Essays on education and child labor in developing countries

by

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Supervisory Committee

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Abstract

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Child labor can affect human capital investment of children, as the daily available time is limited and an increase in time devoted to child labor reduces the available time for investment in human capital. The tradeoff between child labor and human capital investment is important, as the accumulation of human capital is a crucial factor in curtailing poverty and accelerating development plans undertaken by developing countries. The United Nations Convention on the Rights of the Child emphasizes the importance of education and urges nations not to engage children in work that may interfere with their education. This research is comprised of four chapters that study the relationship between human capital investment and child labor. In the first chapter, I examine the available theoretical and empirical literature to determine the main factors that affect the tradeoff between child labor and human capital investment. The literature identifies income, access to credit, returns to education, and parental preferences as the main factors. In chapter 2, I investigate and analyze the Egyptian's SYPE dataset that I use in chapter 3 and chapter 4. The SYPE is the most recent household survey dataset that provides data on education and child labor of Egyptian young people. In chapter 3 and chapter 4, I use the SYPE data for children aged 10 to 17 to study the relationship

between child labor measured by household work and human capital investment measured by hours spent in schooling-related activities and by school attendance.

Chapter 3 focuses on the gender difference in household work and human capital investment and introduces an identity framework (Akerlof and Kranton, 2010) to explain these differences. The chapter first establishes the puzzle that although females spend about twice more time in household work relative to males, there is no difference across gender in human capital investment. This is a puzzle because one would expect that the extra burden on females should impair their ability to invest in human capital and prevent them from 'catching up' ending up with the same amount of human capital investment as males. To resolve the puzzle, I introduce a model of identity where there are two social groups, males and females, and social norms determine time allocation for each social group. The model of identity should be understood as an additional framework, that supplements standard time allocation and human capital investment models (Becker, 1962). It captures differences across genders that are difficult to understand otherwise. I infer the norms from sociological research as well as from answers to questions in SYPE that shed light on gender expectations. The evidence on norms is surprisingly consistent with the time allocation patterns. Thus, a simple model of identity suggests that norms play a large role in explaining gender differences in time allocation and females' ability to 'catch-up' in human capital investment despite a heavier household work burden. In the fourth chapter, I study the impact of household work on girls' human capital investment using an instrumental variable approach and two-stage least squares (2SLS). Human capital investment is measured by school attendance and hours spent in school-related activities. Access to public services, and sisters-to-siblings ratio are used

as instruments for household work. I do not find a significant effect of household work on girls' school attendance. Measuring human capital investment by hours spent in school-related activities, I find that household work has a significant and sizable effect on human capital investment for girls. Increasing household work by one hour reduces hours spent investing in human capital by 2.096 hours. The effect of household work on hours of human capital investment occurs through the effect of household work on homework and private tutoring time, as the effect of household work on time in school is insignificant. The effect of household work on homework time is higher than its effect on private tutoring time (0.612 and 0.572 respectively).

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Chapter 1 : A Review of the Literature on the Trade-off between Child Labor and Human Capital Investment

1. Introduction

Child labor can affect human capital investment of children, as the daily available time is limited and an increase in time devoted to child labor reduces the available time for investment in human capital and vice versa. Despite the large research on child labor and human capital investment, no study has reviewed the literature to examine the tradeoff between human capital investment and child labor. The aim of this chapter is to do so. The main factors that affect this tradeoff are income, access to credit, returns to education, and parental preferences.

The theory shows that income has a negative effect on child labor and a positive effect on human capital investment measured by schooling (Basu and Van, 1998; Basu, 2000). Most empirical studies find evidence for this theoretical result with some notable exceptions (Neilsen, 1998; Ray, 2000; Edmonds, 2005). The different results of the empirical research are due to the nonlinear effect of income on child labor and human capital investment. The effect of income may become significant at certain income levels and is negligible at other levels.

The theory shows that credit market imperfections increase child labor and reduce human capital investment. If there were no credit constraints, poor parents would borrow to send children to school. Assuming education is worth undertaking, income hinders human capital investment and increases child labor only if credit constraints exist. The empirical research finds evidence for the existence of credit market imperfections. In addition, the empirical research finds evidence that removing credit constraints increases

schooling and reduces child labor (Ersado et al., 2005; Dehejia and Gatti, 2002; and Beegle et al., 2006). However, there could be an adverse effect of removing credit constraints at low income levels. Removing credit market imperfections allows parents to borrow to establish a family business in which child labor becomes more productive. Although this adverse effect is not investigated by theoretical works, few empirical studies find evidence for the effect (Maldonado and Gonzalez-Vega, 2008).

Assuming that everybody faces the same return to education indicates that the same amount of education achieved by children with the same abilities results in the same payoff in the labor market when the children become adults. However, this is not the case in many countries, where returns to education differ across regions and groups. The lower school quality in some regions leads to lower returns to the same years of education acquired in better schools, and thus lower future earnings. On the other hand, variable earnings can still occur despite the same educational quality when there is labor market discrimination against certain groups such as females and specific ethnic groups. Moreover, children of parents with a higher educational level are likely to get a higher return to the same amount of education. The theory that considers differential returns to education finds that children of poor households facing a lower return to education are more likely to work.

The empirical evidence demonstrates that the relative importance of income and returns to education differs across gender, as Bhalotra (2007) finds that income is the crucial factor that affects child labor and schooling for boys while the return to education is what mostly affects child labor and schooling for girls. Accordingly, enhancing the

economic conditions of the poor and improving girls' schools may result in an increase in human capital investment for boys and girls respectively.

Parental preferences affect human capital investment and child labor. The theory represents parental preferences in several forms such as the degree of altruism towards children, preferences towards gender, and cultural norms. The degree of altruism is represented in the literature by the weight given to the child's welfare in the parents' utility function. This weight affects the optimal choice of child labor and human capital investment. In addition, the theory finds that parents' preferences towards boys lead in general to more child labor and less schooling for girls. The empirical research finds evidence for favoring boys through more schooling and less household work. However, this finding does not indicate that this favoring is due to son preference. For example, parents may spend more on son's education due to existing labor market discrimination against girls.

Putting the previous factors in an order of priority is not possible since the relative importance of each factor depends on the economic environment. For example, in countries where the differences in the quality of schooling are negligible, income is more important in determining the tradeoff between human capital investment and child labor than returns to education. On the other hand, when differential returns to education exist in a society, enhancing the educational opportunities of the less-fortunate families and reducing discrimination should be the priorities of policy.

In section 2, I use the model of Edmonds (2007) as a general framework that summarizes the main factors that affect the tradeoff between human capital investment

and child labor. In section 3, I provide a review of the theoretical literature that examines parents' choices on child labor and human capital investment, together with the empirical work that tests the implications of the theory. In section 4, I examine the empirical research that investigates the tradeoff between child labor and human capital investment. First, I consider the studies that examine the correlation between human capital investment and child labor where investment in human capital is measured by schooling criteria such as test scores, school attendance, school enrolment, and grade repetition. Second, I review the research that studies the causal effect of child labor on human capital investment, using an IV approach.

2. General framework

In this section, I represent the analytical model introduced by Edmonds (2007). This model constitutes the framework that summarizes the main factors covered by the literature on the tradeoff between human capital investment, measured by schooling, and child labor. These factors include income, returns to education, and parental preferences. In addition, the model identifies different types of child labor.[1]

The model is based on a household with 1 parent and 1 child and two periods. The parent's labor supply is inelastic and the resulting income Y from this labor is exogenous. The parent maximizes a utility function that depends on the current standard of living of the family S and the child's welfare V_k. The parent chooses how to allocate the child's

[1] Three categories of work are considered in the literature: market work, subsistence work, and household chores. Market work comprises producing goods and services for market exchange. Subsistence work involves the production of primary goods for domestic use, such as livestock rearing and making dairy products. Household chores include childcare, chores done inside the house such as cooking and doing laundry, and chores done outside the house such as garbage disposal and fetching water.

time between education E which includes all school-related activities, leisure and play P, market and subsistence work M, and domestic work H. The allocation of the child's time occurs such that E + P + M + H = 1. The family's standard of living is a function of purchased inputs c and the input of child time in domestic work H: $S = F(c, H)$, where $c = Y + wM - eE$, w is the child's wage rate in the labor market, and e is the direct cost per unit of schooling. The child's welfare V_k depends on the production function: $V_k = R(E, P)$. The parent maximizes the following utility function:

$$\max_{E,H,M,P} U(F(c, H), V_k) \tag{1.1}$$

$$subject\ to: E + P + M + H = 1, E \geq 0, P \geq 0, M \geq 0, H \geq 0$$

The first order conditions are as follows:

$$w.r.t\ \ E \qquad \frac{\partial U}{\partial V_k}\frac{\partial R}{\partial E} = \lambda + \frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\, e \tag{1.2}$$

$$w.r.t\ \ M \qquad \frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\, w = \lambda \tag{1.3}$$

$$w.r.t\ \ H \qquad \frac{\partial U}{\partial S}\frac{\partial F}{\partial H} = \lambda \tag{1.4}$$

$$w.r.t\ \ P \qquad \frac{\partial U}{\partial V_k}\frac{\partial R}{\partial P} = \lambda \tag{1.5}$$

This setting clarifies that children spend their time in schooling activities, leisure, market work, and household chores. Equation (1.4) shows that the optimal level of household work H depends on λ, which in turn is a function of the other choice variables

as shown in equations (1.2), (1.3), and (1.5). When the main concern is the tradeoff between human capital investment and child labor, measures of child labor should account for both market work and household chores.

According to equation (1.1), the level of income is one of the determinants of the feasible set available to the household. Thus, the level of income determines the optimal choice of the child's activities. Equation (1.1) considers the returns to education by assuming that child's welfare depends on the child's education. Further, equation (1.1) shows that parental preferences affect the distribution of child's time between work and non-work activities through assigning weights to *S* and *R*.

3. A review of the theories of the tradeoff between child labor and human capital investment

3.1. Income

Parents may send their children to work if they do not have enough income to provide for the needs of the household. In equation (1.1), the level of income determines how parents value child work inside and outside the house. The level of income is one of the determinants of the feasible set available for the household, and thus the optimal distribution of a child's time between different activities. If parents are very poor, the feasible set is relatively small. Thus, there is potential need to increase M and H to realize a higher standard of living.

The effect of poverty on the parents' choice to send their children to work is examined in Basu and Van (1998) and in Basu (2000). Basu and Van (1998) address a crucial policy question: does banning child labor increase the welfare of society? Basu

(2000) uses the model in Basu and Van (1998) to investigate the effectiveness of setting an adult minimum wage on preventing child labor.

The main assumption in Basu and Van (1998) is referred to as the luxury axiom. The luxury axiom indicates that households do not send their children to work unless they are constrained by poverty where, in the absence of the income generated by the child, the consumption of each family member falls below the subsistence level of consumption. Accordingly, adults do not put their children to child labor unless the adult's wage falls below the level that fulfills the subsistence needs of the household. In equation (1.1), the luxury axiom is partly represented by the fact that parents positively value child's leisure. Unlike Basu and Van's (1998) model, work and schooling are continuous variables and there is no subsistence constraint. The subsistence constraint can easily be incorporated by requiring that $S \geq \overline{S}$ at the optimal solution.

In Basu and Van (1998), the household's choice of child labor determines the supply of labor whereas adults supply labor inelastically. The interaction between labor supply and labor demand dictates the labor market equilibrium within which the equilibrium levels of wages and employment are determined. Two equilibria may exist: an equilibrium where wages are high and only adults work and an equilibrium where wages are low and both adults and children work.

The economic environment, represented by the conditions of labor supply and labor demand, determines the states of equilibria in an economy, and thus the levels of child labor and schooling. If the economic environment is such that both equilibria exist while the economy is settled at the one where there is child labor, imposing a ban on

child labor can move the economy to the equilibrium where the market wage is high enough to prevent parents from sending the children to work. Once the economy is at the equilibrium where there is no child labor, there is no longer need for the ban because earning the subsistence wage automatically stops the parents from involving their children in child labor. On the other hand, if only the equilibrium, where wages are low and children work, exists in an economy, banning child labor may result in households being worse off at the new equilibrium where only adults work because the wage level is less than the threshold necessary for meeting the subsistence needs.

While Basu and Van (1998) examine the effect of banning child labor, Basu (2000) investigates the effectiveness of setting an adult minimum wage on preventing child labor. Basu (2000) finds that child labor may increase when a minimum wage is imposed because imposing a minimum wage, while the adults' labor supply is fixed, results in some adults being unemployed. Unemployed adults may send their children to work and they are more likely to do that when they do not get unemployment benefits, which is the case in most developing countries. Thus, imposing a minimum wage is less likely to prevent child labor in developing countries.

The luxury axiom assumed in Basu and Van (1998) is tested in some empirical papers. If the luxury axiom is fulfilled, children do not work if the household meets its subsistence needs. In addition, several papers test the negative relationship between income and child labor and the positive relationship between income and schooling, as represented by the general framework.

Neilsen (1998) and Ray (2000) test the luxury axiom using datasets from Zambia and Peru respectively, where the household's poverty status is measured relative to an established poverty line. Neilsen (1998) and Ray (2000) do not find evidence for the luxury axiom. Neilsen (1998) finds that child labor is not in general sensitive to changes in income and that the effect of income is even positive for some children groups and thus she argues that income subsidies should be carefully targeted to certain groups with the condition that children should stay in school and not work at all. Using a dataset from Ghana, Blunch and Verner (1999) measure poverty by the poverty quintile the household pertains to and find evidence for the luxury axiom. The dependent variable used by Blunch and Verner (1999) measures if the main activity of the child in the past four weeks was a labor-related one rather than being in school. Child labor in this context is considered harmful because it involves a trade-off between work and human capital that favors work.

Using a dataset from Ghana, Canagarajah and Coulombe (1997) test the relationship between per-capita income expenditure and child labor and schooling and conclude that income does not have a significant effect on either child labor or schooling. On the other hand, the negative effect of income on child labor and the positive effect of income on schooling are supported by the evidence in Wahba (2006) and Kambhampati and Ranjan (2005) who use wages to proxy for income. Using the 1988 Labour Force Sample Survey in Egypt, Wahba (2006) finds that the increase in the adult market wage rate and the decrease in income inequality (measured by regional average wages) reduce the probability of child labor, more for boys than girls. Utilizing a dataset from rural India, Kambhampati and Ranjan (2005) use mother's and father's wages to proxy for

income and find that the father's wage has a negative effect on the probability of child labor and a positive effect on the probability of schooling, and that the effect is monotonic and continuous. On the other hand, the effect of the mother's wage on work and schooling is not monotonic. The mother's employment increases the probability of child labor and reduces the probability of schooling, especially for girls, and this effect can only be offset by the increase in the mother's wage when the latter is high enough.

Income can be endogenous to household's decisions on child labor and schooling. Several observed and unobserved factors can affect the household's income and the household's decisions on child labor and schooling as well. For example, well-educated and ambitious parents are likely to earn more income. Meanwhile, well-educated and ambitious parents are likely to take good care of their children's education. To overcome the problems associated with the endogeneity of household's income, three studies exploit exogenous variations in income by considering the effect of household income shocks on child labor and schooling. Beegle et al. (2006) measure the income shock by poor crop harvest in Tanzania, while Dammert (2008) uses the shift in cocoa production from Peru to Colombia in 1995. Duryea et al. (2007) measure the economic shock by the unemployment spells of household heads in Brazil. The three studies find that child labor is used as a buffer stock to confront income shocks, as child labor increases with the shock and starts to decrease with the recovery. However, there is no consensus on the effect of the economic shock on schooling. Dammert (2008) finds that the shift in cocoa production does not affect schooling in Peru while Duryea et al. (2007) find that the unemployment shocks increase the probability of children dropping out of school and performing poorly at school.

The differences in the empirical results regarding the effect of income on child labor and schooling may be explained by the evidence for the nonlinear effect of income. Using a nonparametric method to account for the nonlinearity in the relationship between child labor and income, Edmonds (2005) concludes that the relationship between per capita expenditure and child labor is nonlinear in the sense that the link between income and child labor is not found among the richest and the poorest households but exists among the households whose income is just above the poverty line level. Dammert (2005) finds that the effect of income on child labor is sizable and significant for low-income households while the effect is negligible and flat for wealthy households.

Using landholdings to measure income raises concerns. More landholdings generate return, which encourages adults to forgo the income of child labor. This negative effect of farm size on child labor is referred to as the wealth effect. On the other hand, the marginal product of labor and the value of work experience increase with the increase in landholdings. This positive effect of farm size on child labor is referred to as the substitution or incentive effect. The imperfections of land and labor markets reinforce the substitution and incentive effects. In the absence of imperfections, land holders could hire workers or sell their lands instead of employing their children in the lands. Empirical research finds evidence for the positive effect of farm size on child labor (Bhalotra and Heady, 2003; Congdon Fors, 2007; Dumas, 2007).

The empirical research on the effect of landholdings on child labor motivated Bar and Basu (1999) and Basu et al. (2010) to model the non-linear relationship between landholdings and child labor. The imperfections in labor and land markets are accounted for, in these models, by assuming that children can only work on their own land, and that

households cannot hire adult labor to work on their lands. When wealth, in the form of land, first increases, people get an incentive to employ their children who would not otherwise find work opportunities because of the labor and land market imperfections. As the land size continues to increase, these people become better-off and are likely not to let their children work and thus child labor decreases. This gives rise to an inverted U relationship. Using a dataset from India, Basu et al. (2010) find evidence for the inverted U relationship between landholdings and child labor if child labor is measured inclusively (considering domestic work as well as market work), and also when domestic work is excluded. The effect of land holdings on child labor is stronger when domestic work is included.

3.2. Credit constraints

Credit market imperfections have two opposing effects on child labor and schooling. Poor parents may send their children to school and refrain from sending children to work if they are able to borrow. Thus, credit market imperfections that hinder parents' borrowing increase child labor and reduce schooling. There could be an adverse effect of removing credit market imperfections at low income levels. Parents may borrow to establish a business and in this business, child labor is more productive. In equation (1.1), credit constraints are implicitly assumed (there is no credit market) and education is an investment good. Children's education needs to be paid by current income and parents are not allowed to borrow against their children's future earnings. Income therefore affects human capital investment and child labor only in the presence of credit constraints.

The available theoretical research (Ranjan, 1999; Baland and Robinson, 2000; Pouliot, 2006; and Rogers and Swinnerton, 2004) shows that credit market imperfections increase child labor and reduce schooling. Ranjan (1999) finds that whatever the income of the household, parents always choose to send their children to school as long as there are no credit constraints. Parents can borrow against their future earnings to send the children to school. When households cannot borrow or lend freely in the credit market, they are not able below a certain income level to send their children to school. Ranjan (1999) demonstrates that credit market constraints act with poverty to force parents to send their children to work. Thus, removing credit constraints allows poor parents to borrow to finance the schooling of the children.

Baland and Robinson (2000) construct a model in which parents decide how to allocate their children's time endowment between school and work according to a tradeoff between current earnings and human capital accumulation and investigate the conditions under which the child labor decision results in a loss of efficiency. In their allocation decision, parents are affected by the constraints they face in the credit market. In Baland and Robinson's (2000) model, parents choose child labor supply, savings, and the level of bequests they will give to the children. When there are no credit market imperfections and parents can save and give bequests, parents choose child labor such that the return to schooling in terms of the child's future income is equal to the opportunity cost of schooling in terms of forgone child labor's earnings. When there are credit market imperfections and parents cannot save or cannot give bequests, child labor is inefficiently high, as the marginal return to schooling is higher than the opportunity cost of schooling.

