Gender-bias in Education Opportunities for Population Aged 12-18 in Mexico: 1992-2004

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Abstract

There is considerable evidence that resources are not allocated randomly within households, and that resources are unequally distributed within the family in many developing countries**.** Such an unequal distribution of goods usually takes the form of a bias against females. For example, girls lag markedly behind boys in schooling in many developing countries even though this gender gap has been declining in recent years. Using an OLS-Robust model and a ML-Random Effects model for the years 1992, 1998 and 2004 of ENIGH, we did not find enough statistical evidence to support the idea that poor families, nether in rural nor in urban areas, provide more education to their 12 to 18 years old sons or daughters. In fact, contrary to the common belief, we found that non-poor families, invest more in the education of their daughters, especially in the urban areas. However, this education discrimination against male children has been decreasing over the years. It is also found that female head of households are more likely to have children with higher levels of schooling and that children having both parents at home or having older brothers or sisters present higher levels of educational attainment.

I. Introduction

The intra-household allocation of resources has become one of the most important issues in human capital research. There is considerable evidence that resources are not allocated randomly within households, and that resources are unequally distributed within the family in many developing countries.[1] Becker (1965, 1981) conceives the family acting as a single decision maker which regards child education as an investment decision. Models of intra-household allocation of goods that follow Becker´s approach assume the allocation is determined in one of the following three ways: i) parents allocate resources based on the differential labor market returns to boys and girls (Rosenzweig and Schultz 1982); ii) parents allocate resources according to their own utility, which depends on the well-being of their children (Behrman et al 1982, Behrman 1988); iii) households allocate resources based on the productivity of individual members (Pitt et al 1990);

However, several authors have pointed out the limitations of those approaches and proposed alternative collective models for the analysis of household behavior. Those models assume resources are allocated according to the relative bargaining power of the family members (Manser and Brown 1980, McElroy and Horney 1981, Ulph 1988 and 1990, Thomas 1990, Haddad and Hoddinott 1991, Chiappori 1992, Lundberg and Pollak 1993, Wolley 1993, and Echeverria and Merlo 1999).

Such an unequal distribution of goods usually takes the form of a bias against females. For example, Bardhan (1984), Behrman (1988), Harriss (1990), Rosenzweig and Schultz (1982), Sen (1984), and Sen and Sengupta (1983) provide evidence, based on mortality rates and human capital investments, that gender bias is important in explaining the household expenditures on health, nutrition and education among children. Pitt and Rosenzweig (1990), Parish and Willis (1993), Quisumbing (1994), and others have also worked on the effect of gender bias on investments in childrend´s human capital.

Brinton (1988) developed the concept of human capital system. In this system, social and economic institutions –such as family, educational system and work organization- share the responsibilities of human capital development across the individual´s life cycle. It is argued that a cross cultural perspective in gender stratification theory helps understand gender stratification in countries with different social, economical and cultural characteristics than American ones. Under this concept, differential parents´ investment in sons and daughters is explained by: parents´ perception of sex discrimination by employers, parents´ control over resources for investment in children, extent of government support, sex preference of parents, female marriage behavior and degree of flexibility in life cycle timing human capital development decisions.[2]

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[1] See, for instance, Deolalikar (1993) for Indonesia, Parish and Willis (1993) for Taiwan, Schultz (1993) on investments in health and education in many groups of developing countries. Thomas (1990) finds evidence of non-random distribution or resources in Brazilian households, and, to a lesser extent, Deaton (1987) and Svedberg (1990) find gender bias in Africa. Haddad *et al.* (1994) provide an overview of the literature on within-household resource allocation.

[2] For instance, Brinton (1988) found that Japan has a system of human capital development that encourages greater gender stratification (in favor of male children) than the American system.

Furthermore, girls lag markedly behind boys in schooling in many developing countries even though this gender gap has been declining in recent years (King and Hill 1993; Behrman 1993). Alderman et al (1996) report that, in 1990, girls tended to receive less schooling than boys, particularly in rural areas, low-income countries, and in South Asia. According to the World Bank (2005), in 1990, secondary school enrollment in low-income countries was 26 percent for girls and 42 percent for boys.[3] By 2001, female secondary enrollment had increased to 41 percent as compared to 51 percent for male enrollment.[4]

The existence and sources of gender bias has become highly relevant for the case of Mexico where the government has been implementing social programs aimed at the reduction of gender inequality under the presumption that there is discrimination against girls in education opportunities. Moreover, in 2004, Secretaria de Desarrollo Social (SEDESOL) conducted the *Primera Encuesta Nacional sobre Discriminacion en Mexico* (First Nacional Survey on Discrimination in Mexico). It is reported that 15% of the respondents think they should not invest in their daughters´ education because they will end up getting married.

