IMPACT OF SIBSHIP SIZE, BIRTH ORDER, AND SEX COMPOSITION ON SCHOOL ENROLLMENT IN URBAN TURKEY

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Abstract

This paper investigates the effects of sibship size, birth order and sibling sex composition on children's school enrollment in urban Turkey. Moreover, we examine how the effects of these variables vary by household income and the gender of the children. We utilize an instrumental variables estimation method in order to address parents' joint fertility and schooling decisions where we use twin-births as instruments. In addition, we generate careful measures for birth order and siblings' sex composition in order to purge the impact of these variables from that of sibship size. We find no causal impact of sibship size on school enrollment. However, there is evidence for a parabolic impact of birth-order where middle-born children fare worse. The parabolic impact of birth order is more pronounced in poorer families. Sex composition of siblings matters only for female children. A higher fraction of older male siblings decreases the enrollment probability of female children in poorer households. In the wealthiest families, on the contrary, a higher fraction of male siblings increases the enrollment probability of female children. The finding that birth order and sibling sex composition matters more for poorer households suggests that scarce financial resources are the underlying cause of the sibling composition effects.

Keywords: Educational Attainment, Sibship Size, Birth Order, Sibling Sex Composition, Instrumental Variables

JEL Codes: I2, J1

1. Introduction

It is well documented that a significant variation in children's educational outcomes comes from differences in family-level characteristics like parental education and household income. Sibship size - a family-level characteristic pertaining to children's sibling composition - has received significant attention in the literature since the development of quantity-quality theory of Becker (1960). However, significant variations in educational outcomes are also observed within families. One feature of the sibling composition that shows within-family variation is the birth order of children. Another one is sibling sex composition, which varies for siblings of different sex. In this paper, we attempt to see how far these within-family variations in birth-order and sibling sex composition play a role in determining the educational outcomes of children along with the family-level variations brought about by sibship size in a developing country context.

Even when siblings are of the same innate ability level, within-family variation will arise if the amount of investment received by each child in the family differed. In particular, a child's birth order as well as his/her sibship size and sibling sex composition could matter in determining the amount of resources allocated to him/her. The effect of the sibling composition i.e. sibship size, birth order and sibling sex composition, on the resource allocation process would likely to depend on the resource base of the family, measured in terms of financial as well as and time resources. In this paper, we particularly focus on the financial resources of the household as in a developing country context they are more likely to be binding. We examine how the impact of sibling composition variables changes with the permanent income of the family. Conjecturing that the impact of these variables may also change with the gender of the child, we also examine the way these variables impact male and female children's school enrollment outcomes separately.

The questions we ask in this paper are the following: *Does having a lot of siblings really hurt children's educational outcomes? If there are limited resources, is it the earlier or later-born that get it? Does it matter whether one's siblings are male or female in the allocation of these limited resources? How do these outcomes change as the income of the family increases? Do sibship size, sex composition and birth order have different effects for male and female children?*

Despite the recent progress, there is still room for improvement in the school enrollment rates in Turkey. In 2004, the net enrollment rate in primary education (grades 1-5) was 93 percent for boys and 87 percent for girls. Secondary school (grades 6-8) enrollment rates were 59 and 50 percent for boys and girls, respectively. (SIS, 2006). Understanding the impact of sibling composition on school enrollment is important because it can shed light to educational policies. Establishing the impact of birth order on schooling is particularly important in Turkey where a sizeable fraction of children have large sibship size. The gender gap in school enrollment rates also point out the importance of gender in the intra-household resource allocation in Turkey. Therefore, it is important to find out whether any of the elements of sibling composition particularly bring about a disadvantage for female children.

The theoretical models on this topic in the economics, sociology and psychology literature, which we review in the next section, have different implications for the effect of sibling composition on schooling outcomes. The empirical literature, which started with the testing of the "quantity-quality" theory of Becker (1960), has also produced mixed results. This has been partly due to the endogeneity of sibship size, which was first addressed by Rosenzweig and Wolpin (1980). The studies that followed Rosenzweig and Wolpin often produced results different from the previous research. Later, the literature incorporated the impact of birth order. There, the added problem has been to purge the effect of sibship size from birth order. Studies that address the endogeneity of sibship size while examining the impact of birth order has been rather sparse[3]. The number of those who consider this problem in a developing country context is even fewer.[4] The issue of sibling sex composition and its effect on educational outcomes, on the other hand, has, for the most part, proceeded as a separate line of research.

We contribute to the literature by combining the three elements of sibling composition; sibship size, birth order and sex composition, while at the same time addressing the problem of endogeneity of sibship size within an IV framework, where the exogenous variation in sibship size comes from multiple births. Another contribution of our study is that we examine the impact of our three key sibling composition variables by the income level of the household because the predictions of the theoretical models either depend on the existence of resource constraints or their implications are sharper in that case.

[3] Black, Salvanes, and Devereux (2005) and Haan (2006) use IV methods to address the endogeneity of sibship size while analyzing the impact of birth order.
[4] Ejrnaes and Portner (2004) studies the impact of birth order with endogenous fertiliy in the Phillippines.

A critical issue in the study of the impact of birth order and sex composition along with that of sibship size is to do with disentangling their individual impacts as they are very much correlated. For instance, higher birth order children (children who are born earlier) have a higher probability of coming from smaller families. Similarly, uniform gender composition (all male or all female siblings) is more likely in smaller than larger families.[5] We address these issues by generating birth order and sex composition controls that aim to disentangle their impacts from that of sibship size.

Our dataset is the Turkish Demographic and Health Survey (DHS), which contains complete fertility histories of mothers as well as a rich set of individual and household-level characteristics. The data also contain the school enrollment status of each child in the household as well as information on a rich set of durable goods which allows us to generate a measure of permanent income for each household. We restrict our sample to urban areas since we lack potentially crucial information on schooling facilities available to rural households and information to generate their permanent income. The advantage of conducting this work in a developing country context such as Turkey is that the large average sibship size helps the identification of the birth order effects. In our data, more than 15 percent of the females have at least four children.

Many recent papers studying the impact of sibship size on schooling outcomes in developed countries using IV methods find no causal impact. Our results also show that after instrumentation, the negative impact of sibship size on school enrollment disappears. However, we find that the birth order of children does matter in determining their school enrollment. Except for those coming from wealthiest families - for whom we find no impact – birth order has a parabolic effect on school enrollment, i.e. the earlier-born and the later-born children fare better than the middle-born. Furthermore, we find the parabolic effect to be more pronounced in poorer families. Further investigation shows that the parabolic effect is mainly due to the "first child" effect. When the eldest children are dropped from the sample, there emerges a linear impact of birth order where later-born children do better than the rest.

