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The impact of family size on children's school attendance in the Philippines

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Much empirical work has been done to determine the effects of family size on the education of children. Using a sample from the October 2006 Labor Force Survey, this paper attempts to determine the impact of family size on children's education as measured by school attendance while considering socioeconomic factors. Results have shown that family size is significantly and negatively correlated with children's school enrollment. Even after controlling for family size and birth-order effect, the negative effect of family size on children's school attendance is still robust. We also find marginal differences as the characteristics of the parents and birth-order effect are taken into the analysis. These results confirm the quantity-quality theory introduced by Becker.

JEL classification: D1, J13, I20
Keywords: family size, schooling, human capital

1. Introduction

Poverty has long been a worldwide concern. Schelzig [2005] defines it as lack of income and deficiency of access to necessary assets. Among these basic assets is human capital, wherein the two most important investments are in education and health. Education is considered as the foundation of all societies and a powerful tool for reducing poverty and inequality. The emphasis put on education has brought about one of the millennium development goals set by the World Bank, which states that all children should be able to complete a full course of primary schooling by 2015.

The appendices are available upon request from the authors.

In several developing countries, high fertility has often been cited as a barrier to human capital advancement. Empirical evidence proves that countries with the worst education and health conditions find it more difficult to achieve sustainable economic growth than those with better health and education conditions [Schelzig 2005:41]. In the Philippines, Gerson [1998] cites that public investment in human capital remains low and inefficiently allocated and, consequently, has a restricted effect on poverty.

The World Bank [1994] emphasizes the significant role of active population policy in reducing poverty and promoting economic growth. Analyses of endogenous economic growth models pointed out that quality, rather than quantity, of the labor force is the key to economic progress. According to Lee [2003], a country can better work for national growth if the people to educate and train are fewer, given the inevitable scarcity of resources. It is widely documented that family size and child quality are indeed significantly and negatively correlated across countries. These findings imply that reducing population growth rate should be of utmost priority in developing countries.

Poverty rates in the Philippines are considerably higher than those of other Association of Southeast Asian Nations (ASEAN) member countries [Gerson 1998]. Poverty reduction has always been part of development plans of all political administrations. Yet, after several years, only a few favorable outputs resulted from these efforts. Reducing population growth is a recognized factor in the fight against poverty and move toward development. In the Philippines, which suffers from inadequate budget, population reduction is indeed a matter of immediate concern. Furthermore, poverty incidence is proven to be higher among larger families [Schelzig 2005:96]. The sooner we are able to address this issue as a nation, the sooner we will eradicate poverty and achieve progress like other developed countries.

Studies on the impact of family size or number of children on the education of children have produced results ranging from negative, neutral to mixed relationships. Li, Zhang, and Zhu [2005], Marteleto [2005], and Orbeta [2005] showed significant and negative results for China, Brazil, and the Philippines, respectively. Black, Devereux, and Salvanes [2005] and Maralani [2007], however, proved that the effect of family size on education is irrelevant and neutral in Norway and Indonesia. On the other hand, Qian's [2006] study in the case of China showed mixed results. Among the factors taken into consideration in the studies are birth order, location of household, and fertility and demographic transition. In the case of the Philippines, a similar study was done by Orbeta [2005], which used the proportion of school-age children that attend school as dependent variable.

Our paper, on the other hand, aims to estimate a model to determine the probability that children at least six years old are currently enrolled in school, taking into consideration family size and other socioeconomic factors. We will

be using an individualistic outcome, specifically school attendance of each child, which follows the model used by Li, Zhang, and Zhu [2005]. In addition, our study will also examine the most recent dataset from the Labor Force Survey (LFS) 2006, which we are going to limit using mother's age to ensure that our observations will include only complete households. We will also include other explanatory variables like birth order and worker class of parents, which can be considerable determinants of child outcome.

This paper is organized as follows. Section 2 presents a background of the current education system. Section 3 discusses previous literature regarding the effect of family size on children's education. Section 4 presents the theoretical framework used as a basis for the empirical model. Section 5 introduces the econometric model to be followed, the definition of the variables, description of the dataset, and the econometric procedure adopted. Section 6 presents the results and analysis. Section 7 sums up the findings and provides the policy implications.

2. Background of the study

2.1. Philippine education system

Both formal and nonformal systems offer education in the country. The educational structure is composed of six years of primary education, four years of secondary education, and four years, on average, to gain a bachelor's degree. This composition of formal schooling is one of the shortest in the world [Clark 2004].

The academic school year typically spans a period of 40 weeks, starting in June and ending in March. Primary education in the country is compulsory. It ranges from age seven to twelve, covering the first six grades of education. However, some private schools often adopt a seven-year curriculum, which starts a year earlier. Elementary education consists of a four-year primary cycle and a two-year intermediate cycle. For secondary education, three types of schools are instituted: general secondary school, vocational secondary school, and science secondary school. As for higher education, some private and public institutions work on a semester system, with an optional summer semester [Clark 2004].

According to the Department of Education (DepEd) [Schelzig 2005], the Philippine government has been incapable of funding the whole education system despite the series of national development plans implemented for education and aimed at total elimination of illiteracy in the country. The government has concentrated resources on primary education. As a result, percentages of enrollment in public institutions are 90 percent for the primary level, less than 70 percent for secondary schools, and 27 percent for college education.

2.2. Issues in education

Several decades ago, the Philippines had been a leader in the Asian region, admired for its exceptional education system. However, since the 1990s, the declining quality of the education system and regional differences in educational services in the country have become of serious concern [Schelzig 2005:43].

Currently, three main challenges in the Philippine education system hinder effective human capital formation and, eventually, poverty reduction. According to Schelzig [2005], these are (a) declining participation rates, (b) low cohort survival rates, and (c) deteriorating quality of education.

These problems may be the result of the dual pressure from population growths and limited budgets [Schelzig 2005:43]. According to the United Nations Development Program (UNDP) Report [2000], between 1985 and 1997 the government considerably increased its expenditure on education—from Php 10,500 million to Php 100,000 million (or from 1.94 percent to 4.0 percent of gross national product). However, this significant increase was offset by the fast-growing population and inflation. Based on 2002 estimates, around 39 percent of the population is below the age of 14 [Clark 2004].

Annual Poverty Indicators Survey (APIS) data on education can be divided into the lower 40 percent and the upper 60 percent in terms of income distribution. As can be seen in Table 1, participation rates are generally lower among the poor.

Schelzig [2005:43-44] noted that among the lower 40 percent, the high cost of education is the most frequently cited reason for not attending school. In theory, public education should be free, but there are many associated costs like transportation, uniform, and school supplies, which may be prohibitive for the poor.

Table 1. Enrollment by income stratum and level of education 1998-2002

	1998	*1999*	*2002*
Families with children aged 6-12 in elementary school	91.1	91.6	91.2
Lowest 40%	89.6	89.8	91.1
Highest 60%	92.1	92.8	91.2
Families with children aged 13-16 in high school	69.9	71.5	77.0
Lowest 40%	56.3	57.6	67.1
Highest 60%	77.4	79.2	83.0

Source: National Statistics Office (NSO) Annual Poverty Indicators Survey (1998-2002), cited in Schelzig [2005].

Another problem in the Philippines is low cohort survival rates. Elementary cohort survival rates are the number of students who started Grade 1 and continued to complete Grade 6. DepEd statistics [2003] show decreasing cohort survival rates, from 68.6 percent in the 1997-1998 school year to 67.1 percent in 2001-2002. Compared to other countries in the region, as shown in Table 2, the Philippines has significantly lower cohort survival rates.