The aim of this paper is to determine whether there is evidence for differences by gender in the allocation of household resources. We will focus on child education, as measured by the number of years of schooling completed. Using an OLS-Robust model and a ML-Random Effects model for the years 1992, 1998 and 2004, we did not find enough statistical evidence to support the idea that poor families, nether in rural nor in urban areas, provide more education to their 12 to 18 years old sons or daughters. In fact, contrary to the common belief, we found that non-poor families, invest more in the education of their daughters, especially in the urban areas. Fortunately, this education discrimination against male children has been decreasing over the years. It is also found that female head of households are more likely to have children with higher levels of schooling and that children having both parents at home or having older brothers of sisters present higher levels of educational attainment.

The remainder of this paper is organized as follows. Section II provides some background on Mexico´s educational gender gaps. Section III describes de data used and section IV specifies the model. Section V presents the results and section VI concludes the paper .

II. Educational Gender Gaps in Mexico

Increasing human capital investments in children is considered to be among the most effective ways of encouraging growth and of alleviating poverty in developing countries.

[3] Based on gross enrollment ratio which is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education.
[4] Primary school enrollment in 2001 was 72 percent for female and 82 percent for male.

To stimulate such investments, many governments in Latin America and Asia have initiated programs to provide financial incentives for families to send their children to school.[5]

In 1997, the Mexican government created Programa de Educación, Salud y Alimentación (PROGRESA), which in 2002 became OPORTUNIDADES. This program provides focalized aid on education, health and food with the objective of forming human capital in the poorest communities and families in Mexico (Parker and Scott 2001). The aid for education takes the form of monetary transfers to families that are contingent upon their children´s regular attendance at school. The transfer amount varies with the child´s grade level and is greatest for children in secondary school. The benefit level is also slightly higher for female children who are traditionally thought to have lower secondary school enrollment levels.

Notably remarkable is the fact, however, that, according to the World Bank (2005), between 1990 and 2001, secondary school enrollment in Mexico has been higher for female than for male. Table 1 shows that, in 1990, this ratio was 54 percent for girls as compared to 53 percent for boys. The gender gap widened by 2001 when secondary enrollment for female was 78 percent; 5 percentage points above that for male.

Table 1. School Enrollment by Country Group and Education Level

	1990		2000		2001	
	Male	Female	Male	Female	Male	Female
Primary school [1]						
Low income	..	..	82	71	82	72
Lower middle income	94	90	..	..	93	93
Middle income	94	90	..	..	93	93
Upper middle income	93	91	92	92	92	92
Latinamerica & Caribbean	87	86	96	94	..	..
Mexico	100	98	99	100	99	100
Secondary school [2]						
Low income	42	26	47	36	51	41
Lower middle income	58	49	72	70	..	..
Middle income	58	50	73	71	..	..
Upper middle income	58	59	78	81	78	82
Latinamerica & Caribbean	..	..	81	87	83	89
Mexico	53	54	72	75	73	78
Terciary school [2]						
Low income	13	3	11	7	12	8
Lower middle income	7	9	..	..	..	..
Middle income	10	10	..	..	..	..
Upper middle income	11	15	29	36	31	39
Latinamerica & Caribbean	16	13	20	25	22	26
Mexico	17	13	21	20	22	21

Source: World Development Indicators 2005, the World Bank

[1] Net enrollment ratio. The ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

[2] Gross enrollment ratio. The ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

[5] Such programs exist, for instance, in Bangladesh, Pakistan, Argentina, Chile, Colombia, Brazil, Nicaragua, and Honduras. See Berhman, Segupta and Todd (2001).

Recently, secondary and high school enrollment in Mexico has been higher for female than for men. The gap is particularly higher for high school than for secondary school. This observed gap has increased between 2001 and 2004 as shown in table 2.

