NUMBER OF CHILDREN, BIRTH ORDER AND EDUCATIONAL ATTAINMENT: THE CASE OF VIETNAM

Nguyen Ngoc Anh, Ma Doan Hai
Development and Policies Research Center, DEPOCEN

Abstract: Using data from Round 3 of Young Lives survey in Vietnam, we examine the effect of number of children and birth order on the educational attainment of the children in the family. In term of number of children, we use instrumental variables of average birth spacing among the children and variable of sex composition of the first two children. In term of birth order, we apply birth order variables in both separated dummy variables and continuous variables. In addition, we also examine the effect of birth order when effect of birth spacing is counted. The results show that without instrumental variables, there is a negative relationship between number of children and educational attainment. When adding the average birth spacing as an instrument variable, the effect of birth order becomes positive. In addition, when using sex composition of the first two children as an instrument variable, the effect is positive, but insignificant. On the other hand, higher birth order children, or later – born children, often get lower level of educational attainment. However, when the number of children become larger, the effect is insignificant. The results are similar when taking account to the average birth spacing among the children.

Introduction

A large number of studies have shown the effects of number of children as well as birth order on the educational attainment of the children in the family. Effects of number of children as well as birth order are caused by often caused by the family constraints, in term of finance as well as intellectual environment. Becker and Tomes (1973), Becker and Tomes (1976) point out that increasing number of children often comes up lower quality of children. On the other hand, according to Zajonc (1976), the intellectual environment per person decreases when number of children increases.

There are often two problems raising when examining the effect of number of children on educational attainment. Firstly, number of children often be endogenous, or there are some other variables that affect both number of children and the educational attainment of the children, such as parental educational attainment as Haan (2005) points out. To overcome the issue of endogeneity of number of children, Black et al (2005) as well as Haan (2005) use the IVs such as variable of last twin born and variable of the two first children having the same sex. On the other hand, there is also a relationship between the number of children and the birth order of the children. Early children often have a higher chance of being in a small family, and receive much support in finance as well as intellectual environment until later children comes. Studies like Black (2005), Haan (2005) separate the effect of number of children and birth order by estimating the effect of birth order on the educational attainment for each family size cohort. However, as Booth et al (2005) points out, estimating separately by family size cohorts will not absolutely be eliminated the effect of number of children, and propose the birth order index.

In this paper, in order to avoid the endogeneity in number of children, we also use the instrumental variables for number of children, which are average birth spacing and sex composition of the first two children. While sex composition is used by much literature such as Black (2005) or Haan (2005), we will use a new instrument of average birth spacing between children in the family. It is clear that larger birth spacing between previous children may reduce the probability to have the next children, since birth spacing is also equal to an increase in age of the mother, and when the mother becomes older, the probability to have one more birth will also reduce. On the other hand, as D. Angrist et al (1976) points out, women with the first two children which have the same sex will have a higher tendency to have the third child than women that already that have had one boy and one girl. Therefore, it can be seen that the sex composition of the two first children can have an effect on the number of children. In term of birth order, in order to eliminate the effect of number of children, we will regress the effect of the birth order of the children on the educational attainment by separated family size as Haan (2005). We will also use birth order index, which is similar to Booth (2005) to estimate this effect. Besides, we will look at the effect of birth order when taking to account the birth spacing by adding this variable, and then using the interaction between this variable and birth order.

Our paper is organized as follow: In the first section, we give a literature review of the effect of number of children and the birth order of the children on the educational attainment of them. After that, the second section will introduce the methodology and data used for this paper. After that, in the fourth section, we will give the results of the models and give some explanation on this, and finally is the conclusion.

Literature Review

Earlier literature often shows a negative relationship between the number of children and educational attainment of the children. Becker and Tomes (1973), Becker and Tomes (1976) shows that there is a trade-off between the quantity and the quality of children. It means that the spending for higher level

of quality for the children will become more expensive when the family has more children. On the other hand, when the children have a higher level of quality, an increase in in quantity will means more spending. Therefore, with a budget constraint within a family, it can be seen that there is a negative relationship between the number and the quality of the children.