Pouliot (2006) examines the changes in the results of Baland and Robinson's (2000) model when factors of uncertainty are introduced. The equilibrium level of child labor stays efficient when parents' income in the second period is allowed to be random because parents could use savings or bequests to overcome the income uncertainty. When uncertainty is introduced to the return to schooling, together with the assumption of incomplete insurance markets, parents overcome the increased risks associated with investment in human capital by increasing the level of child labor, which becomes inefficiently high even when there are no credit market constraints, and there are bequests. On the other hand, when the return to schooling is allowed to be random but with complete insurance markets, the equilibrium level of child labor stays efficient in spite of the introduced uncertainty.

Yet another extension of Baland and Robinson's (2000) model by Rogers and Swinnerton (2004) examines the equilibrium changes as income changes due to a transfer that occurs from the altruistic children to their parents.[2] A transfer from children to parents is a form of internal borrowing. Thus, the occurrence of this transfer enhances access to credit. Rogers and Swinnerton (2004) argue that the level of parental income is a crucial determinant of the children's decision to make a transfer to the parents. The relationship between child labor and parental income is non-monotonic, where child labor need not decrease with the increase in parental income. At low levels of parental income, altruistic children choose to make transfers to their elderly parents. The forward-looking parents regard these transfers as a repayment for the forgone income resulting from fewer

[2] When Baland and Robinson (2000) allow for the possibility of a transfer from children to parents. They find that transferring income from the children to their parents results in an efficient amount of child labor only if parents are not faced by credit market constraints and are thus able to save. Otherwise, child labor is still inefficiently high.

hours of labor and extra hours of schooling. Thus, allowing for transfers increases schooling and reduces child labor. On the other hand, at a sufficiently high level of parental income, children choose not to make transfers to their parents while parents still want the repayment. As a result, child labor rises and schooling hours decrease.

The empirical investigation of the effect of credit constraints on child labor and schooling is difficult because there are no good measures of access to credit. Empirical studies either focus on testing the existence of credit constraints or on testing the theory stating that removing credit market imperfections reduces child labor and increases schooling.

Edmonds (2006) tests the existence of credit constraints. Under no credit constraints, decisions of schooling and child work should be determined according to the level of permanent income. Accordingly, the timing of any fully anticipated amount of income holding permanent income constant should not have any effect on decisions regarding child work and schooling. Households can borrow against anticipated future earnings to finance the current schooling of their children.

Using a dataset from South Africa, Edmonds (2006) tests the existence of credit constraints by comparing child labor and schooling decisions of two South African groups. The first group is eligible to receive a social pension income. The second group is not yet eligible but is about to be eligible for the social pension income. Edmonds (2006) observes a reduction in child labor hours and an increase in schooling of black males who are eligible compared to the nearly eligible. This result indicates that black males are

credit constrained. The nearly eligible would act like the already eligible if the nearly eligible were able to borrow against the expected future income.

The studies that examine the effect of credit market imperfections on child labor use different measures of access to credit. These measures include access to a commercial bank branch, the degree of development of financial markets, the value of collateralizable assets that a household owns, and self-assessments of credit limits in microcredit organizations.

Some studies find a negative effect of enhancing the access to credit on child labor (Ersado et al., 2005; Dehejia and Gatti, 2002; and Beegle et al., 2006). Dehejia and Gatti (2002) use cross-country data and find that the effect is greater for the sub-sample of the low-income countries. Dehejia and Gatti (2002) further find that smoothing temporary income shocks (thus reducing the income variability) is the most important channel through which increasing credit access decreases child labor. Few studies demonstrate a positive effect of increasing access to credit on child work. Hazarika and Sarangi (2008) find that increasing access to microcredit during a labor demand peak in Malawi increases child domestic work to replace adults who work in household enterprises. However, school attendance is not affected by enhancing access to microcredit. Maldonado and Gonz´alez-Vega (2008) find that increasing access to microfinance in Bolivia increases demand for child labor in family businesses and in the household.

3.3. Returns to education

So far, returns to education have been assumed to be constant across individuals and the net return to education has been assumed to be positive. Thus, income is the only determinant of child labor and schooling. When the more realistic assumption of differential returns to education is allowed, these differentials should be taken into account while examining the parents' choices on child labor and human capital investment. Returns to education differ across regions and groups. The regional differentials result from differences in educational quality and labor market conditions across different regions. The group differentials result from labor market discrimination against some groups such as females and ethnic groups or the differences in access to information on returns to skilled labor.[3]

In equation (1.1), the returns to education are considered by assuming that the household's utility function depends on the child's welfare, which in turn depends on the child's education. The resulting first-order conditions, from equation (1.1), show that the optimal levels of child labor and schooling depend on the relative return to education, which is the difference between the increase in utility resulting from education and the decrease in utility due to the decreased current consumption. Specifically, manipulating the first-order conditions resulting from equation (1.1) (in equations (1.6), (1.7), and (1.8)) clarifies that the level of a child's education as well as the time spent in market work and household chores depend on the relative returns to education, which generally affect the distribution of the child's time between education, market work, domestic work, and play.

[3] See Emerson and Knabb (2006).

Combining equation (1.2) and equation (1.3) results in:

$$\frac{\partial U}{\partial V_k}\frac{\partial R}{\partial E}-\frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\,e=\frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\,w \qquad (1.6)$$

For a child to be engaged in education and market work, the net return to education should be equal to the returns from the child's market work.

Combining equation (1.2) and equation (1.4) results in:

$$\frac{\partial U}{\partial V_k}\frac{\partial R}{\partial E}-\frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\,e=\frac{\partial U}{\partial S}\frac{\partial F}{\partial H} \qquad (1.7)$$

A child is engaged in education and domestic work if the net returns to education are equal to the returns to domestic work.

Combining equation (1.2) and equation (1.5) results in:

$$\frac{\partial U}{\partial V_k}\frac{\partial R}{\partial E}-\frac{\partial U}{\partial S}\frac{\partial F}{\partial c}\,e=\frac{\partial U}{\partial S}\frac{\partial R}{\partial P} \qquad (1.8)$$

If the relative returns to education are equal to the returns to play, a child is engaged in education and play.

Developing an overlapping generations' model of two periods for an altruistic household, Emerson and Knabb (2006) focus on how the differential returns to education create unequal opportunities that increase child labor and reduce schooling. Emerson and Knabb (2006) assume that households in the lower social status receive a lower return to education than households in the higher social status. Emerson and Knabb (2006) compare the case of differential returns to education across households of different social status with the case of the same return regardless of the social status. Assuming the same

returns to education, parents, whether wealthy or poor, choose to send the child to school and not to work at equilibrium. Thus, the existence of differential returns to education is the reason for the persistence of child labor and poverty and not the multiple labor market equilibria, as in Basu and Van (1998) or the credit constraints, as in Baland and Robinson (2000). When returns to education vary with social status, wealthy households in higher social status send their children to school while poor households in lower social status send their children to work.

The results of Emerson and Knabb (2006) suggest that poverty and child labor are symptoms of the problem of unequal opportunities. Improving schools' quality for the less-fortunate groups, removing discrimination, and easing access to information should alleviate child labor, poverty, and income inequality.

Finding some evidence for the results of Emerson and Knabb (2006), Ray (2003) shows that while poverty is not a significant determinant of child labor and child schooling in Ghana, the quality of schools in the neighborhood, as well as the educational level of the parents determine child labor and child schooling decisions.

Bhalotra (2007) develops an empirical approach to determine the relative importance of income and returns to education in affecting child labor, where the wage elasticity of child labor supply is used to distinguish between the effect of income and the effect of relative returns to education. If children work to meet the subsistence needs of the household, lowering their wages should result in more labor hours to compensate for the lower income associated with the reduction in wages. If, on the other hand, child labor is a result of low returns to education, the labor hours should decrease as a result of

the decrease in wages. Thus we expect a negative wage elasticity if the poverty hypothesis exists and a positive wage elasticity if the relative returns to education hypothesis exists. Bhalotra (2007) uses data from rural Pakistan for boys and girls to estimate the wage elasticity of child labor supply and finds that the wage elasticity is positive for girls and negative for boys. Accordingly, the return to education determines girls' labor, and thus improving the girls' education should reduce girls' labor. However, poverty determines boys' labor, and thus improving the economic conditions of the poor should result in less child labor among boys.

3.4. Parents' preferences

In addition to income and returns to education, parents' preferences have an impact on child labor and human capital investment. According to equation (1.1), the household's utility function depends on the standard of living S and the child's welfare function R. S depends on work activities H and M, whereas R depends on non-work activities E and P. Parental preferences are represented by assigning different weights to the two parameters S and R. Thus, parental preferences, according to equation (1.1), affect child time allocation between work and non-work activities and not the child time allocation between market work and domestic chores.

The theory represents parents' preferences by measures such as the degree of altruism towards children (Baland and Robinson, 2000; Rogers and Swinnerton, 2004), gender preferences (Behrman et al., 1986; Kumar, 2012), cultural norms such as the existence of a negative or positive stigma towards child labor (Lopez-Calva, 2002), and differential parental preferences (Basu and Ray, 2002).

The effect of son's preference on child labor and schooling is examined in the theoretical works of Behrman et al., 1986; and Kumar, 2012. Behrman et al. (1986) find that parental preferences favoring boys have undetermined effects on the choices of the amount of human capital investment for boys and girls. Favoring boys may lead to an increase or a decrease in human capital investment for boys, compared to girls, depending on the parameters of the parents' utility function.

Kumar (2012) extends Baland and Robinson's (2000) model to allow for son preference through placing a higher weight on the utility of the son. The pure son-preference case occurs when parents put more weight on the utility of their son, whereas both male and female face the same earnings function.

In Kumar's (2012) model, bequests play an important role in determining the effects of son preference on child labor and schooling. Kumar (2012) finds that, when parents can give bequests, the pure son-preference case results in more child labor and less leisure by females whereas both male and female are treated equally regarding schooling, as parents can increase the sons' utility by giving bequests. When parents cannot give bequests, females get less schooling than males and they are engaged in more child labor as well. Similar to Baland and Robinson (2000), when parents cannot give bequests to both or any of their male and female children, child labor is inefficiently high and schooling is inefficiently low for the type who is not receiving bequests.

Although there is empirical evidence for gender differences in the form of more schooling and less domestic work for boys, it cannot be determined that this favoring is

due to son preference. For example, forward-looking parents may spend more on boys' schooling because of the existing labor market discrimination against girls.

Allais (2009) shows that girls attend school less than boys and that the school attendance drops considerably with age, especially for girls. Lloyd et al. (2005) find that girls' school enrolment is less than boys' school enrolment. Chumacero and Paredes (2011) find that parents choose high-level and costly schools for their eldest and male children.

The literature also provides evidence for gender differences in child labor, when domestic work is considered. Using survey data from sixteen countries collected between 1997 and 2007, Allais (2009) finds that 70.5 percent of girls do domestic work compared with 54.9 percent of boys. Thus, the gender gap amounts to 15.6 percentage points.

The literature also documents the existence of gender differences in the types of tasks children do in both market and domestic work and in the ages at which boys' work and girls' work peak. Utilizing the UNICEF's Multiple Indicator Cluster Surveys (MICS) from 2000 and 2001, Edmonds (2007) finds evidence for the difference in types of tasks girls and boys do. For example, boys in Bangladesh are more likely to grow cereal crops while girls are more likely to get involved in poultry farming and growing vegetables. In addition, Edmonds (2007) finds that boys witness a considerable increase in the participation rate in market and domestic work at ages 10 and 12 while girls witness the dramatic increase earlier at age 8 and again at ages 10 and 12. The increase at age 8 is mainly concentrated in domestic work while the highest increase at ages 10 and 12 occurs in market work.

Cultural norms such as the existence of positive or negative stigma towards child labor can affect parents' preferences. In spite of the conventional negative social stigma associated with child labor, an alternative positive stigma towards specific types of child labor and among specific groups can exist. Working in a family farm or business is highly valued in some rural areas such as in the Andean regions of Peru.[4] Children of parents who were child laborers may start working at an early age because these parents value their children's work and consider it an addition to their education, especially when it is combined with schooling.[5]

Lopez-Calva (2002) extends Basu and Van's (1998) model by incorporating a social stigma in the form of embarrassment towards child's work in the household's utility function. The cost of the social stigma is included in the model as a reduction in the utility of the household. Incorporating a social stigma towards child labor into the model results in multiple equilibria, as in Basu and Van (1998). Some equilibria have no child labor and higher wages. Other equilibia are associated with child labor and lower wages. However, unlike Basu and Van (1998), the occurrence of the multiple equilibria is robust to all specifications of the demand for labor including the case of a small open economy.

Patrinos and Shafiq (2010) find evidence for a positive social stigma towards child labor. The positive stigma is measured by whether the child is indigenous and whether the household head was a child laborer. Valuing child's work in family farms

[4] See Lopez-Calva (2003)

[5] See previous reference.

and businesses is a cultural value among the indigenous leaders in Latin America, especially when it is combined with schooling and when the work is safe.

The research also considers the relative power of parents and how the decisions are made in the household. Unlike the conventional unitary model in Becker (1981), Basu and Ray (2002) use a weighted average household's utility function of the husband's and wife's utility functions. The weights determine the relative power of the husband and wife. Basu and Ray (2002) also find that the household type least likely to send the children to work is the household with the balanced power between the parents. Starting at a point where one parent has all the power, increasing the power of the other parent decreases child labor until the point of the balanced power is reached where child labor starts to increase. Basu and Ray (2002) test their theoretical findings using data from Nepal and find evidence for the results.

4. A review of the empirical research on the tradeoff between child labor and human capital investment.

In section 3, I reviewed the research that estimated the determinants of child labor and human capital investment. In this section, I review the empirical research that examines the tradeoff between human capital investment and child labor. Children's investment in human capital affects their future earnings (Glewwe, 2002; Ilahi, Orazem, and Sedlacek, 2005). It is not quite obvious that child labor is a bad that we should reduce. Children may be able to combine work and schooling. Children also may acquire useful experiences from work. Beegle et al. (2009) find that child labor increases the probability of wage work when children become adults. In developing countries, wage

work is more desirable on average than self-employment, as wage work is associated with higher income.

The research reviewed in this section assumes that child labor and human capital investment are continuous variables. Thus, this research allows for part-time work and further assumes that time can be spent in other activities such as play. In addition, these studies do not assume that child labor is a bad in itself. The disadvantages of child labor stem from the extent to which child labor reduces human capital investment.

The theoretical research reviewed in section 3 examines the determinants of child labor and human capital investment. The empirical research reviewed in this section examines the tradeoff between human capital investment and child labor using the theoretical determinants as control variables that should be considered for robust estimation. In the first part of this section, I review the research that investigates the simple tradeoff between child labor and human capital investment, whereas the second part reviews the studies that estimate the causal impact of child labor on human capital investment.

4.1. The simple tradeoff between child labor and human capital investment

Most of the current research that examines the correlation between human capital investment and child labor measures child labor by market work (Ranjan and Lancaster, 2005; Heady, 2000; Ravallion and Wodon, 2000) . Few studies consider domestic work (Levison and Moe, 1998; Levison et al., 2001). First, I review the research that measures child labor by market work. I review the studies that examine domestic work in the second part.

4.1.1. Market work

There is a relatively large empirical literature on the effect of child labor measured by market and subsistence work on the human capital investment of the children. Human capital investment is measured by years of schooling, grade repetition, school enrollment, school attendance, test scores, and hours of study.

Some studies measure human capital investment by school attainment, where school attainment is measured by years of schooling and grade repetition. Most studies find a negative effect of market work on years of schooling and a positive effect on grade repetition (Psacharopoulos, 1997; Ranjan and Lancaster, 2005). Psacharopoulos (1997) uses datasets from Bolivia and Venezuela and finds that child labor reduces the school attainment of the children by two years of schooling and increases grade repetition. Ranjan and Lancaster (2005) estimate the effect of child labor on schooling for children aged 12 to 14 using data collected, under the ILO's Statistical Information and Monitoring Programme on Child Labour (SIMPOC), for Srilanka, Portugal, Philippines, Namibia, Panama, Cambodia, and Belize. Schooling is measured by school enrollment and a variable named "schooling for age" that represents the years of schooling attained relative to age. Ranjan and Lancaster (2005) find a significant and robust negative effect of work on the measures of schooling. Only a few studies do not find any evidence of the adverse effect on the years of schooling and grade repetition. Using a dataset from Peru, Psacharopoulos and Patrinos (1997) do not find this adverse effect.

Several papers measure human capital investment by test scores. These studies include Singh, 1998; Post and Pong, 2000; Akabayashi and Psacharopoulos, 1999; and Heady, 2000. Examining part-time child work in the developed world, Singh (1998) and

Post and Pong (2000) find that part-time work has a small negative effect on the test scores of US adolescents. Akabayashi and Psacharopoulos (1999) find that child labor adversely affects the mathematics and reading skills of the children in Tanzania.

Comparing the effect of child labor on test scores with its effect on school attendance, Heady (2000) finds a substantial effect of child work on mathematics and language test scores of children aged 9 to 18 in Ghana. However, Heady (2000) finds that child work has a small effect on school attendance, as most of the children are able to combine work and school. Heady (2000) concludes that the direct effect of child work on the academic achievement of children, through making the children tired and drifting their interest away from learning, is stronger than the indirect effect, through school attendance.

Two studies (Ravallion and Wodon, 2000; Janvry et al., 2006) test the tradeoff between child labor and human capital investment by examining the effect of a change in the price of schooling on child labor and schooling. The aim is to find out how much of the change in schooling resulting from the price change comes from child labor.

Ravallion and Wodon (2000) test the assumption that child labor displaces school enrollment by estimating the effect of a school enrollment subsidy in Bangladesh on child labor and school enrollment. Ravallion and Wodon (2000) find that although the school enrollment subsidy reduces child labor and increases school enrollment, the increase in school enrollment is much greater than the decrease in child labor. The decrease in child labor is only a quarter of the increase in the school enrollment for boys and one eighth of the increase in the enrollment for girls.

Janvry et al. (2006) test the effect of a conditional cash transfer on mitigating the effect of a temporary income shock on child labor and schooling using a panel data from Mexico, where the cash transfer is conditional on children staying enrolled in schools. Janvry et al. (2006) conclude that the conditional cash transfer has a strong effect on reducing the school drop-out that results from the income shock. The conditional cash transfer does not have the corresponding effect on child labor. Parents send their children to work when faced by an income shock although they do not drop them out of school.

4.1.2. Household work

Levison and Moe (1998) estimate the determinants of household work and hours spent in school for adolescent girls in Peru and find that the living conditions and the mother's education are the most important determinants. The better the living conditions and the higher the level of education of the mother, the more hours girls spend in school and the fewer hours they spend doing household chores.

Levison et al. (2001) differentiate between two definitions of work: work outside the household that excludes household work and the inclusive measure of work which includes the household chores. Levison et al. (2001) find that including household work changes the results dramatically. When girls work, they are 7.7 percentage points less likely than boys to attend school when the inclusive measure of work is considered and 13.8 percentage points more likely to attend school when only labor market work is considered.

Hazarika and Bedi (2003) assess the effect of enhancing school access on reducing child labor. Hazarika and Bedi (2003) conclude, using a dataset from rural

Pakistan, that reducing the cost of schooling reduces child market work. However, child work within the household is unresponsive to reducing the costs of schooling.

4.2. The causal impact of child labor on human capital investment

The literature, in the previous section, examines the correlation and not the causal effect of child labor on human capital investment. The household decides on the levels of child labor and children's human capital investment simultaneously. Accordingly, it is not clear if children work because they do not attend school or if children do not attend school because they work. In addition, several factors at the same time affect child labor and children's investment in human capital. For example, inadequate infrastructure and the prevalence of poverty in developing countries deepen the need for child work and reduce children's investment in human capital. Consequently, estimating the causal effect of child labor on human capital investment cannot be undertaken by simple econometric methods.