Literature on sex discrimination in education access in Mexico is limited.[6] Lopez (2004) used a probit model to analyze determinants of secondary schooling enrollment in Mexico, and, in contrast to the aforementioned data about education enrollment, found that being a woman reduces the probability to enroll in secondary school, and this effect is even higher for rural than urban area. A possible explanation of these findings could be that she used data from ENIGH 1984, 1989, 1992 and 1994, thereby reflecting previous information. Parker and Pederzini (2001) find that although there seems to be no difference in primary school enrollment and overall years of education between male and female children, a lower proportion of women attend secondary or tertiary school.

Table 2. School Enrollment for Secondary and High School by Sex in Mexico[1]

	2000	2001	2002	2003	2004
Secondary School					
Male	61	62	64	65	65
Female	61	63	64	66	67
High School					
Male	46	48	50	53	53
Female	48	51	53	55	57

Source: Calculations based on data from Información Estadística. Instituto Nacional de Geografía, Estadística e Informática, INEGI and Proyecciones de la Población de México 2000-2050. Consejo Nacional de Población, CONAPO (2003)

[1] The ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age.

III. Data

We use data from the *Encuesta Nacional de Ingreso Gasto* (ENIGH) for the waves 1992, 1998 and 2004. The ENIGH is a national income expenditure survey that emerged in 1984. However, it was in 1992 when the survey start to be conducted on a regularly basis (biennially). This database is statistically representative for Mexico and contains detailed information of households for several measures of income and expenditure, socio-demographic characteristics of every member in the household such as age, education level, and characteristics of the job. The ENIGH also contains information of the physical characteristics of the dwelling. This national survey uses houses as sample units and households as units of observation.

The purpose to use data for the waves 1992, 1998 and 2004 is to compare the evolution of observable and unobservable factors that might generate differences in education

[6] There is, on the other hand, plentiful literature on sex discrimination in the labor market in Mexico. See, for instance, Camero (1995), Valdez (1995), Mayer and Cordourier (2001), and Sariñana (2002).

opportunities between boys and girls in three different points in time. We know that the best way to perform this kind of analysis is to use panel data and follow the same individuals throw the time. However, we do no have this kind of data source for Mexico.

The original data contained 50,862 individuals from 10,530 households for 1992, 48,110 individuals from 10,952 households for 1998 and 91,378 individuals from 22,595 households for 2004. We decided to drop domestic workers, temporal visitors and heads of households absent. As a result, the size of the database decreases to 50,378 observations from 10,530 households for 1992, 47,581 observations from 10,952 households for 1998 and 91,450 observations from 22,595 for 2004. Additionally, from the sample of individuals we selected only children between 12 and 18 years old in order to avoid possible bias in the selection of the sample.[7] These restrictions led to a total of 7,623 children in the 1992 ENIGH aged between 12 and 18 with valid responses for all the variables employed in this research. In 1998, a total 6,871 children met the age requirements and had valid responses. Finally, in 2004, a total of 11,109 children aged between 12 and 18 and had valid responses.

Before starting the descriptive analysis of the data it is necessary to first define the variables used in this research. Table 3 below presents a complete list of the variables employed in this research and its definitions. Most of the definitions are very transparent and do not need further explanation with the exception of rural and poor. We consider that an individual lives in a rural area if (s)he lives in a town with a population smaller than 2,500 habitants. Additionally, a household is classified as poor if it has a quarterly per capita income lower than $2,170.82 (measured in 2002 pesos) for urban areas. For rural areas, a household is classified as poor if it has a quarterly per capita income lower than $1,615.75 (measured in 2002 pesos).[8]

Table 4 shows the descriptive statistics of the data. The second column presents the mean values for all the individuals in the sample, the third and fourth column show the mean values for boys and girls respectively. The last column contains the difference in means between girls and boys. The figures presented in parentheses represent the standard deviation for each variable and the figures in the squared brackets (in the last column) represent the *t* statistic for the difference in means.

[7] Women usually get married earlier than men. Therefore, we decided not to include children older than 18 because we will end with a smaller number of women and men in the sample. Additionally, because of the same fact we might end with a biased sample of more educated women.