Empirical research shows a negative relationship between the number of children and the educational attainment. On the other hand, using the military examination score modified by the Raven Progress Matrixes, Belmont and Marolla (1973) showed that there is an inverse relationship between the family size and Raven score. They also find out that the higher position of birth order may come up with decreasing level of ability. Using data from various surveys in the US, Blake (1981) also shows a negative effect of family size on the child quality. On the other hand, Blake also shows that the household size has a negative effect on the determining variables of college plans. When a child is born, parent can create an environment for this child by providing homes, necessities of life or cultural objects and create opportunities, which are specific chances for discovering the outside world. In addition, they also provide the treatment, which includes personal attention, intervention and teaching. In this paper, the dilution model was also introduced. It means more children in the family means the resources have to be divided to more and the quality of the children will reduce. Downey (1995) shows that the resources from parents explain most or all of the inverse relationship between the number of children and educational attainment. In addition, the interaction between the number of children and resources also support the dilution model. Using the US Census Data, Delpiano (2005) shows that a larger family size will reduce the likelihood that the older children will attend to the private school, and reduce the participation of the mother and rise the probability that their parent will divorce.

However, adding more variables may make the relationship the children and educational attainment become different. Using a rich data in Norwegian over a long period of time, Black et. Al (2005) shows a negative relationship between the number of children and the educational attainment. However, when adding the dummy variables of the birth order or variable indicating that whether the family have multiple twin or not, the effect become insignificant. Similar to Black (2005), Haan (2005) shows that when including the dummies for birth order and the two last children as twin, the effect of family size will also become statistically insignificant.

The effect of family size may also be different among children. Conley et.al (2006) shows that increasing number of children will reduce the probability that the second children will attend the private school. However, there is no such effect for the first student. On the other hand, Haan (2005), using having twin in two last children and having two first children that have the same sex as instrument variables, indicates that the effect of number of children is positive, but not significant.

There has been a large literature of how birth order affects the educational attainment of the children. Zajonc (1975) introduces the confluence model, in which the intellectual growth of each member depends on the intellectual environment created by all the siblings and parents. The intellectual environment can be determined by the absolute intellectual level of all members in the families. He also points out that the intellectual environment decreases with an increase in the number of children. When the first child is born, the average intellectual environment for each person is higher. When a second child is born, the intellectual environment, which has not increased much after the birth of the first child, is divided by four, so the average intellectual level will decrease, and more children in the family will also mean decreasing intellectual environment per person.

Some empirical research also shows the negative relationship between birth order and educational attainment. Using data of about 400,000 men at the age of 19 in Netherlands, Belmont (1973) shows

that the higher the order of the child, the lower ability he or she is. When examining separately by the number of children, the result shows that the effect of the birth order was clear for families of two through four children, but became less consistent with families with five or six children, and become in inconsistent for families with larger family sizes. In addition, the first child also has a better performance than latter ones. Hanushek (1992) shows that the even though the parents do not show any favor to the first children, they still have an advantage thanks to higher probability to stay in small families. The result also shows that a shift to smaller families can cause an effect in increasing the performance throughout the birth order. Black et.al (2005) also point out the negative effect of birth order on the educational attainment of the children. It shows that the higher level of order the children are, the lower years of schooling that children get. In addition, in all family sizes, there is always a significantly negative effect on the second child in the family. Haan (2005) also gets a similar result of negative effect, but shows that the birth order effects do not relates to the birth spacing. Booth et.al (2005) finds that both family resources and educational attainment reduces for higher order children.

However, the relationship between birth order and educational attainment is not always negative. On the other hand, Hauser et.al (1983) shows that without the birth year control, the birth order has a positive effect on the children's educational attainment. However, with the control of birth year and parental education, the effect becomes insignificant, and there is no difference between the first and the last child. Parish and Willis (1993) shows that lower order children will get lower years of education. The results also show that with poor family with large family size, older sisters may be very helpful for younger siblings because she may quit school and go to work, which means an additional income for the family. On the other hand, she can get marry early, so more resources are available for the younger children. Portner et. al (2002) also examines the effect of birth order on years of schooling, and shows the result that the higher order children will lead to high level of education. One reason for that is the parents at the later stages get richer, and later children will get more benefits. In addition, the older children can go to work when support back to the family, so the younger children will have more chances to get higher levels of education.