Table 2. Share of cohort reaching Grade 5 (2003)
(% of Grade 1 students)

	Male	*Female*
Philippines	72.0	80.0
Indonesia	88.0	90.0
Malaysia	87.0	87.0
China	100.0	98.0
Vietnam	90.0	88.0
Republic of Korea	100.0	100.0

Source: World Bank [2006].

Quality of basic education is another major issue. Gerson [1998] mentions that public education in the Philippines has historically been underfunded compared to that of other ASEAN countries. Expenditures on education, whether as percentage of GDP or as percentage of total government spending, fall short of other Asian countries.

According to DepEd [2003], as cited in Schelzig [2005], public schools in the country increased from 38,400 in 1997-1998 to 41,300 in 2002-2003. Access to both public and private schools in the country has progressed over time, yet there were still some 1,054 barangays with no access to any elementary school in the period 2002-2003.

2.3. Current state of Philippine educational attainment and school enrollment

The proportion of education levels achieved by the estimated 69 million population who are six years old and above based on the 2003 Functional Literacy, Education and Mass Media Survey (FLEMMS) is presented in Figure 1. Twenty-nine percent of the age group are elementary undergraduates. Those who graduated from elementary but did not go on to high school level comprised 11 percent. Sixteen percent, however, reached high school but were not able to finish while another 16 percent finished the secondary level. Moreover, 8.3 percent reached but did not finish college, while only 8 percent from the total population have actually finished college. Approximately 9 percent (or one in every ten) had no formal education. According to Salcedo [2007], this rate is

a cause for concern, given the Philippine government's pledge of providing basic education to all Filipinos.

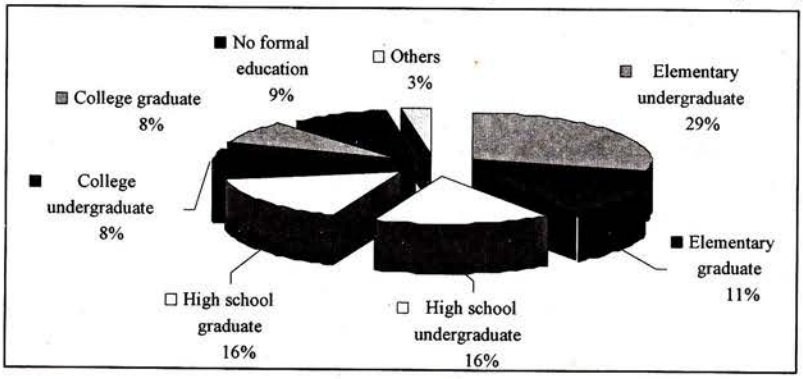
Taking gender into account, data reveal that: female students have high representations in all three education levels, attendance of females even exceeds that of males from primary to tertiary level, and more girls than boys are able to finish schooling [Schelzig 2005:46]. The same findings are confirmed by the 2003 FLEMMS data, which show that females have a net enrollment ratio of 51.4 percent as compared to males with only 47.2 percent.

Moreover, two-thirds of the estimated 34 million population 6 to 24 years old are attending school during the academic year June 2003 to March 2004 or the semester covering November 2003 to April 2004. Figure 2 shows the school attendance rates per region in the Philippines during the said period. Region 6 (Western Visayas), Region 5 (Bicol), and Region 2 (Cagayan Valley) registered the highest percentage of school attendance (approximately seven out of ten) while the Autonomous Region in Muslim Mindanao (ARMM) had the lowest rate, where only an estimated five out of ten students were enrolled.

2.4. Family size and poverty

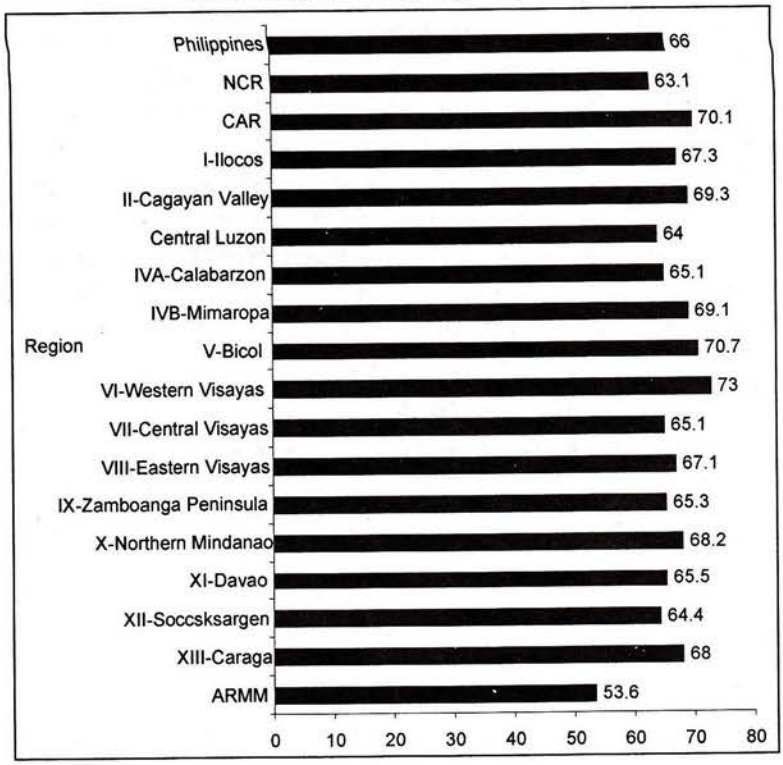
The linkage between fast population growth and incessant poverty has been well established. Schelzig [2005:96] points out that increasing population deters development for two interconnected reasons. First, it decreases growth in per capita incomes and savings. Funds allocated for investment in productive capacity are also reduced. As a result, the reduced investments decreases overall economic growth and opportunities for poverty alleviation. Second, both rural underemployment and urban unemployment worsen as population growth becomes more rapid than the capacity of the industry sector to absorb new entrants to the labor force.

Figure 1. Education level of population 6 years old and above (2004)



Source: 2003 FLEMMS.

Figure 2. Percentage of population 6-24 years old who are currently attending school by region (2003)



Source: 2003 FLEMMS.

Larger families are more likely to be poor. Table 3 shows the strong correlation between family size and poverty for 1997 and 2000. Poverty incidence worsens from smaller to bigger families. Orbeta [2006] also notes that as family size increases, households are unable to sustain the income, expenditure, and savings per person, signifying that a larger family size is related to deterioration of family welfare.

An article by Valle [2006] cites three facets by which family size causes poverty: the impact of the number of children on the income and labor force participation of parents, children's education, and household savings.

3. Review of related literature

The relationship between family size and children's education has attracted academic interest for decades, particularly when Gary Becker introduced the quantity-quality model [Li, Zhang, and Zhu 2005]. According to this model, quality monotonically decreases with quantity [Qian 2006]. An important element of quantity-quality model is that budget constraint results in increasing

marginal costs of quality with respect to family size [Black, Devereux, and Salvanes 2005]. In line with Becker's model, Blake developed the resource dilution model, which argues that resources are divided among the children in the family, so the more the children, the less resources each would receive, which would then lower the quality of life of the children [Guo and VanWey 1999]. Children with more siblings tend to be worse off than those with fewer siblings. Another element of Blake's model is the sibling rivalry hypothesis, that "parents invest in their children to maximize family utility, which often results in investment inequities" [Marteleto 2005:4]. These investments are expected to improve the children's lives. However, according to Becker, "given a set pool of resources, more children per family means fewer resources available for all children, and therefore lower life prospects" [Marteleto 2005:4].