Most of the available research that examines the causal impact of child labor on human capital investment uses the instrumental-variables approach (IV). The instruments are used to create exogenous variations in child labor. The instruments should be highly correlated with child labor and uncorrelated with human capital investment, other than through child labor.

All the studies reviewed in this section use hours of work to measure child labor except for Beegle et al. (2009) and Gunnarsson et al. (2006) who represent child labor as a (0,1) variable. In addition, all the reviewed studies use market work to measure child labor excluding Goulart and Bedi (2008), Assaad et al., 2010a; and Assaad et al., 2010b

who differentiate between market work and domestic work. Gunnarsson et al., 2006; Tyler, 2003; Stinebrickner and Stinebrickner, 2003 measure human capital investment by test scores. Boozer and Suri (2001) measure human capital investment by hours at school while Goulart and Bedi (2008) measure investment in human capital by grade repetition. Meanwhile, Rossi and Rosati (2003) and Beegle et al. (2009) measure children's investment in human capital by school attendance. Since there is no literature review that covers this research, I will review the studies in more details. I will focus on the instruments used in terms of relevance and validity when possible.

Gunnarsson et al. (2006) study the effect of child labor, measured by paid market work outside home, on human capital investment measured by test scores of grades 3 and 4 children. The authors use a dataset of observations from nine Latin American countries for children who are already enrolled in schools, where the enrollment rate is around 95% on average. The instruments in Gunnarsson et al. (2006) aim at realizing exogenous variations in child labor across countries and within countries.

To create exogenous variations in child labor across countries, Gunnarsson et al. (2006) use inter-countries differences in child labor and schooling regulations such as school starting age, the age at which children can legally leave school, and the age at which children can legally work. Gunnarsson et al. (2006) claim that the probability of work increases with age and that the differences in schooling and child labor regulations affect the age at which a child is in grade 3 or grade 4. Thus, these regulations affect the probability of work. For example, children are more likely to combine work and school when the age at which children can legally work is low. In addition, children are more likely to attend school without working in countries where the school starting age is low.

Gunnarsson et al. (2006) claim that the within countries variations in child labor demand can be captured by the interaction of region, either urban or rural, and the age of the child. The demand for child labor differs across urban and rural areas, and is higher in rural areas. Gunnarsson et al. (2006) first estimate child market work as a function of child, school, community, and parent characteristics using an ordered probit model. They next use the predicted child work to estimate the equation for test scores. Gunnarsson et al. (2006) find that being 1 standard deviation above the mean of work hours reduces the mathematics test scores by 16% and the language test scores by 11%. Gunnarsson et al. (2006) also find that test scores are higher for boys and rural residents, indicating that gender and region affect learning indirectly through work.

The differences in child labor and schooling regulations can create exogenous variations in child labor across countries. I believe it is hard to use this measure on the country-level since these regulations are likely to be the same within a country. The interaction between region and age, that is used to create the within-country variations in child labor, can be claimed to affect schooling in many ways. For example, urban areas are likely to have better schools than rural areas.

Boozer and Suri (2001) estimate the causal effect of non-household work hours on hours at school using rainfall differences across several regions of Ghana to capture the exogenous variations in child labor. The differences in rainfall affect the marginal product of child labor, and thus the demand for child labor changes. Boozer and Suri (2001) take advantage of a geographical feature of Ghana, as there are distinct variations in rainfall across northern and southern parts of Ghana. In addition, Boozer and Suri (2001) take advantage of a dataset in which the household data is collected over 11

months and across several regions of Ghana. Another contribution in Boozer and Suri (2001) is manipulating the instruments to distinguish between the long run relationship and the short run relationship between child labor and human capital investment. To target the long run relationship, the authors use month and region dummies to capture variations in rainfall. Boozer and Suri (2001) then use month-region interactions to instrument for child labor. To measure the short-run relationship, Boozer and Suri (2001) use the observed rainfall variations to instrument for child labor.

Boozer and Suri (2001) use two-stage least squares and conclude that, under different model versions, there is a significant negative impact of child labor on time in school. They estimate separate equations for boys and girls at the extensive margin (whether the child works) and at the intensive margin (the hours of work conditional on working). Boozer and Suri (2001) find that the effect of work is higher for boys. In addition, Boozer and Suri (2001) find that girls' time in school is only affected at the extensive margin and not at the intensive margin.

Rossi and Rosati (2003) use datasets for children aged 5 to 14 in Pakistan and Nicaragua to simultaneously estimate the determinants of hours of market work and school attendance. The effect of any explanatory variable, including age, gender, parental education, and income on one dependent variable depends on the effect of the explanatory variable on the other dependent variable through the correlation between the error terms. The identification strategy in Rossi and Rosati (2003) relies on excluding parents' level of education from the hours of work equation. This exclusion is questionable since the level of education is likely to affect parents' decisions on child work. The marginal effects are calculated conditional on the latent variables, which are

the probability of attending school while working and the propensity of sending the child to work while attending school. Rossi and Rosati (2003) claim that this conditioning is important for policy. For instance, the results show that income helps reduce the hours of child labor if the household has a low propensity of sending their children to work. This result questions a policy that targets income transfers to the poor households, as they are likely to have high propensity of sending their children to work.

Beegle et al. (2009) utilize a panel dataset for rural Vietnamese 8-13 year old children to examine the effect of child labor on human capital investment. Child labor is measured by a dummy variable that measures if the child undertook any income-generating activity outside the house, in a family business, or in the farm in round one of the survey. Human capital investment is measured by school attendance and highest grade attended in round 2 of the survey. The study uses the subset sample of children who attended schools in round one and were re-interviewed in round two.

Beegle et al. (2009) employ the inter-commune regulated rice prices when round 1 of the survey was held prior to 1997 to instrument for child labor. In this regard, Beegle et al. (2009) make use of the dataset in which schooling outcomes were measured in a subsequent time to that time child labor had been measured. Accordingly, it is possible to use the exogenous rice prices that affect child labor in the first period with minimal worries of potential correlation with households' decisions on schooling in the second period. Rice prices were liberalized in 1997, and thus rice prices in 1997 are not correlated with the regulated rice prices prior to 1997. In addition, rice prices were measured on the commune level in the first round. Accordingly, rice prices prior to 1997 would not affect household decisions in the second round. Thus, the direct effect of first

round rice prices on outcomes in the second round is eliminated. Beegle et al. (2009) explain that a potential correlation between rice prices and other omitted variables, that could affect the schooling outcomes, could question the credibility of the instruments. For example, people may select themselves into communes according to certain characteristics so that the commune that has high rice prices is the same one that has people who value schooling. Beegle et al. (2009) claim that the restrictions on migration between the communes prior to 1998 rule out this concern.

Beegle et al. (2009) conclude that child labor has a negative impact on school attendance and highest grade attended yet a positive effect on the probability of wage work, which is associated with higher living standards in developing countries. Specifically, the mean level of child labor reduces the probability of attending school by 46%, reduces the school attainment by 1.6 years (21%), and increases the probability of being a wageworker by 7%.

Child labor differs between developing and developed countries. In developed countries, child labor is mostly part-time. In addition, children are involved with the parents in the decision to work. Furthermore, children usually work when they are relatively older. Despite these differences, I review three studies that examine the causal impact of child labor on human capital investment in developed countries. The focus in this section is the tradeoff between human capital investment and child labor. Accordingly, we want to know if child labor has a negative impact on investment in human capital even in developed countries. In addition, it is useful to learn about the instrumental variables that are used by these studies and think about the relevance of the instruments when applied to developing countries.

As Gunnarsson et al. (2006) use child labor regulations across the Latin American countries, Tyler (2003) uses the interstate child labor laws to create exogenous variations in the child labor supply of twelfth-grade students in the USA and estimates the effect of school-year work on math test scores. Tyler (2003) finds that reducing the school-year work by 10 hours increases the mean math test score by 2 points or 0.2 of a standard deviation. Comparing IV and OLS results, Tyler (2003) claims that OLS underestimates the effect of work on test scores by 0.03 of a standard deviation. Using this measure in developing countries is subject to availability, as most of these countries have a more centralized authority. In addition, these laws are usually not enforced in many developing countries.

Stinebrickner and Stinebrickner (2003) use a unique dataset from Berea College's mandatory work-study program to estimate the effect of work hours on the academic performance of students. Only students of low-income families join the college. Although students receive full scholarships, they are required to work for at least 10 hours per week in the college labor program. This unique dataset provides very good instruments. The hours of work on jobs assigned randomly in the first semester are used to create exogenous variations in work hours. The jobs assigned are mainly service-jobs that require the same physical effort. Accordingly, jobs are not likely to affect the students' academic performance in different ways. In addition, assigning the jobs is random, and this guarantees that students are not grouped in certain jobs according to their qualities. Using IV, Stinebrickner and Stinebrickner (2003) find that working an extra hour reduces the average semester grade point by 1.2. Failure to account for the endogneity of work

hours, using OLS, results in the false conclusion of a significant and positive relationship between hours of work and academic performance.

Goulart and Bedi (2008) estimate the effect of hours of work, differentiating between economic work and domestic work, on educational success measured by grade repetition. A dataset for Portuguese children aged 5 to 16 is used. Similar to the instruments used by Tyler (2003), Goulart and Bedi (2008) instrument for hours of work by geographical variations in legislations to reduce child labor and geographical variations in child labor inspection regimes. The authors also use information from the survey dataset to account for children's ambition and interest in school. Goulart and Bedi (2008) find that economic work significantly reduces educational success of children, whereas domestic work is not harmful.

Assaad et al. (2010a) instrument for domestic work by access to basic public services: water, sewage, and garbage collection in order to study the effect of hours of domestic work on girls' school attendance using the Egypt Labor Market Survey of 1998 (ELMS 98). Assaad et al. (2010a) find that there is a significant impact of domestic work on the school attendance of girls. A 10 percentage points increase in the probability of domestic work leads to a 6 percentage points decrease in the probability of school attendance.

Assaad et al. (2010b) estimate a joint model for hours of child labor and school attendance using ELMS 1998. The authors estimate separate equations for boys and girls. Work for girls is domestic work and work for boys is market work. Assaad et al. (2010b) instrument for market work by the percentage of people in the locality working in trade

and service occupations and in agriculture in order to capture the prevalence of jobs that children are usually found in the local community. Assaad et al. (2010b) instrument for domestic work by access to basic public services.

Assaad et al. (2010b) find that market work has a significant impact on the school attendance of boys while inclusive work has a significant effect on the school attendance of girls at all levels of work. However Assaad et al. (2010b) show that such effect is minimal up to 14 hours of work for boys and 10 hours for girls. A 10-hour increase in work hours, beyond 15 hours, reduces the probability of attending school for rural boys in the second wealth quintile, the most vulnerable group of boys, by 5 percentage points. A further 10-hour increase in work hours leads to a 15 percentage points decrease in the probability of school attendance of rural boys in the second wealth quintile. On the other hand, a 7-hour increase in work hours, beyond 7 hours, reduces the probability of school attendance of urban girls in the lowest urban quintile, the most vulnerable group of girls, by 10 percentage points. A further 10-hour increase in work hours leads to a 30 percentage points decrease in school attendance of urban girls in the lowest wealth quintile.

In summary, the reviewed studies that examine the causal impact of child labor on human capital investment use different variables to instrument for child labor, and different measures of schooling yet find a significant effect of child labor on human capital investment.

5. Conclusion

There is a large literature that examines child labor and human capital investment. In this chapter, I reviewed the literature focusing on the tradeoff between human capital investment and child labor. Income, access to credit, returns to education, and parental preferences are the main determinants of this tradeoff. The relative importance of these determinants depends on the economic environment and the concerned demographic groups.

The results of the empirical studies that examine the tradeoff between human capital investment and child labor differ due to the differences in the relative importance of the factors that determine the tradeoff across countries and groups. Although the majority of these studies find evidence for a tradeoff between child labor and human capital investment, the size of this tradeoff differs due to the datasets utilized, the control variables considered, the demographic groups represented, the measures used to account for human capital investment and child labor, and the methodology used.

Chapter 2 : Data, Sample, and Variables

1. Introduction

In the next two chapters, I use data from the Survey of Young People in Egypt (SYPE) which was conducted in late 2009 by The Population Council in collaboration with the Egyptian Cabinet, Information, and Decision Support Center. The SYPE provides data on five basic areas: health, education, work, household composition, and civic and political participation. In this chapter, I provide descriptive analysis of the sample and the variables I use.

2. The design of the SYPE

The SYPE sample is nationally representative in the sense that it covers all the 27 governorates (similar to States and Provinces) of Egypt. Egypt's 27 administrative regions are shown in Figure 2.1. The SYPE sample consists of 11,372 households. In the age group 10-29, the households include 20,200 young people of whom 16,061 were selected randomly for interviewing. The selection criteria were: one male or female in the age group 10-14, one female from females aged 15-21, one male from males aged 15-21, one female from females aged 22-29, and one male from males aged 22-29. The interviewers made up to three visits and were successful in interviewing 15,029 of the 16,061 young people selected. The remaining 1,032 young people refused or were unavailable on all three visits.

The 2009 SYPE sample is the first Egyptian survey to include slum areas. A variable identifies each observation as urban, rural or slum. Slums are located in urban

areas, but are identified separately due to their unique economic and social circumstances. Slum areas are settlements that were established illegally and that lack the basic necessities of suitable housing such as utilities and sanitary infrastructure. Slum areas also suffer from high residential densities, narrow roads, lack of open spaces and problems of accessibility (World Bank, 2008). Figure 2.2 shows a picture of a slum area in Egypt. Improving the conditions of slums is a priority challenge for Egypt. The SYPE's data are an important step in working towards improved conditions. My sample contains 424 observations for slum areas and includes 17 of the 27 Egyptian governorates.

3. The sample

As I am concerned with the relationship between child labor and human capital investment measured by schooling criteria (hours of school-related activities and school attendance), I use the sample of young people in the age group 10-17 (including children in primary, middle, and high schools). The original sample consists of 6540 observations. Due to missing data on several variables, I use a sample that consists of 2,594 males and 2,781 females.

3.1. Measuring human capital investment

The literature uses various measures of human capital investment. Output measures of human capital investment measure the school attainment of children and include test scores, years of schooling, and grade repetition. Input measures of human capital investment include school enrolment, school attendance, and hours spent in school-related activities. As the SYPE has information on past test scores and current

child labor, but no information on past child labor, I cannot analyze the relationship between the SYPE's test scores and child labor. I therefore follow the literature and use input measures of human capital investment. As mentioned, I use school attendance, and a variable that measures the time spent in school-related activities (time at school, time doing homework, and time in private tutoring).

I consider that a variable representing hours spent in school-related activities is a better measure of human capital investment than a variable that simply represents attendance at a school. School attendance has little variability as most children attend school (91.5%), and school attendance does not measure the number of absences from school. Private tutoring is an important complement to school attendance in Egypt. Students, especially in high school, consider private tutoring a major resource for exam preparation. The SYPE dataset confirms this strong dependence on private tutoring as 37% of the children are privately tutored.

Children who have lower learning capabilities may practice private tutoring on a larger scale than do children with higher learning abilities. Concern that bias might arise from this additional tutoring of children with lower learning capabilities is mitigated by the fact that the correlation coefficient (0.78) between past test scores and current time spent in private tutoring is positive. Thus, private tutoring is an important input to building human capital, and worth including along with time spent in school and doing homework.

In the SYPE, children are asked whether they were engaged in any homework/studies at home last week. If the answer to this question is yes, children are

asked whether they were engaged in any homework/studies at home the previous day. If the answer to this question is yes, children are asked about the amount of time spent doing homework/studies at home the previous day. If the answer to either of the first two questions is no, the amount of time is recorded as zero for the third question. The same questions are administered to children in regards to private tutoring and time at school. Recording the amount of time spent in school related activities only if these activities were practiced last week, reduces the noise associated with intermittent activities. Recording the amount of time spent doing the concerned activity the previous day, reduces the recall noise associated with trying to remember details of a whole week.

3.2. Measuring child labor

Most studies examine the effect of market work on human capital investment (measured by schooling) and ignore the role of household work. When the effect on investment in human capital is considered, both market work and household work should be considered. What matters is the extent to which this work affects the child's investment in human capital.

3.2.1. Market and subsistence work

Children are asked to report the daily hours spent in market and subsistence work, and the number of working days per week. The weekly working hours and the average daily hours are then calculated. The SYPE's questions do not differentiate between market and subsistence work, but the children are asked whether they were employed during the last seven days. Children are also asked whether they were involved in any of the following types of work during the last seven days: agricultural work (e.g.,

harvesting, cutting clover, irrigation, etc.), raising poultry/livestock, producing ghee/cheese/butter, collecting fuel/woodcutting, preparing food (e.g., vegetables), sewing/embroidery/crochet, producing hay products/carpets/textile/ropes, offering services for others in the market/in the street/at home, buying and reselling goods, helping with construction work, and learning a skill. If the answer to any of these questions is yes, children are asked to report the total hours of work per day and the number of working days per week.

3.2.2. Household work

Children are asked whether they did any household work in the last seven days. If the answer is yes, children are asked whether they did any household work the previous day. If the answer is yes, children are asked to report the number of hours they spent doing household work the previous day. If the answer to either of the first two questions is no, the number of hours is recorded as zero in the third question. Household work is divided into three types: household chores inside the house, household chores outside the house, and childcare. The sequence of questions is asked separately for each type of household work. As the children are not asked to report the number of days per week they do household work, weekly hours cannot be calculated.

Table 2.1 shows the basic statistics for child labor. According to Table 2.1, a small percentage of children are involved in market and subsistence work (1.2%). The percentage is higher for boys (1.9%) than for girls (0.5%). Table 2.1 also shows that a sizable portion of the sample is engaged in household work (47.4%), but the average hours of household work are lower than the average hours of market and subsistence work. Accurate reporting of household work is more difficult than accurate reporting of

market and subsistence work. Children may consider household chores to be everyday activities, and may not think of such activities as household chores.

A small percentage of children is involved in market and subsistence work and a very sizable percentage is engaged in household work. As household work and market work are measured in a different way in SYPE[6], household work was not considered in most studies, and the percentage of children involved in market and subsistence work is so small, I consider only household work when measuring child labor. I call this variable household work and I refer to it as HHW.

4. Analysis

4.1. Human capital investment

I use two variables to measure children's human capital investment. The first is school attendance which is a binary variable that takes the value one if the child attends school and zero otherwise. The second variable is the sum of daily hours children spend in school-related activities.

4.1.1. School attendance

Table 2.2 shows some facts about patterns of household work and school attendance across gender, regions and age-groups. According to Table 2.2, a sizable portion of children (6.7%) do not attend school and devote the whole time to household chores. There is a big contrast between girls and boys: whereas 11.6 % of girls do not

[6] Children were asked how many hours of household work they worked yesterday (if they did household work yesterday and last week). If children did not do household work yesterday or last week, the hours of household work would be 0. In the context of market work, children were asked if they were involved in any market work last week and how many hours per day and how many days per week they worked.

attend school and spend their time only on household chores, only 1.5% of boys do not attend school. Girls are more likely than boys to do household work and not attend school, and more likely to combine household work and school. They are less likely than boys to be idle (neither do household work nor attend school).

Table 2.2 shows that children aged 15 to 17 are more likely to do household work only and to work only than children aged 10 to 14 while children aged 10 to 14 are more likely to combine household work and school. This is because Egyptian children finish their compulsory schooling at the age of 14.

According to Table 2.2, regional differences do not follow a specific pattern. Rural children are most likely not to attend school (and to do only household work), followed by urban children, and then children in slums. Children in slum areas are most likely to combine household work and school, followed by rural children, followed by urban children.

Most children attend school (91.5%). Among children who do not attend school, 6.1% have been to school in the past and dropped out, and 2.4% have never attended school. Few of the children who dropped out (6.4%) say that work (including market work, household work, and helping another family member in his/her work) is the reason for dropping out. It is clear that most children both attend school and do household work. This is even true for the sizable portion engaged in intensive household work.