Methodology

Family size and educational attainment

In order to address the impact of family size on educational attainment, we will use the similar approach as Haan (2005). Using the OLS specification, our model would be:

$$YROFEDU_i = \beta_1 NUMCHILD_i + \beta_2 X_i + e_i \quad (1)$$

In this equation, YROFEDU is the total years of schooling the child got, NUMCHILD would be the number of children in the family, and X will be a set of variables. Regarding to the variable set X, we use divide into four cases. In the first model, we include age of the children, gender variable, mother's characteristics (Mother's years of schooling and mother's age when the child was born). After that, we add some characteristics of the father (father's years of schooling and father's age when the child was born). Finally, we use add birth order as the separated dummy variables for each order of the children (in the third model) and as a continuous variable (in the forth model).

However, one problem when examining the effect of number of children is endogeneity. On the other words, there may be some factors that affect both the number of children in the family and educational attainment. For example, higher family income can lead to an increase in the number of the children, but also lead to an increase in the higher level of education of the children. Therefore, using the instrumental variables is necessary to solve this problem. For example, Rosenzweig and

Wolpin (2000), Black (2005) and Haan (2005) used the situation of being twin in the last birth as an instrumental variable to number of children in the family. If there are three children in the family, the second and the third children in the family are twin; if there are four children in the family, the third and the forth children are twin. The reason behind that is that giving a birth as a twin would be out of control of the parent, and the increase in the number of children is out of expectation, and putting this as an exogenous variable will create an exogenous part in the number of children. However, due to lack of twins in the last born in our sample, we will not this variable.

Another instrumental variable that can be used here is whether the two first children have the same sex. Porath et. al (1976) shows that there is a relationship between the tendency of having more children and the sex centrifugation of earlier children. D. Angrist et. al (1998) also shows that women who have already had two children with the same sex will be more likely to have the third one than mother with one boy and one girl. However, Keastner (1986) points out there is no such effect of sex centrifugation on educational attainment of the children. In this paper, we also would like to use this variable as the instruments.

One another instrumental variable used in this paper is the average birth spacing of the children in the family. It can be seen that the width of the birth spacing of previous children can affect the probability of having the next child, since the birth spacing is also equal to a large increase in the age of the mother, higher age of mother often comes up with a reduce in the probability of having one more children. In the other words, since the mother should have children within a certain period (from 20s to early 40s), so lower birth spacing would reduce the number of children in the family.

Our model when using instrumental variable would be:

$$YROFEDU_i = \beta_1 NUMCHILD_i + \beta_2 X_i + e_i \quad (2)$$

$$NUMCHILD_i = \delta_1 + \delta_2 Z_i + \delta_3 X_i + \eta_i \quad (3)$$

Z_i in this case is the instrument variable.

Birth order and educational attainment

We also use the similar approach as family size to examine the effect of birth order on educational attainment. Our model in this case is:

$$YROFEDU_i = \beta_1 BIRTHORDER_i + \beta_2 X_i + e_i$$

YROFEDU is still the highest years of schooling that of that child, and BIRTHORDER is the birth order of that child in the family. We will use the variable of birth order in two ways: Firstly, it will be separated dummy variable indicating that whether the child is the second, third or fourth one in the family. In order eliminate the effect of number of children, we will regress birth order of the children on educational attainment by family size. Secondly, we will use birth order variable as the continuous variable and the first child in the family will receive the value zero, the second child will receive the value one, and so on.

Beside examining the effect of birth order of children separately by family size, we also use address the relationship between birth order and educational attainment by using approach used by Booth et. al (2005) to distinguish the effect of birth order. In this model, we will the birth order index. The birth order index is created as:

$$B = \frac{\phi}{A} \tag{4}$$

B in this case in the birth order index, ϕ is the birth order of the children, which receive the value 1 if the child is the first child, 2 if the child is the second child, 3 if the child is the third child, and so on. A in this case is the average birth order, which is calculated by (N+1)/2, and N is the number of children in the family.

