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The decision to invest in child quality over quantity:

Has declining fertility increased household investment in education in Vietnam?

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Abstract: During Vietnam's two decades of rapid economic growth, its fertility rate has fallen sharply at the same time that its educational attainment has risen rapidly. We explore whether the coincidence of these two trends could be explained by parents making a tradeoff between quantity and quality of children, and whether government policies to control family size may therefore have accelerated progress in education. Combining micro data from three sources, including a new survey focused on private tutoring expenditures, we find that families do indeed invest less in the education of school-age children who have larger numbers of (minor) siblings. This effect holds for several different indicators of educational investment—including the child's school enrolment, his or her attendance at private tutoring, and both the money and time spent on tutoring for that child—and is robust to instrumenting for number of siblings.

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1. Introduction

Over the past three decades, there has been considerable study of the relationship between household choices on the quantity and quality of children (Becker and Lewis 1973). The hypothesis driving the literature is that parents make tradeoffs between the number of children they bear and the "quality" of those children, which is shorthand for the amount of investment that parents make in their children's human capital.

This paper explores the tradeoff in the case of Vietnam. It asks whether there is a tradeoff between quantity and quality that shows up in the data on household educational expenditures, with a focus on whether private tutoring -- one major potential mechanism for the tradeoff – rises with reductions in family size.

Vietnam is of particular interest as a site for exploring the quantity-quality tradeoffs for three reasons, beyond its importance as a large and fast-growing economy. The macro time-series evidence suggests that a tradeoff may have occurred on a grand scale. Vietnam has seen a very rapid decline in fertility and rapid advances in education: the total fertility rate decreased steadily from 6 births per woman in the 1970s to 4 births per woman in the late 1980s and to around 2 births per woman currently (World Bank, 2008). At the same time, the average number of years of schooling for the adult population has increased from 4 in 1990 to 6.6 in 1998 and 7.8 in 2006 (World Bank, 2008; VLSS, 1998; VHLSS, 2006).[1]

In addition, household investment in private tutoring is widespread in Vietnam, with an estimated 40% of students enrolled in tutoring in 2006 (VHLSS, 2006). This provides a good continuous quantitative measure of parents' willingness to invest in their children's quality, to supplement data on school enrolment. Data on tutoring thus complements data on enrollment, which is a discrete choice and one for which there is little variation in Vietnam at the primary level.

Our results provide considerable support for the quantity-quality tradeoff in the Vietnam context, and suggest that it extends to the household's financial investment in private tutoring as well as decisions about enrollment. We find that in the uninstrumented multivariate results, there is a strongly significant negative correlation between the number of siblings a child has and the family's investment in that child's education. This is true for several different measures of educational investment: enrolment, tutoring participation, and money and time spent on tutoring. We follow up with instrumental variables analysis, drawing partly on new instruments collected in a new survey for this study, that aims to overcome possible problems with omitted variable bias. The IV analyses largely confirm the earlier results: the correlations between number of siblings and educational investment are always negative, often statistically significant, and usually much larger in magnitude than the uninstrumented results.

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[1] Unless otherwise noted, all estimates from the VLSSs and VHLSSs are authors' estimates.

2. Conceptual framework: The quantity-quality tradeoff and fertility-related interventions

The idea of a quantity-quality tradeoff arose in response to a puzzling question: if children are a normal good, why doesn't fertility rise as families get wealthier? The answer proposed by Becker and others is that children are indeed a normal good, but that parents value both their quantity and their quality, and that the tradeoffs between those two dimensions can lead to an increase in quality rather than quantity as incomes rise.

In the simplest version of the model of Becker and Lewis (1973), the parents' utility function is

$$U = U(N, Q, Z)$$

where N is the number of children, Q is their average quality, and Z is a composite consumption good. Both N and Q have costs, in terms of financial outlays and parents' time. The Becker-Lewis budget constraint is non-linear in N and Q, because the marginal cost of adding a child depends on the average quality, and conversely, the cost of increasing average quality depends on the number of children:

$$M = Q\,N\,\Pi_C + Z\,\Pi_Z$$

where Π_C and Π_Z are the price of the composite child and consumption goods, respectively, and M is the family's money income.

In the domain of expenditures on children (Q and N), then, this yields an optimization problem like the one depicted in Figure 1. The slope of the budget constraint is determined by the relative prices of Q and N. Figure 1 depicts a case with preference heterogeneity, in which at any given income and price vector, Family A prefers fewer, higher-quality children, whereas Family B is wiling to sacrifice quality in order to have more children.

Effects of changes in the relative price of quantity and quality

In the Becker-Lewis framework, changes in the relative price of quality and quantity of children will change the optimal number of children and the investments that parents make in them. Figure 2 shows the effects of a reduction in the price of child quality. Such a reduction could be caused, for example, by an increase in the quality of public education. If this increase allows families to move their children from private to public school, it will reduce the cost to them of improving the quality of their children in terms of human capital.

Another possible source of such a relative price shift, as Becker and Lewis point out, is an improvement in the availability of family planning services. Strictly speaking, these services reduce the price of controlling the quantity of children, which is equivalent to increasing the price of quantity relative to quality. We show this in Figure 2 by pivoting out the budget line.