4.1.2. Hours of human capital investment (HC)

Table 2.3 provides a detailed breakdown of hours spent in school-related activities (HC) by gender, region and age group. About a third of children are involved in 7 to 10

hours of HC per day (32.8%) with only 18% involved in 11 or more hours. A small percentage of children (0.1%) are involved in more than 16 hours of human capital investment. A sizeable percentage of children are investing less than an hour in human capital (16.5%), and 15.2% are engaged in less than 4 hours of human capital investment. These low investments in human capital may be explained by the fact that some schools have multiple shifts and by the fact that some children go to school each day, but then leave the school and do not spend the day there.

Table 2.3 shows that, on average, older children invest less in HC than younger children. Almost 25% of older children (aged 15 to 17) make almost no investment in human capital, but a slightly higher percentage of older children than younger children invest more than 13 hours per day in HC (2.7% of older children compared with 2% of younger children).

Table 2.3 shows that females spend approximately the same number of hours, on average, on HC as males (5.9 and 6 hours respectively). Table 2.3 also shows that urban children spend more time, on average, on HC than rural and slum children. It is also worth noting that 3.3% of urban children spend more than 13 hours daily on HC, whereas around 18% of children of rural areas spend little or no time on HC.

4.2. Household work (HHW)

Table 2.4 shows high variability in the daily hours of household work. A sizable percentage of working children have a heavy work load: 9.5 % work for 2 to 3 hours per day, and 10.4% work for more than 3 hours per day.

Table 2.4 shows that girls are more likely than boys to do household work (68.1% of girls work compared with only 24.3% of boys), and are more likely to be involved in longer hours of work. Table 2.4 also shows that more older children (15-17) than younger children (10-14) are involved in household work. The Table also shows that older children have a heavier work load.

Rural areas have the highest percentages of working children and these children work the longest hours. Children in slums have less of a work burden, followed by children in urban areas. This may be due to the fact that the need for household chores is the highest in rural and slum areas because of the poor infrastructure.

5. Conclusion

The SYPE is the most recent household survey dataset that provides data on education and child labor of Egyptian young people. In the next two chapters, I use the SYPE data for children aged 10 to 17 to study the relationship between child labor measured by household work and human capital investment measured by hours spent in schooling-related activities and by school attendance.

Figure 2.1: Map of the 27 Egyptian Administrative Regions

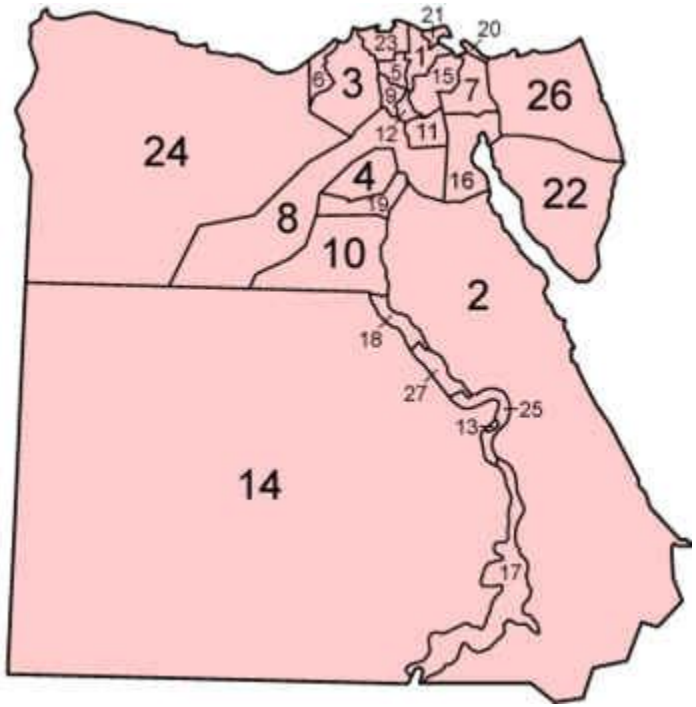

Figure 2.2: A Photo of a Slum Area in Egypt, Cairo, 2012

Table 2.1: The Proportions of Youth (10-17) Working and the Average Hours of Work Conditional on Working

	Children (10-17)
Market and subsistence work (%)	1.2
Average hours of market and subsistence work	4.6
Standard deviation of hours of market and subsistence work	1.9
HHW (%)	47.4
Average hours of HHW	1.8
Standard deviation of HHW	1.5

Notes: HHW refers to hours spent in household chores per day.

Table 2.2: Children's Activities by Gender, Age, and Region

Activity	All children	Age		Gender		Region		
	(10-17)	(10-14)	(15-17)	Male	Female	Rural	Urban	Slum
Work only (%)	6.7	3.3	13.1	1.5	11.6	8.6	4.5	3.5
Attend school only (%)	51.3	54.5	45.3	72.9	31.1	46.9	58.6	49.5
Work and attend school (%)	40.2	40.9	39	22.8	56.5	42.4	35.5	46
No activity (%)	1.7	1.3	2.6	2.7	0.8	2.1	1.4	0.9
Sum	100	100	100	100	100	100	100	100

Table 2.3: The Proportions, Averages, and Standard Deviations of Daily Hours of Human Capital Investment (HC) across Gender, Regions, and Age-Groups

HC	C\hildren	Age		Gender		Region		
	(10-17)	(10-14)	(15-17)	Male	Female	Rural	Urban	Slum
1>HC≥0	16.5	12.1	25.12	14	19.2	18.8	14	13
4>HC≥1	15.2	15	13.5	13.7	15.3	15.2	12.9	16
7>HC≥4	18.3	18.4	18.4	22.4	14.6	19.3	16.3	20.8
10>HC≥7	32.8	37	26.3	34.8	31.9	33.4	34.2	27.8
13>HC≥10	15	15.5	14.1	13.3	16.5	11.7	19.2	19.6
16>HC≥13	2.9	1.9	2.5	1.8	2.5	1.4	3.1	2.6
HC≥16	0.1	0.1	0.2	0.04	0.2	0.1	0.2	0.2
Average	5.8	6.2	5.2	6	5.9	5.5	6.4	6.1
Standard deviation	3.9	3.6	4.1	3.6	4	3.8	3.9	3.8

Notes: HC is measured as the sum of hours spent in school-related activities including time in school, time in private tutoring, and time spent doing homework.

Table 2.4: The Proportions of Children Involved in Daily Hours of Household Work, the Averages, and the Standard Deviations across Age, Gender, and Region

	Children	Age		Gender		Region		
	(10-17)	(10-14)	(15-17)	Male	Female	Rural	Urban	Slum
0 hours of HHW	53	55.8	47.9	75.7	31.9	49	60	50.5
2>HHW>0	27.1	30.2	21.3	21	32.8	27.4	25.9	30.7
3>HHW≥2	9.5	7.6	13	2.6	15.9	10.7	7.4	10.6
4>HHW≥3	5.2	3.8	7.8	0.6	9.5	6.1	3.9	4.5
HHW≥4	5.2	2.6	10	0.2	9.9	6.9	2.8	3.8
Average hours of HHW conditional on working	1.8	1.5	2.4	0.9	2.1	2	1.6	1.6
Standard deviation of HHW	1.6	1.3	1.8	0.7	1.6	1.7	1.4	1.4

Notes: HHW refers to hours of household chores

Chapter 3 : An Identity Model of Time Use

1. Introduction

Gender norms affect the responsibilities and time-use activities of boys and girls, especially in developing countries. The SYPE dataset shows that Egyptian girls do more household work than boys. Despite the negative relation between household work and human capital investment, the mean difference between girls' and boys' investment in human capital is almost zero. The purpose of this chapter is to explain how we get this result and to develop a framework to understand the mechanism at play. Specifically, this chapter re-investigates the relationship between child labor and human capital investment and makes three main contributions. The first contribution is to measure child labor by household work. Few studies recognize household work as a form of child labor (Goulart and Bedi, 2008; Hazarika and Bedi, 2003; Levison et al., 2001; and Levison and Moe, 1998). The second contribution is to examine how the relationship between human capital investment and household work differs between genders. The third contribution is to write a model of identity to explain the differences in time use between genders, and specifically differences in human capital investment and household work. The fourth contribution is to present evidence from the SYPE consistent with the predictions of the identity model.

The overall effect of gender on human capital investment is the mean difference between girls' and boys' investment in human capital. The overall effect is the sum of the direct effect of gender on human capital investment, holding household work constant, and the indirect effect through household work. Although the data shows that girls do more household work relative to boys, I find that girls manage to compensate and spend the same time on average investing in

human capital. Thus, the direct effect of gender on human capital investment cancels out the indirect effect.

The differences between boys and girls in educational choices can be explained by the identity theory of economics developed by Akerlof and Kranton (2010). The identity model starts with the standard economic utility function and adds social norms to the function, aiming at bringing economics closer to reality. Social norms are developed in a social context, do not represent standard individual tastes, and are identified by observing the social context. The identity model puts norms in the utility function, and people get utility gains from conforming to norms and utility losses from violating norms. People internalize the social norms and follow them to maintain a sense of belonging to a certain group. Abiding by these prescribed behaviors affirms the sense of self (the identity), while violating the prescribed behaviors causes anxiety in the subject and in others. Identity- based payoffs result from one's actions and from the actions of others. According to Akerlof and Kranton (2010), individuals may engage in activities that do not correspond to their individual taste in order to maintain their identities.

I follow Akerlof and Kranton (2010) in developing an identity model of time use for Egyptian boys and girls. According to Akerlof and Kranton (2010), the identity model starts with a standard utility function and adds three elements: social categories, social norms, and gains in utility from following norms or losses in utility from acting against norms. I start with a standard household utility function in which the household chooses the levels of human capital investment, household work, and leisure for its members. The social categories of the model are males and females. I identify the norms towards six gender related areas: women's education, sharing household work, power relations, women's employment, and males and females' mobility. To identify these norms, I use the SYPE's young people's (15-29) reported attitudes

towards gender roles, as well as sociologists' observation, as documented in the literature. When the majority of people in the SYPE report systematic differences in how males and females "should" behave, I argue that these reports reveal a social norm.

The SYPE does not report people's attitudes towards males' and females' mobility. Yet sociologists observe that the norm towards mobility of males and females is that girls should stay inside the house and refrain from spending time outside while boys should spend time outside the house to gain life experiences and play sports (Mensch et al., 2003).

Since the majority of young people (76.3%) did not agree that education is more important for boys than girls, the norm towards women's education is that educating girls is as important as educating boy. Since 67% of young people did not agree that boys should do as much household work as girls, the norm regarding sharing household work indicates that boys should not do as much household work as girls. About 60% of young people agreed that a girl must obey her brother even if he is younger, and about 80% agreed that a woman must ask her husband for permission before she does anything, indicating that the lack of women's power is the norm towards gender power relations. Finally, since 86% of young people believe that when jobs are scarce, men should have preference over women for getting a job, the norm towards women's employment supports the domesticity of women and men being the bread winners.

The identity model of time use predicts that girls do more household work than boys, girls and boys spend about an equal amount of time in human capital investment, and boys spend more time outside the house. The model's prediction fits the time-use patterns in the SYPE dataset for boys and girls (10-17). The mean average hours of investment in human capital is about the same for boys and girls. On average, girls do double the household work that boys do

(0.9 hours for males and 2.1 hours for females). The data also shows that, on average, males spend more time outside the house than females. The activities outside the house include playing sports, socializing with friends, and visiting relatives.

The theory of identity economics explains the differences between boys and girls in educational choices. First, according to norms, an ideal girl should be well educated. Second, girls lose utility if they spend a lot of time doing activities outside the house, such as socializing with friends and playing sports, while boys gain utility when they do so. Although girls do more household work, they can use the time (that is spent by boys doing activities outside the house) to invest in human capital. Thus, the mean average hours of human capital investment are about the same for boys and girls in spite of the extra burden of household work on girls.

The higher the percentage of people (belonging to a certain group) who agree on a norm, the stronger the norm is across this group (compared to other groups). The strength of the gender social norms differs across regions (rural and urban) and across wealth quintiles (lowest and highest), and the differences are larger across wealth quintiles than across regions. The SYPE dataset for children aged 10 to 17 provides evidence of these differences.

The social norms supporting women' domesticity, women doing most of the household chores, and the lack of women's power are more apparent in the lowest wealth quintile than in the highest wealth quintile and in rural areas than in urban areas. In addition, the difference in norms between the lowest and highest wealth quintiles is larger than the corresponding difference between rural and urban areas. The data is consistent with the differences in norms. On average, females spend more time on household work and less time on activities outside the

house than males, and the difference between males' and females' averages in these activities is higher in the lowest wealth quintile and in rural areas.

2. The effect of gender on human capital investment: A simple decomposition

To compute the total effect of gender on HC, I define two channels: the direct effect and the indirect effect of gender. The direct effect measures the impact of gender on HC holding HHW constant. The second effect is indirect and relates to the impact of gender on household work which subsequently affects human capital investment. The total effect of gender on human capital investment results from adding up the direct and indirect effects of gender, and represents the mean difference between boys' and girls' investments in human capital.

HC is a function of both Gender and HHW, and HHW is a function of Gender:

$$HC = HC(Gender, HHW), \tag{3.1}$$

$$HHW = HHW(Gender), \tag{3.2}$$

$Gender \in \{M, F\}$, where M stands for Male and F stands for Female. The direct effect of gender on HC (holding HHW constant) is represented by equation (3.3), and the effect of gender on HC through HHW is represented by equation (3.4)

$$\frac{\Delta HC}{\Delta Gender} = HC(F, HHW(M)) - HC(M, HHW(M)), \tag{3.3}$$

$$\frac{\Delta HC}{\Delta HHW}\frac{\Delta HHW}{\Delta Gender} = HC(M, HHW(F)) - HC(M, HHW(M)). \tag{3.4}$$

The total effect of gender on human capital investment is represented by equation (3.5)[7]:

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[7] Equation (3.5) is derived as follows: let $\widetilde{HC}(Gender) = HC(Gender, HHW(Gender))$. So,

$$\widetilde{HC}(F) - \widetilde{HC}(M) = HC(F, HHW(F)) - HC(M, HHW(M))$$

$$= HC(F, HHW(M)) - HC(M, HHW(M)) + HC(F, HHW(F)) - HC(F, HHW(M))$$

$$\frac{dHC}{dGender} = \left(\frac{\Delta HC}{\Delta HHW} + \frac{\Delta^2 HC}{\Delta HHW \Delta Gender} \right) \frac{\Delta HHW}{\Delta Gender} + \left(\frac{\Delta HC}{\Delta Gender} \right), \qquad (3.5)$$

where $\frac{dHC}{dGender}$ is the total effect of gender on human capital investment, $\frac{\Delta HHW}{\Delta Gender}$ is the extra time females spend in domestic work relative to males, $\frac{\Delta HC}{\Delta HHW} + \frac{\Delta^2 HC}{\Delta HHW \Delta Gender}$ is the marginal effect of HHW on HC for females, $\left(\frac{\Delta HC}{\Delta HHW} + \frac{\Delta^2 HC}{\Delta HHW \Delta Gender} \right) \frac{\Delta HHW}{\Delta Gender}$ is the indirect effect of gender on HC, and $\frac{\Delta HC}{\Delta Gender}$ is the direct effect of gender on HC (holding HHW constant). To compute $\frac{dHC}{dGender}$, the parameters of equation (3.5) are estimated by regressing gender on HHW and regressing gender on HC.

Table 3.1 shows the results of the OLS regression of HHW on gender where the regression is represented by the model:

$$HHW = b_0 Gender. \qquad (3.6)$$

$= HC(F, HHW(M) - HC(M, HHW(M)) + HC(M, HHW(F)) - HC(M, HHW(M)) +$
$[HC(F, HHW(F)) - HC(F, HHW(M)) - (HC(M, HHW(F)) - HC(M, HHW(M)))]$,

where $HC(F, HHW(F)) - HC(M, HHW(M)) = \frac{dHC}{dGender}$,

$HC(F, HHW(M) - HC(M, HHW(M)) = \frac{\Delta HC}{\Delta Gender}$,

$HC(M, HHW(F)) - HC(M, HHW(M)) = \frac{\Delta HC}{\Delta HHW} \frac{\Delta HHW}{\Delta Gender}$, and

$[HC(F, HHW(F)) - HC(F, HHW(M)) - (HC(M, HHW(F)) - HC(M, HHW(M)))] =$

$\frac{\Delta^2 HC}{\Delta HHW \Delta Gender} \frac{\Delta HC}{\Delta Gender}$.

Table 3.2 shows the results of the OLS regression of HC on HHW and gender where the regression is represented by the model:

$$HC = a_0 HHW + a_1 Gender + a_2 HHWgender. \qquad (3.7)$$

.
Substituting the parameters of equation (3.6) and equation (3.7) in equation (3.5) results in:

$$\frac{dHC}{dGender} = (a_0 + a_2)b_0 + a_1. \qquad (3.8)$$

Substituting the values from Table 3.1 and Table 3.2 in equation (3.8) to compute the total effect of gender results in:

$$\frac{dHC}{dGender} = (-0.63 - 0.31)*1.23 + 1.06 \approx 0. \qquad (3.9)$$

The results of column 1 and column 2, shown in Table 3.2, together with the results of Table 3.1 present a puzzle. In spite of the tradeoff between HHW and HC and the fact that females do more HHW, column 2 shows that females do not invest less in human capital relative to males (the estimated effect of the variable *Gender* is insignificant). This puzzle is resolved by the decomposition in column 3 when holding HHW constant and allowing for different marginal effects of HHW on HC for males and females (the estimated effect of the variable *Gender* is now significant).[8]

The total effect of gender on HC is calculated by adding the direct and indirect effects of gender on HC. When this simple calculation is performed in equation (3.9), I find that although females work more than males, they compensate by studying more, and thus the total effect of gender on HC is zero.

[8] Including dummy variables for rural/urban/slum does not change the significance nor the size of the coefficients in Table 3.2.

Table 3.2 (column 3) shows that the marginal impact of HHW on HC is higher for females than for males (-0.94 for females and -0.63 for males). The idea of substitutability between time and input goods can be used indirectly to explain the different marginal effect of HHW on HC across gender. This idea was introduced by Guryan et al. (2004). In their model, Guryan et al. explain how people get utility from three sources: home-produced goods (such as cooking and cleaning), leisure, and well-cared-for children. To produce any good in the model, both time and input goods are used, and the degree of substitutability between both kinds of inputs differs according to the particular commodity. For example, it is possible to substitute input goods for time in home production by hiring someone to help with cleaning the house or by buying semi-cooked food and so on. However, substitutability does not apply to leisure. For example, we cannot hire others to watch movies for us or socialize with our friends.

Both time and input goods contribute to the performance of household chores such as cleaning and cooking inside the home, but the poverty and deteriorating economic conditions of developing countries mean that it is quite costly to acquire the inputs (e.g., cleaning machines and semi processed foods) that can replace time spent performing tasks inside the home. As a result, many Egyptian households cannot readily substitute input goods for time spent on household tasks inside the home, and the situation resembles leisure in Guryan et al.'s (2004) model. Affordable inputs such as simple toys, radio, and TV can, however, substitute for time spent in child care. In this case the situation resembles home-produced goods in Guryan et al.'s model.