[8] This is the definition employed by the Mexican Technical Committee for Measuring Poverty (Comité Técnico de Medición de la Pobreza (2002)). It is worth mentioning that, in order to estimate this line of poverty, the Mexican Technical Committee for Measuring Poverty uses a different definition of rural area. They consider a household as rural if it is located in a population smaller than 15,000 habitants and for the construction of this variable we use the same definition.

Table 3. Variable Definitions

Variable	Definition
Education	Years of education of child
head education	Years of education of the head of the household
Gender	Dummy variable equal to 1 if the child is boy and zero otherwise
Poor	Dummy variable equal to 1 if the child lives in a poor household and zero otherwise
hours worked	Weekly hours worked by the child
child order	Equal to the birth order of the child divided by the total number of children in the family
Rural	Dummy variable equal to 1 if the child lives in a rural area and zero otherwise
Age	Age of the child
both parents	Dummy variable equal to 1 if the two parents are present in the household and zero otherwise
gender x rural	Equal to the interaction between gender and rural
gender x poor	Equal to the interaction between gender and poor
State dummies	We include state dummy variables as controls

The data shows that girls had 0.25 more years of education than boys in 1992. Additionally, it is possible to observe a statistically significant difference of 9 hours between the number of hours worked weekly by boys and girls in that year. It is also identified a slightly higher proportion (0.03) of boys in poverty compared to girls. The rest of the variables in the sample of 1992 do not present any statistically significant difference between the two groups analyzed. On the other hand, in 1998, girls had, on average, 0.20 years of education more than boys. In addition, the data for this year shows that, compared to girls, a slightly higher proportion of boys lived in households where the head of the family is a man. Moreover, boys worked on average 1.87 hours per week more than girls. The rest of the variables for 1998 do not present any statistically significant difference between boys and girls. For 2004, the data shows that the difference in years of education between girls and boys is equal to 0.15 in favor of girls. The data shows that, on average, boys work 5.72 hours a week more than girls and that boys are 0.12 years older than girls in the year 2004. No other statistically significant difference between the two groups analyzed was found in the 2004 sample.

Table 4. Descriptive Statistics

1992				
Variable	All	Boys	Girls	Difference in Means
Education	6.64 (2.35)	6.52 (2.37)	6.77 (2.32)	0.25* [4.53]
head education	5.01 (3.74)	4.99 (3.70)	5.03 (3.78)	0.054 [0.63]
head gender	0.86 (0.34)	0.87 (0.34)	0.86 (0.35)	-0.007 [-0.93]
Poor	0.39 (0.49)	0.37 (0.48)	0.40 (0.49)	0.03 [2.37]
hours worked	10.30 (19.89)	14.66 (22.36)	5.59 (15.51)	-9.06* [-20.70]
child order	0.56 (0.27)	0.56 (0.27)	0.57 (0.27)	0.009 [1.45]
Rural	0.45 (0.50)	0.45 (0.50)	0.44 (0.50)	-0.01 [-1.18]
Age	14.83 (2.01)	14.87 (2.03)	14.79 (1.99)	-0.08 [-1.74]
both parents	0.89 (0.31)	0.89 (0.31)	0.89 (0.32)	-0.005 [-0.69]
1998				
Education	7.08 (2.35)	6.98 (2.38)	7.18 (2.32)	0.20* [3.55]
head education	5.43 (4.33)	5.36 (4.34)	5.52 (4.32)	0.15 [1.47]
head gender	0.84 (0.36)	0.84 (0.36)	0.82 (0.38)	-0.02* [2.50]
Poor	0.48 (0.50)	0.49 (0.50)	0.48 (0.50)	-0.002 [-0.17]
hours worked	1.61 (10.08)	2.53 (12.66)	0.66 (6.28)	-1.87* [-7.81]
child order	0.59 (0.28)	0.59 (0.28)	0.60 (0.28)	0.003 [0.59]
Rural	0.41 (0.49)	0.42 (0.49)	0.40 (0.49)	-0.02 [-1.77]
Age	14.81 (1.99)	14.82 (1.99)	14.78 (1.99)	-0.04 [-0.77]
both parents	0.87 (0.34)	0.87 (0.34)	0.86 (0.38)	-0.005 [-0.68]
2004				
Education	7.63 (2.33)	7.56 (2.33)	7.71 (2.33)	0.15* [2.33]
head education	6.72 (4.61)	6.73 (4.66)	6.72 (4.57)	-0.008 [-0.09]
head gender	0.81 (0.39)	0.81 (0.39)	0.82 (0.39)	0.006 [0.93]
Poor	0.31 (0.46)	0.31 (0.46)	0.31 (0.46)	0.004 [0.50]
hours worked	7.84 (17.22)	10.62 (19.33)	4.90 (14.07)	-5.72* [-18.34]
child order	0.63 (0.28)	0.63 (0.28)	0.63 (0.28)	-0.0009 [-0.18]
Rural	0.29 (0.45)	0.29 (0.45)	0.29 (0.45)	-0.004 [-0.52]
Age	14.84 (1.99)	14.90 (2.01)	14.77 (1.97)	-0.12* [-3.45]
both parents	0.82 (0.38)	0.82 (0.38)	0.83 (0.38)	0.009 [1.35]