The predicted effect of a reduction in the relative price of quality is to increase the equilibrium quality of children in both families relative to quantity – in this case, from Q* to Q". Any intervention that reduces the price of quality for one family relative to another identical family should therefore lead to a higher quality of children in the former. If the substitution effect

dominates any income effect from the change in price (as in the figure), then N* will also fall for both families. In the empirical analysis below, we use the availability of family planning to instrument for number of children and estimate the tradeoff with quality that is implicit in the indifference curve. This strategy is consistent with the one in previous studies which also use family planning infrastructure in the community to instrument for family size (see, e.g. Rosenzweig and Schultz, 1985; Joshi and Schultz, 2007).

Effects of exogenous restrictions, such as Vietnam's two-child policy

A second policy instrument that could affect the parents' quantity-quality choice more directly is an explicit *government restriction* on the number of children a couple can have. Recent research has argued that China's one-child policy has contributed to the country's rapid rise in educational attainment, as parents have focused their investments in the child domain on quality rather than quantity *(citation)*. Could Vietnam's two-child restriction, adopted with varying degrees since the late 1980s, also have driven increased investment in education by families?

Figure 3(a) illustrates the case of an explicit restriction on number of children. In the hypothetical case depicted here, Family B is forced to reduce its number of children from its optimum, N_B^*, to no more than the government-dictated N^{max}. To reach the highest indifference curve possible, the family sets its constrained number of children, N_B^c, equal to N^{max} and increases the quality of each child from Q_B^* to Q_B^c. The family's utility is lower than in the unconstrained optimum, despite the increase in quality. By contrast, Family A is unaffected by the government restriction, because its optimal number of children is N_A^*, which is less than N^{max}.

Unlike the price change depicted in Figure 2, this intervention does not cause a movement along the indifference curve of Family B, and hence assessing its effects will not allow us to estimate the slope of the indifference curve at that point. But it does capture the movement along the budget constraint, and hence tells us something about the tradeoff as embodied in the slope of the budget constraint between those two points. This would provide a minimum estimate of the slope of the indifference curves.

There are two factors that could mitigate the quality-enhancement effect of the policy, however, even if preferences do reflect the quality-quantity tradeoff. First, with a nonlinear Becker-Lewis budget constraint, the increase in quality may be less than with a linear budget constraint. Intuitively, this is because the quantity-quality interaction term in the cost function makes it more expensive to increase quality when there is more than one child. Panel b of Figure 3 depicts this case.

A second point is that, faced with this constraint on its optimization in the child domain, the family may shift some of its resources out of that domain. Recall that in the Becker-Lewis model, the family's consumption is spent not only on children but also on the composite consumption good Z. If the family responds to the policy by reducing its expenditures in the child domain significantly, in favor of greater spending on Z, then the quality-enhancement effect may be even weaker.

3. Empirical literature: Testing the quantity-quality tradeoff

Is this quantity-quality tradeoff in fact a reasonable description of the world? If so, what is the magnitude of the tradeoff between quantity and quality, on average and for different types of families? This is an empirical question with important policy implications. As Schultz (2007) points out in a recent review paper,

> Because society often intervenes to subsidize or organize social services to improve childhood nutrition, public health, and schooling, the magnitude of this causal quantity-quality tradeoff could be a motivation for society to assist couples to avoid unwanted births, or to subsidize birth control.

A variety of papers have looked at the relationship between household size and child educational attainment (see, for example, Blake 1989; Eloundou-Enyegue and Williams, 2006; Knodel and Wongsith 1991; Li, Zhang and Zhu, 2008; Shapiro and Tambashe 2001). The empirical challenge is to identify this quantity-quality tradeoff convincingly in the data. It is relatively common to find a negative correlation between the number of children in a family and their educational attainment or health outcomes. But this simple correlation may just reflect the unobserved factors that affect both fertility and child human development outcomes such as parental preferences or their earning potential (Angrist, Lavy, and Schlosser, 2006; Schultz, 2007). While we can control for some of these factors in multivariate analyses, we may not be able to get at important underlying characteristics. For example, even if we include as a regressor a variable capturing parental education levels, we will not be able to control for any component of the parents' devotion to education that is not correlated with their educational attainment.

At the same time, Angrist, Lavy, and Schlosser (2006) also point out that establishing causality has important policy implications: "If there is a causal "quantity-quality trade-off," then policies that discourage large families should lead to increased human capital, higher earnings, and, at the macro level, promote economic development."

Researchers have used different strategies such as instrumental variables and randomized experiments methods to address the endogeneity of family size. These instruments include unplanned (multiple) births (Rosenzweig and Wolpin, 1980), the gender mix of children combined with parental sex preference (Angrist and Evans, 1998; Chun and Oh, 2002), a combination of these two instruments (Angrist, Lavy and Schlosser, 2006; Iacovou, 2001), family planning infrastructure in the community (Joshi and Schultz, 2007; Rosenzweig and Schultz, 1985), and cultural belief in auspicious years for giving birth (Vere, 2008). However, the evidence on family welfare outcomes, and in particular, the quantity-quality tradeoff is still mixed.[2]

Few papers have investigated the correlation between household size and household educational investment in their children through private tutoring. To our knowledge, the exceptions are the papers on Korea by Lee (2008) and Kang (2008). Private tutoring merits attention for several