Some household tasks outside the home can be combined with some activities involved in human capital investment. For example, a child can buy groceries on his/her way to or from school or private tutoring. Thus, time devoted to some tasks that occur outside the home does not

compete with time devoted to HC. On the other hand, household tasks inside the home cannot be combined with activities involved in HC

The dataset shows that although females average twice as much time as males doing HHW in the home (1.82 hours for females compared with 0.77 hours for males), the difference in the average hours of HHW outside the home is fairly small (0.74 and 0.89 hours for males and females respectively). The difference in the average hours that females and males spend on childcare is also fairly small (1.81 and 1.91 hours for males and females respectively). Thus, the difference in the total average number of household work hours (0.90 and 2.1 hours for males and females respectively) results mostly from the difference in the average hours of household work inside the home. As most HHW time spent by girls is spent inside the home on tasks such as cooking and cleaning, HHW has a greater detrimental effect on girls than on boys and the marginal impact of HHW on HC is higher for girls than boys.

3. The identity theory of Economics and the differences in time use across gender

We saw in the previous section that although girls do more household work than boys, they can catch up and the mean difference between girls' and boys' investment in human capital is almost zero. This puzzle can be explained by the identity theory of economics developed by Akerlof and Kranton (2010). In the following sections, I explain the identity theory of economics and review the literature that examines the gender identity theory of economics. I then form an identity model of time use, investigate the predictions of the model in regards to differences in time use across gender, and examine whether the predictions of the identity model of time use fit the SYPE data of boys and girls aged 10 to 17.

3.1. The identity theory of economics and the relevance of social norms

The identity theory of economics was developed by Akerlof and Kranton (2000). The theory of identity economics starts with the standard economic utility function and adds social norms to it. Social norms are the social rules about how people should behave in different situations. These norms get internalized and are then deeply held resulting in tastes or preferences that are sometimes explicit and sometimes implicit. Norms-related tastes result from the social setting and do not represent idiosyncratic preferences. In every social setting, people have notions about who they are and how they should behave and who the others are and how others should behave and this is called identity. Identity motivates people to act in a certain way, and thus identity affects how economies work. Since norms and identity result from the social context, they lead to a theory of decision making in which the social context matters. The theory of identity economics examines how these internalized norms affect economic decision making. Gender and race are the clearest identities and the social settings where these identities and related norms come to a play include schools, workplaces, and homes.

Norms are learned by watching and observing others (like when a child learns languages). Norms dictate the prescribed behavior associated with a social category, as people hold views of who they are (which social category they belong to) and how they should behave (the ideal characteristics of the members of this social category). They also hold views on how others who belong to other social categories should behave.

Different norms of behavior are associated with different social categories and thus people's identity affects how they take decisions. The merry-go-round is a good example. The social categories are the different age groups of the children. There are norms for how someone in those social categories should behave. For example, the merry-go-round is too childish for a

thirteen-year-old. Norms affect behavior. If a thirteen-year-old rides the merry-go-round, he cannot enjoy it not because he believes the ride is considered inappropriate for his age, so he makes his way off.

To form the identity utility function, the theory of identity economics starts by the standard utility function and then specifies the identity elements for the relevant social context. The effect of an individual's action on utility depends in part on its effect on identity. The three identity elements that are specified are:

1- The social categories and each person's category (identity).
2- The social norms or ideals for each category.
3- The identity utility, which is the gains if the actions conform to the prescribed social norms and the losses if the actions do not conform to norms.

The identity theory of economics puts the desire to follow norms in the utility function, and people get utility from following these norms and utility losses from not following them. People internalize the social norms and follow them to signal that they belong to a certain group, and to maintain a sense of belonging. Abiding by these prescribed behaviors affirms the sense of oneself (the identity) while not following the prescribed behaviors evokes anxiety in the person and others. There are possible externalities, since people derive losses and gains from others' actions and not only their own actions. So, there are identity-based payoffs from one's actions and there are identity-based payoffs from others' actions.

People learn norms in their communities and the norms get internalized through means of community approval and disapproval. For example, gossip, stories, private and public censure are ways of reinforcing norms. The gain in identity utility that results when an individual sticks

to the norms of her category may represent the enjoyment that people get when they do something that makes them fit in a group and it may result from differentiating one group from others. Introducing identity elements results in an enhanced utility function with trade-offs. An action may increase consumption but reduces utility. Maximizing the utility function involves balancing these trade-offs.

The standard economic model does not take account of socialization, unless everybody socializes in the same way. Any differences between people are seen as idiosyncratic personal differences. The identity model allows for both possibilities. People have individualistic tastes in their utility function but also norms appear in the utility function.

Researchers have studied how norms are formed and different explanations were given. One explanation is that norms are ways to adapt to unfavorable environments. Another explanation is that people may invest in understanding themselves and then want to maintain these understandings for themselves and others. A third explanation is that people need a confirmation of their beliefs. The last explanation is that people need to feel and keep a sense of belonging. Analysts specify the relevant social categories and norms based on observation.

3.2. Identity norms and experimental research

According to Akerlof and Kranton (2010), identity economics is based on a large body of experimental research that shows that norms matter. An experiment reviewed by Akerlof and Kranton (2010) shows that children's behavior is affected by norms and that people form groups and ideals for each group and then act accordingly. The experiment occurred in 1954 and was undertaken by a group of psychologists. The psychologists took two groups of 11-year-old to a state park and separated the two groups. Within each group, the boys became close to each other

and formed distinct identities. The first group named itself the Rattlers and the other group named itself the Eagles. By the end of the week, each group was informed of the existence of the other group in the same park but the two groups did not meet. The boys then met and had a big fight in which each group raided the other group's house and burned its flag. Afterwards, the psychologists applied methods to make the boys friends before they returned home. This experiment shows all the elements of identity: social categories (the Rattlers and the Eagles). The norms: both groups saw fighting appropriate for the situation. Identity utility: the boys derived pride from the experiences.

Another experiment reviewed by Akerlof and Kranton (2010) shows that social categories greatly affect behavior. People behave differently when they are reminded of their racial, ethnic, and gender identities. This type of experiment is called "priming". An experiment was conducted on Stanford's graduates who were grouped into whites and African-American. The two groups were told that the test would measure their abilities. There was a control group that was not told so. The African-American group performed worse than the whites and the control group. The researchers accrued the under-performance to the stereo-type threats, as the African-American group was affected by the stereo-types of race-related performance. The Stanford's graduates have done similar tests before and the test had no consequences. However, the stereo typing had a big effect.

The stereo-type threat was confirmed by another experiment by two economists on caste in India. Subjects were asked to solve mazes and were paid a rewarding amount of money for each maze they solved. Castes in India can be identified by last name. When the last name was called publicly, the low-caste subjects solved 23 percent fewer mazes in spite of the high monetary reward.

All these experiments provide empirical support for identity economics. They all have social categories, norms that prescribe how each social category should behave and different identity utilities, depending on different contexts, and lead to different outcomes.

3.3. Literature review of studies on identity economics of gender

Most empirical studies that consider gender norms study the effect of these norms on the labor market, specifically women's labor market participation and gender labor market segregation.

Akerlof and Kranton (2010) and Golden (2002) model the effect of gender identity norms on labor market segregation. I follow the methodology applied by Akerlof and Kranton (2010) but I apply the relevant gender norms to the differences in time use of children. Akerlof and Kranton (2010) apply the identity model to the effect of gender identity on gender occupational segregation in the labor market. According to Akerlof and Kranton (2010), there are norms according to which people consider some jobs appropriate for males and other jobs appropriate for females. For example, people believe that females cannot work as nuclear engineers or rocket scientists and males cannot work as nurses or secretaries. Those who work in jobs that the society considers gender-inappropriate are not happy about their work and may face harassment and even violence in the workplace. Based on these observations, Akerlof and Kranton (2010) build a theory of gender identity in the work place. They start with a standard economic model of the labor market and then add the three identity elements to the workers' utility functions. The social categories are men and women. The norms are that specific jobs are labeled as women's jobs and specific jobs are labeled as men's jobs. Gains and losses in identity utility: men lose utility when they work in women's jobs and women lose utility when they work in men's jobs. Men also lose utility when women work in men's jobs. The model's main conclusion is that

firms will usually hire men for men's jobs and hire women for women's jobs. The conclusions of the model fit the actual labor market's situation. Take USA as an example. In 2007, 96.7 percent of secretaries were females, 97.3 percent of preschool and kindergarten teachers were females, and 93 percent of nurses were females.

The pollution discrimination model developed by Goldin (2002) to explain gender segregation in the labor market assumes that men get utility from their prestige in the job and not only from wage. This prestige is polluted when women enter the men's profession, as women are assumed by the society to have lower average skills than men, through signaling to the outsiders that the qualifications of the profession have deteriorated. This occurs even if the woman entering has the required skills. Golden's model is thus a representation of statistical discrimination while Akerlof and Kranton's (2010) model is a representation of tastes-based discrimination.

In addition to following Akerlof and Kranton (2010) in using observation to identify norms (specifically the observations of sociologists whom Akerlof and Kranton (2010) called "the official observers", I follow Fortin (2005) and Kamenica et al. (2013) in using answers to survey questions about attitudes towards gender roles and women's employment and education to observe gender norms. Fortin (2005) studies the effect of gender identity norms reflected in the attitudes towards gender roles on the difference between 25 OECD countries in women's labor force participation. Fortin uses data from World Value Surveys in the OECD countries and finds that the differences between attitudes towards gender roles predict the differences in women's labor market participation among the concerned countries. The answers to two survey questions were used to measure the agreement to whether women should be the homemakers and men should be the breadwinners. The first question is: "When jobs are scarce, should men have

more right to a job than women?" The second question is: "Is being a housewife just as fulfilling as working for pay?" Fortin finds that the higher the agreement to these two questions, the less the women's participation in the labor market. Kamenica et al. (2013) study the effect of a common gender identity norm that the man/husband should earn more than the woman/wife. They find using the US census that within couples, when a nonworking wife is likely to get a potential higher pay than her husband's current pay, the wife is more likely not to work. They also find using the American time-use surveys that the wife does more non-market home production than her husband when she gets higher pay than her husband, a result that is at odds with standard economic models.

Fernandez and Fogli (2005) find that gender identity norms measured by women's labor force participation in the countries of ancestry predict the differences between the second generation of American women in labor force participation. Katz et al. (2009) find that gender identity norms regarding motherhood (working mothers cannot establish a warm relationship with their children) affect the gender pay gap due to shorter work hours and work discontinuity for women.

4. The social norms in the Egyptian society regarding attitudes towards gender roles and women's work and education

To identify the norms of the Egyptian society towards gender roles and women's work and education, I depend on sociologists' observation, as documented in the literature and on questionnaire questions, as documented in answers of respondents aged 15 to 29 to the SYPE's questions about the attitudes towards gender roles and women's work and education.

4.1. Norms of the Egyptian society in the literature[9]

Late in the 19th century and early in the twentieth century, girls in Egypt started to modestly get educated and join school. The 1924's constitution extended obligatory free elementary education to girls. In 1925, the first secondary school for girls was established (four decades after the first secondary school for boys). Women first entered university in 1929 and a small number of women joined, then the numbers gradually increased. The big change in women's education occurred with the 1952's revolution which gave priority to women's education. Comparing old women with young girls, Egyptian women have achieved a remarkable progress in the field of education. Although the enrolment rates are lower for females (for every 100 boys enrolled in school, there are 84 girls enrolled), once females are in school, they do well. One half of those with higher education degrees are women.

Although the post-revolution government encouraged women to get educated and employed, there was no support for employed women. The Egyptian National Charter (1962) passed contradictory messages to women. The Charter stressed that the family should be the primary concern of women and that women are solely responsible for maintaining the national tradition in the country. Men's duties towards the family were not mentioned and thus women were torn between their responsibilities to maintain the family (including full responsibility for household work and taking care of the children) and working outside if they chose to be employed.

The country's policies and the official curriculum enhance the idea that women's education is valued because it enhances the women's roles as wives and mothers and that

[9] I use Guenena, N and Wassef, N, "Unfulfilled Promises: Women's Rights in Egypt", population council as a reference in this section.

maintaining and preserving the family are the responsibilities of women. Education stresses the domesticity of women and is represented as a way to allow women to provide for themselves as the need arises. Although the Egyptian constitution gives men and women equal access to public employment and there are laws to allow women flexible work hours and maternity leaves and access to child centers, the laws are not enforced. The women's work hours and conditions of work are incompatible with the family. The discouragement of women's economic role is legitimated by the current norms and the value system. These values and norms denigrate women's labor and contrast it to women's domesticity and see women's work as detracting from men's opportunities. According to the Economist, 2011, Egyptian women constitute only 23% of the labor force and they are 4 times more likely to be unemployed than Egyptian men.

Mobility manifested in spending time outside the house visiting relatives, doing sports and hanging out with friends are features the Egyptian society associates with boys while immobility manifested in spending time inside the house and refraining from engaging in activities outside are features of girls. Mensch et al. (2003) clarify that boys in Middle Eastern countries including Egypt have considerably more freedom in managing their free time, relative to girls. For example, boys usually spend their free time outside the house playing sports and visiting friends, but girls do not have the same opportunity and spend more time at home.

4.2. Norms in the SYPE across the whole sample

Several questions in the SYPE were asked to reveal attitudes towards gender roles. Specifically, attitudes towards five gender-related areas were examined: women's education, sharing household work, power relations, and women's employment. Table 3.3 shows the norms pertaining to these areas. When the majority of people agree on a certain gender attitude, this attitude is considered the norm towards the area of concern. These norms are in agreement with

the social norms observed by sociologists and documented in the previously mentioned literature.

The norm towards women's education is that educating girls is as important as educating boys. In answer to the question of whether education is more important for boys than girls, the majority of young people (76.3%) did not agree. The percentages of females and males who did not agree were 86% and 65%, respectively. This result is in line with the observed progress in women's education in Egypt and in line with the country's focus on the importance of educating girls. The attitude towards women's education reflects a social norm (and is not a matter of gender bargaining), as 13% of girls believe that educating boys is more important than educating girls. If the attitude represented a matter of bargaining, we would expect this percentage to be equal to zero.

The norm that boys should not do as much household work as girls is the norm towards sharing household work between boys and girls. When young men and women were asked if they believe that boys and girls should bear the burden of domestic chores equally, 73% of young men and 60% of young women (67% of young people) did not agree.

The norms towards power relations across gender reflect the lack of power that women have. When young women and men were asked if a girl must obey her brother even if he is younger, about 50% of young women answered yes and 75% of young men also agreed. When asked if a wife should obtain her husband's permission before doing anything, 86% of young men and 75% of young women agreed. The lack of women's power indicates that even when a girl thinks that her brother should do as much household work and the brother does not think so, she will end up obeying her brother (according to norms).

The norm for women's employment is that men should be preferred to women in the labor market. When young men and women were asked about their attitudes towards women's work, 93% of young men and 81% of young women agreed that men should have preference over women for jobs when jobs are scarce. These answers confirm that the social norms in Egypt are in favor of women's domesticity and that women's employment is not the main purpose of education.

Although there are no direct questions in the SYPE to measure norms towards mobility of males and females, the literature reviewed in the previous section shows clearly that the norms are in favor of girls staying inside the house and refraining from doing activities outside. The norms are also in favor of boys doing activities outside the house.

To summarize the gender norms, women are responsible for doing the household work while men are not required to share the household work responsibilities if they choose not to. The ideal boy and the ideal girl are well-educated, as the society believes in the importance of education for both boys and girls. The ideal boy spends time outside the house hanging out with friends, visiting family, and playing sports while the ideal girl does not spend time doing activities outside the house. When girls spend a long time outside the house, they are acting against the prescribed behavior, and thus their utility decreases. In contrast, when boys spend time outside the house, they gain utility because they are acting according to norms.

The identity model of time use predicts that girls in Egypt do more household work than boys, spend less time doing activities outside the house, and spend an equal amount of time investing in human capital. The identity model provides a possible explanation of why girls invest the same amount of time in human capital as boys, although they do more household

work. Girls' education is as important as boys' education and girls can use the time that they could have spent outside the house (if the norms were different) to invest in human capital and compensate for the extra time they spend in household work.

The predictions of the identity model of time use fit the SYPE data of children aged 10 to 17 and explain the puzzle in time use patterns across gender. The differences in the time use between males and females follow the gender social norms. In spite of the tradeoff between household work and human capital investment and the fact that females do more household work, the difference between males and females' average human capital investment, as shown in Table 3.4, is negligible and not statistically significant (6 hours for males and 5.9 hours for females). Table 3.4 shows that females do more household work on average than males and that the difference is statistically significant (0.9 hours for males and 2.1 hours for females). Table 3.4 also shows that males spend more time on average than females outside the house. The activities outside the house include doing physical activities, visiting family members, and hanging out with friends. The differences between males and females' averages are significant in all activities.

The gender norms extracted from the SYPE do not represent individual tastes. If these preferences were universal, the preferences would prevail everywhere in the world regardless of cultures and norms. The answers to the SYPE questions represent norms-related preferences that were developed within the social setting. The identity model is useful to complement a standard economic approach to explain the boy-girl differences in educational choices in Egypt.

4.3. Differences in norms across regions and wealth quintiles

Table 3.5 shows the differences in the strength of adherence to the gender social norms (the strength is measured by the percentage of agreement with the norms displayed in Table 3.3) across regions and wealth quintiles. The differences are larger across wealth quintiles than across regions. The norm that educating girls is as important as educating boys is stronger in the highest wealth quintile than in the lowest wealth quintile. The percentage of young people who did not agree that educating boys is more important than educating girls is lower by 6.8% in the lowest wealth quintile. Although young people in urban areas are more likely to disagree that educating boys is more important than educating girls, the difference in young people's opinions between rural and urban areas is not significant. Table 3.6 shows evidence for these variances in the adherence to the women's education norm across regions and wealth quintiles. Since there is no difference in the belief in the equality of girls' and boys' education across urban and rural areas, Table 3.6 shows that there is no significant difference in human capital investment between the genders in either urban or rural areas. Weaker belief in the importance of educating girls in the lowest wealth quintile is evident since Table 3.6 shows that girls in the lowest wealth quintile invest 0.556 fewer hours acquiring human capital investment than boys. However, girls' human capital investment is not significantly different from boys' in the highest wealth quintile. This result shows that gender equality in human capital investment occurs in the sample as a whole and in three of the four categories considered (rural, urban, and the highest wealth quintile), this equality is not realized in the lowest wealth quintile.

Apparent differences exist between the lowest and highest wealth quintiles in the strength of the norms towards sharing household work, power relations, and women's employment. The percentage of young people who did not agree that boys should do as much domestic work as

girls is higher by 5.3% in the lowest wealth quintile. The percentage of young people agreeing that a girl must obey her brother even if he is younger is higher by 3% in the lowest wealth quintile. The belief that women should stay home while men work is stronger in the lowest wealth quintile (7% more people in the lowest wealth quintile believe that when jobs are scarce, men should have preference over women for getting a job).

The percentage of young people who did not agree that boys should do as much domestic work as girls do is higher by 1.2% in rural areas, but the difference is not significant. However, Table 3.5 shows that higher percentages of young people in rural areas believe that a girl must obey her brother even if he is younger and that a woman must ask her husband for permission before she does anything. Although there is no significant difference between rural and urban young people's beliefs regarding the first point, their responses to the other two points indicate a belief that a girl is still expected to do the household work if her brother is not willing to. These beliefs indicate that a girl is expected to do the household work if her brother is not willing to. Rural areas also exhibit stronger social norms of women's domesticity and men's responsibility to provide for the house, but the difference between rural and urban areas is less than the difference between the wealth quintiles.

The stronger norms of household work, power relations, and women's employment in the lowest wealth quintile and in rural areas (with larger differences across wealth) are consistent with the time allocation outcomes. Table 3.6 shows that females in the lowest wealth quintile do on average 1.36 more hours of household work than females in the highest wealth quintile and that females in rural areas do 0.572 more hours of household work than females in urban areas. Table 3.6 shows that boys spend more time on average on activities outside the house including playing sports, visiting family members, and hanging out with friends. However, the difference

is higher in rural areas and in the lowest wealth quintile, and the most significant difference is between the highest and lowest wealth quintiles.