Table 3. Poverty incidence of families by family size (1997-2000) (%)

	1997	*2000*
All families	31.80	33.7
By family Size		
1	9.80	9.8
2	14.30	15.7
3	17.80	18.6
4	23.40	23.8
5	30.40	31.1
6	38.20	40.5
7	45.30	48.4
8	50.00	54.9
9 or more	52.60	57.3

Source: NSO Family Income and Expenditure Survey (FIES) [M92], in Schelzig [2005].

Much empirical work has also been done to determine the effects of family size on schooling of children, but since the start, scientists studying the relationship have realized that the apparent association could be spurious [Guo and VanWey 1999]. Several potential factors affecting both family size and education have also been identified, which may affect the actual causal relationship.

One of the factors often discussed in previous studies is the relevance of birth order in determining educational attainment. A study on the effect of family size and birth order on children's education was conducted by Black, Devereux, and Salvanes [2005] for the entire population of Norway, aged 16-74,

at some point in the period from 1986 to 2000. Controls for family background characteristics and birth order were included to determine how much of the estimated effect of family size on child education could be ascribed to these detectable factors. Also, the method of 2-stage least squares (2SLS) was used as an estimation procedure, employing twin births as a source of exogenous variation in family size. Results show that family-size effects are irrelevant to children's educational attainment when birth-order indicators are included and/or twin births are used as instruments. Moreover, birth order has a significant negative effect on children's education, regardless of the estimation strategy used. Family size, more probably, affects only the marginal children through birth-order effects. Results showing that family size continues to decline in developed countries also suggest that even if average child outcomes improved, there might be insignificant effect on firstborn children. The effects of birth order are so vital that the difference in educational attainment between the first and the fifth child in a family of five children is approximately equal to the difference between black and white educational attainment gathered from the 2000 census.

Another factor often considered is the location of households. A study in Indonesia by Maralani [2007] discloses that the relationship between family size and children's schooling is neither uniformly positive nor negative since there are important differences by cohort and urban-rural residence. The study involves the use of data gathered from 3,200 families of the 1993 and 1997 Indonesian Family Life Survey. To assess the relationship between family size and completed education, it employs ordered probit models, with controls for child characteristics, parents' characteristics, place of residence, and birth order. Furthermore, to test the robustness of the results to assumptions on joint determination and endogeneity, the study uses binary probit and reports on miscarriages. Results reveal that for rural groups, the association between children's schooling and family size is statistically insignificant. In urban areas, this has evolved from positive to neutral to negative over a span of 30 years. In addition to location, effects of sex and birth order of children are also analysed. Girls obtain less schooling than boys in the oldest urban cohort and in all rural areas. However, this disadvantage disappears over time in urban areas and diminishes over time in rural areas. The same is true for disadvantages related to being the oldest child in the family. Thus, socioeconomic and demographic conditions brought about by development can also alter ways in which families benefit or impinge on children.

In the case of China, data involving children who are at least six years old with mothers aged no more than 35 are used by Li, Zhang, and Zhu [2005] to conduct a similar study. They apply a probit estimation to approximate the equation in which education is dependent on family size, parental and child characteristics, and birth order. Instrumental variable (IV) estimations using

birth of twins are also performed to check for the heterogeneity of the effect of family size. The analysis indicates that family size is negatively correlated with children's education even after controlling for parental characteristics and birth-order effects. Supportive evidence are also obtained when family size is instrumented by twin births to explore the causal link between child education and family size. More precisely, the tradeoff relationship is smaller in urban areas than in rural areas where education is relatively poor.

Still another important aspect in studying the effect of family size on education is fertility transition. An analysis by Marteleto [2005] for 14-year-olds in Brazil shows that the effect of family size on children's schooling and school enrollment has remained statistically significant and negative under high and low fertility regimes. The study covers 12,834 children for the period 1977 and 7,861 for the year 1997. It uses ordinary least squares (OLS) as estimation procedure for the years of schooling and logit estimations for the probability of children's school enrollment. The study considers demographic, residence, and family characteristics. Two sets of decompositions are also done to estimate the differences accounted for by effects and by distribution of number of siblings. The assessment of the impact of number of siblings further explains that children from both pre- and post-fertility decline cohorts are disadvantaged compared to children in smaller families. In the younger cohorts, even with other factors accounted for, the negative association of family size and educational outcomes persists. Fertility decline has a direct impact on increasing children's schooling mainly through a change in the distribution of children across family sizes. However, the change in the distribution does not lead to decreasing the effect of family size on children's education.

In the case of Matlab, Bangladesh, Razzaque and Streatfield [2001] conducted a study to examine the relationship between family size and education for two periods: 1982 (the start of fertility transition) and 1996 (when it is well under way). The samples studied are children aged 9-17 selected from households where the mother is aged 30-49 and the father is the head. Households in Treatment and Comparison Areas of Matlab, Bangladesh, are examined, where the Treatment area has a higher level of fertility decline due to greater exposure to family-planning programs. Both areas are studied for the years 1982 and 1996. Bivariate and multivariate analyses are employed and results show that for all three categories of children studied (9-12 years old, 12-17 years old, and 15-17 years old), there is a positive relationship between family size and children's education in 1982. However, the pattern is reversed in 1996. The multivariate analysis of the study, after controlling for parents' education, distance from school, possession of school items, and extent of food for education program, shows that family size is not associated with children's education in 1982, but is negatively related with education in 1996. The same pattern is observed for all the three age groups studied, but the degree of

relationship greatly varies among groups. Among the significant findings of the study is that the relationship between family size and education depends on more extensive socioeconomic conditions of the society in which the family belongs. The association is likely to be weak where extended family shares some of the costs of children's education and/or the state provides subsidy for education.

Furthermore, studies also show that there are two potential sources of endogeneity—parental heterogeneity and heterogeneity in the quality of the first child. These are the two issues addressed by another study in China conducted by Qian [2006]. Data are taken from the 1990 Population Census and 1989 China Health and Nutritional Survey. A random cluster process is used to draw a sample of roughly 3,800 households, which vary considerably in geography, economic development, health resources, and public resources. The correlation between family size and school enrollment is obtained by using OLS. In the estimated equation, school enrollment is a function of the number of siblings, individual characteristics, distance to urban area, a variable indicating whether an individual was born in a year l, birth-year fixed effects, and country fixed effects. Results show that an additional sibling has a positive effect on the school enrollment of the first child, which is attributed to the only-child disadvantage and the increasing returns in the number of children. For the effect of family size beyond the one-child context, it uses the occurrence of twins. The results reveal that an additional sibling has a negative effect on school enrollment of firstborn children, which makes the relationship between family size and child quality inverse-U shaped. These results are consistent with the evidence of birth-order effects from Black, Devereux, and Salvanes [2005].

The preceding paragraphs have shown various results on the relationship of family size and education depending on individual, family, and community characteristics. Similar studies are also performed in the Philippines. A study is conducted by Orbeta [2005] involving data on individual, household, and location characteristics obtained from the 2002 Annual Poverty Indicator Survey. OLS regression is applied to estimate the impact of the number of children per household on the proportion of school-age children attending school. To test for the endogeneity of family size, the analysis uses 2SLS and sex of first two children as instruments. Results show that the number of children has a negative impact on the proportion of school-age children attending school. Another research by Bauer et al. [1992] for the Philippine case examines the effects of household composition on enrollment. School enrollment logit regressions for secondary and tertiary school-age males and females are used to determine the effects of household composition on enrollment, controlling for the age of children, place of residence, education of parents, and occupation of household head. The third round of the 1985 Labor Force Survey, which includes 8,383 households, is analysed. It focuses on the high school and college

school-age populations since primary school enrollment is almost ubiquitous. Results show that in the Philippines, the presence of additional young children in the household decreases the probability of the older siblings to be enrolled in school. This may happen because of resource dilution more than the increased demand for time to be used in household production. It is also determined that family background variables, like education of both parents and occupation of the household head, have substantial effects on youth enrollment.