IV. Model Specification

The aim of this study is to explain the differences in schooling between female and male children within a family and, specifically, if there exists gender bias during the allocation process. In order to do this, we estimate equations of the form

$$Edu_{ij} = \beta_0 + \beta_1 X_i + \beta_2 Z_{ij} + \delta_i + u_{ij} \quad (1)$$

where Edu_{ij} is the number of years of formal education completed by child j in family i. X_i is a vector of variables which are common to all family members (we include characteristics of the head of family such as gender and education, as well as family characteristics such as the presence of both parents in the household, rural or urban location of the household, the number of children, and whether the family is classified as poor according to their income). We also include dummy variables to control for cultural and other (regional) unobserved differences between the states of residence of the families. Z_{ij} is a vector of variables which vary across family members (such as gender, age, child birth order, and hours worked, if applicable). Interactions between gender and rural/urban status and between gender and poverty status are included to investigate to which extent gender bias is influenced by each of these conditions. The error term is assumed to have two components: one common to all children within a family, δ_i, and another which varies independently across siblings, u_{ij}.

First, following Parish and Willis (1993), the models are estimated applying heteroskedasticity-robust methods (Eicker 1967, Huber 1967, and White 1980). That is, we deal with the issue that errors in the equations are not independent because of the common unmeasured family effect, δ_i, by estimating robust standard errors.[9]

Unobservable preferences, however, may influence both the family characteristics and the allocation of resources to children.[10] The instrumental variable approach normally used to solve this problem is not feasible in this case because all of the exogenous variables are contained in the model, leaving no instruments available to identify the family effect. Instead, we could estimate fixed- and random-effect models that control for the possible correlation between the regressors and the disturbance.

A limitation of the fixed-effect model is that we cannot estimate β_1, the coefficients of the variables common to all siblings. Additionally, as Griliches (1979) emphasizes, the within estimators are not necessarily closer to the "true" estimators because differentiating may exacerbate the effects of other potential econometric problems such as measurement errors in explanatory variables or endogeneity involving the individual error component.

[9] We do not know whether robust standard errors will be larger than usual standard errors ahead of time. However, as an empirical matter, the robust standard errors are often found to be larger than the usual standard errors. (Wooldridge 2003, p. 261)

[10] For example, high fertility families may choose to invest less in the education of each child, leading to a negative correlation between δ_i and the number of siblings, which, in turn, leads to correlations with related variables such as relative birth order.

On the other hand, one can think of the unobserved effect to be uncorrelated with all explanatory variables, whether these variables are fixed across a family or not. In this sense, a child´s education is explained by his own characteristics as well as his family´s background, but there is an unobserved effect that varies randomly within and across families. Thus, we can include in a child´s education equation a variable such as head of family´s education even if it does not change across siblings. But we are assuming that head of family´s education is uncorrelated with the unobserved effect, which contains other family and child characteristics (see Wooldridge 2003, pp. 469-71).