The sex composition of siblings matters for female children but not for male children. Moreover, the effect of sibling sex composition on female children's school enrollment depends on household income. Female children in poor families become less likely to be enrolled in school as the fraction of male siblings in their sibship group increases. However, this effect vanishes for female children coming from middle income and wealthier families. In

[5] A common control variable "any sister/brother" in the literature is more likely to take place in a larger family.

fact, in wealthier families, a completely opposite result emerges. A higher fraction of brothers increases the school enrollment probability of females. This finding parallels the findings of a number of studies conducted in developed countries. The finding that both birth order and sibling sex composition matter more in poorer families suggests that the allocation of scarce financial resources among siblings is the primary cause of the observed sibling composition effects. On the other hand, the positive impact of the fraction of male siblings on female children's school enrollment in wealthy families is likely to have a non-economic explanation like the reference group argument put forward in the psychology literature.

Finally, a further look at the negative impact of the fraction of male siblings on female children's school enrollment in poorer households reveals that what matters is the fraction of older male siblings. Holding the total fraction of male siblings constant, an increase in the fraction of males among older siblings decreases female children's school enrollment. On the other hand, holding the sex composition of older siblings constant, the sex composition of younger siblings has no effect on female children's school enrollment. This finding that sibling sex composition has a direct impact on the schooling outcomes of female children implies that the use of the sex composition of early-born children as an instrument for sibship size, as it is done in a number of studies on this topic, would be problematic in Turkey. This suggests that a similar problem may arise in other countries, in particular in developing countries.

The paper is organized as follows. Section 2 introduces the conceptual frameworks developed in economics, sociology and psychology literatures on the effect of sibling composition on schooling outcomes. Section 3 provides a review of recent literature. Section 4 introduces the data used. Estimation method and identification are discussed in Section 5. Estimation results are provided in Section 6. Section 7 summarizes the basic findings and concludes the paper.

2. Conceptual Framework

A number of theories developed in the economics as well as the sociology and psychology literatures have implications on the impact of sibling composition on schooling outcomes. The quantity-quality theory put forward by Becker (1960) and later developed by Becker and Lewis (1973) and Becker and Tomes (1976) examines the joint decisions of quality and quantity of children and postulates a negative impact of sibship size on children's quality, as measured by their schooling outcomes, for instance. The allocation of parental time and financial resources among children also implies a negative impact of being later-born on educational outcomes (Behrman, 1997). The corresponding theory in the sociology literature, the resource dilution model, also postulates a negative impact of sibship size on children's schooling outcomes. Moreover, according to this model, birth order also matters because later-born children spend a longer part of their childhood with fewer siblings. The confluence model put forward by Zajonc (1976) in the psychology literature highlights the average intellectual climate of the family and claims that a larger sibship size lowers this average and, therefore, exerts a negative effect on children's schooling outcomes. Similarly, as later-born children live in an environment where the average intellectual level is lower, their schooling outcomes will be worse.

These theories predict a negative impact of sibship size on children's schooling outcomes. However, if children stabilize marriages or decrease the probability that parents work – meaning more time to be devoted to children – sibship size could have a positive impact as well. The above theories also predict a negative impact of being later-born on schooling outcomes.[6] However, in larger families the impact of birth order could very well be U-shaped. As older children leave the household, the situation for the youngest children will improve because the circumstances surrounding the youngest children will be more like their oldest siblings, in the sense that there will be fewer children in the household. On the other hand, there are reasons which would imply a positive relationship between birth order and schooling outcomes. Earlier born children could help their younger siblings attend school by improving the financial standing of the household for instance. This would be especially important in families with limited financial resources.

Sibling sex composition is another important dimension of sibling composition that can influence the resource allocation problem among the children. In an environment where parents do not face borrowing constraints, we would expect them to invest in their children's schooling until the marginal rate of return to education is equal to the market interest rate. Therefore, unless there is a difference in this marginal rate of return by sex, we would not expect the schooling outcomes to vary between male and female children. Apart from ability differences, the marginal rates of return could differ by sex for a number of reasons: First, the direct monetary costs as well the opportunity cost (either in terms of market or home work) of school enrollment could vary substantially by sex. There could also be important disparities between the psychic costs of sending daughters and sons to school for parents. Furthermore,

[6] Moreover, in the psychology literature, there is evidence for higher innate ability for earlier born.

parents would care more about their sons' future earnings whenever the attachment to family after marriage is weaker for females. It may also be that the expected lifetime earnings of females are lower because they spend less time in the labor market on average.

3. Literature Review

The effects of sibship size on various measures of children's educational outcomes are extensively studied in the economics, sociology and psychology literatures. This literature is reviewed by Blake (1989), Lloyd (1994) and Schultz (1994). The literature witnessed changes over time in terms of the empirical methodologies used. Accordingly, the empirical regularities previously established have been challenged. In the earlier literature, in which OLS regressions were used, it was a well-established result that individuals from larger families perform worse relative to the individuals from smaller families.[7] This result has been contested in some recent studies utilizing IV and family-fixed effects estimation methods. In fact, Guo and Van Wey (1999), using family fixed-effects and Angrist et al. (2005), using IV estimation methods, find no causal effect of sibship size in the U.S. and in Israel, respectively. Other studies that also find no causal impact of sibship size using IV estimation include Black et al. (2005) for Norway and de Haan (2006) for both the U.S. and the Netherlands. However, there also exist studies that use IV estimation and, yet find a negative causal impact of sibship size. Most notably, the first empirical test of the quantity-quality model conducted by Rosenzweig and Wolpin (1980) using data from India finds a negative effect. In more recent work, despite instrumenting for sibship size, Booth and Kee (2005) find a negative causal effect of sibship size in the U.K. and Baez (2006) finds the same result in Colombia. Similarly, Conley and Glauber (2005) find a negative effect of sibship size on private school attendance and the probability of being held back in school.

From the literature on testing the quantity-quality theory, a new line of studies emerged analyzing the joint impact of sibship size and birth order. Some of the earlier studies include Blake (1981), Hauser and Sewel (1985) and Behrman and Taubman (1986). While Blake as well as Hauser and Sewel find no effect of birth order in the U.S., Behrman and Taubman find a negative effect of being later-born. Recently, the literature using the IV estimation approach has also started to incorporate the impact of birth order along with the impact of sibship size. Black et al. (2005) in Norway and de Haan (2006) in the US and

[7] This literature includes studies from developed countries (Blake, 1981; Stafford, 1987; Hanushek, 1992) as well developing countries (Knodel et al., 1990; Anh et al., 1988).

Netherlands find a negative effect of being later born. The joint incorporation of family structure variables raises the issue of disentangling their individual effects. Booth and Kee (2005) point out that the approach of Black et al. (2005) does not really purge the impact of birth order from sibship size as they use dummies for birth order controls and first born children have a higher probability of coming from smaller families. For this reason, they generate a birth order index that purges the impact of sibship size from birth order. The studies examining the impact of birth order in the developing countries has produced mixed results. In contrary to the findings in developed countries, Ejrnaes and Portner (2004) find a positive effect of being later-born in the Philippines using family fixed-effect methods. In earlier studies, Hanushek (1992) and Parish and Willis (1993) find a U-shaped pattern for the impact of birth order for low income blacks in the U.S. and in Taiwan, respectively.