4. Theoretical framework

The theoretical framework used in this study is based on the work of Becker [1991]. He presented a utility (U) function for each family of the form

$$U = U\left(n, q, Z_{1,} \ldots Z_{m}\right) \tag{1}$$

where n is the quantity of children, q is the expenditure on each child, which also represents the quality of children, and Z_m denotes the quantities of other commodities.

Since there are no appropriate substitutes for children, the quantity of other commodities will be combined as Z, a single aggregate commodity. Quality will first be ignored in analysing the demand for children [Becker 1991:137]. Hence, the utility function becomes

$$U = U\left(n, Z\right) \tag{2}$$

The above equations described by Becker [1991] do not consider the changes in the age of children and the timing and spacing of birth. Moreover, also part of his assumptions is that all children in the same family have the same quality, which is entirely produced with the family's own resources such as time and market goods. The budget constraint for each family would then be

$$p_c q_n + \Pi_Z Z = I \tag{3}$$

where p_c is the constant cost of a unit of quality, q the total quality of each child, $p_c q_n$ the total amount spent on children, Π_Z is the cost of Z, and I is the income of the family.

The budget constraint is nonlinear in the commodities composing the utility function, but changes multiplicatively depending on n and q. This nonlinearity explains the interaction between quantity and quality in the study [Becker 1991:145]. Taking the derivative of equation (3) in terms of n, q, and Z to maximize utility results in the following equilibrium conditions:

$$\left.\begin{aligned}\frac{\partial U}{\partial n} &= MU_n = \lambda p_c q = \lambda \Pi_n \\ \frac{\partial U}{\partial q} &= MU_q = \lambda p_c n = \lambda \Pi_q \\ \frac{\partial U}{\partial Z} &= MU_Z = \lambda \Pi_Z\end{aligned}\right\} \tag{4}$$

where Π_n and Π_q are the relevant shadow prices of n and q. As expected, each shadow price depends on p_c, the constant cost of a unit of quality. In addition, it is also observed that Π_n varies with q and Π_q varies with n [Becker 1991:145]. That is, an increase in n corresponds to an increase in Π_q, thereby lowering the demand for q, which in turn decreases Π_n and further increases n. The same effects are repeated until a new equilibrium position is reached. From these observations, Becker [1991:145] further explains that an increase in the amount spent on each child improves the quality and, thereby, the relevant cost of each child. Likewise, an increase in the number of children adds to the cost of developing the quality of each child. The equilibrium values of n, q, and Z can then be solved from equations (3) and (4) as functions of shadow prices and of income:

$$\left.\begin{aligned} n &= dn(\Pi n, \Pi q, \Pi z, R) \\ q &= dq(\Pi n, \Pi q, \Pi z, R) \\ Z &= dZ(\Pi n, \Pi q, \Pi z, R)\end{aligned}\right\} \tag{5}$$

where shadow income, R, equals the sum of the shadow amounts spent on different commodities. The demand functions possess the common income and substitution effects. However, Becker [1991:146] also notes that the demand functions depend on the quantities of n and q through their respective shadow prices and also on the interaction term nq through R.

If the interaction between n and q is strong, even a small exogenous increase in n (or q) could result in a significant reduction in q (or n). The substitution between n and q in the utility function proves that equilibrium would not be possible if they are close substitutes, since n and q would continue to vary with each other until either of them is insignificant [Becker 1991:146-147].

Therefore, Becker [1991:147] states that the interaction between quantity and quality, as determined by the substitution effects in the utility function, is the reason behind the close relationship between education and number of children.

5. Empirical results

5.1. Empirical model and variable definitions

Our empirical model, based on Li, Zhang, and Zhu [2005] and first introduced by Rosenzweig and Wolpin [1980], is given by

$$EDU = \beta_0 + \beta_1 SIZE + X\beta_2 + Z\beta_3 + B0\beta_4 + \varepsilon' \quad (6)$$

where EDU is the binary dependent variable that equals 1 if the child is currently attending school and 0 if otherwise, $SIZE$ is the variable for the total number of persons in the family, X is a vector of variables that measure child attributes, Z is a vector for parental characteristics, and BO stands for birth order. In our case, we are going to use the age and sex of the observation for the child characteristics and the age, educational attainment, and work class of the parents for the parental characteristics. Educational attainment covers six categories: elementary undergraduate, elementary graduate, high school undergraduate, high school graduate, college undergraduate, and college graduate. Lastly, work class is categorized based on the following: private household, private establishment, government organization, self-employed, employer, family-owned business with pay, and family-owned business without pay.

The coefficient associated with family size, β_1, is expected to be negative based on the quantity-quality model explained in section 4. β_2, estimating child's sex, is expected to be positive while child's age is expected to be negative. A negative coefficient is also expected for birth order, β_4. On the other hand, a positive coefficient is expected for the parental characteristics pertaining to parents' educational attainment, β_3, relying on the rationale that as parents become more educated, the more willing they will be to allow their children to attend school. A negative coefficient is expected for parents' age and work class because as they become older and more involved with their work, they spend less time with their children.

5.2. Data description, sources, and limitations

For this investigation, we use the data from the third round of the 2006 Labor Force Survey. The third round was conducted from July to September 2006 during the school term in the Philippines and is not the agricultural peak season. The survey contains detailed information on youth activity status; household composition; and the education, occupation, and earnings of household members. The LFS aims to provide a quantitative framework for the preparation of plans and formulation of policies affecting the labor market. Specifically, the survey is designed to provide statistics on levels and trends of employment, unemployment, and underemployment for the country, as a whole, and for each of the administrative regions, including provinces and key cities.

Although the 2006 Labor Force Survey provided precise and reliable estimates at the provincial and key city levels for the crucial variables, problems may emerge because households rather than families were surveyed. It also does not contain information on family members who have left the household. Lastly, there are no details provided for other family members supporting the observed family.

To organize our analysis, we use a subsample of the survey data. First, we checked if these households fit the sample restrictions presented by Li, Zhang, and Zhu [2005]. We only selected the children of the household head, since we can only match the parental information for such children. Second, we restricted the sample to children who were at least six years old and whose mothers were aged no more than 35. We used six as the lower bound for the age of children because six was the normal age for children to start studying in grade school. Limiting the mother's age to less than or equal to 35 made it moderately certain that no adult children have moved out of the household. Lastly, we exclude the households with missing information on parents and families with a birth that occurred before the mother was 16 years old.

5.3. Estimation procedure

In estimating discrete dependent variable models, wherein y is a random variable taking on a finite number of outcomes, two estimation procedures are available: probit and logit. The choice of model depends on the distribution of error terms. Probit is employed if the distribution of the error term is normal; otherwise, logit is applied. In our study, we are going to use the probit procedure to estimate the model.

6. Results and analysis

6.1. Presentation of raw data

Table 4 shows a summary of the data used in the economic estimations.