The educational level of each child i-th child in the k-th family in this case will be given by:

$$E_i = \left[(W_{ik} / N_{ik}) B_i^{\beta} \right]^{\alpha} \tag{5}$$

W_{ik} in this case is the parental total educational resource in the family. On the other hand, it is determined by the per – sibling family resource weighted by the child birth order index B_i. We can see that if β = 0, the parental educational resource will be equally allocated to all children in the family. If β < 0, the earlier – born child will get more advantage, and if β > 0, the later – born child will get more share in the educational resource of the children, so they will achieve higher education level.

Taking the natural logarithm, we get:

$$\ln E_i = \alpha \ln(W_{ik} / N_{ik}) + \alpha\beta \ln(B_i) \tag{6}$$

When using data from the British Household Panel Survey (BHPS), Booth (2005) used some proxy indicating the parental wealth. The equation now will become:

$$\ln E_i = \omega X_i + \alpha \ln N_i + \alpha\beta \ln B_i + \varepsilon_i \tag{7}$$

X_i includes a set of variables, including the dummy of ages, ethnic, parental highest degrees and other family resources. While the parameter ∝ if expected to be negative, the sign of β will show that whether the earlier or the later born child will get more benefits. The educational level of children can be determined whether by the highest grade that the children attained or by the logarithm of the years of schooling for the robustness test. Our set of variable is also similar: It includes dummies for ages, dummies for gender, years of schooling for father and mother when the child was born.

Child – spacing and educational attainment

It is worth noting that the child – spacing may also affect the educational attainment of the children, and it effects may influence the birth order effect. Zajonc et. al (1976) shows that the while smaller birth spacing can hurt the later born children, larger birth spacing can make the older children in the family become the disadvantaged. The result also shows that when the age gap between two children is small, higher order children means lower educational performance. However, when the gap is large enough, the effect can become insignificant and even reserve. The reason behind that may be the older children start working and can support back to the family, so there are more resources available for the later born children.

We will use the approach similar to Booth (2005) to examine the effect of child spacing on educational attainment. The model in this case is:

$$YROFEDU_i = \beta_1 + \beta_2 BIRTHORDER_i + \beta_3 AVERAGESPACE_i + \beta_4 X_i + e_i$$

$$YROFEDU_i = \beta_1 + \beta_2 . BIRTHORDER_i + \beta_3 . AVERAGESPACE_i + \beta_4 . (BIRTHORDER_i \times AVERAGESPACE_i) + \beta_5 . X_i + e_i$$

The first equation contains the average birth spacing by years in a family and also the birth order variable, which is continuous variable and the first child will receive the value 0. Other variables are also included such as dummies for age and gender of the child, the parental years of schooling. In the second equation, we will the interaction between birth order and the average birth spacing of the children. If the parameters β_2 and β_4 have the same sign, higher average birth spacing will increase the effect of birth order. If, for example, the increasing average spacing will reduce the competition among the children and birth order is expected to have a negative effect on the years of schooling of the children, β_2 will be negative while β_4 will be positive.

Data

We used the data from the third round of the panel study Young Lives. It is conducted by the Department of International Development of University of Oxford and other partners in four countries: Ethiopia, India, Peru and Vietnam (in Vietnam, the partners are Vietnam's General Statistics Office (GSO), Center for Analysis and Forecast (CAF) and Vietnam Academy of Social Sciences (VASS)). The survey collects information about 2000 children who were at the age between 6 and 18 months when the Round 1 of the survey was conducted in 2002 and 1000 children who aged between 7.5 and 8.5 years old. It was conducted in 20 sentinel sites of 31 communes (because some sites did not have enough one-year-old children when the first round of the survey was carried out, and so other neighbor communes with similar socio – economic characteristics were chosen). The respondents in this survey lives in five provinces from five regions when the first round of the survey was conducted: Lao Cai (North East region), Hung Yen (Red River Delta), Da Nang (city), Phu Yen (South Central Coast) and Ben Tre (Mekong River Delta).

There are 2748 observations coming from 976 families in the initial sample. However, from these sample, we only include families with no more than five children, because families with more than five children are not suitable for the sample size when we regress the in each family size cohort. In addition, we also do not count to the family with adoptive children because the parents can treat these children differently. In addition, we also do not have any information about when the adoption happened, so it really difficult to examine when this adoptive child really affects the family. The table 1 shows the statistics summary of variables used in the model.