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[2] For example, Angrist, Lavy and Schlosser (2006) find no tradeoff in Israel; Black, Devereux, and Salvanes (2005) found that controlling for birth order reduces the impacts of family size to almost zero; Qian (2006) finds a non-monotonic relationship between number of children and educational attainment in China; and Lee (2008) finds a weak tradeoff in Korea that gets stronger with more children. See Schultz (2007) for a recent review.

reasons. First, expenditures on private tutoring may be an especially good measure of a household's decision to invest voluntarily in their children's human capital – compared with enrollment, for example, which may also reflect exogenous factors such as compulsory schooling laws. Second, private tutoring is now widespread in many countries, especially but not solely in East Asia; and there is increasing evidence that it does in fact improve students' academic performance (Bray and Kwok 2003; Dang and Rogers 2008). Third, there has been considerable debate about tutoring among policymakers in some countries (Bray, 2003). One crucial question is whether widespread availability and use of private tutoring exacerbates social and income inequality. Here, the link with demography is important: if use of tutoring is correlated with both smaller family size and higher family income, this heightens the risk that it could exacerbate inequality.

The literature on private tutoring contains some hints about the quantity-quality tradeoff in tutoring expenditures. Dang and Rogers (2008) review the literature on correlates of tutoring at the household level. In addition to finding that richer, more educated, and urban households are more likely to enroll their children in tutoring, we cite a number of studies indicating that smaller families are more likely to invest in tutoring. It can be calculated from these studies that the reduction in expenditure on private tutoring correlated with one more child in the household ranges from a lower bound of 10 percent in Korea (Kim and Lee, 2004) to an upper bound of 30 percent in Turkey (Tansel and Bircan, 2006).

Nevertheless, this literature remains limited. These studies cover only three countries, and it is useful to explore the tradeoff in other contexts, such as that of Vietnam. Moreover, while the correlations in those studies are consistent with a quantity-quality tradeoff, the tutoring literature has not focused on identifying causality, as we do in this paper.

4. Empirical methodology and data

Our empirical approach first tests for multivariate correlations between family size and the education-related dependent variables, and then instruments for family size in these regressions. The basic estimation equation is

$$E_{ij} = \alpha + \beta FamSize_i + \gamma Z_{ij} + \varepsilon_{ij}$$

where the dependent variable E_{ij} is educational outcomes including school enrolment, attendance at private tutoring classes, school enrolment and attendance at private tutoring classes, and expenditure and time spent on private tutoring classes. Z_{ij} is a vector of child, household, community and school characteristics. We first estimate this equation using actual family size, then run an IV model instrumenting for family size.

In implementing this empirical strategy, we draw on three data sources – two existing household surveys and a new private-tutoring-focused survey:

1. *Vietnam Household Living Standards Survey (VHLSS) 2006* – The VHLSS is a large representative household survey includes a rotating panel of households, administered most recently in 2006, and before that in 2002 and 2004. The major advantage of this survey is its large sample size, with 9,189 households and 10,000+ school-age children (age 6-18). *(check).* It also collected some data on household investment in education. In particular, the

commune module of the VHLSS 2002 collects information on the distance to family planning facilities, which is the instrument that we use. However, it includes relatively little information on demographics and fertility or on the details of tutoring expenditures.

2. *Vietnam Demographic and Health Survey (DHS) 2002* – The DHS for Vietnam has the advantage of including more detailed demographic data, including data on family planning availability. But because it includes no data on education expenditures, it was necessary to merge the DHS data with the VHLSS at the commune level to make it possible to use the data on availability of family planning services in this analysis. A limited number of communes were covered by both data sets, and so the overlap between the two data sets includes only 720 households and 1,259 school-age children.

3. *New survey focused on private tutoring, 2008* – We collaborated with other researchers[3] to design a survey of a random subsample of VHLSS 2006 households, focused on tutoring, that was carried out in the spring of 2008. In addition to gathering detailed data on the prevalence and cost of tutoring expenditure, the survey gathered information on demographic variables that could be used in an IV analysis. We draw on one of those variables below. The main limitation of this survey is its relatively small sample size, of around 780 households and fewer than 1,400 school-age children.

These datasets include a number of variables that can be used to instrument for the number of siblings that a school-age child has. The three used in the empirical analysis below are: the distance to the nearest family planning center (from the VHLSS), whether the parents were covered by government restriction on number of children, and the number of siblings that the parents have (the latter two from the new survey).[4]

5. Results

Uninstrumented results on quantity and quality

From our smaller-sample tutoring survey, we obtained data on the expenditures that each family makes on tutoring for its children. In the basic descriptive statistics, we observe a very rough negative relationship between the number of children and per-child tutoring expenditures (**Table 1**). For example, families with two children of age 0 to 18 spend just over half as much on tutoring per child as those with one child, and those with four children spend even less per child. These

[3] Paul Glewwe (University of Minnesota), Seema Jayachandran (Stanford University), and Jeffrey Waite (World Bank); the survey was administered by Vietnam's Government Statistics Office, using funding from the World Bank's Research Support Budget and the Hewlett Foundation.

[4] The datasets also included several other potential instruments: the parents' stated preferences over number of children (which could help to account for preference heterogeneity illustrated in Figure 1); the parents' gender preferences for children (which could be useful if optimal stopping rules are important determinants of fertility); and the parents' belief in the Vietnamese lunar horoscope, which specifies certain years as being lucky or unlucky for giving birth. However, in the analysis that we have done to date, these variables have not proven to be useful instruments.

descriptive statistics are very noisy, however, and the relationship is doubtless confounded by other variables, such as income and education of the parents.

