

Flying Ducks? Girls' Schooling in Rural Vietnam: A Revisit

Amy Y.C. Liu

Asian Pacific School of Economics and Government Australian National University

In Vietnam, girls are colloquially referred to as 'flying ducks' as they are regarded as a loss to the family upon marriage. Using the Vietnam Living Standards Surveys of 1992–1993 and 1997–1998, the method of Doiron and Riddell (1994) is applied to decompose the probability gap of being in school to explore gender differences in children's education and changes over time. The unexplained component is found to account for most of the observed gender probability gap in each period. Over time, however, the gap has narrowed. The explained component (namely, household income and children's involvement in housework or work activities) contributes to the narrowing gap. Cutting the indirect cost of education for girls (forgone contribution in work and housework) is crucial in ensuring girls have the same education opportunities as boys do.

Keywords: children's schooling, discrimination, gender differences, Vietnam

JEL classification codes: I2, J16, J71

I. Introduction

A low level of human capital investment is widely recognized as a significant impediment to economic growth and poverty reduction. This explains the attention that has been paid to the determinants of human capital investment decisions on children.¹

While there is little doubt that education of children in general is of utmost importance, gender difference is another key question for researchers. Interest in this issue is driven by the evidence that extending education to girls has economic as well as non-economic benefits. Not only can it reduce gender inequalities in the labor market, but it can also improve various aspects of children's

1. For example, Behrman and Knowles (1999) and Gertler and Glewwe (1992) studied the relationship between household income and schooling of children; Rosenzweig and Evenson (1977) examined the contribution of children and their education.

development, such as nutrition, mortality, height² and educational attainment. Although there are signs of decline in the gender gap (King and Hill, 1993; Behrman, 1993; World Bank, 1993), girls still lag behind boys in education in many developing countries.

Given the benefits of investing in the education of girls, it is important to identify factors that affect the decisions regarding girls' schooling.³ It is particularly important for transitional economies. The growing market economy may have different impacts on children's education depending on the gender of children. One of the key challenges for transitional economies is to ensure that the education system meets the emerging needs of the growing market economy. Providing equal opportunity for girls as well as boys to receive an education is important if this challenge is to be met.

Most studies in this genre focus on explaining why girls are more likely to leave school earlier than boys are. Yet, there has been little research on decomposition of gender difference in education. Using Vietnamese data collected during 1992–1993, Liu (2000) applies the decomposition methodology of Doiron and Riddell (1994) to take into account the non-linear nature of the probit model in addition to the standard probit analyses of different gender groups. By decomposing the gender gap, Liu (2000) finds that gender disparities reflect gender discrimination in schooling investment. Discrimination contributes more to the gender gap, highlighting that policy has to address the bias embedded in household preferences.

The shift to a market economy amid strong economic growth has led to an increase in the demand for education. However, agricultural liberalization and growth in the productivity of the agricultural sector during the 90s has created new earning opportunities for children. Studies on the changes of children's schooling are scarce. Using two rounds of the Vietnam Living Standards Survey collected during 1993–1998, this paper extends Liu (2000) to investigate the impact of market reforms on children's education in general, as well as the changes in education gender gap. How do the explained and unexplained factors account for the gender gap over time? This is not only important in the Vietnamese context, but can also have important lessons for other transition economies.

2. For instance, Glewwe (1999), Handa (1996), Sahn and Alderman (1997), Schultz and Benefo (1995), Thomas, Strauss and Henriques (1991).

3. Davies and Zhang (1995) suggested that bequest has a role to play in explaining gender differences in education. Tansel (1993) demonstrated that costs of schooling represented by the distance to the nearest school affect the demand for schooling and have different gender implications. Alderman and King (1998) attributed the gender differences to the differences in costs and school fees as well as a result of differences in returns realised by parents. Alderman, Behrman, Ross and Sabot (1996) have shown that in Pakistan, the gender gap in cognitive achievements could have been narrowed had the gender differences in local primary school availability been eliminated. Glick and Sahn (2000) found that an increase in household income, mother's education and lower domestic responsibilities have raised girls' schooling in Conakry in Guinea.