5. Conclusion and policy implications

I find that girls in Egypt do more household work than boys. This result is consistent with several theoretical and empirical studies conducted in developing countries, including the work of Kumar, 2010; Edmonds and Pavcnik, 2005; and Allais, 2009.

Although girls do more household work than boys, they manage to compensate so that the mean hours of human capital investment are about the same for boys and girls. The identity theory of economics explains this puzzle. Girls and boys gain utility by adhering to the social norms of how an ideal boy and girl should behave, and lose utility if they do not abide by the social norms. According to the social norms in Egyptian society, boys and girls should be well educated. Household work is the responsibility of women, and men are not required to do household work if they do not want to. Boys spend time outside the house socializing with friends and doing sports, while girls are not supposed to spend as much time outside the house.

Forming an identity model of time use, I find that the model's predictions fit the data patterns for children (10-17) in the SYPE. On average, girls and boys spend the same amount of time investing in human capital. Girls do twice as much household work on average than boys per day (0.9 hours for males and 2.1 hours for females). Boys spend more time than girls in doing outside activities, such as socializing with friends, visiting relatives, and doing sports.

The identity theory of economics opens new scopes for policy. For example, reducing the burden of household work in order to increase girls' investment in human capital should be accompanied by efforts to change the norms of sharing the household work burden. Otherwise,

reducing the burden could result in less household work by boys while the share of girls does not change.

According to Akerlof and Kranton (2010), societal notions of identity can change as a result of campaigns, media effects, and legislations. The social norms in Egypt towards women's education have changed considerably since 1952's revolution due to the role of the government, the new legislations, and the media effects. The change in the attitudes towards women's education was not accompanied by a change in the attitudes towards women's employment and shared household work responsibilities between males and females. Domesticity of women has always been stated and supported by the country's officials and has been enhanced by the educational curriculum. In order to change the societal norms in favor of gender equality, especially in sharing household work, policy makers could use media, educational curricula, and legislations to encourage change.

Table 3.1: Gender Effects (OLS Regressions of Hours of Household Work (HHW) on Gender)

Variables	
Gender	1.23***
	(0.034)
R-squared	0.1923
Number of observations	5375

Notes: Standard errors are in parentheses. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent. Gender is a dummy variable taking the value 0 for males and 1 for females.

Table 3.2: Gender Effects (OLS Regressions of Hours of Human Capital Investment (HC) on HHW and Gender)

Variables	Model 1	Model 2	Model 3
HHW	-0.76***		-0.63***
	(0.036)		(0.137)
Gender		-0.16	1.06***
		(0.105)	(0.119)
HHWgender			-0.31**
			(0.144)
R-squared	0.078	0.0004	0.091
Number of observations	5375	5375	5375

Notes: Standard errors are in parentheses. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent. HC is measured as the sum of hours spent in school-related activities including time in school, time in private tutoring, and time spent doing homework. Gender is a dummy variable taking the value 0 for males and 1 for females. HHW refers to hours of household chores. HHWgender is a variable resulting from interacting Gender with HHW to differentiate the marginal effect of HC on HHW for females from males.

Table 3.3: Patterns of answers of Egyptian young people 15-29 to SYPE questions about attitudes towards gender role and women's work and education

Norms	All	Women	Men
	Agree	Agree	Agree
Women's education: educating girls is as important as educating boys.	76.3%	86%	65%
Sharing household work: a boy should not do as much household work as girls do.	67%	60%	73%
Power relations: a girl must obey her brother even if he is younger.	60%	49.1%	71.1%
Power relations: a woman must ask her husband for permission before she does anything.	80%	74.7%	86%
Women's employment: when jobs are scarce, men should have preference over women for getting a job.	86%	81%	92.9%

Table 3.4: Patterns in time use for Egyptian boys and girls (10-17)

Activity	Average for Males	Average for Females	Diff
Human capital investment	6	5.9	0.1
Household work	0.9	2.1	-1.2***
Exercising/Doing physical activities	.101	.013	0.088***
Visiting family members	.355	.2292	0.1258**
Hanging out with friends	.823	.115	0.708***

Notes: Diff = mean (males)-mean (females). H_0: diff=0, H_1 = diff≠0. The test follows a t-distribution with degrees of freedom equal to the number of observations minus two. *** indicates significance at 1 percent. ** indicates significance at 5 percent.

Table 3.5: Differences in patterns of answers of Egyptian young people 15-29 to SYPE questions about attitudes towards gender role and women's work and education across region and wealth quintile

Norms	Lowest wealth quintile	Highest wealth quintile	Diff 1	Rural	Urban	Diff 2
	Agree	Agree		Agree	Agree	
Women's education: educating girls is as important as educating boys.	80.2%	87%	-6.8%***	82%	83.6%	-1.6%
Sharing household work: a boy should not do as much household work as girls do.	75.3%	70%	5.3%***	74.2%	73%	1.2%
Power relations: a girl must obey her brother even if he is younger.	48%	39.3%	8.7%***	47%	42%	5%***
Power relations: a woman must ask her husband for permission before she does anything.	59.8%	58%	1.8%	61%	58%	3%**
Women's employment: when jobs are scarce, men should have preference over women for getting a job.	90%	83%	7%***	81%	79%	2%*

Notes: Diff1 = % agreeing in lowest wealth quintile - % agreeing in highest wealth quintile. H_0: diff 1=0, H_1 = diff 1≠0. The test follows a t-distribution with degrees of freedom equal to the number of observations minus two. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent.

Diff 2 = % agreeing in rural areas - % agreeing in urban areas. H_0: diff 2=0, H_1 = diff 2≠0. The test follows a t-distribution with degrees of freedom equal to the number of observations minus two. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent

Table 3.6: Differences in Averages between Males and Females According to Region and Wealth Quintile

Activity	Mean (males)-mean(females)		Diff 3	Mean (males)-mean(females)		Diff 4
	Lowest wealth quintile	Highest wealth quintile		Rural	Urban	
Human capital investment	0.556**	-0.288	0.844**	0.033	0.336	-0.303***
Household work	-1.838***	-0.478***	-1.36***	-1.474***	-0.902***	-0.572***
Exercising/Doing physical activities	0.087***	0.037**	0.05***	0.061***	0.038**	0.023***
Visiting family members	0.126***	-0.002	0.128***	0.208***	-0.013	0.221***
Hanging out with friends	0.735***	0.524***	0.211***	0.795***	0.546***	0.249***

Notes: Diff 3 = (mean (males)-mean (females) in lowest wealth quintile)-(mean (males)-mean (females) in highest wealth quintile). H_0: diff 3=0, H_1 = diff 3≠0. The test follows a t-distribution with degrees of freedom equal to the number of observations minus two. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent

Diff 4 = (mean (males)-mean (females) in rural areas)-(mean (males)-mean (females) in urban areas). H_0: diff 4=0, H_1 = diff 4≠0. The test follows a t-distribution with degrees of freedom equal to the number of observations minus two. *** indicates significance at 1 percent. ** indicates significance at 5 percent. * indicates significance at 10 percent

Chapter 4 : The Causal Effect of Household Work on Human Capital Investment: the Egyptian Case

1. Introduction

There has been growing interest, both theoretically and empirically, in the effects of child labor on major aspects of children's well-being, especially education and health. The United Nations Convention on the Rights of the Child emphasizes the importance of education and urges nations not to engage children in work that may interfere with their education (Boozer and Suri, 2001).

Estimating the causal impact of child labor on human capital investment is complicated for several reasons. First, children distribute the 24 hours of the day between labour, human capital investment, and other activities. An increase in time spent in labour may reduce the time available for human capital investment. Similarly, a rise in the number of hours of human capital investment may decrease the number of hours of child labour. Thus, estimates of the effect of child labour on human capital investment may measure the correlation between the two variables and not the causal effect.

Second, other factors may affect child labor and human capital investment in opposite directions. For example, poor economic conditions may simultaneously reduce children's investment in human capital and increase child labor. An apparent negative relationship between child labor and human capital investment may then reflect the effect of the poor economic conditions and not the causal impact of child labour on investment in human capital.

Third, there may be an element of self-selection in child labor. Households who opt for child labor may be households with less-educated and/or less-ambitious parents. Parents may select their hard-working and smart children for child labor, but these are the children whose characteristics suggest that they would have the most potential for excelling at school. In such households, a positive correlation between child labor and human capital investment may reflect the impact of these unobserved features and not the causal effect of child labor on human capital investment.

Because of the difficulties involved in estimating the causal effect of child labor on human capital investment, most current research examines the correlation between child labor and investment in human capital and not the causal relationship. Relatively few papers (Boozer and Suri, 2001; Rossi and Rosati, 2003; Tyler, 2003; Stinebrickner and Stinebrickner, 2003; Goulart and Bedi, 2008; Gunnarsson, et al., 2006; Beegle et al., 2009; Assaad et al., 2010a; and Assaad et al., 2010b) examine the causal impact of child labor on human capital investment using an instrumental-variables approach.

Most current research, investigating the relationship between child labor and investment in human capital, measures child labor by market work. Such papers include Psacharopoulos, 1997; Psacharopoulos and Patrinos, 1997; Singh, 1998; Akabayashi and Psacharopoulos, 1999; Heady, 2000; Post and Pong, 2000; Ray, 2000a; Ray, 2000b; Ray, 2000c; Ravallion and Wodon, 2000; Ray, 2002; Ranjan and Lancaster, 2005; and Gunnarsson et al., 2006. Few studies recognize domestic work as a form of child labor. However, Goulart and Bedi, 2008; Hazarika and Bedi, 2003; Levison et al., 2001; and Levison and Moe, 1998 do.

The tradeoff between household work and investment in human capital is important, as what matters is whether the work has a detrimental impact on the child's learning. In addition, it is rare for children in developing countries to undertake hard work and long hours outside the house. Edmonds and Pavnick (2005) examined surveys conducted in more than thirty low-income countries and found that only 2.4% of children aged 5 to 14 work for pay outside the home. Most working children work on the farm, in the family businesses, or at home helping with household work. In contrast to developed countries, household chores in developing countries are tiring and time-consuming due to the absence of home appliances, supermarkets, and semi-processed foods. For example, meals are prepared from scratch, homes have no running water, clothes are washed in waterways, and shopping must be done at several places (Assaad et al., 2010a).

My study contributes to the literature on child labor by examining the causal impact of household work on girls' human capital investment using two-stage least squares (2SLS) and the 2009 SYPE dataset for children aged 10 to 17 in Egypt. To identify the causal impact of household work on educational outcomes, I use the ratio of girls to siblings in the household and the household access to public services: public garbage collection, public sewage disposal, and piped water.[10] The literature indicates that girls in the Middle Eastern Countries, including Egypt do most of the household chores. As the ratio of girls to siblings ten years and up increases, the household work

[10] Access to public service was used to instrument for girls' work in Assaad et al. (2010a)

demanded from a certain girl is likely to decrease. Better Access to public services is likely to reduce household work.[11]

Assaad et al. (2010a) were the first to study the effect of household work on girls' school attendance. They used data from the Egypt Labor Market Survey of 1998 (ELMS 98) for girls aged 6 to 14. Assaad et al. (2010a) instrumented for household work by access to public services and concluded that, for girls who are working (defined as working at least 14 hours per week), a 10 percentage points decrease in the probability of household work results in a 6 percentage points increase in the probability of school attendance.[12]

This study differs from Assaad et al.'s (2010a) study in some important aspects. First, in addition to estimating the effect of household work on human capital investment at the extensive margin (human capital investment is measured by school attendance), I estimate such effect at the intensive margin by measuring human capital investment by the sum of the hours spent in school-related activities including attending school, doing homework, and private tutoring. I argue that this approach provides a better proxy for human capital investment, especially in the Egyptian context where private tutoring is practiced on a large scale. Egyptian students regard private tutoring as the main source of exam-preparation and many (45%) pre-university students are privately tutored

[11] Although I estimated the effect of household work on boys' human capital investment, I am not showing the estimation's results, as the instrumental variables are not significantly related to boys' household work and thus are invalid (access to services and the sisters-to-siblings' ratio do not influence the amount of household work boys do).

[12] Inclusive work includes market work, subsistence work, and household work. Market work involves producing goods and services for market exchange. Subsistence work involves the production of primary goods for domestic use, such as livestock rearing and making dairy products. Household chores include childcare, chores done inside the house such as cooking and doing laundry, and chores done outside the house such as garbage disposal and fetching water.

(Elbadawy, 2004). As a result, simple school attendance alone is a poor measure of human capital investment. Secondly, I extend Assaad et al.'s (2010a) analysis by measuring work continuously rather than dichotomously and by estimating the effect of household work on the three categories of human capital investment.[13] I measure household work by hours and Assaad et al. (2010a) measure household work by a dummy that equals one if the girl works for at least 14 hours weekly. Assaad et al's (2010a) estimates do not tell us what would happen to a girl's human capital investment as she works 10 hours before the policy intervention. Hence a policy that might have a good chance of reducing HHW for girls by an hour no matter whether they worked more than 14 hours or less than 14 hours before the policy intervention can be much better assessed in terms of its impact on HC in my framework. Thirdly, I use the SYPE dataset which includes data on categorized hours of human capital investment[14] and therefore makes it possible to consider homework and private tutoring time and not only attending school in measuring human capital investment. At odds with Assaad et al. (2010a), I do not find a significant effect of household work on girls' school attendance. Measuring human capital investment by hours spent in school-related activities, I find that household work has a significant and sizable effect on human capital investment for girls. Increasing household work by one hour reduces hours spent investing in human capital by 2.096 hours. The effect of household work on hours of human capital investment occurs through the effect of household work on homework and private tutoring time, as the effect of household work on time in school is insignificant. The effect of household work

[13] Time in school, time in homework, and time in private tutoring.

[14] Unlike ELMS-1998 and ELMS-2006.

on homework time is higher than its effect on private tutoring time (0.612 and 0.572 respectively).

I estimate the effect of girls' household work on hours of human capital investment using Ordinary Least Squares (OLS) to measure the direction of the bias. I find that the IV estimates are larger than their OLS counterparts, indicating that the OLS estimates underestimate the effect of household work on investment in human capital. Thus, more productive girls are selected into work. This result places doubts on the assumption that children who are less productive at school get selected into work. Other studies have also found that more competent children are selected into work. Such studies include Beegle et al., 2009; Boozer and Suri, 2001; Tyler, 2003; Stinebrickner and Stinebrickner, 2003; Gunnarsson et al., 2006; and Assaad et al., 2010b.

The chapter is organized as follows. Section 2 examines child labor and education in the Egyptian context, section 3 describes the data. Section 4 outlines the methodology. Section 5 presents the regression results. Section 6 concludes and presents policy implications.

2. Child labor and education in the Egyptian context

2.1. Education

Since 1991, nine years of schooling, which include primary and lower secondary education, have become mandatory in Egypt. Nevertheless, the school enrollment law is not firmly enforced (Assaad et al. 2010b).Thus, we see children out of school at the school-compulsory age (6-14). However, there has been an improvement in the school attendance rate, as shown in Table 4.1 which compares the rates across three household

survey datasets that adopt comparable methodologies and use the same definition for school attendance, market work, and domestic work. The three recent household surveys that included data on employment and education of young people in Egypt, as well as other relevant family and individual characteristics are the Egypt Labor Market Survey of 1998 (ELMS 98) and the Egypt Labor Market Survey of 2006 (ELMS 2006). The third survey, the data of which is being used in this study, is the Survey of Young People in Egypt (SYPE).

Table 4.1 shows that an initial increase occurred in the school attendance rate of children aged 10 to 14 according to ELMS 2006. The school attendance rate then decreased in SYPE while the overall attendance rate stayed constant, indicating that the attendance rate of children aged 15 to 17 increased. The attendance rates of boys and girls in the 10-14 age group reflect similar patterns as the overall attendance rates.

While there exists a gender gap in school attendance in favor of boys, Table 4.1 shows that there has been a continuous increase in the school attendance rate of girls aged 10 to 17 while the boys' school attendance rate witnessed an initial increase followed by a decrease.

2.2. Child labor

The age at which the Egyptian Law permits children to get engaged in work outside the home was set to 15 in 1996 to match the age at which schooling is no longer mandatory. Nevertheless, these regulations are hardly applied or respected (Assaad et al. 2010a).

Table 4.2 shows how child labor is documented across the three surveys. Market work is measured for all children, whereas domestic work is measured for females. Table 4.2 shows that the ratio of children engaged in market work increased according to ELMS 2006 and then decreased according to SYPE. The ratio of females engaged in domestic work decreased according to ELMS 2006 and increased in SYPE.

3. Data

I use data from the SYPE, which is the most recent household survey carried out in Egypt. The survey collected data on the employment and education of young people and various important family and individual characteristics. Unlike ELMS-1998 and ELMS-2006, the SYPE has data on hours spent in different categories of human capital investment and on males' household work.

I use the sub-sample of young girls in the age group 10-17 to measure the effect of household work on schooling. After omitting missing observations, my sample consists of 2,781 females.[15]

4. Methodology

4.1. Measuring human capital investment

I use two variables to measure the human capital investment of girls aged 10 to 17. The first variable is school attendance. This is expressed as a binary variable that takes the value 1 if a girl attends school and 0 otherwise. I call this variable *school attendance* and I refer to it as SA. The second variable is the sum of the hours spent in

[15] Detailed description of the original sample the sample restrictions were included in chapter 2.

school-related activities. These activities include attending school, private tutoring, and doing homework. I call this variable *hours of human capital investment* and I refer to it as HC.

4.2. Measuring child labor

The SYPE contains data on market and subsistence work (combined) and also on household work. The dataset shows that only 14 girls are involved in market and subsistence work (0.5%)[16], but a very sizable percentage is engaged in domestic work (68.1%). As household work and market work are measured in a different way in SYPE[17], and as the percentage of girls involved in market and subsistence work is so small, I consider only household work when measuring child labor.[18]

Household work is measured as the sum of the daily hours spent performing household chores inside the home (e.g., cleaning and cooking) and outside the home (e.g., fetching water), and child care. I call this variable *hours of household work* and I refer to it as HHW.

4.3. Endogeneity of child labor

Estimating the impact of child labor (measured by household work) on human capital investment is complicated due to the endogeneity of child labor. First, household work may reduce the time available for human capital investment and children's failure

[16] The 14 girls do household work too, are from rural areas, and from poor families.

[17] Children were asked how many hours of household work they worked yesterday (if they did household work yesterday and last week). If children did not do household work yesterday or last week, the hours of household work would be 0. In the context of market work, children were asked if they were involved in any market work last week and how many hours per day and how many days per week they worked.

[18] I do not drop the few observations for girls who do market work since they do household work too.

at school may urge parents to give these children more household chores. Second, the association between child labor and human capital investment is determined by a net of social and economic factors that simultaneously affect both variables. In a developing country like Egypt, with inadequate infrastructure and much poverty, this net of social and economic factors is of great importance. For example, poor families may find it hard to enroll their children in school because of school fees, and these families may be obliged to involve their children in more household work due to lack of resources. Consequently, child labor may increase and school enrollment may decrease as a result of external economic and social factors that increase child labor and decrease schooling without real causation between the factors. Third, as mentioned, there is potential for self-selection into child labor. Beegle et al. (2009) differentiate between inter-household and intra-household self-selection. Inter-household self-selection occurs in households that choose child labor on the basis of unobserved household characteristics such as ambition and level of education. Intra-household self-selection occurs when parents choose to put their children to work on the basis of certain child characteristics such as intellectual abilities. Children with higher intellectual abilities have the most potential for excelling at school. If child labor is found to have a positive effect on human capital investment, the effect may be due to these unobserved characteristics and not the result of a causal effect of child labor on human capital investment. Intra-household selection bias is harder to overcome as it is not usually possible to obtain measures of children's abilities.