<Table 1 is shown here>

Result

The effect of number of children on educational attainment

Firstly, we examine the effect of number of children on the educational attainment of the children. The result shows that there is an inversed relationship between number of children and educational attainment. In the first model, we just add age of children, sex of that children, mom's years of schooling and mom's age when she had the first child. The result in table 2 shows that one more children in the family will reduce the average number of children by 0.458 years. In the second model, we add some characteristics of the father like years of schooling and dad's age when the child was born as well as the dummies about performance of the children in the past, the effect of number of children is still negative, but slightly decreases. Specifically, one more children in the family will reduces the average educational attainment of children by 0.451 years.

<Table 2 is shown here>

We also add the effect of birth order as dummy variables (in model 3) and continuous variables (in model 4). Both models show a negative relationship between number of children in the family and average educational attainment. Specifically, when using separate dummy variables for each child in the family (we use dummy for being the first child in a family as a baseline), one more children in the family will reduce 0.744 year in average educational attainment of the children in the family. On the other hand, when using number of children as the continuous variables, one more children in the family will reduce 0.693 year in the average educational attainment of the children in the family.

However, as mentioned earlier, this effect can be caused by the endogeneity. For example, income of the household may affect the parent's decision on the number of children in the family, but it also affects the educational attainment of the children in the family. Another example is number of hours that mother and father working. Higher number of hours that mother and father work may increase the income of family, then their children can improve the education attainment. On the other hand, parents with higher working hours per day will tend to have fewer children. Therefore, using instrumental variables are necessary to make the number of children become exogenous, and then determine the "real effect" of number of children on the children's educational attainment.

As mentioned earlier, firstly, we use spacing between the first and the second children in the family to find out the effect of number of children on average educational attainment, the effect reserves. Specifically, in the first stage, with or without controlling for dad's characteristics, average birth spacing has a negative effect on the number of children. In the second stage, the number of children have a positive effect on educational attainment. Without variables of dad's year of schooling and dad's age when the children were born, one more children in the family increase the average educational attainment by 0.959 year. On the other hand, when using variables for dad's year of schooling and dad's age when the children were born, the effect increases slightly: One more year in the number of children will increase the average educational attainment by 0.996 year.

<Table 3 is shown here>

There are several reasons that explain a positive effect of number of children on the average educational attainment. Firstly, through the signs of relationship between the average birth spacing and number of children as well as the number of children on the average educational attainment, we can see the negative relationship between average child spacing and average educational attainment, the lower average birth spacing means higher average educational attainment. It can be explained that the lower birth spacing can help two children find it easier to have a close relationship, and it is also easier to help each other in studying. Therefore, the average educational attainment of the children can be higher. It is also worth noting that the resource of parents is not consistent over time, and the parents can accumulate more assets. Therefore, one more child is born may not mean that other resources among other children will reduce. On the other hand, parents just decide to have one more child when they see that it is affordable to raise him or her. In this case, one more child can be seen as a sign showing that the wealthier the parents are.

Using the dummy variable of having the first two children that are the same sex as instrumental variable, we see that in the first stage, it has a positive effect on number of children in the family. However, in the second stage, the effect of number of children is still positive, but insignificant.

<Table 4 is shown here>

Effect of birth order in educational attainment

We use the separated dummy variables to indicate the order of the children in the family to examine the effect of birth order in the family on the educational attainment, and the first child in the family is treated as base for comparison. The result is shown in the Table 5.

<Table 5 is shown here>

We can see that for families with two, three and four children in the family, the last child in the family had lower educational attainment than older children in the family. Specifically, in two - children families, the second child have 1.828 years of schooling less than the first children. For three – children families, the effect of birth order of children on the educational attainment is significant for both the second and the third children in the family, when the second child receives 0.879 year less in educational attainment, and the third child has 1.866 years less than the first child in the family. In the four-children family, the last child receives less 1.349 years less than the first child in the family. On the other hand, the effect of birth order on the education attainment for the cases of second and third children in the family is insignificant. In five – children families, the effect of birth order effect is significant just in the third children and the forth children (at 0.01 level). On the other hand, the effect of birth order is not significant on other child, especially on the last child.