Another dimension of the study of sibship structure is the sibling sex composition. A significant portion of the literature on the impact of sex composition on educational outcomes has examined the impact of sex composition controlling for sibship size. In doing so, most of the studies excluded the impact of birth order. The findings of this literature in the U.S. have been contentious. Butcher and Case (1994), for instance, find that having a brother increases educational attainment of women. However, their results were contested by Kaestner (1997) and Hauser and Kuo (1998). The literature on the impact of sex composition in the developing countries generally indicates a positive impact of having sisters rather than brothers. Morduch (2000) and Parish and Willis (1993) find such results in Tanzania and in Taiwan, respectively. A few of the studies on the impact of sex composition also includes the impact of birth order as we do. Parish and Willis (1993) in Taiwan and Gary-Bobo et al. (2006) in France are examples of such studies. However, unlike our study, they do not address the endogeneity of sibship size. Moreover, Parish and Willis have controls for older/younger male/female siblings which make it hard to purge the impact of sex composition from birth order.

4. Data

The data for this study come from the 1998 round of the Turkish Demographic and Health Survey (DHS) conducted by the Hacettepe University of Turkey in cooperation with Macro International. The 1998 round surveyed 8,576 women between the ages of 15-49 from 8,059 households across the country. Of these 8,576 women, 5,550 are mothers. This data set serves our purpose the best since it provides detailed information on the birth history of mothers, not available elsewhere, along with a rich set of mothers' and children's individual as well as household-level characteristics. Using mothers' reproductive histories, we are able to construct the birth order of each child and the sex composition of his/her siblings. Moreover, the survey provides information on the school enrollment status of children present in the household.

Our sample is representative of mothers between the ages of 15 and 49, many of whom could still choose to have more children. However, we need completed fertility histories to examine the impact of sibship size, birth order, and sex composition. Therefore, we restrict our sample to mothers aged 35 and above. Here, we make the assumption that it is safe to ignore the children who are born to a mother above this age. In fact, when we examine the data on fertility by age in Turkey in 1998, we find that only 7.8 percent of all the births take place after this age. Since some of these births may be given by the same women, this provides an upper bound to the fraction of incomplete fertility histories.

For the mothers with completed fertility histories, we examine the schooling outcomes of children between the ages of 8 and 15. The choice of the upper age cut-off is justified on the grounds that older children have a higher tendency to leave the household implying that the ones living with their parents may not be representative of their population. A related reason is to do with the conjecture that older children are more likely to assert their own preferences on their parents, which implies that the decision process might be different from what is envisaged here. Age eight, on the other hand, is chosen as the lower cut-off point for the reason that late entry to the schooling system is quite common in Turkey.

Since we start with a sample that is representative of women between the ages of 15 and 49, our sample of the children between the ages of 8 and 15 misses those whose mothers are at or above the age of 50. However, for a woman at or above this age to have a child in our target age group, the earliest age she must have given birth is 35. As pointed above in the discussion of completed birth histories, 7.8 percent of the births are given by mothers at or above the age of 35. This implies that for 15-year-old children, our sample misses out 7.8 percent of the cases. The percentage that is missed out is naturally lower for younger children. For instance, for 10-year-olds, we are missing only those whose mothers were 40 or older at the time of birth, and only 1.5 percent of the births take place at this age interval.

We restrict our analysis to urban areas in Turkey, which are defined as settlements with a population above 10 thousand. The optimization problem that rural parents solve is likely to be structurally different from that solved by urban parents, due for instance to the differences in the choice sets for children (e.g., in rural areas family farm work is in the choice set). Therefore, the reduced form parameters that we aim to estimate could be markedly different according to rural/urban residence. We could address this issue by running separate regressions for urban and rural households. However, in the data we lack information that is likely to be crucial in children's school enrollment in rural areas. For instance, our data set does not provide information on the availability of schooling facilities. While the existence of schooling facilities can be taken as given in urban areas, we can not make this assumption in rural areas. Another issue with regard to rural residence is that the wealth index that we generate, which is explained below, to measure household well-being using durable household goods and housing facilities would not be a as good indicator of wealth for rural residents as it is for urban residents because we have no information about land ownership.

Table 1 presents the school enrollment rates by age and sex. Although our sample consists mostly of compulsory school age children[8], only 78.6 percent of children are found in school. School enrollment is substantially lower among female children at 73.2 percent as opposed to 84 percent for the male children. The gender gap is observed at all ages. The enrollment rates stay above 90 percent until age 10. However, beyond that a gradual decline in enrollment rates takes place as more and more children reach the end of primary school. By the age of 14, enrollment rates are just above sixty percent.

Table 2 provides further descriptive statistics on the basis of school enrollment status. A number of individual and household level factors characterize school drop-outs: They are older and have more siblings; they have less educated and older parents; their mothers had married early and fewer of them live in intact families; they come from poorer households. The relationship between children's school enrollment status and household material well-being is investigated further in Table 3. In this study, household material well-being is measured using a wealth index, which is constructed on the basis of a set of household durables and various housing facilities. Altogether 13 items[9] are used in the construction of the index, each item taking a value of 1 if available in the household. The index, therefore, can take values between 0-13. Since there are very few households for whom the index takes values above 10, we group such households into a single group. The enrollment rates in Table 3 show that children with higher wealth indices are indeed more likely to attend school.

[8] Some of the children in sample could have completed compulsory schooling under the old law and left the schooling system.

[9] These items include such durables as a radiator, oven, dishwasher, washing machine, vacuum cleaner, video recorder, camera, CD player, cell phone and computer; household assets as a car and a house; and housing facilities as the existence of an inside flush toilet.

The descriptive statistics also indicate that community level variables are likely to affect children's school enrollment (see Table 2). The worst enrollment ratios are observed in eastern provinces, which are substantially poorer compared to the rest of the country. Among the children who are not enrolled in school, while almost a third comes from eastern provinces, among the enrolled, this figure drops to 18.9 percent. There also seems to be ethnic differences in school enrollment where the worst outcomes are observed for children with Kurdish and Arabic backgrounds as determined by their mother's mother- tongue. While such children make up 33.6 percent and 6.8 percent of the non-enrolled children respectively, among those who are enrolled in school their shares are substantially lower estimated at 15.5 and 2.2 percent, respectively.

Next, we examine how enrollment rates vary with sibship size, birth order and sex composition – our key variables of interest – by taking a 12-year-old child as our reference category. There is a need to use a reference category because school enrollment changes remarkably with age. Table 4 shows that as sibship size increases, a marked drop in school enrollment rate occurs. While the enrollment rate for a 12-year-old child with a single sibling is 97.9 percent, it goes down to 73.9 percent for a child with four siblings. Testing whether this correlation also implies causality is one of the key goals of this study.