Using OLS with endogenous regressors leads to inconsistent estimates that neither represent the true magnitude nor the direction of the causal impact. Assume that the relationship between child labor and schooling is represented by equation (4.1):

$$Y = \beta x + \mu \quad (4.1)$$

Y refers to human capital investment, x refers to child labor, and μ is the error term that captures all household and individual characteristics and the unobserved factors that affect human capital investment. OLS assumes that there is no correlation between x and μ. If this were the case, the OLS estimates would be consistent and $\hat{\beta}$ would capture the effect of child labor on human capital investment. However, if the factors embodied in μ also affect x, $\hat{\beta}$ captures both the direct effect of x on Y and its indirect effect through μ, rendering inconsistent estimates.

To reach consistent estimates, the instrumental-variables approach can be used to create exogenous variations in x so that x does not change with μ. An instrument in this case is a variable z that is correlated with x and uncorrelated with μ. There is no direct correlation between z and Y and z can affect Y only through x. Using instruments can also handle the problem of measurement errors in reporting household work.

I use two variables to instrument for household work. The first variable is an index that measures if the household has access to public services (piped water, public sewage, and garbage collection).[19]Having less access to public services increases the demand for household work. The second variable is the ratio of sisters to siblings ten and up in the household, and as far as I am aware, this variable has never been used in the literature to instrument for child labor.[20] As girls do more household work than boys, the household work demanded from one girl is likely to decrease with the increase in the

[19] The index is calculated using principal factor analysis. The data on household's access to public services is taken from the SYPE. Assad et al. (2010a) use access to public services to instrument for girls' household work.

[20] I count girls and boys 10 and up.

ratio of girls to siblings in the household. Instruments should allow for exogenous variations in the demand for household work. Instruments should also affect school attendance and hours spent in human capital investment only through household work. Two factors determine the strength of instruments. The first factor is the extent to which the instruments are significant in the equation for household work. The second factor is the extent to which the instrumental variables satisfy the exclusion restriction in the outcome equation. Table 4.3 shows the first stage results of the instrumental variables' regression. The index of instruments is significant at the 5 percent level. Not having access to services increases household work by 0.761 hours daily. An increase in the sisters-to-siblings' ratio in the household reduces household work by 0.253 hours.

Having established the significance of instruments in the equation for household work, I discuss the validity of the exclusion restriction in the outcome equation. One concern is that communities that have inadequate public services could be the same communities that have inadequate or low-quality schools. To address this problem, I control for school availability and school quality. To control for school availability, I use an index of the percentages of females and males with secondary schooling or above, the percentages of boys and girls enrolled in secondary schools, and the percentages of boys and girls enrolled in middle schools from the Egyptian population census of 2006 (PC2006). These variables are measured at the district level. I use two indices of school quality calculated from the SYPE. One index is composed of variables that are expected to improve the school quality and the other index contains variables that are expected to

reduce the school quality.[21] The school quality variables are measured at the household level.

Another concern about the validity of the public service instruments is that parents who care for their children's education may choose where to live according to the availability and quality of schools, as well as according to the availability of physical infrastructure, rendering any instruments measured at the locality level invalid. This concern is ruled out by the rigidity of the housing market and the immobility of households in Egypt (Assaad and Ramadan, 2008). When couples marry and choose where to live, they are more likely to base their decision on affordability rather than on the availability and quality of schools (Assaad et al., 2010b). Relocation is unlikely to occur after having children. An additional concern is that lack of access to public services can affect the health of children, and thus affects children's investment in human capital. I control for children's health using a variable that measures if children have health problems.

The assumed association between the sisters-to-siblings' ratio and household work is based on the validity of the assumption that females do more household work than males. This assumption is supported by the literature[22], the dataset itself that shows

[21] The indices are calculated using principal component analysis. The positive school quality index includes variables that measure if the school has a library, a computer lab, a science laboratory, a clinic, a playground, musical instruments or musical classes, and field trips. The negative school quality index is composed of variables that measure if the school a child goes to has multiple shifts, whether the child thinks that the number of students on one bench is greater than what it should be, whether some chairs or benches are broken, whether the lighting is inadequate, if there is not enough ventilation, if some windows are broken, and if the blackboard is in a poor condition.

[22] The greater household work burden on females is emphasized in the work of Edmonds and Pavnick (2005) and Allais (2009). Levison et al. (2001) find that considering domestic work changes the effect of work on school attendance for boys and girls dramatically. Girls are 7.7 percentage points less likely than boys to attend school when the inclusive measure of work (that includes domestic work and market work) is

that females considerably do more household work than males, and the inferred norms of chapter 3. A concern is that children's birth order and siblings' sex composition may affect the parents' decision to have another child which would affect the total number of children and indirectly the sisters-to-siblings' ratio. As the effect of the birth order on the sisters-to-siblings' ratio is indirect and as I control for the number of siblings, this concern is of little importance. Another concern is that the sisters-to-siblings' ratio could influence human capital investment through peer effects. Seeing a sister doing well at school may motivate a girl sibling more than a boy sibling to study hard. This concern is of little importance since the empirical literature on peer effect finds no evidence of such impact although the peer effect is found in different cases. Hauser (1997) and Kaestner (1996) do not find an effect of sibling sex composition on the educational attainment of white males and females. Kaestner (1996) finds an effect only on black teens between 15 and 18, as those who grew up with sisters had achieved higher education than those who grew up with brothers. Butcher and Case (1994) find that women who were raised with only brothers have received more education than women who were raised with only sisters. Conley (2000) finds that the number of opposite sex siblings reduces the educational attainment of a boy or girl.

4.4. The empirical specification

My basic specification takes the following form:

$$Y = \beta_1 X + \beta_2 H + \varepsilon \qquad (4.2)$$

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considered and 13.8 percentage points more likely to attend school when only market work is considered, indicating that girls do most of the household work. Mensch et al. (2003) indicate that girls in Middle Eastern countries, including Egypt, do the household chores while boys spend much time outside with friends and doing sports.

where Y is the vector of outcomes, X is the vector of household, child, and community characteristics, and H is hours of household chores. OLS produces an inconsistent estimate of β_2. To solve this problem, I estimate the following IV model using two-stage least squares (2SLS):

$$H = \gamma_1 X + \gamma_2 Z + \delta \quad (4.3)$$

$$Y = \beta_1 X + \beta_2 \hat{H} + \nu \quad (4.4)$$

Z is the vector of instrumental variables used to estimate the household work reduced form equation (4.3), and is excluded from the outcome equation (equation (4.4)). Predicted hours of household chores, denoted by $\widehat{H}$ from equation (4.3) are used to estimate equation (4.4).

I estimate a reduced-form household work (HHW) equation and a structural human capital investment equation. Depending on the model's specification, the outcome variables that I use are either continuous or binary. In the first case, human capital investment is measured by school attendance. In the second case, human capital investment is measured by daily hours of school-related activities (HC). HHW is a continuous variable in both cases, measured on a daily basis as well.

4.5. Control variables and descriptive statistics

Table 4.4 shows selected descriptive statistics of the explanatory variables including control variables and instruments. Control variables are categorized as girls' characteristics, household characteristics, and community characteristics. Girls' characteristics include age of the girl, a variable to measure if the girl has health

problems[23], and the relationship to the household head. Although none of the children are domestic servants, a small percentage (2%) are grandchildren of the household head. As this family relationship may affect children's domestic activities, I include a variable to measure whether or not a girl is the daughter of the household head.

Household characteristics include father's age when child was six, mother's age when child was six, mother's education level (a dummy variable to measure if the mother completed secondary schooling), father's education level (a dummy variable to measure if the father completed secondary schooling), mother's employment sector (a dummy variable to measure if the mother works in the private sector), father's employment sector (a dummy variable to measure if the father works in the private sector), household's position in the distribution of wealth (the variable includes five wealth quintiles), the number of children in the household, and the household size.

Parents' age is expected to affect children's schooling and work. Younger parents may face limited financial sources that affect their decisions on child work and schooling. The household's position in the distribution of wealth is measured by a wealth index calculated in the SYPE and includes five wealth quintiles. The wealth index is a composite variable that assesses the household's wealth in terms of ownership of durable goods, measures of house quality (such as the number of rooms and the material of the walls and roof), and household access to interest and dividend income from financial assets and bank deposits.

[23] Health problems include diabetes, cancer, hypertension, acne, kidney problems, bilharzia, gastric or duodenal ulcer, asthma, anemia, heart disease, skin allergy, epilepsy, cataract, other lung disease, arthritis, hepatitis, cholesterol, and migraine or frequent headache.

The variables that measure the community characteristics include a set of dummies to determine the region of residence (urban/rural/slum) and the index that measures the school availability. The index of school availability is calculated using variables that are measured at the district-level using PC2006. These variables include the percentage of women with secondary schooling and above, the percentage of men with secondary schooling and above, the percentage of boys enrolled in middle schools, the percentage of girls enrolled in middle schools, the percentage of boys enrolled in secondary schools, and the percentage of girls enrolled in secondary schools. School quality is measured by a series of variables obtained from the SYPE[24].

4.6. Results of the IV estimation of hours of human capital investment (HC)

Table 4.5 shows the IV estimates and OLS estimates of hours of human capital investment. Girls' household work significantly affects their human capital investment (1% significance level). One extra hour of HHW reduces HC by 2.096 hours. According to this coefficient, closing the gap in household work hours between the first quartile and the third quartile girl (0 and 2 hours respectively) closes 59.9% of the gap in hours of human capital investment between the first quartile and the third quartile girl (2 and 9 hours respectively).[25]

Table 4.5 shows that the father's age has a positive effect on girls' investment in human capital, but the mother's age has a negative effect. While father's education does not have an effect on girls' investment in human capital, mother's education has a sizable

[24] See footnote 18 for a description of the variables that constitute the school quality index.

[25] When the data is put in an increasing order, the first quartile is the median of the lower half and the third quartile is the median of the upper half. About 25% of the numbers in the dataset lie below the first quartile and about 75% of the numbers in the dataset lie above the third quartile.

effect, as when the mother has secondary schooling or above, girls' human capital investment increases by 0.939 hours. The results also show that girls' health significantly affects their investment in human capital, as having health problems reduces girls' human capital investment by 0.937 hours.

As the school availability increases, girls' human capital investment increases by 0.364 hours. The negative school quality index has a higher effect on girls' investment in human capital than the index of positive school quality (0.796 and 0.176 respectively).

The first column of Table 4.5 shows the OLS results of regressing HC on HHW for girls. The effect of household work on HC is significant at the 1% level: an extra hour of household work leads to a decrease of 0.529 hours in HC. As the IV estimate of the effect of girls' household work on human capital investment is larger than the OLS estimate, the OLS estimate underestimates the effect of household work on girls' investment in human capital. This is an indication that girls with a higher ability are selected into work, perhaps because of the higher productivity of these girls. This result places doubts on the assumption that children who are less productive at school get selected into work.

4.6.1. The effect of household work on the different categories of human capital investment

Tables 4.6, 4.7, and 4.8 show the results of regressing the disaggregated hours of human capital investment on HHW. Time in school is not affected by household work. Household work has a higher effect on homework than on private tutoring (0.612 and 0.572 hours respectively). The wealth quintile variable has a significant effect on

homework's time, as being in a higher wealth quintile results in an increase in time doing homework by 0.192 hours. As expected, the wealth quintile variable has a higher effect on time in private tutoring, as being in a higher wealth quintile increases hours of private tutoring by 0.469 hours. A noticeable result is that mother's work in the private sector increases girls' time in private tutoring while father's work in the private sector does not have an effect. This result may indicate that females tend to spend their income to enhance children's education. Private sector work is desirable in Egypt, as it results in higher income (compared with the public sector). Mothers working in the private sector might place a higher value on girls' human capital investment. It is also noticeable that children living in slum areas spend more time in private tutoring. This may result from lower school quality in slum areas.

We conclude in this section that the effect of household work on human capital investment occurs through the effect of household work on homework's time and time spent in private tutoring. Time in school is not affected by household work.

4.7. Results of the IV estimation of hours of school attendance (SA)

Table 4.9 shows the coefficient estimates of regressing school attendance on hours of household work. Household work does not have a significant impact on girls' school attendance. This result coincides with the insignificant effect of household work on time at school. The result shows that household work does not affect children's school attendance but it affects their homework and private tutoring time.[26]

[26] This result differs from the results of Assaad et al. (2010) who find a significant effect of household work on girls' school attendance.

Age has a positive yet small effect on girls' school attendance: age increases the probability of attending school by 0.609 percentage points. Father's age affects HC (see Section 3.6), but does not have an impact on girls' school attendance. Mother's age has no effect in either case.

Mother's and father's education dummies are significant and have a positive impact on girls' school attendance. When the girl's mother and (father) have secondary schooling or above, the probability of school attendance increases by 2.8 and 4.6 percentage points respectively.

School availability has a positive effect on girls' school attendance. The negative school quality index has a higher effect on school attendance than the positive school quality index. The negative school quality reduces girls' school attendance by 25.3 percentage points. Children in rural areas are 5.9 percentage points less likely to attend school than children in urban areas by. As in the case of HC, lack of good health has a negative effect on school attendance, as girls with health problems are 3.5 percentage points less likely to attend school.

5. Conclusion and policy implications

The main objective of this chapter was to estimate the causal effect of household work on human capital investment measured by hours spent in school-related activities and by school attendance. Using the SYPE 2009 dataset for girls aged 10 to 17 in Egypt, I find that household work has a significant and sizable effect on girls' hours of human capital investment: increasing household work by one hour reduces hours spent by girls investing in human capital by 2.096 hours. In case of school attendance, I find that

household work does not have a significant effect on girls' school attendance. I also find that the effect of household work on hours of human capital investment occurs through the effect of household work on homework and tutoring time, as the effect of household work on school time is insignificant. To identify the causal impact of household work on the educational outcomes, I instrument for household work using variables that greatly affect the demand for household work. These variables are the ratio of sisters- to- siblings 10 and up in the household and the household access to basic public services (public garbage collection, public sewage disposal, and piped water).Studies show that investment in human capital is closely related to future earnings. Glewwe (2002) reviewed the literature on human capital in developing countries and noted that test scores in childhood are positively correlated with future earnings. Ilahi, Orazem, and Sedlacek (2005) found that, even when completed years of schooling are held constant, Brazilian adults who were child workers receive 4 to 11 percent less return per year of schooling. Given the strong association between investment in human capital and future earnings, my findings that 10.4% of the children in the sample work for more than 3 hours daily, and that household work has a sizable effect on human capital investment indicate that policies to reduce the burden of household work are of great importance.

To reduce the time devoted to household work, policy makers should improve access to public infrastructure, especially in rural and slum areas where children do more household work. Fetching water from faraway places and carrying heavy dishes and utensils to a shared faucet to be washed take a lot of time and effort. Improving the infrastructure will reduce the time children spend doing household chores. In addition, improving the living conditions and increasing the financial resources of poor families

should allow these families to acquire the tools needed to reduce time and energy spent on household tasks.

As the level of mother's education shows a robust and sizable effect on the human capital investment of boys and girls, policies to improve education, especially for females, may produce significant results in developing countries.

Table 4.1: School Attendance Percentages across Surveys

	ELMS 1998	ELMS 2006	SYPE 2009
All children	83.3	85.5	85.8
Children 10-14	89.1	93.3	92.8
Boys	85.5	87.9	85.5
Girls	80.9	83.5	84.3

Notes: the definition of school attendance is the same across surveys.

Table 4.2: Child Labor Percentages across Surveys

	ELMS 1998	ELMS 2006	SYPE 2009
Market work			
All children	11.2	13.8	5.5
Children 10-14	4.6	9	2.6
Domestic work			
Females	96.7	55.3	68.8
Females 10-14	86.8	43.9	63.7

Notes: The definitions of market work and domestic work are the same across surveys.

Table 4.3: First Stage Estimates, Dependent Variable: Hours of Household Work (HHW)

Public services' index	0.761**
	(0.30)
Sisters to siblings' ratio	-0.253*
	(0.13)
Girls' characteristics	
Age	0.170
	(0.17)
Age squared/100	-0.059
	(0.63)
Not daughter of household head	-0.038
	(0.18)
The girl has health problems	-0.058
	(0.13)
Household's characteristics	
Father's age when the girl was six	-0.001
	(0.01)
Mother's age when the girl was six	-0.012*
	(0.01)
Parents' education	
Mother has secondary schooling or above	-0.290***
	(0.08)
Father has secondary schooling or above	-0.228***
	(0.08)
Household size	0.055
	(0.02)
# of children in the household	-0.023
	(0.04)
Parents' employment sector	
Mother works in the private sector	0.211
	(0.15)
Father works in the private sector	0.028
	(0.06)
Household's wealth position	-0.643*
	(0.38)
Community characteristics	
School availability	-0.122***
	(0.03)
School quality	
Positive school quality	0.017
	(0.03)

Negative school quality	-0.485***
	(0.04)
Region of residence	
Rural	0.116
	(0.19)
Slum	0.514
	(0.41)
N	2781
R^2	0.550

Notes: Standard errors in parentheses. *** indicates significance at 1 percent; ** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Table 4.4: Descriptive Statistics of the Explanatory Variables

Variable	Mean/Percentage	Standard Deviation
Girls' characteristics		
Age	13.42	2.27
The girl is not the daughter of the household head*	2.41	
The girl has health problems*	30.42	
Household's Characteristics		
Father's age when the girl was six	39.49	7.47
Mother's age when the girl was six	32.67	6.36
Parents' education		
Mother has high schooling or above*	32.15	
Father has high schooling or above*	42.11	
Parents' employment sector		
Mother works in the private sector*	3.49	
Father works in the private sector *	53.65	
# of children	2.04	0.91
Household size	6.01	1.69
Wealth		
HH in the 2nd quintile*	18.85	
HH in the 3rd quintile*	20.89	
HH in the 4th quintile*	20.78	
HH in the 5th quintile*	20.06	
Community characteristics		
School availability		
% of females completed secondary schooling or above	30.80	15.59
% of males completed secondary schooling or above	46.06	12.61
% of boys enrolled in high school	85.38	7.61
% of girls enrolled in high school	82.02	13.04
School quality		
School has multiple shifts*	24.88	
School has a library*	82.24	
The number of students on one bench is more than what it should be*	23.23	

Region of residence		
Rural*	56.85	
Slum*	7.95	
Instruments		
Services variables on the household-level (SYPE)		
HH has no piped water*	9.49	
HH has no public sewer connection8	55.75	
HH has no garbage collection (garbage is not collected from home)*	68.8	
Ratio of sisters-to-siblings in the HH	0.50	0.38

Notes: Means and Standard Deviations are used to describe continuous variables while proportions are used to describe binary variables. * Indicates a dummy variable.