Some reasons can be used to explain the elimination of the effect on birth order of children on the education attainment of the children when the number of children becomes larger. One reason is that older children can start working and contribute more to the resource in the family. Therefore, the parent will not have to spend resources (money, time, etc.) on the first child but receive the support from his/her, and it will help the latter children can continue their studying. In addition, as we explain earlier, the decision on number of children can be controlled by the parents. The wealth of parents can be accumulated over time, parents feel that they can have one more child when they see that it is affordable to raise him/her.

Birth order index

We use the birth order index introduced in the methodology as another approach to examine the effect birth order in the family. We use two different models (i) Order probit model in which the dependent variable is the highest grade that the children attain, and (ii) OLS model in which the dependent variable is years of schooling by the children. In which model, the first specification shows only the logarithm of household size, and the second specification shows both the effect of family size and birth order. The results are shown in the Table 6.

<Table 6 is shown here>

In both models, results show that there is a negative relationship between the household size and the educational attainment (highest level of education attained/years of schooling). In term of birth order, the coefficient is negative (-0.687 in case of ordered probit model, -0.157 in term of OLS) show that the earlier children receive more resources in the family, so their educational attainment is higher. This result is mostly consistent with the results using models by Booth (2005), except for five – children families.

Birth order and birth spacing

Firstly, we use order of children as the continuous variable to examine the effect of this to the education attainment of the children in the family. The result shows a negative relationship between the order of children and average educational attainment, but when the number of children in the family becomes larger, the effect is smaller. For two – children families, the later children will receive

1.85 years less, but for four children families, later children will receive 0.416 year less in educational attainment. In the case of five children families, the coefficient is positive, but insignificant.

<Table 7 is shown here>

We put the birth spacing variables to examine the effect of birth order beside the effect of birth spacing. The results are similar: There is a negative relationship between the birth order and educational attainment. When we put average birth spacing, the effect is larger. For example, for families with two children, with average birth spacing effect, later-born children will receive about 1.85 years less in term of educational attainment. However, when adding average birth spacing, the effect increase to 1.95 years. When the number of children in the family increases, the effect becomes insignificant. Regarding to the effect of average birth spacing, the coefficient is negative for most cases (except for five children families), but insignificant.

We also put the interaction between birth order and average birth spacing, but we see that the interaction is also insignificant for most cases (except for two children families). In the other word, the effect of birth spacing does not affect the effect of birth order when the number of children become larger.

<Table 8 is shown here>

Conclusion

Using the data from Round 3 of the Young Lives survey, we examine the effect of educational attainment and birth order in the family on the educational attainment of the children. Regarding to the number of children in the family, when not using instrumental variables, we see the negative relationship between the number of children and the educational attainment of the children, but this result can be affected by the endogeneity of the number of children. When we put the average number of children and the sex composition of the first two children, we find the positive relationship between the number of children and the educational of the children. The positive relationship can be explained as the closer relationship between siblings so they can support each other during their studying, and an increase in the income of the family. Regarding to birth order of the children in the family, using both methods adapted by Haann (2005) and Booth (2005), we find out that older children tends to have higher educational attainment then later - born ones. Nonetheless, for five – children families, the effect of birth order is not significant anymore. The reason behind that is the older children can go to work and support back to the family, so the younger children will not suffer in receiving the resources from the parents and can keep up their studying.

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TABLE 1: SUMMARY STATISTIC

	Mean	Standard deviations
Number of children - Round 3	3.001	0.979
Age in whole years - Round 3	15.421	4.035
Sex of members - Round 3	0.498	0.500
Mom - Years of schooling	6.873	3.737
Dad - Years of schooling	7.724	3.920
Mom's age when the child was born	26.130	5.225
Dad's age when the child was born	28.443	5.652
Average birth spacing	3.900	1.957
Two first children have the same sex	0.516	0.500
First child	0.353	0.478
Second child	0.380	0.485
Third child	0.180	0.385
Forth child	0.071	0.256
Fifth child	0.016	0.127