Table 2 provides a better first-cut test of the quantity-quality hypothesis. Here, we estimate the correlates of a variety of indicators of educational investment: whether the child is enrolled in school; whether (s)he is enrolled in private tutoring; a combined school enrollment/tutoring variable (which takes a value of 2 if enrolled in both school and tutoring, 1 if school only, and 0 if neither); how much the family is spending on the child's tutoring; and how much time the child spent in tutoring. We control for several child and family characteristics, as well as regional and urban dummies.

In each of these regressions, the coefficient of number of (minor) siblings is negative and highly statistically significant. These results are consistent with the quantity-quality tradeoff story: families that are raising fewer children are able to invest more in the education of each child, even controlling for income and parental education. In terms of magnitudes, they suggest that a child with one sibling is 17 percent less likely to be enrolled in school and 13 percent less likely to be enrolled in tutoring than a similar child with no siblings. He or she will also spend D 94,500 less and 35 fewer hours on tutoring per year than a child with no siblings.

IV estimates

Because omitted variables may bias their results, the uninstrumented regressions are open to question. We therefore run a series of instrumental variable regressions, using the same specifications as in the base regressions but instrumenting for number of siblings using three different IVs. As noted above, these instruments include: the distance to the nearest family planning center (from the VHLSS 2002), whether the parents were covered by government restriction on number of children, and the number of siblings that the parents have (the latter two from the new survey). We try each of them in a series of regressions using different indicators of educational investment.

Table 3Table 3 reports on the first-stage regressions for each of the instruments, with the number of siblings as the dependent variable. The *distance to nearest family planning center* variable is significant at the 1% level as a predictor of larger family sizes; the finding of significance is likely aided by the relatively large sample size, as this variable is drawn from the VHLSS household survey. Another measure of access to family planning services, the *number of visits per month by the mobile family planning team* (from the DHS), is also highly statistically significant, as is a variable capturing whether the family reports that it is covered by the *government regulation on the two-child policy*. The final instrument, the *number of siblings of the parents* (the average of the number of siblings reported by the child's mother and father), is marginally significant, but we include it as an additional robustness check on our findings. All four instruments have the expected sign.

The next five tables use these variables to instrument for number of siblings in analyses of the quantity-quality tradeoff, using different indicators of educational investment. First, we investigate the determinants of *enrollment* (Table 4Table 4), and find that the instrumented sibship-size variable is a robustly significant predictor of a lower probability of enrollment. All four instruments yield this result, and in each case the IV coefficients are much larger (in absolute value terms) than the coefficients from Table 2. Other variables generally have the expected signs: students from

wealthier households are more likely to be enrolled, as are those from households with better-educated household heads, while older children are less likely to be enrolled.

The remaining tables investigate the effects of sibship size on tutoring investment. In Table 5Table 5, the dependent variable is *participation in private tutoring*. The coefficients on instrumented number of siblings are all negative, and again larger than in the first column, but they are statistically significant only when instrumented by the family-planning-services variable. The same is true in Table 6, in which the dependent variable combines those from the previous two tables, to create a variable jointly capturing *school enrollment and participation in tutoring*. Table 7Table 7 takes as its dependent variable the household's *expenditure on private tutoring* for the child. The results are slightly different – in this case, it is the government-regulation instrument that yields a modestly significant coefficient – but again, the instrumented coefficients are negative and, in three out of four cases, show an effect that is larger than suggested by the uninstrumented regression. In Table 8, where the child's *hours spent on tutoring* during the past school year is the dependent variable, only the distance-to-family-planning-center instrument gives significant results, but again that instrumented coefficient is much larger than the uninstrumented coefficient.

6. Summary

This paper starts from the observation that over the past two decades, Vietnam's fertility rates have fallen sharply at the same time that its educational attainment has risen sharply. We use micro data from three sources, including a new survey focused on private tutoring expenditures, to assess the extent to which this macro correlation indicates the operation of a household-level tradeoff between quantity and quality of children. Have families responded to opportunities for family planning – and in some cases, to mandatory restrictions through Vietnam's two-child policy – by increasing their per-child investments in education?

We find that, controlling for other important factors such as household expenditure and parental education, families invest less in the education of school-age children who have larger numbers of (minor) siblings. This effect is robust across different indicators of educational investment, including the child's school enrolment, his or her attendance at private tutoring, and the amount spent on private tutoring for that child.

Because this result could be driven by omitted variables, we test whether it holds when we instrument for number of siblings. Analysis with different instrumental variables – including access to family planning services, coverage by the two-child policy, and size of parents' birth families – partially confirms this quality-quantity tradeoff. The instrumented number of siblings has a strongly negative effect on school enrollment, and the coefficient is not only robust across instruments but also much stronger than in the original uninstrumented regressions. In the case of private tutoring variables, the quantity-quality story receives mixed support: the coefficient on sibsize is robustly negative and almost always larger than the uninstrumented coefficient, but it is only sometimes statistically significant. From a statistical perspective, the indicator of availability of family planning services appears to be the most reliable instrument for number of children.