Table 4.5: IV Estimates and OLS Estimates of Hours of Human Capital Investment (HC)

	OLS	IV
Household work	-0.529***	-2.096**
	(0.04)	(0.90)
Girls' characteristics		
Age	-0.108	0.217
	(0.40)	(0.52)
Age squared/100	0.406	0.089
	(1.48)	(1.82)
Not daughter of household head	0.213	0.153
	(0.38)	(0.48)
The girl has health problems	-0.126	-0.937*
	(0.27)	(0.56)
Household's characteristics		
Father's age when the girl was six	0.029**	0.027*
	(0.01)	(0.02)
Mother's age when the girl was six	-0.024	-0.043**
	(0.02)	(0.02)
Parents' education		
Mother has secondary schooling or above	0.642***	0.939***
	(0.20)	(0.24)
Father has secondary schooling or above	0.513***	0.154
	(0.18)	(0.31)
Household size	0.127***	0.212***
	(0.01)	(0.01)
# of children in the household	0.017	0.038
	(0.07)	(0.09)
Parents' employment sector		
Mother works in the private sector	-0.430	-0.155
	(0.36)	(0.49)
Father works in the private sector	-0.152	-0.100
	(0.14)	(0.18)
Household's wealth position	0.066	0.040
	(0.99)	(0.745)
Community characteristics		
School availability	-0.008	0.364***
	(0.07)	(0.09)
School quality		
Positive school quality	0.149**	0.176**
	(0.07)	(0.08)
Negative school quality	-1.577***	-0.796*
	(0.08)	(0.46)

Region of residence		
Rural	0.124	0.397
	(0.42)	(0.63)
Slum	-0.191	0.560
	(1.03)	(1.47)
N	2781	2781
R^2	0.55	0.49

Notes: Standard errors in parentheses. *** indicates significance at 1 percent; ** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Table 4.6: IV Estimates of Daily Hours in School

Household work	-0.911
	(0.64)
Girls' characteristics	
Age	0.088
	(0.37)
Age squared/100	-0.439
	(1.29)
Not daughter of household head	0.396
	(0.36)
The girl has health problems	-0.30*
	(0.18)
Household's characteristics	
Father's age when the girl was six	0.021*
	(0.01)
Mother's age when the girl was six	-0.019
	(0.02)
Parents' education	
Mother has secondary schooling or above	0.180**
	(0.07)
Father has secondary schooling or above	0.050
	(0.22)
Household size	0.200
	(0.02)
# of children in the household	0.100
	(0.06)
Parents' employment sector	
Mother works in the private sector	-0.310
	(0.36)
Father works in the private sector	-0.105
	(0.13)
Household's wealth position	-0.280
	(0.59)
Community characteristics	
School availability	0.216**
	(0.11)
School quality	
Positive school quality	0.100*
	(0.06)
Negative school quality	-0.595*
	(0.32)

Region of residence	
Rural	0.245
	(0.41)
Slum	-0.020
	(0.99)
N	2781
R^2	0.53

Notes: Standard errors in parentheses. *** indicates significance at 1 percent;
** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Table 4.7: IV Estimates of Daily Hours of Private Tutoring

Household work	-0.572**
	(0.25)
Girls' characteristics	
Age	0.263*
	(0.14)
Age squared/100	-0.557
	(0.50)
Not daughter of household head	-0.158
	(0.13)
The girl has health problems	-0.137
	(0.10)
Household's characteristics	
Father's age when the girl was six	0.002
	(0.001)
Mother's age when the girl was six	-0.013**
	(0.01)
Parents' education	
Mother has secondary schooling or above	-0.029
	(0.10)
Father has secondary schooling or above	-0.049
	(0.09)
Household size	-0.004
	(0.85)
# of children in the household	-0.042
	(0.03)
Parents' employment sector	
Mother works in the private sector	0.215
	(0.13)
Father works in the private sector	0.059
	(0.05)
Household's wealth position	0.469**
	(0.22)
Community characteristics	
School availability	0.029
	(0.04)
School quality	
Positive school quality	0.017
	(0.02)
Negative school quality	-0.037
	(0.13)

Region of residence	
Rural	-0.004
	(0.17)
Slum	0.460*
	(0.27)
N	2781
R^2	0.43

Notes: Standard errors in parentheses. *** indicates significance at 1 percent;
** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Table 4.8: IV Estimates of Daily Homework Hours

Household work	-0.612*
	(0.34)
Girls' characteristics	
Age	-0.134
	(0.19)
Age squared/100	1.085
	(0.71)
Not daughter of household head	-0.085
	(0.16)
The girl has health problems	-0.020**
	(0.001)
Household's characteristics	
Father's age when the girl was six	0.003
	(0.01)
Mother's age when the girl was six	-0.011
	(0.01)
Parents' education	
Mother has secondary schooling or above	0.197
	(0.13)
Father has secondary schooling or above	0.153
	(0.11)
Household size	0.016
	(0.59)
# of children in the household	-0.020
	(0.03)
Parents' employment sector	
Mother works in the private sector	-0.059
	(0.16)
Father works in the private sector	-0.054
	(0.07)
Household's wealth position	0.192*
	(0.11)
Community characteristics	
School availability	0.025
	(0.08)
School quality	
Positive school quality	0.059**
	(0.03)
Negative school quality	-0.043
	(0.17)

Region of residence	
Rural	0.155
	(0.18)
Slum	0.134
	(0.42)
N	2781
R^2	0.52

Notes: Standard errors in parentheses. *** indicates significance at 1 percent;
** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Table 4.9: IV Estimates of School Attendance

Household work	-0.061
	(0.04)
Girls' characteristics	
Age	-0.092***
	(0.02)
Age squared/100	0.366***
	(0.09)
Not daughter of household head	-0.001
	(0.02)
The girl has health problems	-0.353*
	(0.19)
Household's characteristics	
Father's age when the girl was six	0.001
	(0.002)
Mother's age when the girl was six	-0.001
	(0.002)
Parents' education	
Mother has secondary schooling or above	0.028**
	(0.01)
Father has secondary schooling or above	0.046***
	(0.01)
Household size	0.005
	(0.17)
# of children in the household	-0.001
	(0.002)
Parents' employment sector	
Mother works in the private sector	0.010
	(0.02)
Father works in the private sector	-0.013*
	(0.01)
Household's wealth position	-0.004
	(0.43)
Community characteristics	
School availability	0.173***
	(0.00)
School quality	
Positive school quality	0.039***
	(0.001)
Negative school quality	-0.253***
	(0.02)

Region of residence	
Rural	-0.059*
	(0.03)
Slum	0.040
	(0.06)
N	2781
R^2	0.69

Notes: Standard errors in parentheses. *** indicates significance at 1 percent;
** at 5 percent; * at 10 percent. Standard errors are heteroscedasticity consistent.

Bibliography

Abu Gazaleh, K., Bulbul, L., Hewala, S., and Najim, S. (2004). Gender, Education and Child Labour in Egypt. *International Labour Organization (ILO)*.

Akabayashi, H. and Psacharopoulos, G. (1999). The Trade–off between Child Labour and Human Capital Formation: A Tanzanian Case Study. *The Journal of Development Studies, 35(5),* 120 –140.

Akerlof, G. A. and Kranton, R. E. (2000). Economics and Identity. *Quarterly Journal of Economics, 115 (2000),* 715–753.

Akerlof, G. A. and Kranton, R. E. (2010). Identity Economics: How Our Identities Shape Our Work, Wages, and Well-Being. *Princeton University Press*.

Allais, F. B. (2009). Assessing the Gender Gap: Evidence from SIMPOC Surveys. *IPEC*.

Angrist, J. D. (2001). Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. *The Journal of Economic perspectives,* 15*(4),* 69 –85.

Assaad, R., Levison, D. and Dang, H. (2010). How Much Work is too Much? Effects of Child Work Hours on Schooling –The Case of Egypt. *Research in Labor Economics, 31*, 53 –97.

Assaad, R., Levison, D. and Zibani, N. (2010). The Effect of Domestic Work on Girls' Schooling: Evidence from Egypt. *Feminist Economics, 16(1),* 79 –128.

Baland, J. and Robinson, J. (2000). Is child Labour Inefficient? *Journal of Political Economy, 108(4),* 663–679.

Bar, T. and Basu, K. (2009). Children, Education, Labor, and Land: in the Long Run and Short run. *Journal of the European Economic Association, 7(2–3),* 487–497.

Basu, K. and Van, P. (1998). The Economics of Child Labor. *The American Economic Review, 88(3),* 412-427.

Basu, K. (2000). The Intriguing Relation between Adult Minimum Wage and Child Labor. *The Economic Journal, 110(462)*: C50-C61.

Basu, K. and Ray, R. (2002). The Collective Model of the Household and an Unexpected Implication for Child Labor: Hypothesis and an Empirical test. *Policy Research World Bank, 2813.*

Basu, K. (2006). Gender and Say: a Model of Household Behavior with Endogenously Determined Balance of Power. *The Economic Journal, 116(511)*, 558–580.

Basu, K., Das, S. and Dutta, B. (2010). Child Labor and Household Wealth: Theory and Empirical Evidence of an Inverted-U. *Journal of Development Economics, 91*, 8–14.

Behrman, J., Pollak, R. and Taubman, P. (1982). Parental Preferences and Provision for Progeny. *Journal of Political Economy, 90(1)*, 52-73.

Behrman, J., Pollak, R. and Taubman, P. (1986). Do Parents Favor Boys? *International Economic Review, 27(1)*, 33-54.

Ben-Porath, Y. (1976). The Production of Human Capital and the Life Cycle of Earnings. *Journal of Political Economy, 75(4)*, 352-365.

Bhalotra, S. and Heady, C. (2003) Child Farm Labor: the Wealth Paradox. *World Bank Economic Review, 17(2)*, 197–227.

Bhalotra, S. (2007). Is Child Labor Necessary? *Oxford Bulletin of Economics and Statistics, 69(1)*, 29-55.

Beegle, K., Dehejia, R. and Gatti, R. (2003). Child Labor, Crop Shocks, and Credit Constraints. *NBER Working Paper, 10088*.

Beegle, K., Dehejia, R. and Gatti, R. (2006). Child Labor and Agricultural Shocks. *Journal of Development Economics, 81,* 80-96.

Beegle, K., Dehejia, R. and Gatti, R. (2009). Why should we Care about Child Labor? The Education, Labor market, and Health Consequences of Child Labor. *Journal of Human Resources, 44(4),* 871–889.

Ben –Porath, Y. (1967). The Production of Human Capital and the Life Cycle Earnings. *The Journal of Political Economy, 75(1),* 352 –365.

Bertrand, M. (2014). Economic Consequences of Gender Identity. *NBER Working Paper No. 2.*

Blunch, N. and Verner, D. (2001). Revisiting the Link between Poverty and Child Labor: the Ghanaian Experience. *CLS Working Paper No. 01-03*.

Boozer, M. A. and Suri, T. K. (2001). Child Labor and Schooling Decisions in Ghana. *Labor and Population Workshop Paper, Yale University*.

Buse, A., (2003). Instrumental Variables. *The Journal of Economic Perspectives, 17(1),* 224 –226.

Canagarajah, S. and Coulombe, H. (1997). Child Labor and Schooling in Ghana. *World Bank Policy Research Working Paper No. 1844*.

Chen, L. C., Huq, E. and D'Souza, S. (1982). Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh. *Population and Development Review, 7(1),* 55-70.

Chumacero, R. and Paredes, R. (2011). Favored Child? School Choice within the Family. *Munich Personal RePEc Archive, 31838*.

Congdon Fors, H. (2007). The Determinants of Rural Child Labor: an Application to India.*Working Papers in Economics, 256, University of Gothenburg*.

Dammert, A. (2005). Does Child Labor Decline with Household Income? A Non-parametric Approach. *Mimeo, Syracuse University*.

Dammert, A. (2008). Child Labor and Schooling Response to Changes in Coca Production in Rural Peru. *Journal of Development Economics, 86(1),* 164-180.

Das Gupta, M. (1987). Selective Discrimination against Female Children in Rural Punjab, India, *Population studies, 51(3),* 77-100.

Dehejia, R. and Gatti, R. (2002). Child Labor: the Role of Income Variability and Access to Credit across Countries. *NBER Working Paper, 9018.*

Duryea, S., Lam, D. and Levison, D. (2007). Effects of Economic Shocks on Children's Employment and Schooling Shocks in Brazil. *Journal of Development Economics, 84(1),* 188-214.

Edmonds, E. (2005). Does Child Labor Decline with Improving Economic Status? *The Journal of Human Resources, 40(1),*77-99.

Edmonds, E. (2006). Child Labor and Schooling Responses to Anticipated Income in South Africa. *Journal of Development Economics, 81(2),* 386–414.

Edmonds, E. (2007). Child Labor. *Discussion Paper No. 2606, The Institute for the Study of Labor (IZA).*

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

Elbadawy, A., Assaad, R., Ahlburg, D. and Levison, D. (2004). Private and Group Tutoring in Egypt: Where is the Gender Inequality? *Working Paper, 200429, Economic Research Forum, Cairo.*

Emerson, P. and Knabb, S. (2006). Opportunity, Inequality and the Intergenerational Transmission of Child Labor. *Economica, 73,* 413–434.

Emerson, P. and Souza, A. (2007). Child Labor, School Attendance, and Intra Household Gender Bias in Brazil. *The World Bank Economic Review, 21(2),* 301–316.

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

Fafchamps, M. and Wahba, J. (2006). Child Labor, Urban Proximity, and Household Consumption. *Journal of Development Economics, 79*, 374-397.

Fernandez, R. and Fogli , A. (2005). Culture: An Empirical Investigation of Beliefs, Work, and Fertility. *NBER Working Paper No. 11268.*

Fortin, N. (2005). Gender Role Attitudes and the Labour Market Outcomes of Women Across OECD Countries. *Oxford Review of Economic Policy, 21*, 416–38.

Goldin, C. (2002). A Pollution Theory of Discrimination: Male and Female Differences in Occupations and Earnings. *NBER Working Paper No. 8985*.

Goulart, P. and Arjun, B. S. (2008). Child Labour and Educational Success in Portugal. *Economics of Education Review, 27(5),* 575–87.

Guarcello L., Mealli, F. and Rosati, F. (2010). Household Vulnerability and Child Labor: the Effect of Shocks, Credit rationing, and Insurance. *Journal of Population Economics, 23*, 169–198.

Guenena, N. and Wassef, N. (1999). Unfulfilled Promises. *Population Council*.

Gunnarsson, V., Orazem, P. and Sanchez, M. A. (2006). Child Labor and School Achievement in Latin America. *World Bank Economic Review, 20(1),* 31–54.

Guryan, J., Hurst, E. and Kearney, M. (2004). Parental Education and Parental Time with Children. *Manuscript*.

Hazarika, G. and Bedi, A. S. (2003). Schooling Costs and Child Work in Rural Pakistan. *Journal of Development Studies, 39(5),* 29–64.

Hazarika, G. and Sarangi, S. (2008). Household Access to Microcredit and Child Work in Rural Malawi. *World Development, 36(5),* 843-859.

Hoodfar, H. (1996). Development, Change, and Gender in Cairo: A View from the Household. *Bloomington: Indiana University Press*, 1–26.

Horowitz, A. W. and Wang, J. (2004). Favorite Son? Specialized Child Laborers and Students in Poor LDC Households. *Journal of Economic Development,* 73(2), 631-642.

Heady, C. (2000). What is the Effect of Child Labor on Learning Achievement? Evidence from Ghana. *Innocenti Working Paper, 79, UNICEF Innocenti Research Centre*.

Imbens, G. (2006). Lecture 18: Two-Stage-Least-Squares, Control Function, and Limited-Information-Maximum-Likelihood Estimation. *Retrieved from UC Berkeley AER 213 Blackboard site*.

Imbens, G. and Wooldridge, J. (2007). What's New in Econometrics. *NBER Summer Course.*

Janvery, A., Finan, F., Sadoulet, E. and Vakis, R. (2006). Can Conditional Cash Transfer Programs Serve as Safety Nets in Keeping Children at School and from Working when Exposed to Shocks? *Journal of Development Economics, 79*. 349-373.

Jensen, P. and Nielsen, H. S. (1997) Child Labor or School Attendance? Evidence from Zambia. *Journal of Population Economics, 10(4),* 407 –424.

Kambhampati, U.S. and Rajan, R. (2005). Does Child Work Decrease with Parental Income? The Luxury Axiom Revisited in India. *European Journal of Development Research, 17(4),* 649–680.

Kamenica, E., Bertrand, M., and Pan, J. (2013). Gender Identity and Relative Income within Households. *NBER Working Paper No. 19023.*

Katz, L. F., Bertrand, M., and Goldin, C. (2009). Dynamics of the Gender Gap for Young Professionals in the Corporate and Financial Sectors. *NBER Working Paper No. 14681*.

Klasen, S. (2002). Low Schooling for Girls, Slower Growth for All? Cross –Country Evidence on the Effect of Gender Inequality in Education on Economic Development. *The World Bank Economic Review, 16(3),* 345 –373.

Kumar, A. (2012). Son Preference, Gender Differentials in Child Labor, and Efficiency. *Manuscript*.

Kurosaki, T., Ito, S., Fuwa, N., Kubo, K. and Sawada, Y. (2006). Child Labor and School Enrollment in Rural India: whose Education Matters? *Developing Economies, 44(4),* 440–464.

Kumar, A. and Underhill, E. (2010) Gender Bias and Child Labor in LDCs. *Manuscript.*

Lemieux, T. (2012). Lecture 2: IV Estimation and Two-Stage Least Squares. *Retrieved from UBC ECON 594 Blackboard Site.*

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

Levison, D., Moe, K. S., and Knaul, F. (2001). Youth Education and Work in Mexico. *World Development, 29(1),* 167–88.

Lloyd, C. B., Mete, C. and Sathar, Z. A. (2005). The Effect of Gender Differences in Primary School Access, Type, and Quality on the Decision to Enroll in Rural Pakistan. *The University of Chicago*.

Lopez-Calva, L. (2002). A Social Stigma Model of Child Labor. *Estudios Economicos,* 17(2), 193-217.

Maldonado, J. and Gonzalez-Vega, C. (2008). Impact of Microfinance on Schooling: Evidence from Poor Rural Households in Bolivia. *World Development, 36(11),* 2440–2455.

Mensch, B. S., Ibrahim, B. L., Lee, S. M. and El-Gibaly, O. (2003). Gender-Role Attitudes among Egyptian Adolescents. *Studies in Family Planning, 34(1),* 8–18.

Munshi, K. and Rosenzweig, M. (2006). Caste, Gender and Schooling Choice in a Globalizing Economy, Traditional Institutions Meet the Modern World. *American Economic Review, 96(4),* 1225-1252.

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

Patrinos, H. and Shafiq, N. (2010). An Empirical Illustration of Positive Stigma towards Child Labor. *Economics Bulletin, 30(1),* 799–807.

Post, D. and Pong, S. (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.

Pouliot, W. (2006). Introducing Uncertainty into Baland and Robinson's Model of Child Labour. *Journal of Development Economics, 79(1),* 264–272.

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

Patrinos, H. and Psacharopoulos, G. (1997). Family Size, Schooling and Child Labor in Peru: an Empirical Analysis. *Journal of Population Economics, 10(4),* 387-405.

Ranjan, P. (1999). An Economic Analysis of Child Labor. *Economics Letters,* 64, 99–105.

Ravallion, M. and Wodon, Q. (1999). Does Child Labor Displace Schooling? Evidence on Behavioral Responses to an Enrollment Subsidy. *Manuscript*.

Ray, R. (2000). Poverty, Household Size and Child Welfare in India. *Economic and Political Weekly, 35(39),* 3511 –3520.

Ray, R. (2000). Analysis of Child Labour in Peru and Pakistan: A Comparative Study. *Journal of Population Economics,* 13, 3 –19.

Ray, R. (2003). The Determinants of Child Labor and Child Schooling in Ghana. *Journal of African Economics, 11(4),* 561 –590.

Ray, R. and Lancaster, G. (2005). The Impact of Children's Work on Schooling: Multi – Country Evidence. *International Labor Review, 144(2),* 189 –210.

Rogers, C. and Swinnerton, K. (2001). Inequality, Productivity and Child Labor: Theory and Evidence. *Mimeo, Georgetown University*.

Stock, J. H., Wright, J. H. and Yogo M. (2002). A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments. *Journal of Business and Economic Statistics, 20(4),* 518 –529.

Wahba, J. (2006). The Influence of Market Wages and Parental History on Child Labor and Schooling in Egypt. *Journal of Population Economics, 19,* 823-852.

Whitney, N. K., Powell, J. L. and Walker, J. R. (1990). Semiparametric Estimation of Selection Models: Some Empirical Results. *The American Economic Review, 80(2),* 324 –328.

Wooldridge, J. M. (2002). Econometric Analysis of Cross Section and Panel Data. *MIT Press, Chapter 5.*