In the sample taken from the October 2006 Labor Force Survey, a significant portion (85 percent) is aged 6-12, the age group of elementary students. Fourteen percent is composed of 12-16-year olds or high school students, while only 1 percent is in the age group of college students. It should be noted that majority of the children under study are in the lower age groups since the sample was restricted to households whose mothers were at most 35 years old. Regarding the sex distribution, it can be observed that there are more males than females in the sample studied (53 percent were males and 47 percent were females).

Table 4. Descriptive statistics of the sample

	All families			*Two-child families*		
Variables	*N*	*Min-Max*	*Mean & std. dev.*	*N*	*Min-Max*	*Mean & std. dev.*
CHILDREN						
Education	12874	0 - 1	0.90 (0.31)	12388	0 – 1	0.90 (0.31)
Sex	12874	1 –2	1.48 (0.50)	12388	1 –2	1.48 (0.50)
Age	12874	6 – 19	9.46 (2.81)	12388	6 – 19	9.49 (2.81)
Birth order	12874	1 – 10	1.84 (1.03)	12388	1 – 10	1.88 (1.04)
PARENTAL CHARACTERISTICS						
Father's age	12874	22 – 99	35.87 (5.42)	12388	22 – 99	35.92 (5.38)
Father's education	12874	0 – 7	2.96 (1.57)	12388	0 – 7	2.94 (1.57)
Father's work	12281	0 - 6	2.16 (1.07)	11828	0 – 6	2.16 (1.07)
Mother's age	12874	22 - 35	31.61 (2.81)	12388	22 – 35	31.65 (2.79)
Mother's education	12874	0 – 7	3.09 (1.48)	12388	0 – 7	3.06 (1.47)
Mother's work	5811	0 – 6	3.18 (2.02)	5569	0 – 6	3.19 (2.03)
FAMILY						
Family size	12874	13-Mar	5.72 (1.57)	12388	4 – 13	5.83 (1.51)

Note: Standard deviations are shown in parentheses.

Table 4. Descriptive statistics of the sample (continued)

	Three-child families			*Four-child families*		
Variables	*N*	*Min-Max*	*Mean & std. dev.*	*N*	*Min-Max*	*Mean & std. dev.*
CHILDREN						
Education	9921	0 - 1	0.89 (0.32)	6461	0 - 1	0.87 (0.34)
Sex	9921	1 –2	1.48 (0.50)	6461	1 –2	1.48 (0.50)
Age	9921	6 – 19	9.66 (2.85)	6461	6 – 19	9.94 (2.92)
Birth order	9921	1 – 10	2.02 (1.09)	6461	10-Jan	2.25 (1.19)
PARENTAL CHARACTERISTICS						
Father's age	9921	22 – 99	36.27 (5.36)	6461	24 – 99	36.85 (5.41)
Father's education	9921	0 – 7	2.82 (1.55)	6461	0 – 6	2.61 (1.51)
Father's work	9502	0 – 6	2.18 (1.06)	6233	0 – 6	2.21 (1.04)
Mother's age	9921	22 – 35	31.86 (2.69)	6461	22 – 35	32.21 (2.47)
Mother's education	9921	0 – 7	2.93 (1.45)	6461	0 – 7	2.72 (1.41)
Mother's work	4341	0 – 6	3.28 (2.06)	2789	0 – 6	3.39 (2.10)
FAMILY						
Family size	9921	5 – 13	6.29 (1.34)	6461	13-Jun	6.98 (1.18)

Note: Standard deviations are shown in parentheses.

Figures 3 and 4 present the highest level of education attained by parents of the children (6-24 years old), included in the analysis. Majority of the fathers were elementary undergraduates and high school graduates, while a significant number of mothers were high school and elementary graduates. It should also be observed that only 16-18 percent of the parents were able to reach or finish college level or even pursue postgraduate studies.

Figure 3. Highest educational attainment of fathers

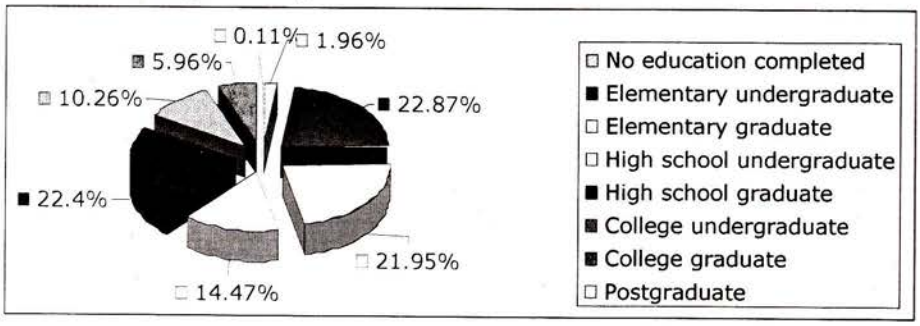
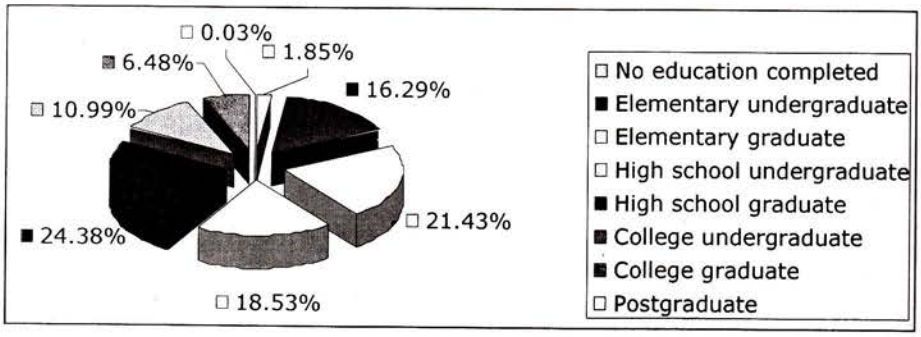


Figure 4. Highest educational attainment of mothers



Figures 5 and 6 show the reported worker class of the parents. Majority of the fathers are self-employed and working for private establishments. Approximately 51 percent of fathers are self-employed, followed by 35.43 percent working for private establishments.

For the mothers, majority are also self-employed, comprising 36.12 percent, while 30.2 percent are working without pay on a family-owned business. However, these rates are only for households that have reported the parents' worker class.

