Hassan. 2009. “Education Transitions in Egypt.” Poster presented at the 2009 annual Meeting of the Population Association of America (PAA). Detroit, MI, April 30-May 2.

Lee, Lung Fei. 1992. “Amemiya’s Generalized Least Squares and Tests of Overidentification in Simultaneous Equation Models with Qualitative or Limited Dependent Variables.” *Econometric Reviews* 11 (3): 319–28.

Levison, Deborah. 2000. “Children as Economic Agents.” *Feminist Economics* 6(1): 125–34.

Levison, Deborah, Jasper Hoek, David Lam, and Suzanne Duryea. 2007. "Intermittent Child Employment and Its Implications for Child Labour Estimates." *International Labour Review* 146(3–4): 217–51.

Levison, Deborah and Karine S. Moe. 1998. "Household Work as a Deterrent to Schooling: An Analysis of Adolescent Girls in Peru." *Journal of Developing Areas* 32(3): 339–56.

Levison, Deborah, Karine S. Moe, and Felicia Knaul. 2001. "Youth Education and Work in Mexico." *World Development* 29(1): 167–88.

Levy, Victor. 1985. "Cropping Pattern, Mechanization, Child Labor, and Fertility Behavior in a Farming Economy: Rural Egypt." *Economic Development and Cultural Change* 33(4): 777–91.

Lloyd, Cynthia, Sahar E. Tawila, Wesley Clark, and Barbara Mensch. 2003. "The Impact of Educational Quality on School Exit in Egypt." *Comparative Education Review* 47(4): 444–67.

McCall, Brian. 1992. "A Note on the Identifiability of a Dynamic Binary Choice Model with State Dependence." *Economic Letters* 40(3): 273–80.

Mensch, Barbara S., Barbara L. Ibrahim, Susan M. Lee, and Omaima El-Gibaly. 2003. "Gender-role Attitudes among Egyptian Adolescents." *Studies in Family Planning* 34(1): 8–18.

Moffitt, Robert. 2005. "Remarks on the Analysis of Causal Relationships in Population Research." *Demography* 42(1): 91–108.

Mueller, Eva. 1984. “The Value and Allocation of Time in Rural Botswana.” *Journal of Development Economics* 15(1–3): 329–60.

Netz, Janet S. and Jon D. Haveman. 1999. “All in the Family: Family, Income, and Labor Force Attachment.” *Feminist Economics* 5(3): 85–106.

Egypt Ministry of Education. 2003. “The National Plan for Education for All (2002/2003–2015/2016).” Arab Republic of Egypt Ministry of Education.

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

Post, David and Suet-ling Pong. 2000. “Employment During Middle School: The Effects on Academic Achievement in the U.S. and Abroad.” *Educational Evaluation and Policy Analysis* 22(3): 273–98.

Psacharopoulos, George. 1997. “Child Labor versus Educational Attainment: Some Evidence from Latin America.” *Journal of Population Economics* 10(4): 377–86.

Psacharopoulos, George and Ana Maria Arriagada. 1989. “The Determinants of Early Age Human Capital Formation: Evidence from Brazil.” *Economic Development and Cultural Change* 37(4): 683–704.

Reynolds, Pamela. 1991. *Dance Civet Cat: Child Labour in the Zambezi Valley*. Athens, OH: Ohio University Press.

Rosenzweig, Mark R. 1977. “Farm-Family Schooling Decisions: Determinants of the Quantity and Quality of Education in Agricultural Populations.” *Journal of Human Resources* 12:71–92.

Skoufias, Emmanuel. 1994. “Market Wages, Family Composition and the Time Allocation of Children in Agricultural Households.” *Journal of Development Studies* 30(2): 335–60.

Stinebrickner, Ralph and Todd R. Stinebrickner. 2003. “Working During School and Academic Performance.” *Journal of Labor Economics* 21(2): 473–91.

Sultana, Ronald G. 2007. *The Girls’ Education Initiative in Egypt*. Report presented to the National Council for Childhood and Motherhood (NCCM), Cairo, Egypt.

Tyler, John H. 2003. “Using State Child Labor Laws to Identify the Effect of School-Year Work on High School Achievement.” *Journal of Labor Economics* 21(2): 381–408.

Tzannatos, Zafiris. 2003. “Child Labor and School Enrollment in Thailand in the 1990s.” *Economics of Education Review* 22(5): 523–36.

Wahba, Jackline. 2006. “The Influence of Market Wages and Parental History on Child Labour and Schooling in Egypt.” *Journal of Population Economics* 19: 823–52.

Zibani, Nadia. 2002. “Gender Differentials in Children’s Work Activities: 1988–98,” in Ragui Assaad, ed. *The Egyptian Labor Market in an Era of Reform*, pp. 178–220. New York: American University in Cairo Press.

APPENDIX

Household wealth proxy

To capture the effect of wealth on child labor and schooling we constructed a composite variable based on the ownership by the household of a list of 23 durable goods and on a series of housing characteristics, such as type of floor and ceiling and number of rooms. Following Deon Filmer and Lant Pritchett (2001), we used factor analysis to obtain the weights that combine the various indicators into a single composite "wealth" score. Since we are using the asset index as a proxy for household wealth, it refers to the long-run economic status of households rather than its current poverty or consumption status.