We draw two lessons from these results. First, at least in the Vietnamese context, availability of family planning services has probably increased investment in education, by lowering the relative cost of child quality and encouraging families to invest in quality. Second, and more speculatively,

this micro evidence is consistent with the possibility that Vietnam's two-child policy has led to greater educational investment in those two children per family, although at a likely cost in terms of the parents' utility.

Figure 1

: Optimization over Quantity and Quality of Children

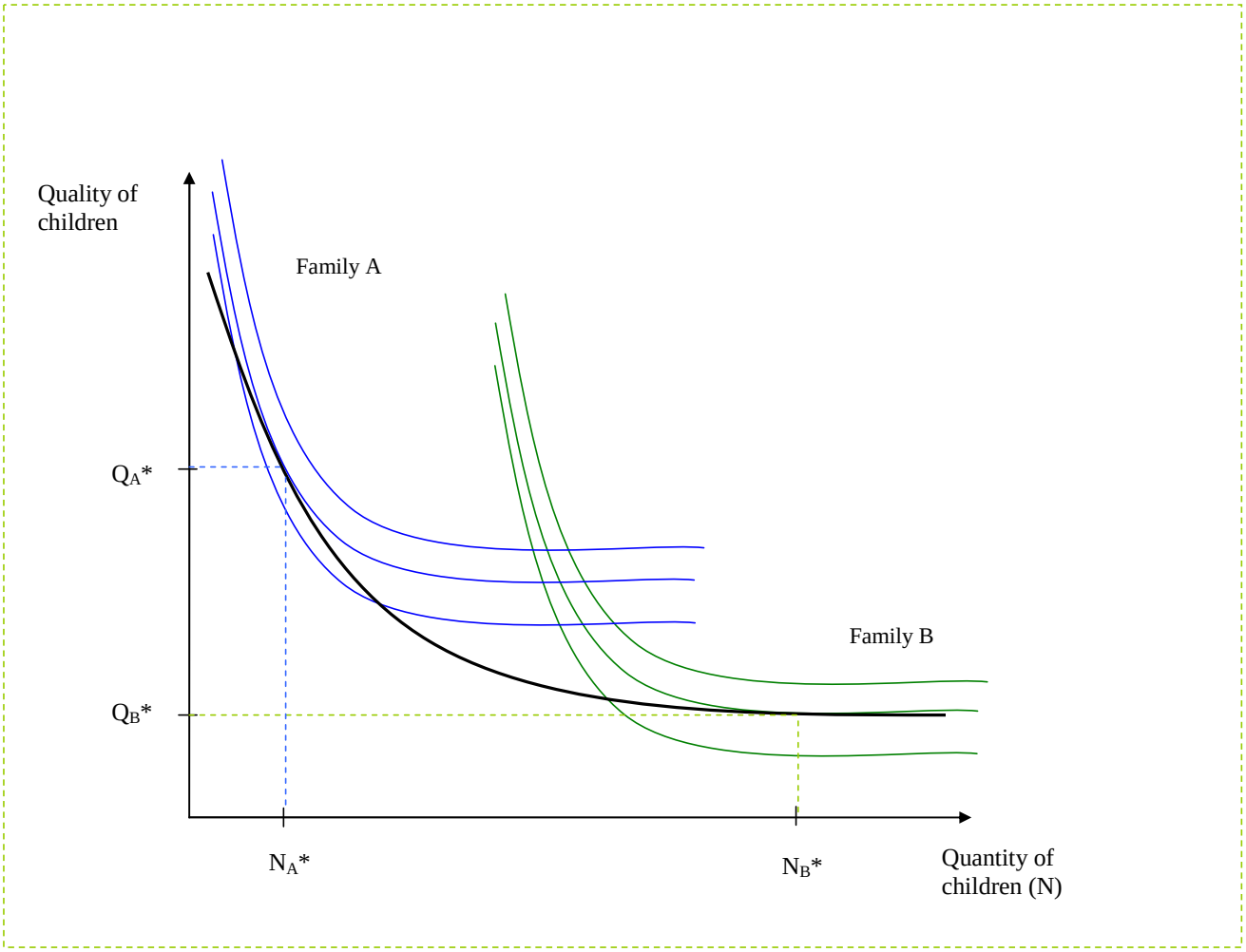


Figure 2

Effects of a Reduction in the Price of Quality

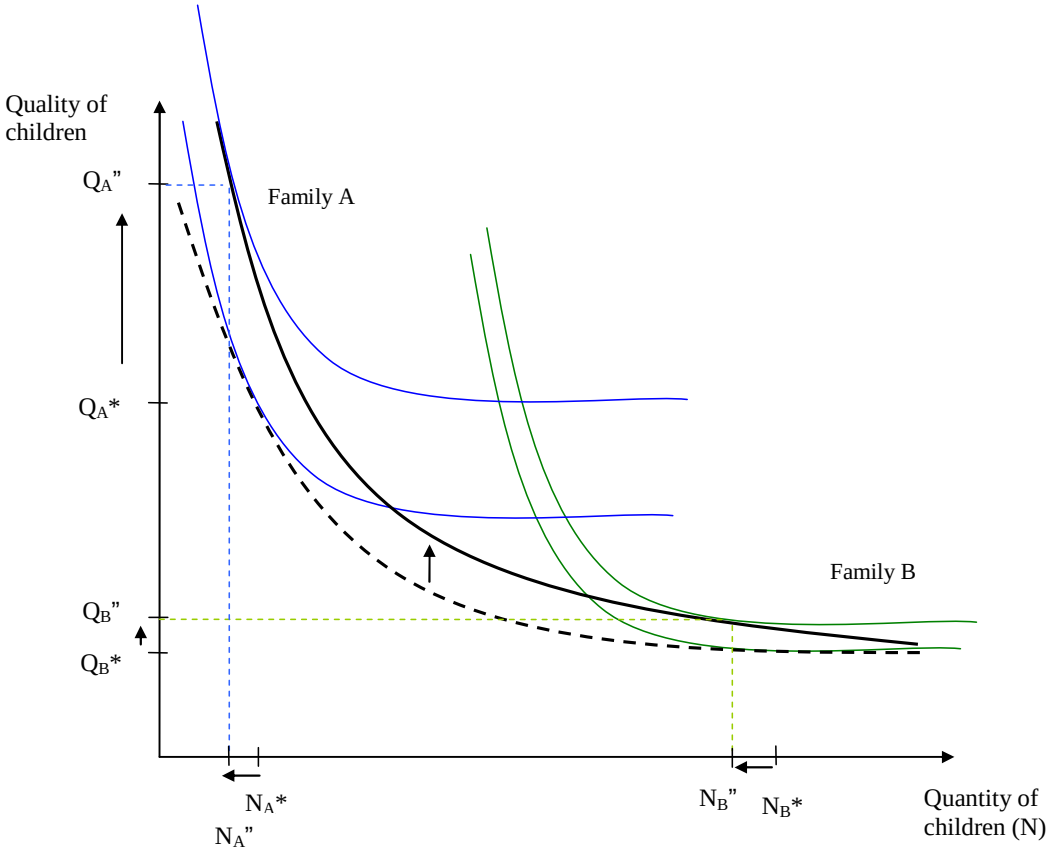
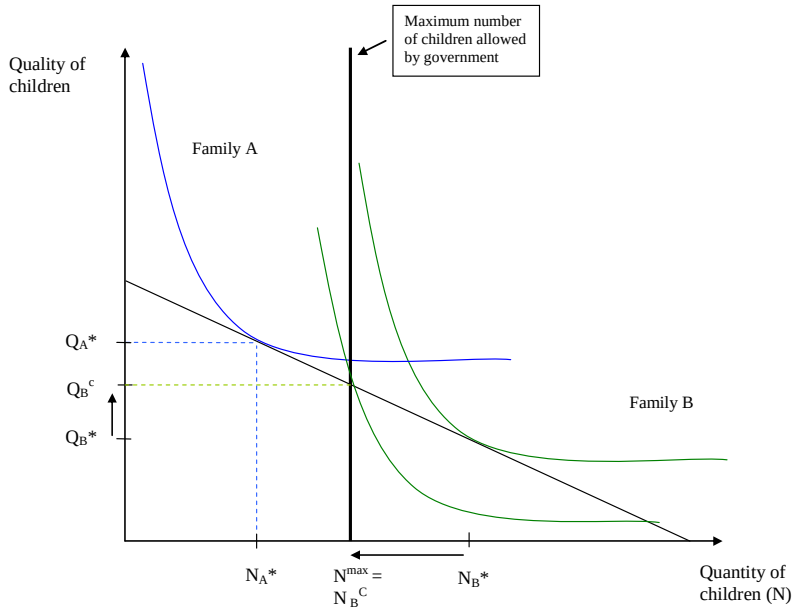


Figure 3
Effects of Government Restriction on Number of Children

(a) With linear budget constraint



(b) With Becker-Lewis non-linear budget constraint

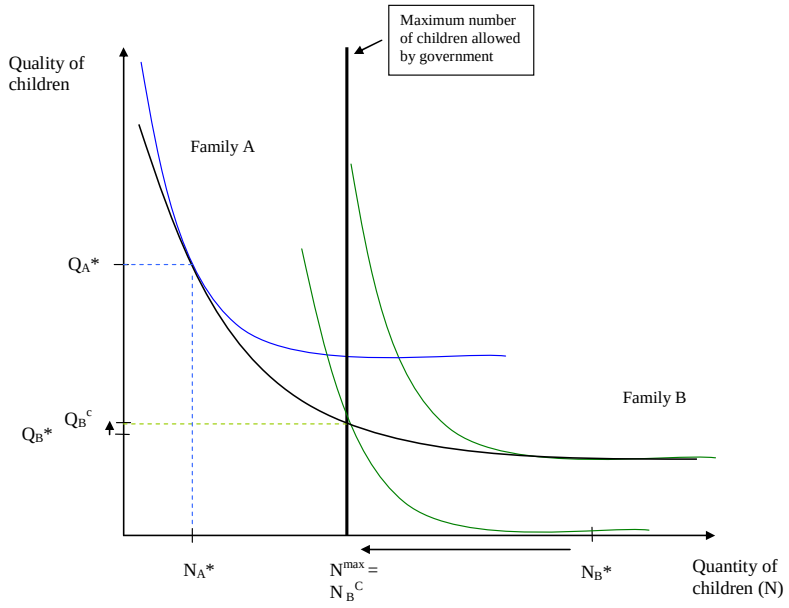


Table 1

Average expenditure on tutoring classes by the number of children in the household (VND'000)