The way enrollment rates vary by birth order is presented in Table 5. Earlier born children fare better than later born. While the enrollment rates of the first and second born children are around 95 percent, for no birth order higher than 2 is the enrollment rate above 80 percent. This may be partly due to the fact that there is a higher likelihood of earlier-born children to come from smaller families. This highlights the importance of being able to disentangle the impact of birth order from sibship size.

Finally, Table 6 presents how enrollment rates change with the fraction of male siblings. A clear pattern does not emerge. However, when the fraction of male siblings is the highest (fraction between 0.8 and 1) and the lowest (fraction between 0 and 0.2), enrollment rates are much higher. Once again, this may be the artifact of the correlation between sibling sex composition and sibship size. Children with smaller sibship sizes have a higher probability of having all male or all female siblings. This could partly explain why enrollment rates are higher for children with the lowest and highest fraction of male siblings.

5. Estimation Method and Identification

In a framework where parents make joint schooling and fertility decisions, the number of children will not be exogenous to schooling choices. One way to handle this problem is to use an instrument that would bring about an exogenous variation in the number of children and at the same time not have any direct effect on schooling outcomes.

In this paper, the exogenous variation in sibship size comes from multiple births. This instrument is first used by Rosenzweig and Wolpin (1980) as a cause of exogenous variation in family size. A twin birth brings about an unanticipated increase in family size.[10] However, the existence of multiple births in a family is not independent of the family size. Families with more children are more likely to have twins. To avoid this problem, one approach that has been taken in the literature is to take a multiple birth in the first pregnancy. Another approach is to take multiple births in the last pregnancy because it is easier to adjust for an unplanned change in the number of children after the first birth (de Haan, 2006). Instead, we use all multiple births regardless of when they occur, but correct it with the number of births. This instrument - twins per birth - has also been used by Rosenzweig and Wolpin (1980). Its advantage over the other multiple birth indicators is that it occurs more frequently, so that the instrument is not based on a small number of occurrences, which is often the case in multiple births in the first and last pregnancies. This becomes crucial in this study because our sample size is relatively small.

Another important estimation issue is to be able to purge the impact of birth order from family size. A number of studies on the impact of birth order utilized dummy variable controls for birth order. However, as pointed out by Booth and Kee (2005), dummy variable controls for birth order does not completely accomplish this goal because a first-born child has a higher probability of being in a small family than a child with a higher birth order. Therefore, we generate a birth order index – similar to that by Booth and Kee – that lies between zero and one for all children using the following formula:

Birth order (i) = (i-1) / (N – 1) where,

[10] The validity of this instrument requires that there is no direct impact of the instrument on the schooling outcomes of children. For instance, a twin birth not only changes the sibhip size but also the spacing of children. If the spacing of children has a direct impact on their school enrollment probabilities, this assumption would fail. However, de Haan (2006) finds no evidence for the impact of average spacing on educational attainment in the U.S. A multiple birth could also have a direct impact if multiple-birth children have lower birth weight, and this negatively affects their educational outcomes because families cannot compensate for disparities at birth. There exists no empirical evidence on this issue in Turkey; however, not being able to compensate for a child's birth-weight deficiency is quite unlikely in Turkey, partly due to heavy breast-feeding and very low food poverty.

i is the birth order of the child in question and n is the total number of births of his/her mother. In the denominator, rather than the total number of children, we use the total number of births because our instrument needs to be orthogonal to the birth order control. Using the number of children rather than births would cause a twin birth to change not only the sibship size but also the birth order of children. Under the above construct, the first child always takes on an index value of 0 and the last child an index value of 1.

For the sibling sex composition control, we employ the fraction of male siblings in the family. The rationale for using a fraction rather than a variable indicating size is that we want to purge the impact of sex composition from that of the sibship size. The use of a fraction accomplishes this because it is free from the influence of sibship size.

We implement a two-stage least squares estimation where twins-per-birth is used as an instrument for the number of children in the first stage. The key independent variables in the second stage include sibship size, birth order and sibling sex composition. Both the first and the second stage regressions include a rich set of individual and household level controls. The child level controls include age and sex in an interacted way. Controls for parental characteristics include parental schooling; mother's age, marital status and her age at first marriage and whether the mother has had multiple marriages. The general household level characteristics include household permanent income, ethnicity as well as geographic location and its size.

We control for the permanent income of the household using a wealth index, which as described earlier, is constructed on the basis of housing facilities and a set of consumer durables present in the household. In the data, there is information on current household income as well. However, it is collected rather crudely on the basis of five income brackets and more importantly, may include the incomes of the child if he/she happens to be working. Moreover, the current income measure is likely to include transitory elements. To minimize measurement errors and avoid endogeneity problems as well as transitory shocks to household material well-being, we rely on this wealth index. Since we are particularly interested in how the impact of sibship size, birth order, and sex composition changes with income, we interact these three key variables of interest with our measure of household permanent income.

In our sample, in some cases, we have multiple observations from the same family. Because of the potential correlation among the observations from the same family, standard errors need to be adjusted. We do this by using mothers as clusters. Moreover, we use sampling weights provided in the survey to obtain estimators of the population characteristics.

6. Results

In this section, we present the results of our analysis of the effect of sibship size, birth order and sibling sex composition on children's school enrollment. As discussed earlier, we instrument for the number of children using twin births and estimate the effects of the key variables accordingly. However, for comparison purposes, we also present the results of the OLS estimation when the number of children is not instrumented. Furthermore, in order to examine whether sibship size, sibling sex composition and birth order are more likely to affect the schooling of children when the household is income-constrained, we specify two models, where in the basic model wealth index is not interacted with the key variables, whereas in the full-model it is.[11] Another important feature of the full-model is that we look for differential impacts of the key variables on female children by interacting the female dummy with the variables of interest. Hence, in Table 7, we report four sets of results. The first and the second columns include the OLS and 2SLS[12] coefficient estimates for the basic model, whereas columns three and four include the results of the full model. The full model specification presented in Table 7 includes the interaction term of female dummy only with the fraction of male siblings because the other interactions with sibship size and birth order turned out to be insignificant, and we dropped them for tractability.

6.1. Sibship size

The OLS results, both in the basic and extended models, indicate that sibship size negatively affects the school enrollment probability of children. The coefficients for the log of number of children are -0.18 and -0.183 in the basic and full models, respectively. Statistical significance is at 1 percent level in both cases. However, the 2SLS estimation results reveal that sibship size, when instrumented, no longer plays a role in determining the enrollment status of children. The negative coefficients of sibship size in the OLS estimates, in fact, turn positive in the 2SLS estimation but at the same time lose their statistical significance. The finding that the negative impact of sibship size on educational outcomes in the OLS estimation vanishes once the joint decision process between quantity and quality is addressed

[11] The sibship size is not interacted with the wealth index because when its interaction term is instrumented using the interaction term of twin-per-birth with wealth index, we encounter the problem of weak instruments.