Because wealth in urban and rural areas take different forms, a single index was not adequate to rank urban and rural households along a wealth continuum. We therefore opted to construct separate wealth scores for urban and rural households. To allow for non-linearity in its effect, we used the wealth score to construct a series of dummy variables indicating whether the household is in the bottom, next to bottom, or top three quintiles of wealth distribution in urban and rural areas respectively. We created the set of wealth quintile variables included in the regression by interacting the urban and rural indices (in quintiles) with the corresponding urban/rural dummy variables. This allows the wealth index to differ for urban and rural households. The reference category describes residents of greater Cairo who are in the lowest wealth quintile.

The analysis combines measures of wealth that can be broken down conceptually into housing assets, durable goods, and financial assets, as follows:

(1) Housing quality variables: number of rooms; quality of material of walls, floor, and roof; presence of a telephone; and access to the electricity network. (Each of these indicators was ranked from worst to best on a two or three point scale).

(2) Ownership of durable goods including: fridge, freezer, dishwasher, color TV, black and white TV, VCR, air conditioner, microwave, gas stove, kerosene stove, fan, water heater, space heater, sewing machine, iron, radio, washing machine, camera, bicycle, motorcycle or scooter, automobile, taxicab, and truck

(3) Access to interest or dividend income from financial assets and bank deposits.

Like Filmer and Pritchett (2001) we decided to only retain the first factor, which captures the largest amount of information that is common to all the variables. Appendix Table 1 reports the scoring coefficients for this factor. These estimates are obtained using the maximum-likelihood estimation method without rotation, retaining only one factor. The results are very robust to the retention of more factors and to estimation method. Theoretically, the asset index is a standardized variable with zero mean and a standard deviation of 1. The estimation routines never yield a standard deviation of exactly one, unless an exact solution to the factor model is found. Our model yields standard deviations of 0.941 in urban areas and 0.937 in rural areas. Since most variables are measures as 0 or 1, a change from zero to 1 would change the asset score by the value of the variable's coefficient divided by its standard deviation. So, for example, owning a telephone increases the asset score by 0.23 in urban areas and by 0.25 in rural areas. Owning a refrigerator increases it by 0.38 and 0.37 respectively.

Appendix Table 1. Scoring Coefficients and Summary Statistics for Variables Entering the Computation of the First Factor

	urban households			rural households		
	scoring coefficients	Mean	SD	scoring coefficients	Mean	SD
number of rooms in dwelling	0.056	3.584	1.151	0.033	4.048	1.778
quality of wall materials	0.020	0.803	0.398	0.037	0.594	0.491
quality of floor materials	0.064	0.94	0.237	0.084	0.576	0.494
quality of roof materials	0.065	0.892	0.31	0.073	0.506	0.5
own a phone	0.117	0.484	0.5	0.090	0.149	0.357
own a fridge	0.127	0.875	0.331	0.187	0.46	0.499
own a stand alone freezer	0.039	0.074	0.262	0.027	0.012	0.111
own a dishwasher	0.017	0.026	0.158	0.015	0.005	0.071
own a color TV	0.161	0.758	0.429	0.148	0.329	0.47
own a black and white TV	-0.049	0.275	0.446	-0.031	0.521	0.5
own a VCR	0.066	0.209	0.407	0.046	0.03	0.17
own an air-conditioner	0.035	0.054	0.225	0.019	0.005	0.073
own a microwave	0.009	0.017	0.129	0.012	0.011	0.106
own a gas stove	0.089	0.852	0.355	0.122	0.557	0.497
own a kerosene stove	-0.062	0.437	0.496	-0.049	0.724	0.447
own an electrical fan	0.091	0.773	0.419	0.105	0.496	0.5
own a water heater	0.153	0.538	0.499	0.105	0.102	0.303
own a space heater	0.044	0.099	0.299	0.032	0.022	0.147
own a sewing machine	0.038	0.229	0.42	0.037	0.097	0.295
own an iron	0.130	0.792	0.406	0.162	0.461	0.499
own a radio	0.065	0.832	0.374	0.059	0.689	0.463
own a washing machine	0.078	0.925	0.264	0.109	0.687	0.464
own a camera	0.055	0.162	0.369	0.048	0.047	0.212
own a bicycle	0.021	0.18	0.384	0.026	0.188	0.391
own a motorcycle or scooter	0.006	0.015	0.122	0.020	0.018	0.135
own an automobile	0.050	0.108	0.31	0.036	0.019	0.137
own a taxicab	0.006	0.01	0.101	0.007	0.008	0.089
own a truck	0.008	0.011	0.104	0.013	0.006	0.076
Asset Index		0	0.941		0	0.937

Notes: All variables except for number of rooms take on a value of zero and one. Number of rooms ranges from 1 to 12 in urban areas and 1 to 20 in rural areas.