No of children	age 0-11	age 0-15	age 0-18
1	269.4	312.3	403.7
2	243.2	208.0	223.4
3	58.8	227.6	232.1
4	193.7*	299.2	131.7
5	N/A	164.8*	452.7

Note: * less than 20 observations
Source: Tutoring survey 2007-2008

Table 2

Impact of family size on educational outcomes (uninstrumented regressions), Vietnam 2007-08

	Enrollment	Priv. tutoring	Enrolment & Pri. tutoring	Exp. On tutoring	Hours spent on tutoring
No of children age 0-18	-0.167***	-0.131***	-0.070***	-94.529***	-35.200***
	(-9.48)	(-6.62)	(-10.58)	(-7.32)	(-6.78)
Age	-0.213***	0.067***	-0.033***	49.214***	15.307***
	(-25.40)	(13.90)	(-17.87)	(12.11)	(12.42)
Male	-0.133***	-0.094***	-0.058***	-54.483***	-33.441***
	(-3.90)	(-3.11)	(-5.04)	(-2.62)	(-4.70)
Head's years of schooling	0.085***	0.036***	0.030***	31.956***	8.230***
	(13.94)	(6.33)	(14.29)	(6.29)	(6.00)
Ethnic major group	0.049	0.906***	0.168***	494.937***	209.008***
	(0.79)	(12.73)	(8.21)	(7.90)	(11.26)
Log of total hh exp.	0.482***	0.217***	0.160***	295.042***	60.841***
	(11.40)	(5.42)	(11.12)	(8.16)	(5.99)
Instruments					
Model	Probit	Probit	OLS	Tobit	Tobit
Log likelihood/ R2	-3467	-4625	0.23	-30791	-28923
N	10797	8844	10797	8844	8952

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.

Table 3

First-stage regressions predicting the number of children

(Dependent variable is number of siblings age 0-18)

	(1)	(2)	(3)	(4)	(5)
Distance to fam. center	0.036***				
	(3.22)				
No of visits per month by mobile fam. Team		-0.079**			
		(-2.23)			
Government reg.			-0.205**		-0.202**
			(-2.19)		(-2.16)
Parental siblings				0.042*	0.041*
				(1.89)	(1.85)
Age	-0.030***	-0.026***	-0.047***	-0.047***	-0.048***
	(-9.72)	(-3.38)	(-6.12)	(-6.00)	(-6.12)
Male	-0.176***	-0.196***	-0.149***	-0.150***	-0.149***
	(-7.56)	(-3.34)	(-2.61)	(-2.61)	(-2.59)
Head's years of schooling	-0.053***	-0.066***	-0.052***	-0.054***	-0.052***
	(-8.91)	(-3.62)	(-4.46)	(-4.47)	(-4.35)
Ethnic major group	-0.533***	-0.489*	-0.363	-0.360	-0.362
	(-7.91)	(-1.89)	(-1.63)	(-1.56)	(-1.57)
Log of total hh exp.	0.295***	N.A.	0.100	0.107	0.095
	(7.41)		(1.12)	(1.16)	(1.05)
R2	0.17	0.18	0.19	0.19	0.19
N	9052	1279	1371	1350	1350

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.

Table 4

Impact of family size on school enrolment, Vietnam 2007-2008

	Probit	IV Probit	IV Probit	IV Probit	IV Probit	IV Probit
No of children age 0-18	-0.167***	-0.544***	-0.999***	-0.867***	-0.945***	-0.923***
	(-9.48)	(-2.61)	(-15.55)	(-2.79)	(-4.86)	(-5.50)
Age	-0.213***	-0.212***	-0.090**	-0.266***	-0.235***	-0.244***
	(-25.40)	(-11.45)	(-2.55)	(-2.99)	(-2.63)	(-3.65)
Male	-0.133***	-0.209***	-0.161**	-0.297***	-0.300***	-0.301***
	(-3.90)	(-4.94)	(-2.35)	(-3.21)	(-3.17)	(-3.37)
Head's years of schooling	0.085***	0.056***	-0.024	0.053	0.033	0.037
	(13.94)	(2.60)	(-0.81)	(0.82)	(0.59)	(0.87)
Ethnic major group	0.049	-0.173	-0.316	-0.351	-0.377	-0.360
	(0.79)	(-1.15)	(-1.23)	(-1.42)	(-1.63)	(-1.54)
Log of total hh exp.	0.482***	0.543***	N/A	0.634***	0.560**	0.585***
	(11.40)	(11.42)		(2.75)	(2.47)	(3.17)
Instruments						
Distance to fam. center		Y				
No of visits per month by mobile fam. team			Y			
Government reg.				Y		Y
Parental siblings					Y	Y
Overid test (J statistic)						0.04
Log likelihood	-3467	-16069	-2163	-2195	-2170	-2164
N	10797	9052	1259	1371	1350	1350

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.