[12] We have also used IV probit estimation in the second stage and found the results to be very similar to the ones obtained from 2SLS estimation. However, with IV probit we encountered convergence problems in some specifications and, therefore, opted to use 2SLS estimation throughout the paper.

using IV estimators is also noted in a number of other recent studies like Black et al. (2004), Angrist et al. (2005) and de Haan (2006).

To see whether finite-sample bias created by weak instruments is a problem in our study, we check the F-statistic in the first stage for our instrument. The rule of thumb generally used in the literature is a F-value of 10 to ensure that the finite-sample bias of the IV-estimator is less than 10 percent that of the OLS estimator.[13] The F-statistic for our instrument is 22.52 in the basic model and 22.06 in the full model. Therefore, we can conclude that our instruments are not weak and finite-sample bias is not a problem.

6.2. Birth order

Although the number of siblings does not affect the school enrollment of children, birth order does. The effect of birth order on school enrollment is not linear. In fact, the results of the 2SLS estimation of the basic model in Table 7 show that there is a parabolic effect of birth order, i.e. as birth order increases – as we move on to children who are born later –school enrollment first declines, and then increases. (The coefficients are statistically significant at 5 percent level.) As noted earlier, similar results are reported in the literature (see for instance Hanushek, 1992 and Parish and Willis, 1993). Another conspicuous feature of birth order coefficients in Table 7 is that the magnitude of the coefficients for both the birth order and its square term increase when sibship size is instrumented (even though the parabolic shape holds under the OLS estimation as well.)

Next, we test whether the parabolic effect we find for birth order is observed for all households regardless of their income level. The coefficients of the interaction terms in the full model in Table 7 indicate that as household income increases, the parabolic shape of the impact of birth order loses its strength. Both the negative coefficient of the birth order term and the positive coefficient of its squared term become smaller in magnitude as household income increases. The coefficients and standard errors of birth order variables at selected levels of household income as well as the joint significance of the birth order variables at these income levels are presented in Table 8. The results indicate that both the birth order and its squared term are statistically significant at 5 percent level when the wealth index is equal to or less than 7 and statistically significant at 10 percent level when wealth index is equal or less than 8. This implies that for the majority of the population, 86.2 percent (see Table 3),

[13] As shown by Staiger and Stock (1997), the inverse of the F-statistic provides an estimate of the finite-sample bias of the IV estimator relative to that of the OLS.

there is evidence for a parabolic shape of the impact of birth order (according to 10 percent level statistical significance).

The parabolic effect generated by birth order variables are depicted in Figure 1, which displays difference between the enrollment probabilities of children of various birth orders and that of the oldest child. The magnitudes of the differences are remarkable. For instance, among the poorest households, the difference between the enrollment probabilities of the oldest child and that of the middle born ones exceeds 20 percent. On the other hand, for households in the same income group, the enrollment probability of the youngest children exceeds that of the oldest children by more than 10 percent. In the next section, where we take a further look at the sibling sex composition, we also find clues regarding the parabolic shape.

6.3. Sibling sex composition

According to the 2SLS estimation results for the basic model, controlling for the number of siblings[14], there is no evidence that sibling sex composition - which we control using the fraction of male siblings – has an impact on the school enrollment of children. In the full model, we also include interaction terms of the fraction of male siblings with the female dummy and the wealth index because sibling sex composition may have differential impacts depending on the gender of the child and the financial resources of the family. Indeed, as can be seen from Table 7 (column 4), the impact of sex composition on school enrollment diverges for male and female children. While having male instead of female siblings do not affect the school enrollment of male children, this is not the case for females, whose schooling gets negatively affected by having male instead of female siblings. Furthermore, the negative effect the fraction of male siblings exerts on female children’s school enrollment diminishes with household income.

In Table 9, we present the coefficient estimates and standard errors for the fraction of male children at selected values of the wealth index, separately for male and female children. From the table, the asymmetric effect of sex composition on male and female children can be discerned. For male children, the coefficient for the fraction of male siblings is very close to zero. Even in the poorest households, moving from an all-female to an all-male siblings structure decreases the school enrollment probability of male children by a meager 1.2 percentage points and this is very imprecisely estimated. On the other hand, for female children living in the poorest households, the impact of moving from an all-female to an all-male siblings structure is much larger; it decreases the enrollment probability by 17.8 percentage points. (Statistical significance is at 10 percent level.)

Another salient feature of the impact of sex composition is that while in poor families, having brothers rather than sisters negatively affects female children's schooling, in wealthier families, as the fraction of male children increases, the school enrollment of female children actually goes up. For instance, for the wealthiest group of households, moving from an all-female to an all-male sibling composition increases the school enrollment probability of female children by 13.8 percentage points. (This is statistically significant at 5 percent level.) The finding that the fraction of male siblings decreases the school enrollment probability of female children living in poorer households holds only for the very poorest, with a wealth index value of 0 or 1, which include 11 percent of the child sample. Similarly, the finding the fraction of male siblings increases enrollment probability for female children living in wealthier households holds only for the very wealthiest, or those with an index value of 9 or 10, which corresponds to 13.8 percent of the sample.

These effects are illustrated in Figure 2 for a 12-year-old girl. While a 12-year-old girl who has average sample characteristics other than having only female siblings coming from the poorest group of households has a school enrollment probability of 64.1 percent, this figure goes down to 46.3 percent when the girl has only brothers rather than only sisters. In contrast, in the richest group, female children's probability of school enrollment increases from 88.8 percent to 103 percent[15] with a move from an all-female to an all-male sibling composition.

The results presented above regarding the positive impact of having brothers rather than sisters on the schooling outcomes of female children living in the wealthiest households carry similarities to those found for developed countries (see for instance Black et al., 2005 for Norway). It is probably not surprising that the processes that determine children's educational outcomes in wealthy families in developing countries present similarities to those in developed countries.

6.4. A further look at the sibling sex composition and birth order

As discussed above, sibling sex composition matters for the school enrollment of female children. Our general finding has been that a larger fraction of male siblings hurts

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[14] Controlling for the number of siblings is important here, because fraction of male siblings is more likely to take extreme values (0 and 1) for smaller families.

[15] Since we are using linear predictions, the estimated rates may exceed 100 percent.

female children's school enrollment in poor households but improves it in rich households. In this section, we would like to see if the effect of sex composition of younger siblings and that of older siblings could have a differential impact. In other words, is it the presence of older or younger brothers that affect the school enrollment of female (and perhaps, male) children? For this purpose, we construct an indicator showing the proportion of older male siblings for each child in the household. Under this construct, since the first child cannot have an older brother, we lose the eldest child in each household.