Therefore, we estimate also equation 1 assuming random effects with the following specification in the error terms

$$\mu_{ij} \sim N(0, \sigma^2_{\mu}) \quad (2)$$

$$\delta_i \sim N(0, \sigma^2_{\delta}) \quad (3)$$

$$E(\mu_{ij}\, \delta_i) = E((\delta_j\, \delta_k) = 0 \ (i \neq k) \quad (4)$$

$$E(\mu_{ij}\, \mu_{is}) = E(\mu_{ij}\, \mu_{kj}) = E(\mu_{ij}\, \mu_{ks}) \ (i \neq k;\ j \neq s) \quad (5)$$

$$Cov\ (X_i, \delta_i) = Cov\ (Z_{ij}, \delta_i) = 0 \quad (6)$$

Notice that in the random effect model β_1 represents the mean value of all the intersections and δ_i represents the (random) deviation from the mean value of the individual intersection. However, δ_i is not directly observable and for that reason the error w_{ij} (equal to $\mu_{ij} + \delta i$) is heteroskedastik ($\sigma^2_w = \sigma^2_{\mu} + \sigma^2_{\delta}$) and, therefore, is not appropriate to use Ordinary Least Squares (OLS) to estimate this equation.

V. Results

Table 5 reports the coefficient estimates and standard errors for the two models considered (OLS-Robust and ML-Random Effects) for the years 1992, 1998 and 2004. Each year was estimated independently. The OLS-Robust model presents less significant coefficients than the ML-RE model. However, both models report similar results. As noted, we include in our regressions children between 12 and 18 years old having at least one parent at home. In order to investigate whether families discriminate among the education given to their daughters and sons, depending on their rural or urban status and their economic (poor or non-poor) condition, we include the interaction between the variables gender and rural and gender and poor.

With the inclusion of these interaction variables, the coefficient of the variable gender inquires only into the existence of gender discrimination on education within non-poor urban families (i.e. poor=0 and rural=0). A negative sign indicates that, after controlling by

other individual and family characteristics, non-poor urban boys expect to achieve less years of schooling than non-poor urban girls.

In our regressions, the coefficient for the variable gender is negative and significant in all cases. In 1992, the OLS-Robust model reports that, within non-poor urban families, boys have in average 0.3564 years of schooling less than girls. In 1998, this number decreased to 0.3003 years and by 2004, education discrimination against boys within non-poor urban families decreased to only 0.1654 years. The ML-RE model reports slightly smaller coefficient estimates than the OLS-Robust model. In 1992, non-poor urban boys had 0.3382 years of schooling less than non-poor urban girls; in 1998, this number decreased to 0.2646 years; and, by 2004, this estimate decreased to 0.1458 years.

The sum of the coefficients of the variables gender and the interaction variable *gender x rural* allow us to inquire whether non-poor rural families (i.e. poor=0 and rural=1) discriminate among the education given to their female and male children (the sum of the coefficients and standard errors are reported in table 6). The OLS-Robust model estimates that, in 1992, non-poor rural boys obtained 0.3847 years of schooling less than non-poor rural girls. However, in 1998, gender discrimination on education within non-poor rural families became statistically not significant. The ML-RE model reports very similar results. In 2004, the ML-RE model reports, with statistical significance, that non-poor rural boys get 0.2505 years of schooling less than non-poor rural girls. In general, we can affirm statistically that non-poor families, especially in the urban areas, discriminate against their male children on the education provided. Fortunately, such education discrimination against male children seems to have been decreasing.

Gender discrimination on education within poor families can be estimated by adding the coefficients of gender and the interaction between poor and gender for the case of urban families and by adding the coefficients of gender, the interaction between poor and gender, and the interaction between rural and gender for the case of rural families (table 6). It is generally believed that girls within poor families, especially in the rural areas, are relatively more discriminated against. For example, Oportunidades (formerly Progresa), the Mexican government assistance program, is intended to alleviate discrimination against girls in the poor families by offering larger monetary transfers to families with girls attending school. However, contrary to our findings for non-poor families, we did not find enough evidence to claim that poor families, both in rural and urban areas, discriminate on the education given to their male or female children in any of the years of the period under study. It is noteworthy that discrimination against girls is not even evident in 1992, before Oportunidades was created. The lack of evidence supporting gender bias against female children on education suggests the need for a review of assistance programs favoring the investment in human capital for girls and their impact on a possible education gender gap.

Children in the rural areas used to achieve less years of schooling than children in the urban areas. However, in the 2004 regressions, the coefficient of the variable rural (for girls) and the sum of the coefficients of the variables rural and *gender x rural* (for boys) became statistically equal to zero (except for girls in the random effects regression). In 2004, rural and urban children get, on average, the same years of schooling (table 6).