The remainder of the paper is structured as follows. Section II provides an overview on education scene in Vietnam during the transition. Section III describes the data set and the sample and also outlines the education gender gaps in rural Vietnam. The conceptual framework that underlies the empirical work is discussed in Section IV, with the empirical results presented in the following section. The paper concludes in Section IV with a discussion of the policy implications.

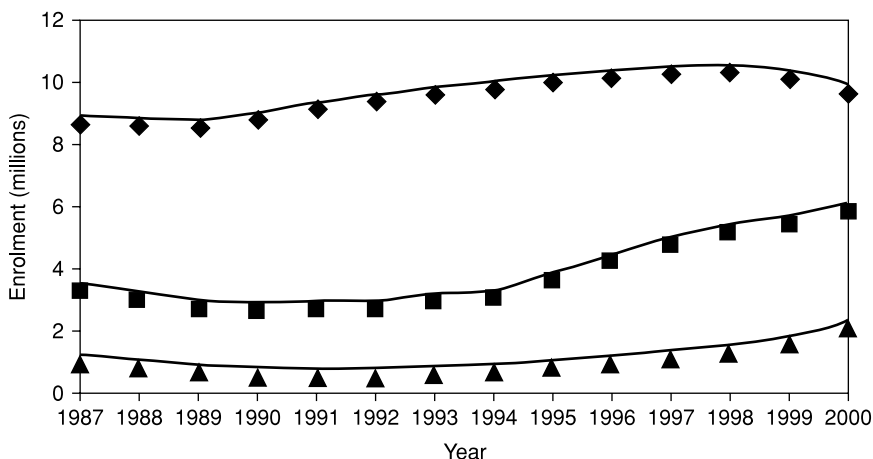
II. Education in Vietnam

Educational reform in 1979 unified the educational systems in the north and south of Vietnam (the reunification of the North and South Vietnam occurred in 1975). The school education system in Vietnam consists of crèche and kindergarten (1–5 year olds); compulsory primary education from grade 1 to grade 5 (6–10 year olds); lower secondary education from grades 6 to 9 (11–14 year olds); and upper secondary from grade 10 to grade 12 (15–17 year olds). The official age for starting school is six.

Vietnam has a long tradition of respect for education. Its adult literacy rate is about 88 percent (World Bank, 1996). However, education enrollments fell off, particularly in lower and upper secondary education during 1989 and the early 1990s and dropout rates were high, as were the rates of repeating years of study. Some attribute the falling enrolments and high dropout rate to market reforms (World Bank, 1996; Rorris and Evans, 1995). Comprehensive market reform, *Doi Moi*, was introduced in 1986. Since then, a number of changes have occurred in Vietnam's education system. For instance, public institutions may now levy tuition and other fees, resulting in higher education costs. Also, the government is phasing out guaranteed public sector jobs for upper secondary and higher education graduates. This implies an increase in uncertainty regarding the benefits of investing in education. At the same time, Vietnam has experienced economic liberalization and rapid economic growth that could imply higher foregone earnings now, but higher returns in the future. Furthermore, semi-public and private schools have developed alongside public schools. They were non-existent prior to the reform. There is evidence that non-public schools may play a role of expanding education to children who fail the entrance examination for public upper secondary school (Glewwe and Patrinos, 1999). Clearly, some combinations of these offsetting forces play a role in affecting the household investment in education and may affect boys and girls differently.

According to the Ministry of Education and Training (MOET, 2000), the numbers of students attending primary school have increased substantially from the mid 1990s to 1998, increasing by 7 percent from 1993 to 10.4 million in 1998. Since 1998, a downward trend was noted for primary school enrollment (Fig. 1). Nguyen (2002) attributes the decline to demographic changes. However, the upward trends witnessed in the period of 1993–1998 for lower and upper secondary school enrollment have continued into year 2000.

Figure 1 Trends in school enrolment, 1987–98. ◆, primary; ■, lower secondary; ▲, upper secondary



III. Educational gender gaps

The available data are from the Living Standards Survey (VLSS) 1992–1993 and 1997–1998 conducted by the World Bank and the State Planning Committee of Vietnam. Both surveys collected data on the household and individual levels in health, education, agricultural, fertility, expenditure, migration and saving. The Living Standards Surveys allow comprehensive exploration of many aspects of the economy during the early phase of the transition.