Table 5

Impact of family size on attendance at private tutoring, Vietnam 2007-08

	Probit	IV Probit	IV Probit	IV Probit	IV Probit
No of children age 0-18	-0.131***	-0.932***	-0.286	-0.525	-0.389
	(-6.62)	(-5.85)	(-0.57)	(-1.17)	(-1.09)
Age	0.067***	0.001	0.060	0.039	0.050
	(13.90)	(0.04)	(1.57)	(0.91)	(1.62)
Male	-0.094***	-0.208***	-0.223**	-0.235***	-0.220**
	(-3.11)	(-7.79)	(-2.17)	(-2.66)	(-2.48)
Head's years of schooling	0.036***	-0.022	0.022	0.007	0.016
	(6.33)	(-0.98)	(0.65)	(0.21)	(0.59)
Ethnic major group	0.906***	0.021	0.925**	0.762*	0.853**
	(12.73)	(0.05)	(2.53)	(1.78)	(2.51)
Log of total hh exp.	0.217***	0.337***	0.188	0.221*	0.215*
	(5.42)	(8.44)	(1.51)	(1.87)	(1.79)
Instruments					
Distance to fam. center		Y			
Government reg.			Y		Y
Parental siblings				Y	Y
Overid test (J statistic)					0.08
Log likelihood	-4625	-14547	-2204	-2177	-2172
N	8844	7467	1149	1133	1133

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.

Table 6

Impact of family size on school enrolment and attendance at private tutoring, Vietnam 2007-08

	OLS	IV Reg	IV Reg	IV Reg	IV Reg
No of children age 0-18	-0.070***	-0.352**	-0.412	-0.327	-0.358*
	(-10.58)	(-2.34)	(-1.51)	(-1.21)	(-1.86)
Age	-0.033***	-0.041***	-0.048***	-0.044***	-0.045***
	(-17.87)	(-8.22)	(-3.39)	(-3.20)	(-4.22)
Male	-0.058***	-0.117***	-0.174***	-0.158***	-0.163***
	(-5.04)	(-3.93)	(-3.05)	(-2.83)	(-3.37)
Head's years of schooling	0.030***	0.016*	0.016	0.020	0.018
	(14.29)	(1.88)	(0.97)	(1.19)	(1.40)
Ethnic major group	0.168***	0.010	0.092	0.114	0.102
	(8.21)	(0.11)	(0.63)	(0.85)	(0.85)
Log of total hh exp.	0.160***	0.232***	0.216***	0.215***	0.218***
	(11.12)	(4.84)	(3.36)	(3.44)	(3.67)
Instruments					
Distance to fam. center		Y			
Government reg.			Y		Y
Parental siblings				Y	Y
Overid test (J statistic)					0.03
R2	0.23	0.03		0.03	
N	10797	9052	1371	1350	1350

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.
4. Dep. variable is 2 if in school and in tutoring, 1 if in school with no tutoring, 0 if not in school.

Table 7

Impact of family size on tutoring expenditures for the child (in VND 000)

	Tobit	IV Tobit	IV Tobit	IV Tobit	IV Tobit
No of children age 0-18	-94.529***	-776.373	-693.115*	-60.736	-465.234
	(-7.32)	(-0.94)	(-1.68)	(-0.17)	(-1.47)
Age	49.214***	22.779	16.085	50.065**	27.058
	(12.11)	(0.71)	(0.68)	(2.22)	(1.46)
Male	-54.483***	-183.819	-169.421**	-58.125	-128.091*
	(-2.62)	(-1.25)	(-1.97)	(-0.76)	(-1.81)
Head's years of schooling	31.956***	1.893	-6.633	24.940	4.260
	(6.29)	(0.05)	(-0.30)	(1.25)	(0.24)
Ethnic major group	494.937***	133.010	391.574*	574.379***	446.209**
	(7.90)	(0.32)	(1.70)	(2.96)	(2.28)
Log of total hh exp.	295.042***	478.263**	345.943***	268.165***	313.861***
	(8.16)	(2.01)	(2.79)	(3.13)	(2.95)
Instruments					
Distance to fam. center		Y			
Government reg.			Y		Y
Parental siblings				Y	Y
Overid test (J statistic)					3.5
Log likelihood	-30791	-37986	-6344	-6259	-6252
N	8844	7467	1149	1133	1133

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.

Table 8

Impact of family size on the number of hours spent on private tutoring during the past school year, Vietnam 2007-08

	Tobit	IV Tobit	IV Tobit	IV Tobit	IV Tobit
No of children age 0-18	-35.200***	-573.306**	35.831	-51.672	-8.398
	(-6.78)	(-2.12)	(0.33)	(-0.46)	(-0.11)
Age	15.307***	-7.504	19.120***	13.515*	15.979***
	(12.42)	(-0.66)	(2.93)	(1.89)	(3.09)
Male	-33.441***	-131.604***	-45.104*	-61.403**	-54.086***
	(-4.70)	(-2.61)	(-1.80)	(-2.38)	(-2.58)
Head's years of schooling	8.230***	-17.549	11.884*	6.539	8.642*
	(6.00)	(-1.27)	(1.89)	(1.07)	(1.75)
Ethnic major group	209.008***	-65.128	247.417***	226.865***	236.574***
	(11.26)	(-0.49)	(3.41)	(3.24)	(3.47)
Log of total hh exp.	60.841***	204.369***	44.406	53.316	47.994
	(5.99)	(2.66)	(1.35)	(1.39)	(1.39)
Instruments					
Distance to fam. center		Y			
Government reg.			Y		Y
Parental siblings				Y	Y
Overid test (J statistic)					0.38
Log likelihood	-28923	-36352	-6234	-6151	-6146
N	8952	7575	1191	1175	1175

Note 1. Regressions control for regional and urban dummy variables.
2. Cluster-robust t statistics in parentheses.
3. Overidentification tests are from linear regression.

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