Figure 5. Worker class of fathers

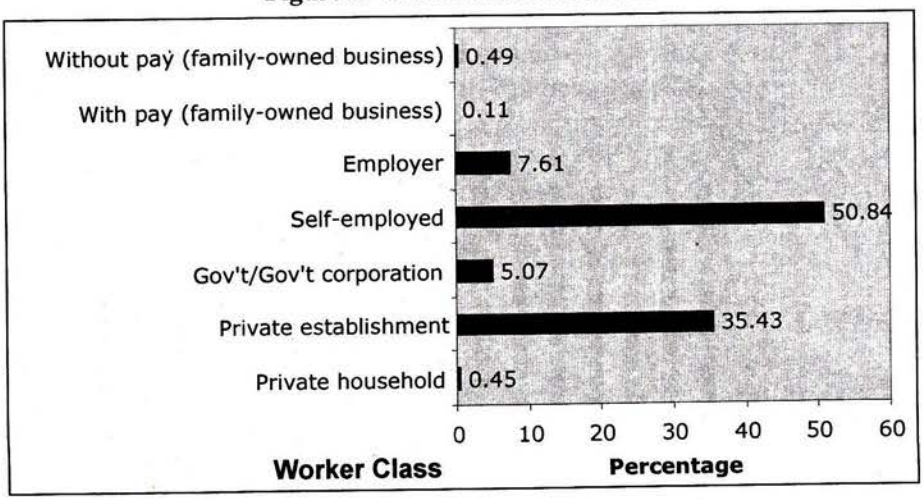


Figure 6. Worker class of mothers

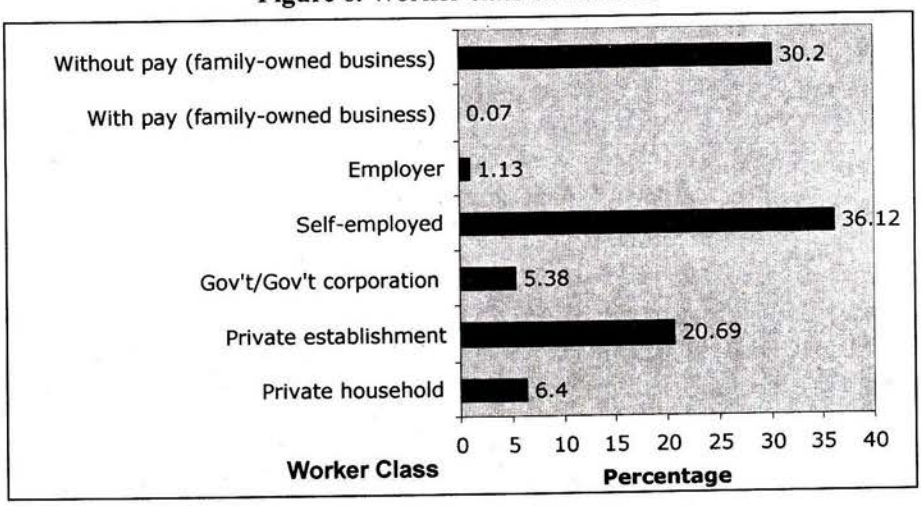


Figure 7 shows a regional comparison of the percentage of children (6-24 years old) attending school in October 2006. Figure 8, on the other hand, shows the average family size per region. These two variables (school attendance and family size) are the primary variables of interest in this study.

Figure 7. Percent of population 6 to 24 years old who are currently attending school, by region

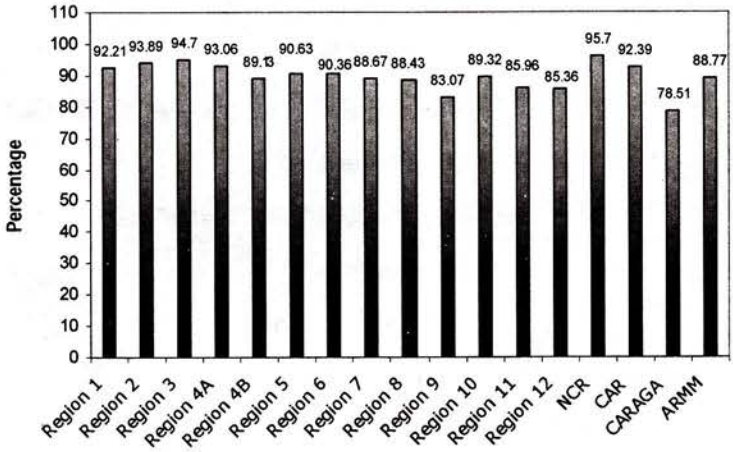
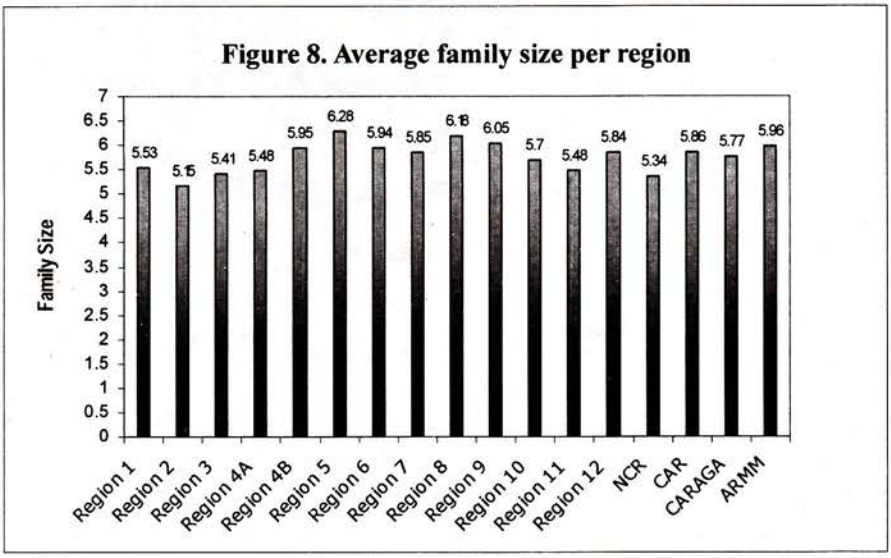


Figure 8. Average family size per region



Data show that the National Capital Region (NCR), Region 3 (Central Luzon), Region 2 (Cagayan Valley), and Region 4A (Calabarzon) registered the highest percentages of school attendance, comprising 95.7, 94.7, 93.89, and 93.06 percentage, respectively. Data also reveal that Region 2 (Cagayan Valley), NCR, and Region 4A (Calabarzon) were also among the regions with lowest average family size, along with Region 11 (Davao), showing an average of 5.15, 5.34, 5.48 and 5.48, respectively). These findings confirm the negative relationship between family size and education, as measured by school attendance in this study. Regions with the lowest average of family size have the highest rates of school attendance.

6.2. Results and analysis

We begin the analysis by looking at the effect of family size on children's education. Results show that family size is significantly and negatively correlated with children's school enrollment. As can be seen from Table 5, having one more child in the family reduces the probability of being enrolled by –0.10 while holding the other variables constant. The impact of family size is also consistent since only minimal variations can be observed as larger families are taken into account. The estimated effects are also not very sensitive to the exclusion and inclusion of parental characteristics and birth order. A unit increase in family size reduces school enrollment by approximately –0.07 to –0.14 as some of the parental variables are being controlled, as shown in Tables 5-8.

Child's sex and age also significantly affect child's education. Unlike the cases in other Asian countries, female children in the Philippines have a higher probability of being enrolled in school. All other factors being equal, the probability of attending school is 18-20 percentage points higher for females than for males. The impact of child's sex also varies as parental characteristics and birth order are controlled. The female's probability of attending school increased to 30 percent, as the other factors are included in the model. Moreover, child's age exerts only a mild effect on children's school attendance. From Table 5, the probability of attending school decreases by –0.01 as the child gets a year older, all other factors being equal. The impact of child's age also increases as larger family sizes are taken into consideration. For families with at least four children, age reduces the probability of attending school by –0.04. These results reflect the pressure in larger families to engage their children in labor, which heightens as the child gets older. Furthermore, the higher probability of males not being enrolled in school can be attributed to the nature of their work, such as helping out during the planting and harvesting season, which may be inflexible relative to the academic year.