TABLE 2: THE EFFECT OF NUMBER ROF CHILDREN ONLY

	Model 1	Model 2	Model 3	Model 4
Number of children - Round 3	-0.458***	-0.451***	-0.744***	-0.693***
	(-8.01)	(-7.94)	(-10.22)	(-9.61)
Age in whole years - Round 3	0.562***	0.558***	0.596***	0.602***
	(-41.78)	(-41.55)	(-38.29)	(-38.65)
Sex of members - Round 3	0.357***	0.346***	0.380***	0.379***
	(-3.56)	(-3.47)	(-3.85)	(-3.82)
Mom - Years of schooling	0.138***	0.076***	0.078***	0.078***
	(-9.71)	(-4.13)	(-4.25)	(-4.24)
Mom's age when the child was born	-0.025**	-0.001	-0.026	-0.028
	(-2.42)	(-0.07)	(-1.43)	(-1.55)
Dad - Years of schooling		0.091***	0.093***	0.093***
		(-5.31)	(-5.5)	(-5.44)
Dad's age when the child was born		-0.027*	-0.034**	-0.033**
		(-1.70)	(-2.15)	(-2.06)
Second child			0.023	
			(-0.17)	
Third child			0.748***	
			(-3.83)	
Forth child			1.428***	
			(-4.94)	
Fifth child			2.426***	
			(-5.11)	
Order of child in the family (first child, second child) - Round 3				0.454***
				(-5.37)
Constant	0.272	0.178	0.989**	0.143
	(-0.69)	(-0.44)	(-2.35)	(-0.35)
Observations	1897	1897	1897	1897
R^2	0.543	0.55	0.561	0.557

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 3: AVERAGE BIRTH SPACING AS AN INSTRUMENTAL VARIABLE

	Model 5		Model 6	
	Second stage	First stage	Second stage	First stage
Number of children - Round 3	0.959***		0.996***	
	(-3.55)		(-3.68)	
Age in whole years - Round 3	0.470***	0.063***	0.464***	0.063***
	(-20.4)	(-12.5)	(-20.08)	(-12.47)
Sex of members - Round 3	0.103	0.196***	0.084	0.196***
	(-0.83)	(-5.02)	(-0.68)	(-5.02)
Mom - Years of schooling	0.263***	-0.080***	0.196***	-0.077***
	(-9.3)	(-15.19)	(-6.43)	(-10.89)
Mom's age when the child was born	-0.089***	0.050***	-0.066***	0.047***
	(-5.32)	(-12.8)	(-2.85)	(-7.02)
Average birth spacing		-0.110***		-0.110***
		(-10.89)		(-10.87)
Dad - Years of schooling			0.102***	-0.005
			(-5.1)	(-0.69)
Dad's age when the child was born			-0.028	0.003
			(-1.50)	(-0.5)
Constant	-1.604***	1.600***	-1.764***	1.593***
	(-2.80)	(-10.4)	(-2.99)	(-9.98)
Observations	1897	1897	1897	1897
R^2	0.395	0.255	0.395	0.255

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 4: SEX COMPOSITION OF TWO FIRST CHILDREN AS INSTRUMENTAL VARIABLE

	Model 7		Model 8	
	Second stage	First stage	Second stage	First stage
Number of children - Round 3	0.59		0.708	
	(-1.28)		(-1.51)	
Age in whole years - Round 3	0.494***	0.065***	0.483***	0.065***
	(-14.92)	(-12.57)	(-14.34)	(-12.47)
Sex of members - Round 3	0.169	0.187***	0.136	0.189***
	(-1.24)	(-4.71)	(-0.99)	(-4.73)
Mom - Years of schooling	0.231***	-0.089***	0.172***	-0.086***
	(-5.36)	(-16.78)	(-3.96)	(-11.89)
Mom's age when the child was born	-0.073***	0.045***	-0.053*	0.045***
	(-3.08)	(-11.25)	(-1.88)	(-6.54)
Two first children have the same sex		0.235***		0.234***
		(-5.9)		(-5.86)
Dad - Years of schooling			0.100***	-0.005
			(-5.18)	(-0.78)
Dad's age when the child was born			-0.028	0
			(-1.57)	(-0.06)
Constant	-1.116	1.233***	-1.376*	1.251***
	(-1.51)	(-7.91)	(-1.79)	(-7.72)
Observations	1897	1897	1897	1897
R^2	0.462	0.223	0.451	0.223