Before going into the effect of older male siblings on the school enrollment of children, it is interesting to note that with the drop of the eldest children from the sample, both of the birth order variables become statistically insignificant (see the first column of Table 10). In other words, the evidence we found for the parabolic impact of birth order no longer exists once the sample excludes the first-born children. (When we interact the birth order variables with household income and investigate the coefficients and standard errors at selected values of household income, as we did in Table 8, we find that for no household income level is there evidence for a parabolic impact of birth order when the sample does not include the first-born children). On the other hand, when we specify a linear form for the birth order variable, we find a positive effect of birth order on school enrollment as it is presented in the second column of Table 10. Moreover, when we interact the linear birth order term with household income, we find that the positive impact of birth order holds for all wealth indices, except for the top two groups, which correspond to less than 14 percent of the population. In other words, once we drop the first-born children, the later born have higher school enrollment rates, except for those in the very wealthiest group. These findings imply that the parabolic effect we found in the previous section, with the exception of the very wealthiest, is brought about by the "first child" effect. In other words, the first child in the family is favored over the others.

The results of the final estimation where we show the effect of younger and older siblings on the school enrollment of children are given in column 3 of Table 10. To ease the analysis of the results, we have constructed Table 11 which shows the impact of the fraction of male siblings among older siblings and the fraction of male siblings alone on the school enrollment probability for male and female children, at selected household income levels. For male children, the finding that sex composition is not a significant determinant of school enrollment still holds. More precisely, there is no evidence at any household income level that either the fraction of male siblings or the fraction of males only among older siblings matters for the enrollment of male children. On the other hand, controlling for the sex composition of older siblings uncovers a new piece of evidence for female children: It is not the presence of male children per se that negatively affects the schooling of female children but rather the presence of older male children. As can be seen from Table 11, the impact of the fraction of male siblings on the school enrollment of female children becomes statistically insignificant once we also control for the fraction of males among older siblings. However, controlling for the fraction of males among all siblings, we find a statistically significant negative effect for the fraction of males among older siblings. For wealth indices equal to or less than 4 – for almost 40 percent of the population – a higher fraction of males among older siblings, holding the fraction of total male siblings constant, decreases the school enrollment probability of female children. In other words, if we replace older female siblings with younger male siblings, which would increase the fraction of males among older siblings while maintaining the same level for the fraction of total male siblings, the school enrollment probability of female children would decrease.

7. Conclusions

In this paper, we study the impact of sibship size, birth order, and sex composition of siblings on the school enrollment outcomes of children in urban Turkey. We use an instrumental variables estimation method to handle the endogeneity of sibship size and generate careful measures for birth order and sex composition in order to be able to purge their individual impacts from that of sibship size.

Our results indicate that the negative correlation observed between sibship size and school enrollment among urban Turkish households does not have a causal interpretation. The exogenous variation in sibship size brought about by multiple births has no impact on school enrollment of children. On the other hand, birth order of children does matter for their educational outcomes. Middle born children are found to fare worse for all household income groups except for roughly the top 15 percent of the income distribution. The parabolic shape is at its strongest for the poorest households and weakens as household income increases. When the oldest children are dropped from the sample, the parabolic effect disappears, and evidence for a linear impact of birth order emerges in which later-born children are more likely to be enrolled in school. This finding again holds for all income groups but roughly the top 15 percentile of the income distribution and the impact of birth order is again stronger for poorer households. The finding that the effect of birth order diminishes with household income and finally disappears in the highest income households are consistent with the resource base explanations, which predict a negative relationship between birth order and school enrollment. The loss of the parabolic shape with the drop of first-born children from the sample highlights the much higher school enrollment probability of first-born children. This is likely to arise from the fact that many families in Turkey, in particular the less wealthy, see their first child as an integral part of their future income security.

An interesting result we find is that sex composition of siblings matters for female children but not for male children. In the poorest families, a higher fraction of male children decreases the school enrollment probability of female children. However, it has no significant impact on male children. If the parents had identical preferences for their daughters' and son's schooling, the reason for this difference would have been differences in the cost/benefit structure of schooling. However, in that case we would expect the fraction of males to have an impact on both male and female children's education. Therefore, there must be something about parents' preferences that make them less willing to substitute away from male children. The finding that the fraction of male siblings matters more for female children in the poorest households is also consistent with the resource-constraint based explanations.

The impact of the fraction of male siblings on female children's school enrollment is just the opposite in the wealthiest families. In fact, in these families, the fraction of male children increases school enrollment probability of female children. This could be explained by adhering to the reference group argument. Since male children are more likely to attend school, if parents take their sons as a reference group for their daughters, female children will become more likely to attend school as well and for female children with many male siblings, the reference group is more likely to be male siblings. This finding is similar to the finding of a number of studies in the developed countries (see Butcher and Case, 1994). It should not be surprising that in an environment where there are no resource-constraints, the behavior of parents in a developing country is similar to those in developed countries.

A further investigation of the fact that a higher fraction of male siblings is detrimental for the school enrollment of female children in the poorest families shows that it is in fact the fraction of males among older siblings that really matters. Holding the fraction of total male siblings constant, an increase in the fraction of males among older siblings decreases the school enrollment probability of female children in poorer households. This fact holds for roughly the lower 40 percent of the income distribution. On the other hand, holding the sex composition of older siblings constant, there is no evidence for an impact of the sex composition of younger siblings on the schooling of female children.

The finding that sibship size does not have a causal impact on school enrollment rates implies that development policies that aim to increase the socio-economic status of poor households by solely concentrating on keeping the family size in check will not be effective in increasing children's school enrollment. Our findings have shown that there is a significant variation in the resource allocation among siblings, especially in poor households. Therefore, targeting the poor would help in increasing the enrollment rates but there is also a need to look more carefully into the family structure, in particular to the sibling composition of children in formulating effective policy tools. Our finding that earlier born children, except for the first-born ones, have worse educational outcomes suggests that educational policies could target earlier born-children. Similarly, female children with many male siblings in the poorest households need to be specially targeted since they are under a higher risk of not enrolling in school.

One of the assistance programs implemented around the world (including Turkey) that aims to increase children's school enrollment in poor households is the conditional cash-transfer program. Under this program, which is means-tested, households can receive aid if they send their children to school. The aid is given on a per-child basis to encourage families to send all their children to school. However, if the aim is also to help the most vulnerable, there is a need to distinguish between children with high and low propensities of school attendance. Failing to do so may result in the payment of the assistance for the children who would have attended school anyway and may not particularly change the schooling status of children with low propensities of school enrollment. Instead, specific targeting can be employed with higher amounts of aid instituted for the most vulnerable children, who we identify in the paper for Turkey as the older children and females with many older male siblings.