Table 5. Probit estimations for the effect of family size on children's education: all families with children

Variables	*All variables*	*W/o parent's age*	*W/o parent's education*	*W/o parent's work*	*W/o mother's characteristics*	*W/o father's characteristics*	*Birth order only*	*Child char. only*	*Parent's char. only*
	0.44	1.05	1.05	0.08	0.95	0.59	1.83	1.81	0.45
Constant	-1.39	(6.43)***	(3.42)***	0.39	(7.18)***	(1.94)*	(22.26)***	(22.61)***	1.49
	-0.1	-0.1	-0.14	-0.07	-0.07	-0.11	-0.11	-0.12	-0.1
Family size	(-5.50)***	(-5.62)***	(-7.94)***	(-5.43)***	(-6.24)***	(-6.00)***	(-9.90)***	(-13.05)***	(-6.53)***
Child's	0.3	0.3	0.29	0.19	0.19	0.29	0.18	0.18	0.3
sex	(6.07)***	(6.06)***	(6.03)***	(6.13)***	(5.84)***	(6.06)***	(5.77)***	(5.76)***	(6.07)***
Child's	-0.04	-0.03	-0.06	-0.02	-0.01	-0.04	-0.01	-0.01	-0.04
age	(-3.72)***	(-3.00)***	(-5.70)***	(-2.44)**	(-1.66)*	(-3.84)***	(-2.28)**	(-1.94)*	(-4.62)***
Father's	-0.002		-0.004	0.003	0.005				-0.002
age	(-.34)		(-0.72)	-1.04	-1.57				(-0.35)
Father's	-0.11	0.11		-0.11	-0.2				-0.11
education	(5.17)***	(5.22)***		(8.13)***	(17.92)***				(5.17)***
Father's	0.01	0.02	0.02		-0.05				0.01
work	-0.48	0.53	0.7		(-3.02)***				0.47
Mother's	0.03		0.05	0.02		0.03			0.03
age	(2.39)*		(4.65)***	(2.82)***		(2.4)**			(2.52)**
Mother's	0.15	0.16		0.16		0.23			0.15
education	(6.89)***	(7.23)***		(11.10)***		(12.69)***			(6.92)***
Mother's	-0.04	-0.04	-0.07			-0.04			-0.04
work	(-2.82)***	(-2.90)***	(-5.21)***			(-3.72)***			(-2.82)***
Birth	-0.005	0.03	-0.05	-0.03	-0.02	-0.005	-0.02		
order	(-0.16)	0.93	(-1.58)	(-1.43)	(-0.88)	(-0.15)	(-1.20)		
Observations	5557		5557	12874	12281	5811	12874	12874	5557

Note: *, **, *** represent significance at 10 percent, 5 percent, and 1 percent level, respectively.

Table 6. Probit estimations for families with at least two children

Variables	*All variables*	*W/o parent's age*	*W/o parent's education*	*W/o parent's work*	*W/o mother's characteristics*	*W/o father's characteristics*	*Birth order only*	*Child char. only*	*Parent's char. only*
	0.63	1.18	1.22	0.16	1.07	0.79	1.94	1.92	0.66
Constant	(1.91)*	(6.96)***	(3.83)***	-0.82	(7.86)***	(2.50)**	(22.6)***	(22.94)***	(2.08)**
	-0.11	-0.11	-0.15	-0.08	-0.09	-0.12	-0.13	-0.13	-0.12
Family size	(-5.87)***	(-5.98)***	(-8.22)***	(-6.38)***	(-7.04)***	(-6.34)***	(10.72)***	(-13.92)***	(-6.97)***
Child's	0.31	0.31	0.3	0.2	0.19	0.3	0.18	0.18	0.31
sex	(6.13)***	(6.11)***	(6.14)***	(6.11)***	(5.89)***	(6.13)***	(5.79)***	(5.78)***	(6.13)***
Child's	-0.04	-0.03	-0.06	-0.02	-0.01	-0.04	-0.01	-0.01	-0.04
age	(-3.96)***	(-3.51)***	(-5.88)***	(-2.78)***	(-2.05)**	(-4.05)***	(-2.41)**	(-2.06)**	(-4.86)***
Father's	-0.001		-0.003	0.004	0.001				-0.001
age	(-0.18)		(-0.54)	-1.14	-1.59				(-0.21)
Father's	0.12	0.12		0.11	0.2				0.12
education	(5.28)***	(5.33)***		(7.96)***	(17.38)***				(5.29)***
Father's	0.01	0.01	0.02		0.05				0.01
work	-0.38	-0.66	-0.57		(-3.08)***				-0.37
Mother's	0.02		0.05	0.02		0.02			0.02
age	(2.01)**		(4.23)***	(2.91)***		(2.04)**			(2.06)**
Mother's	0.15	0.16		0.16		0.23			0.15
education	(6.74)***	(7.04)***		(10.69)***		(12.50)***			(6.78)***
Mother's	-0.04	-0.04	-0.07			-0.04			-0.04
work	(-2.56)***	(-2.64)***	(-4.85)***			(-3.47)***			(-2.55)**
Birth	-0.01	0.02	-0.05	-0.03	-0.02	-0.01	-0.02		
order	(-0.30)	-0.64	(-1.69)*	(-1.64)	(-1.07)	(-0.27)	(-1.26)		
Observations	5327	5327	5327	12388	11828	5569	12388		5327

Note: *, **, *** represent significance at 10 percent, 5 percent, and 1 percent level, respectively.

Table 7. Probit estimations for families with at least three children

Variables	*All variables*	*W/o parent's age*	*W/o parent's education*	*W/o parent's work*	*W/o mother's characteristics*	*W/o father's characteristics*	*Birth order only*	*Child char. only*	*Parent's char. only*
	0.86	1.3	1.45	0.42	1.17	1.12	2.03	1.98	0.97
Constant	(2.26)**	(6.67)***	(3.94)***	(1.86)*	(7.63)***	(3.06)***	(19.85)***	(19.89)***	(2.66)***
	-0.11	-0.11	-0.14	-0.08	-0.08	-0.12	-0.12	-0.14	-0.12
Family size	(-4.82)***	(-4.93)***	(-6.67)***	(-5.38)***	(-5.80)***	(-5.26)***	(-8.92)***	(-11.81)***	(-5.98)***
Child's	0.32	0.32	0.32	0.22	0.21	0.31	0.2	0.2	0.32
sex	(5.91)***	(5.89)***	(6.04)***	(6.27)***	(6.01)***	(5.86)***	(6.05)***	(6.04)***	(5.90)***
Child's	-0.06	-0.05	-0.07	-0.03	-0.02	-0.06	-0.02	-0.02	-0.05
age	(-4.62)***	(-4.74)***	(-6.18)***	(-3.49)***	(-3.49)***	(-4.66)***	(-3.93)***	(-3.25)***	(-5.33)***
Father's	-0.0002		-0.002	0.004	0.004				-0.0008
age	(-0.03)		(-0.27)	-0.98	-1.15				(-0.14)
Father's	0.12	0.12		0.13	0.22				0.12
education	(5.18)***	(5.19)***		(8.06)***	(16.89)***				(5.17)***
Father's	0.02	0.02	0.02		-0.04				0.02
work	-0.55	-0.6	-0.71		(-2.67)***				-0.54
Mother's	0.02		0.04	0.01		0.02			0.01
age	-1.34		(3.19)***	(1.68)*		1.22			-1.05
Mother's	0.16	0.16		0.17		0.24			0.16
education	(6.43)***	(6.65)***		(10.32)***		(11.77)***			(6.53)***
Mother's	-0.04	-0.04	-0.07			-0.04			-0.04
work	(-2.27)***	(-2.33)**	(-4.54)***			(-3.05)***			(-2.25)**
Birth	-0.03	-0.01	-0.07	-0.04	-0.04	-0.03	-0.04		
order	(-0.94)	(-0.37)	(-2.11)**	(-2.08)**	(-2.05)**	(-0.89)	(-2.23)**		
Observations	4172	4172	4172	9921	9502	4341	9921		4172

Note: *, **, *** represent significance at 10 percent, 5 percent, and 1 percent level, respectively.