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE 5: BIRTH ORDER EFFECT

	Number of children in the family			
	Two children	**Three children**	**Four children**	**Five children**
Second child	-1.828***	-0.879***	-0.342	1.153
	(-10.71)	(-3.67)	(-0.77)	(-1.64)
Third child		-1.866***	-0.605	1.978**
		(-6.21)	(-1.16)	(-2.27)
Forth child			-1.349**	1.636*
			(-2.25)	(-1.69)
Fifth child				1.623
				(-1.59)
Constant	2.988***	2.913***	1.426	0.057
	(-5.45)	(-5.63)	(-1.51)	(-0.05)
Observations	729	618	370	180
R^2	0.599	0.588	0.384	0.622

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The models include dummies for ages of the children, dummy for gender of that children, dummies of father and mother when they give that child and years of both mother and father's schooling.

TABLE 6: BIRTH ORDER INDEX

	Ordered probit		OLS	
	Model 9	Model 10	Model 11	Model 12
Logarithm of household size	-0.454***	-0.576***	-0.111***	-0.137***
	(-4.64)	(-5.82)	(-3.61)	(-4.47)
Logarithm of birth order index		-0.687***		-0.157***
		(-8.90)		(-6.68)
Constant			1.011***	1.005***
			(-14.11)	(-14.18)
Observations	1897	1897	1848	1848
Pseudo R^2	0.141	0.149		
R^2			0.586	0.595

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The models include dummy variables for ages, dummy variable for gender of the children, years of schooling of mother and father and dummy variables for ages of mother and father when the child was born.

TABLE 7: BIRTH ORDER AND AVERAGE BIRTH SPACING

	Two children		Three children		Four children		Five children	
Order of child in the family (first child, second child) - Round 3	-1.854***	-1.954***	-0.902***	-0.965***	-0.416**	-0.466**	0.127	0.141
	(-11.21)	(-11.58)	(-6.15)	(-6.40)	(-2.15)	(-2.34)	(-0.57)	(-0.63)
Average birth spacing		-0.084***		-0.106*		-0.153		0.111
		(-2.74)		(-1.78)		(-1.08)		(-0.45)
Observations	729	729	618	618	370	370	180	180
R^2	0.595	0.599	0.586	0.588	0.372	0.374	0.608	0.608

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The models include dummies for ages, dummies for gender, years of schooling for father and mother, mother and father's ages when the child was born as continuous variables.

TABLE 8: INTERACTION BETWEEN THE AVERAGE BIRTH SPACING AND BIRTH ORDER

	Number of children			
	Two children	**Three children**	**Four children**	**Five children**
Order of child in the family (first child, second child) - Round 3	-2.446***	-0.952***	-0.675	0.053
	(-8.53)	(-3.22)	(-1.64)	(-0.09)
Average birth spacing	-0.269***	-0.099	-0.339	0.015
	(-2.91)	(-0.62)	(-0.97)	(-0.02)
Interaction between birth order and average birth spacing	0.138**	-0.004	0.07	0.034
	-2.12	(-0.05)	-0.58	-0.17
From 11 to 20 year old	5.593***	5.472***	5.549***	4.904***
	-19.78	-18.82	-11.33	-8.23
From 21 to 30 year old	7.143***	7.226***	6.103***	6.980***
	-13.97	-17.97	-9.72	-8.91
Above 30 year old	0	0	0	7.374***
	(.)	(.)	(.)	-3.6
Sex of members - Round 3	0.054	-0.013	-0.03	0.937**
	(-0.37)	(-0.08)	(-0.11)	(-2.36)
Dad - Years of schooling	0.077***	0.150***	0.068	0.178***
	(-2.92)	(-4.64)	(-1.62)	(-3.12)
Mom - Years of schooling	0.082***	0.045	0.134***	0.282***
	(-2.92)	(-1.41)	(-2.87)	(-4.26)
Mom's age when the child was born	-0.01	0.062*	0.039	0.095
	(-0.43)	(-1.76)	(-0.7)	(-1.3)
Dad's age when the child was born	0.009	-0.073**	-0.02	-0.094
	(-0.43)	(-2.46)	(-0.40)	(-1.61)
Constant	5.586***	4.585***	3.397**	-0.599
	(-8.29)	(-4.83)	(-2.08)	(-0.27)
Observations	729	618	370	180
R^2	0.602	0.588	0.374	0.608

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$