Another finding of the paper that is of methodological importance is that sex composition matters for the school enrollment outcomes of female children in poorer households. This implies that using sex composition of earlier born children as an instrument for sibship size would be problematic in Turkey due to the direct effect of sex composition on school enrollment. This finding also suggests that sex composition as an instrument could be problematic in other countries as well.

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Table1 School enrollment by age and sex

Ages	All children	Male children	Female children
8	91.0	94.3	86.5
9	89.8	96.1	84.2
10	93.2	95.0	90.5
11	86.6	92.9	80.2
12	83.2	90.9	75.4
13	79.3	84.4	74.1
14	62.7	66.4	59.8
15	63.4	66.3	60.6
Overall	78.6	84.0	73.2

Table 2 Descriptive statistics for children by school enrollment (8-15 years)

	Enrolled	Not enrolled
Age	11.78	13.16
	(2.22)	(1.92)
No of children	3.84	5.63
	(1.98)	(2.29)
Father's years of schooling	7.32	4.08
	(4.37)	(3.01)
No/absent father (%)	2.59	6.01
	(15.88)	(23.81)
Mother's age	39.64	40.72
	(3.81)	(4.07)
Mother's years of schooling	4.61	1.73
	(4.02)	(2.42)
Mother's age at first marriage	19.20	16.98
	(3.87)	(3.30)
Mother not married (%)	3.85	9.05
	(19.24)	(28.74)
Married more than once (%)	1.53	3.52
	(12.29)	(18.45)
Mother tongue: Turkish (%)	81.42	58.73
	(38.91)	(49.30)
Mother tongue: Kurdish (%)	15.46	33.58
	(36.17)	(47.29)
Mother tongue: Arabic (%)	2.19	6.78
	(14.64)	(25.17)
Mother tongue: Other (%)	0.93	0.90
	(9.60)	(9.47)
Wealth index	5.66	3.52
	(2.63)	(2.20)
Reside in city (%)	78.22	76.52
	(41.29)	(42.44)
Population of city (in 100,000)	17.16	18.39
	(29.11)	(31.19)
West (%)	35.69	32.39
	(47.93)	(46.86)
South (%)	18.12	19.04
	(38.53)	(39.31)
Central (%)	20.23	16.42
	(40.19)	(37.09)
North (%)	7.02	2.65
	(25.56)	(16.08)
East (%)	18.93	29.51
	(39.19)	(45.67)
No. of observations	1,362	371

Notes: Figures in parentheses are standard deviations. Cities are defined as urban areas with a population above 50 thousand.

Table 3 Distribution (in %) of children by wealth index

Wealth index	All	Enrolled
0 (poorest)	1.41	1.13
1	9.55	6.06
2	8.47	7.06
3	8.19	6.65
4	11.27	10.94
5	17.48	17.67
6	12.65	13.41
7	10.00	11.75
8	7.17	8.39
9	4.89	5.78
10 (richest)	8.93	11.16
Column total	100	100

Table 4 School enrollment by sibship size

Sibship size	All	Male	Female
1	97.93	100.00	95.77
2	95.43	93.52	97.63
3	84.96	90.04	80.04
4	73.88	88.84	56.51
>=5	56.57	76.43	40.98

Note: School enrollment probabilities are based on 12-year-old children.

Table 5 School enrollment by birth order

Birth order	All	Male	Female
1 (first born)	94.55	100.00	88.31
2	95.46	96.28	94.75
3	71.48	81.29	62.05
4	79.64	94.36	66.59
5	78.09	83.56	63.64
>5	66.72	87.93	50.24

Note: School enrollment probabilities are based on 12-year-old children.

Table 6 School enrollment by sex composition

Fraction male	All	Male	Female
0.0<= <=0.2	96.99	97.34	96.49
0.2<= <=0.4	72.30	85.13	64.03
0.4<= <=0.6	77.80	96.02	62.25
0.6<= <=0.8	65.36	70.39	59.40
0.8<= <=1.0	92.73	93.44	91.96

Note: School enrollment probabilities are based on 12-year-old children.

Table 7 OLS and IV estimate results for school attendance – key variables

	Basic Model		Full Model	
	OLS	2SLS	OLS	2SLS
Log number of children	-0.180***	0.207	-0.183***	0.203
	[0.039]	[0.248]	[0.040]	[0.245]
Fraction of male siblings	-0.029	0.002	-0.018	-0.012
	[0.025]	[0.033]	[0.084]	[0.089]
Fraction of male siblings* female			-0.189**	-0.166*
			[0.093]	[0.097]
Fraction of male siblings* wealth index			-0.003	0.00
			[0.011]	[0.012]
Fraction of male siblings* female* wealth index			0.034***	0.031***
			[0.011]	[0.012]
Birth order	-0.266**	-0.739**	-0.464*	-0.928**
	[0.121]	[0.323]	[0.254]	[0.395]
Birth order squared	0.309***	0.816**	0.555**	1.036***
	[0.116]	[0.342]	[0.230]	[0.386]
Birth order* wealth index			0.041	0.038
			[0.037]	[0.039]
Birth order squared*wealth index			-0.049	-0.044
			[0.035]	[0.036]
Wealth index	0.296***	0.338***	0.223**	0.242**
	[0.051]	[0.059]	[0.099]	[0.113]
Number of observations	1,733	1,733	1,733	1,733
R squared	0.2913	0.2324	0.2985	0.2401

Note: Robust standard errors are in brackets. * indicates significance at 10%, ** significance at 5%; and *** significance at 1%. Birth order is defined as (order-1)/(N-1), where N is total births. Other covariates include mother's age at first marriage, mother's current age and schooling, father's schooling, absent father dummy, marital status of the mother, five regions of the country, city residence and its population, ethnic background of the child and single age groups for male and female children. Wealth index is measured based on household durables and housing facilities.

Table 8 Impact of birth order at selected values of wealth index

Wealth index		Coefficient	Standard error
0 (poorest)	Birth order	-0.928**	0.395
	Birth order squared	1.036***	0.386
	p-value for joint significance = 0.009		
2	Birth order	-0.851**	0.356
	Birth order squared	0.948***	0.358
	p-value for joint significance = 0.012		
4	Birth order	-0.774**	0.332
	Birth order squared	0.860**	0.343
	p-value for joint significance = 0.022		
6	Birth order	-0.697**	0.325
	Birth order squared	0.772**	0.343
	p-value for joint significance = 0.053		
7	Birth order	-0.659**	0.328
	Birth order squared	0.728**	0.349
	p-value for joint significance = 0.087		
8	Birth order	-0.620*	0.336
	Birth order squared	0.684*	0.358
	p-value for joint significance = 0.139		
10	Birth order	-0.543	0.363
(richest)	Birth order squared	0.596	0.387
	p-value for joint significance = 0.293		

Note: Based on the estimates of Table 7. Wealth index is measured based on household durables and housing facilities. * indicates significance at 10%, ** significance at 5%; and *** significance at 1%.