Table 8. Probit estimations for families with at least four children

Variables	*All variables*	*W/o parent's age*	*W/o parent's education*	*W/o parent's work*	*W/o mother's characteristics*	*W/o father's characteristics*	*Birth order only*	*Child char. only*	*Parent's char. only*
	1.23	1.46	1.71	1.05	1.53	1.48	2.32	2.18	1.47
Constant	(2.51)**	(5.80)***	(3.62)***	(3.46)***	(7.78)***	(3.13)***	(16.33)***	(15.90)***	(3.14)***
	-0.09	-0.09	-0.11	-0.08	-0.08	-0.09	-0.11	-0.14	-0.11
Family size	(-3.13)***	(-3.15)***	(-3.98)***	(-4.25)***	(-4.37)***	(-3.31)***	(-6.08)***	(-8.78)***	(-4.26)***
Child's	0.34	0.34	0.33	0.22	0.21	0.32	0.2	0.20	0.34
sex	(5.28)***	(5.28)***	(5.33)***	(5.23)***	(5.07)***	(5.17)***	(5.09)***	(5.05)***	(5.26)***
Child's	-0.08	-0.08	-0.09	-0.05	-0.06	-0.08	-0.06	-0.04	-0.06
age	(-5.64)***	(-6.45)***	(-6.64)***	(5.5)***	(-6.48)***	(5.67)***	(7.11)***	(-5.91)***	(-6.18)***
Father's	0.002		-0.001	0.006	0.005				0.001
age	(0.32)		(-0.21)	(1.54)	(1.18)				(0.15)
Father's	0.12	0.12		0.12	0.21				0.12
education	(4.08)***	(4.10)***		(6.11)***	(13.54)***				(4.07)***
Father's	0.02	0.02	0.04		-0.04				0.02
work	(0.59)	(0.61)	(1.02)		(-1.75)*				(0.55)
Mother's	0.006		0.03	0.002		0.007			-0.005
age	(0.38)		(1.95)*	(0.18)		(0.42)			(-0.35)
Mother's	0.2	0.2		0.18		0.26			0.2
education	(6.55)***	(6.61)***		(9.12)***		(10.47)***			(6.67)***
Mother's	-0.03	-0.03	-0.07			-0.03			-0.03
work	(-1.46)	(-1.5)	(-3.64)***			(-1.83)*			(-1.42)
Birth	-0.06	-0.05	-0.09	-0.07	-0.08	-0.06	-0.08		
order	(-1.74)*	(-1.68)*	(-2.61)***	(-4.25)***	(-3.74)***	(-1.7)*	(-3.98)***		
Observations	2698	2698	2698	6461	6233	2789	6461		2698

Note: *, **, *** represent significance at 10 percent, 5 percent, and 1 percent level, respectively.

Turning to parental characteristics, the mother's characteristics and the father's education are found to be significantly affecting children's school attendance. On the other hand, father's age and father's work are found to be insignificant in explaining the dependent variable. In all the estimations employed, father's age is insignificant while father's work becomes significant only when mother's characteristics are not controlled in the analysis. The insignificance of father's age could be attributed to the wide range of values (i.e., 22-99), and insignificance of father's work could be related to the missing values for some mother characteristics. As expected, father's education is positively correlated with children's education. The higher the father's educational attainment, the higher the probability of school attendance of the children. At the given levels of the other variables, an increase in the father's educational attainment increases the probability of being enrolled by 0.11 to 0.12. The magnitude of the effect of father's education is also constant across family sizes. This suggests that college-educated household heads tend to put a higher value on schooling than those who graduated only from high school or any other level. Examining the mother's characteristics with respect to children's education, results also show diverse relationships. The probability of being enrolled in school increases by 0.03 as the mother gets a year older, holding the other variables constant. This result does not confirm the reports from past literature. The significance of mother's age, however, cannot be observed in larger families. Moreover, just like father's educational attainment, mother's education is also positively correlated with children's education. A higher educational attainment increases the probability of school attendance by 0.15 to 0.16, all other factors being equal. It is also noteworthy that the impact of mother's education has about the same impact as father's education. Furthermore, the more hands-on the mother's work (i.e., employer or self-employed), the lower the probability of the children attending school. If the mother becomes more involved with her work, the probability of school attendance is reduced by -0.04. This result is consistent and can be observed in families with low and high family sizes. A possible reason for this relationship could be the reduced time and other resources that the mothers allot for their children's education.

Lastly, birth-order effects are only observed to be significant when the family sizes in the analysis are at least equal to five. At the given levels of the other variables, an increase in birth order reduces the probability of being enrolled in school by –0.04 if family size is at least five and increased to –0.08 when family size is at least six. These are shown in Tables 7 and 8. Moreover, including the birth-order variable only changes the effect of family size marginally. This suggests that the negative relationship between family size and children's school attendance is partially driven by birth order but only to a small extent.

The appendix shows regression results using all families, families with at least two children, families with at least three children, and families with at least four children (the appendix is available upon request from the authors).

In summary, the results we have gathered are consistent with the expectations we have mentioned in section 5, except mother's age. Family size exerts a negative impact on the probability of children's school attendance. These results confirm the Quantity-Quality Theory introduced by Becker and are consistent with the findings of Orbeta [2005]; Bauer et al. [1992]; Li, Zhang, and Zhu [2005]; and Marteleto [2005].

7. Conclusion

This paper has attempted to determine the impact of family size on children's education as measured by school attendance while considering socioeconomic factors. Past studies have shown mixed results, ranging from negative, neutral, or mixed relationships. Using a sample from the LFS Survey comprising children who are at least six years old with mothers who are not more than 35 years old, this paper has shown that family size is significantly and negatively correlated with children's school enrollment. Even after controlling for family size and birth-order effect, the negative effect of family size on children's school attendance is still robust. Having one more child in the family reduces the probability of being enrolled by 12 percentage points. We also find marginal differences as parent characteristics and birth-order effect are taken into the account.

The quality of human capital as key to economic progress is widely established. The Philippines, being a developing country far outpaced by our Asian neighbors in terms of poverty alleviation and economic development, should put primary focus on human capital development, especially investments in education.

Proving that family size and children's education are indeed negatively correlated, poverty-reduction efforts should be aimed at implementing well-defined population programs specifically reducing family size and, eventually, promoting education for all youth.

The government should initiate information drives to promote reducing family size and intensify its family-planning programs among households, especially for the poor, among whom incidences of large family size are more rampant.

The Philippine government should prioritize well-targeted investments in human capital. It could provide education subsidies that would target the poor and large households who cannot afford to send their children to school. If these underprivileged children would not be given sufficient educational opportunities, they are more likely to remain poor and bequeath poverty to

the next generation, thereby entailing consistently high poverty incidences and exacerbated income inequalities. Since it has been determined that parents' education has a positive impact on children's education, providing adequate education for today's youth will likewise improve the education and, hence, human capital quality of future generations.

The government should also create more jobs. Sufficient and appropriate employment would enable parents to invest in education and other basic welfare needs of their children. This would also encourage them to maintain a smaller family size with high significant welfare implications.

These policy recommendations may take some time to implement and to show positive effects. Therefore, these need to be started immediately for the Philippines not to fall too far behind.

Our research needs to further explore the relationship of family size and education. Since our study used current school enrollment as a measure for children's education, future research may dwell on the mechanisms through which family size affects educational attainment. Future studies may also investigate other factors that vary with family size like socialization, communication, levels of intimacy, and allocation of family resources.

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