Poor children complete less years of schooling than non-poor children. In both models and in all years poor girls are about 0.7 years less educated than the non-poor ones (reading the coefficient of the variable poor). Similarly, poor boys are about 0.45 years less educated than the non-poor ones (reading the sum of the coefficients of the variables poor and *gender x poor*) (table 6).

The education level and the gender of the head of the household are also related to the education attainment of children. Female and more educated head of households are more likely to have children with higher levels of schooling. Children having both parents at home or having older brothers or sisters present also higher levels of schooling. Parish and Willis (1993) found this last result in his study for Taiwan and describe that family credit constraints, when all children are young, force the older ones to leave school and help with the family income. However, we found that, the larger the family size the fewer years of education a child will have.

The coefficients of the variable age can not be interpreted in this regression but it was introduced to control for the fact that older children have more years of schooling. The variable hours worked was introduced to the model to check whether children leave school to work. We found a negative and significant relation between hours worked and schooling but the coefficient estimate of the gender variable was only modestly modified when we introduced hours worked to the model. Finally, we included 31 state dummies to control for cultural differences among the regions of the country.

VI. Concluding Remarks

There is considerable evidence that resources are not allocated randomly within households, and that resources are unequally distributed within the family in many developing countries**.** Such an unequal distribution of goods usually takes the form of a bias against females. For example, girls lag markedly behind boys in schooling in many developing countries even though this gender gap has been declining in recent years.

For the case of Mexico, it is generally believed that girls -more specifically poor rural girls- are educationally discriminated against within their families. It is also claimed that 15 of every 100 parents do not invest on the education of their daughters because they think girls will get married and, therefore, investing in their education will be a waste of money. Furthermore, government efforts to abate poverty have been recently focused on decreasing the "assumed" discrimination against female children. The government assistance program Oportunidades (formerly Progresa) gives monetary transfers to poor families conditioned on having their children attending school and health clinics. Intended to reduce such "assumed" discrimination against girls, transfers are larger for girls than for boys. We did not find enough evidence to support such believes. Using an OLS-Robust model and a ML-Random Effects model for the years 1992, 1998 and 2004, we did not find enough statistical evidence to support the idea that poor families, nether in rural nor in urban areas, provide more education to their 12 to 18 years old sons or daughters. In fact, contrary to the general belief, we found that non-poor families, as established by the Mexican Technical Committee for Measuring Poverty (2002), invest more in the education of their daughters,

especially in the urban areas. Fortunately, this education differences have been decreasing over the years.

We also found that female head of households are more likely to have children with higher levels of schooling and that children having both parents at home or having older brothers or sisters present higher levels of educational attainment.