Table 9 Significance of sibling sex composition for male and female children at selected values of wealth index

	Male children		Female children	
Wealth index	Coefficient	Standard error	Coefficient	Standard error
0 (poorest)	-0.012	0.089	-0.178*	0.093
1	-0.012	0.078	-0.146*	0.083
2	-0.011	0.067	-0.115	0.074
4	-0.011	0.048	-0.051	0.058
6	-0.010	0.036	0.012	0.047
8	-0.010	0.040	0.075	0.047
9	-0.009	0.047	0.106**	0.051
10 (richest)	-0.009	0.056	0.138**	0.057

Note: Based on the estimates of Table 7. Wealth index is measured based on household durables and housing facilities. * indicates significance at 10%, ** significance at 5%; and *** significance at 1%.

Table 10 2SLS estimate results for school attendance

	First child effect		Effect of older males
	2SLS(1)	2SLS(2)	2SLS(3)
Log number of children	0.281	0.278	0.22
	[0.290]	[0.287]	[0.285]
Fraction of male siblings	-0.311	-0.319	-0.173
	[0.210]	[0.208]	[0.221]
Fraction of male siblings* female	0.259	0.265	0.302
	[0.280]	[0.279]	[0.275]
Fraction of male siblings* wealth index	0.032	0.032	0.007
	[0.033]	[0.033]	[0.035]
Fraction of male siblings* female* wealth index	-0.005	-0.005	-0.01
	[0.046]	[0.045]	[0.045]
Fraction of older male siblings	0.079	0.086	0.104
	[0.184]	[0.183]	[0.184]
Fraction of older male siblings*female	-0.422*	-0.422*	-0.452*
	[0.253]	[0.253]	[0.251]
Fraction of older male siblings* wealth index	0.007	0.006	0.002
	[0.031]	[0.032]	[0.031]
Fraction of older male siblings* female*wealth index	0.033	0.033	0.038
	[0.042]	[0.042]	[0.042]
Birth order	-0.17	0.498**	0.553***
	[0.409]	[0.200]	[0.189]
Birth order squared	0.475		
	[0.370]		
Birth order* wealth index			-0.022
			[0.018]
Birth order squared*wealth index			
Wealth index			0.399**
			[0.162]
Number of observations	1,476	1,476	1,476
R squared	0.2353	0.2336	0.2568

Note: Robust standard errors are in brackets. * indicates significance at 10%, ** significance at 5%; and *** significance at 1%. Birth order is defined as (order-1)/(N-1), where N is total births. Other covariates include mother's age at first marriage, mother's current age and schooling, father's schooling, absent father dummy, marital status of the mother, five regions of the country, city residence and its population, ethnic background of the child and single age groups for male and female children. Wealth index is measured based on household durables and housing facilities.

Table 11 Significance of sibling sex composition for male and female children at selected values of wealth index

	Male children		Female children	
	Fraction male among siblings			
Wealth index	Coefficient	Standard error	Coefficient	Standard error
0 (poorest)	-0.173	0.221	0.129	0.192
2	-0.159	0.162	0.123	0.144
4	-0.149	0.115	0.116	0.112
6	-0.131	0.10	0.109	0.112
8	-0.117	0.127	0.102	0.145
10 (richest)	-0.103	0.179	0.095	0.194
	Fraction male among older siblings			
0 (poorest)	0.104	0.184	-0.348**	0.163
2	0.109	0.132	-0.267**	0.120
4	0.113	0.094	-0.187**	0.094
6	0.118	0.090	-0.106	0.101
8	0.122	0.123	-0.025	0.137
10 (richest)	0.127	0.173	0.056	0.184

Note: Based on the estimates of Table 10. Wealth index is measured based on household durables and housing facilities. * indicates significance at 10%, ** significance at 5%; and *** significance at 1%.

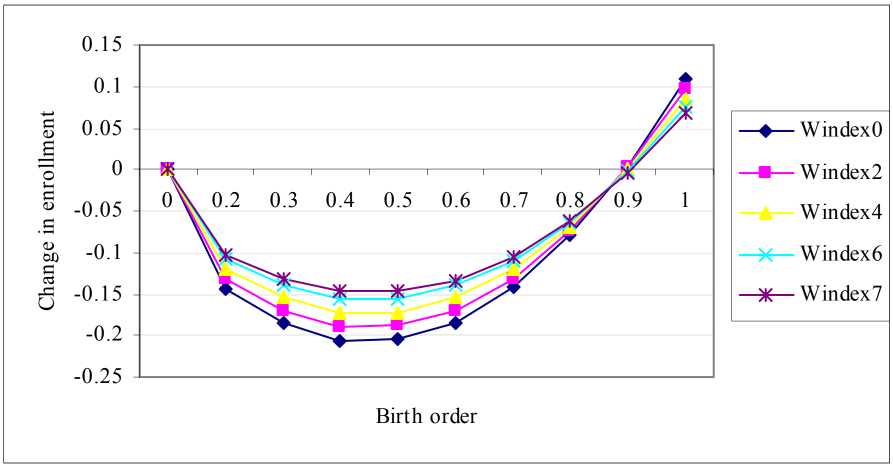

Figure 1: Difference between enrollment probability of children of various birth orders and that of the first-born children.

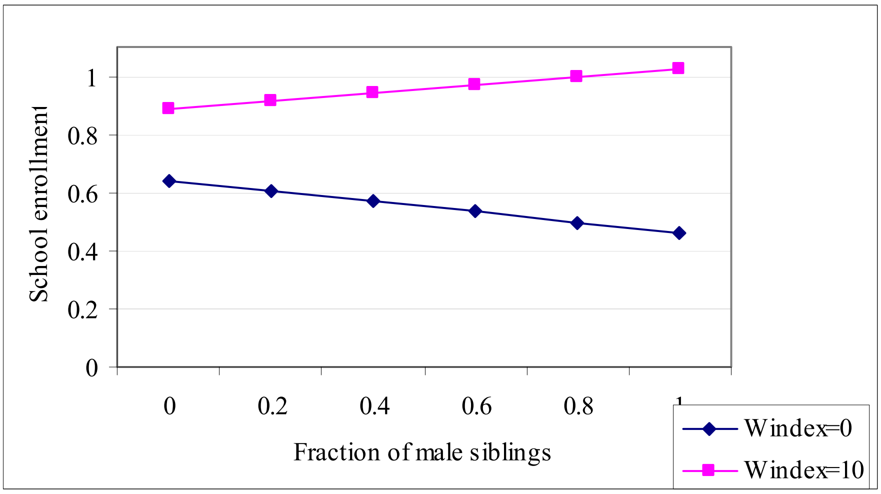

Figure 2 Effect of sibling sex composition on school enrollment probability of female children (in reference to a 12-year-old girl)