Table 5. OLS Robust and Random Effect Models: 1992, 1998, 2004

	1992				1998				2004			
education[a]	OLS-Robust		Random Effects		OLS-Robust		Random Effects		OLS-Robust		Random Effects	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
gender	-0.3564	0.0773 **	-0.3382	0.0507 **	-0.3003	0.0717 **	-0.2646	0.0613 **	-0.1654	0.0695 **	-0.1458	0.0426 **
rural	-0.7123	0.1252 **	-0.7190	0.0742 **	-0.5807	0.1146 **	-0.5554	0.0836 **	0.1794	0.1245	0.1294	0.0619 **
gender x rural	-0.0282	0.1339	-0.0752	0.0856	0.1709	0.1569	0.1590	0.0978 *	-0.1137	0.1608	-0.1047	0.0719
head gender	-0.0853	0.1353	-0.0723	0.1093	-0.5509	0.1467 **	-0.5141	0.1067 **	-0.1346	0.1396	-0.1262	0.0924
head education[a]	0.1334	0.0100 **	0.1313	0.0068 **	0.1502	0.0082 **	0.1483	0.0068 **	0.0997	0.0091 **	0.0983	0.0050 **
child order	0.0574	0.0319 *	0.0487	0.0195 **	0.0871	0.0325 **	0.0880	0.0235 **	-0.0149	0.0475	0.0146	0.0196
no. of children	-0.1223	0.0250 **	-0.1180	0.0154 **	-0.1149	0.0278 **	-0.1045	0.0177	-0.1431	0.0402 **	-0.1355	0.0155 **
poor[b]	-0.6311	0.1118 **	-0.6725	0.0702 **	-0.4907	0.1042 **	-0.5389	0.0778 **	-0.6092	0.1084 **	-0.6034	0.0604 **
gender x poor	0.2422	0.1295 *	0.3255	0.0803 **	0.2007	0.1344	0.1925	0.0900 **	0.2538	0.1505 *	0.2109	0.0691 **
both parents	0.2729	0.1479 *	0.2383	0.1165 **	0.6839	0.1753 **	0.6566	0.1156 **	0.3196	0.1430 *	0.3043	0.0951 **
age	0.5861	0.0178 **	0.5751	0.0106 **	0.5526	0.0157 **	0.5513	0.0112 **	0.7278	0.0234 **	0.7166	0.0089 **
hours worked	-0.0145	0.0020 **	-0.0121	0.0011 **	-0.0088	0.0048 *	-0.0087	0.0026 **	-0.0219	0.0029 **	-0.0189	0.0011 **
:	:	:	:	:	:	:	:	:	:	:	:	:
state dummies	:	:	:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:	:	:
constant	-1.8711	0.3651 **	-1.7145	0.2719 **	-1.1291	0.3144 **	-1.1560	0.2971 **	-2.7095	0.4575 **	-2.5970	0.2276 **
sigma_u			1.0251	0.0261			1.0583	0.0299			1.1065	0.0210
sigma_e			1.4019	0.0162			1.4965	0.0190			1.3991	0.0142
rho			0.3484	0.0147			0.3334	0.0161			0.3848	0.0120
R^2	0.46				0.40				0.43			
F or LR-Chi2	79.57	**	4426	**	72.10	**	3420	**	75.54	**	6930	**
observations	7,623		7,623		6,871		6,871		11,109		11,109	
groups			4,119				4,040				7,176	

a) years of education; b) less than 1,615 pesos of 2002 per capita for rural households and less than 2,170 pesos for urban households
**) 95% significant; *) 90% significant.
The sample includes boys and girls between 12 and 18 years old living with at least one of their parents.
Source: own estimations with data from ENIGH 1992, 1998 and 2004.

Table 6. OLS Robust and Random Effect Models: Coefficient Interactions

education[a]	1992				1998				2004			
	OLS-Robust		Random Effects		OLS-Robust		Random Effects		OLS-Robust		Random Effects	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
non-poor urban families	-0.3564	0.0773 **	-0.3382	0.0507 **	-0.3003	0.0717 **	-0.2646	0.0613 **	-0.1654	0.0695 **	-0.1458	0.0426 **
non-poor rural families	-0.3847	0.1283 **	-0.4134	0.0839 **	-0.1294	0.1669	-0.1056	0.1024	-0.2791	0.1640 *	-0.2505	0.0687 **
poor urban families	-0.1142	0.1192	-0.0127	0.0726	-0.0995	0.1173	-0.0721	0.0755	0.0883	0.1408	0.0651	0.0633
poor rural families	-0.1424	0.1243	-0.0879	0.0794	0.0713	0.1269	0.0869	0.0798	-0.0254	0.1485	-0.0396	0.0691
rural vs. urban (girls)	-0.7123	0.1252 **	-0.7190	0.0742 **	-0.5807	0.1146 **	-0.5554	0.0836 **	0.1794	0.1245	0.1294	0.0619 *
rural vs. urban (boys)	-0.7405	0.1109 **	-0.7942	0.0728 **	-0.4098	0.1227 **	-0.3964	0.0812 **	0.0657	0.1506	0.0248	0.0603
poor vs. non-poor (girls)	-0.6311	0.1118 **	-0.6725	0.0702 **	-0.4907	0.1042 **	-0.5389	0.0778 **	-0.6092	0.1084 **	-0.6034	0.0604 **
poor vs. non-poor (boys)	-0.3889	0.1095 **	-0.3470	0.0700 **	-0.2900	0.1192 **	-0.3464	0.0753 **	-0.3555	0.1303 **	-0.3925	0.0591 **

a) years of education

**) 95% significant; *) 90% significant.

The sample includes boys and girls between 12 and 18 years old living with at least one of their parents.

Source: own estimations with data from ENIGH 1992, 1998 and 2004.

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