The 1993 survey was the first of this kind of large-scale survey ever carried out in Vietnam. It is a self-weighted sample⁴ and it surveys 4800 households. The sample for the VLSS97–98 was primarily selected from the households surveyed in the original 150 communes/wards of the VLSS92–93. Because of additional funding available, the sample was increased by 1200 households, with these additional households obtained from the sample of the Multi-purpose Household survey (MPHS), which was based on a similar sampling methodology. In order to obtain a sufficient sample to disaggregate results into the seven major regions⁵ for rural areas and three categories of urban domains,⁶ the selection of the additional households was chosen so that the total sample of 6000 households over-sampled specific domains. Therefore, the data must be weighted in order to correct for the bias due to over-sampling.

4. The author thanks Mr Nguyen Phong from the General Statistic Office in Vietnam and Ms Diane Steel in the Living Standards Measurement Study Office at the World Bank for clarifying the sampling procedure of the VLSS92–93.

5. The seven major regions are Northern Uplands, Red River Delta, North Central, Central Coast and Central Highlands, Southeast and Mekong River Delta.

6. The three categories of urban domains are Hanoi and Ho Chi Minh City, other cities and other urban areas.

The samples used include children from 9 to 14 years of age for the VLSS92–93 and from 6 to 14 for the VLSS97–98.⁷ The present study is concerned only with those whose highest attained educational level is primary education or below.⁸ This restriction eases concerns that the reasons for dropping out of primary school may be quite different to those for not going onto secondary school.⁹ Ideally, two separate samples should be used to look at primary and secondary school participation. Although secondary school enrolment rose as indicated by the VLSS97–98, the sample size of children with this age group in the VLSS92–93 who are in secondary school is too small to work with.

Additionally, the community surveys were only administrated in rural areas. Therefore, the present study will only focus on rural children. There are 1455 children in the 1993 sample, 728 boys and 727 girls. About 90 percent of the boys and 80 per cent of the girls were in school at the time of the interview. The 1998 sample contains 2155 children, 1135 boys and 1020 girls.

III.1 Starting school

Officially, children start grade 1 in primary school when they are six years old and finish lower secondary school when they reach the age of 14. Despite the official age for commencing school being six years, many do not begin primary school until age seven or even later. As shown in Table 1, the VLSS92–93 reveals that 36 percent of children between 6 and 15 years old who have never attended school are concentrated in the youngest age group. In stark contrast, fewer children surveyed in 1997–1998 reported that they have never attended school at the time of interview. Only 5 percent of children between 6 and 15 have never attended school. Around 14 percent of those who have never attended school fall into the youngest age group.

Table 1 also presents the proportion of children between 6 and 15 who have never attended school by gender. In line with Table 1, the proportion of boys and girls who have never attended school has fallen between 1993 and 1998. For instance, 39 percent of boys and 37 percent of girls aged between 6 and 15 had never attended school in 1993. These percentages decline to about 4 percent and 6 percent for boys and girls, respectively, in 1998. The data suggest that the

7. The VLSS indicates that delayed primary enrolment appears to be common in 1993, but not in 1998 (See Table 1). Therefore, the 1993 sample is restricted to children of 9 years of age and above to ensure that those who have not yet enrolled will never enrol, whereas children between 6 and 14 years of age are included in the 1998 sample.

8. An alternative method would be to define the sample by age. That is, to only include children of primary school age (6–10) in the sample. However, as mentioned in footnote 7, some children, especially in 1993, did not enter primary school until age 7 or even later. Also, grade repeating is common in both surveys. Therefore, I have defined the age range rather broadly.

9. An alternative choice of the sample is to track the same children over time. The advantage of forming a panel is to get rid of the unobserved household heterogeneity. However, the panel structure cannot address the concerns that children stop going to primary school may differ from those not going on to secondary school.

Table 1 Number of rural children never attended school, by gender and by age

Age (years)	1992–1993					1997–1998				
	Never attended school†		Proportion of children who never attended school (%)			Never attended school†		Proportion of children who never attended school (%)		
	Boy	Girl	Boy	Girl	All	Boy	Girl	Boy	Girl	All
From 6–7	276	261	91.1	94.2	92.6	23	44	10.0	18.1	14.1
Over 7–8	220	182	75.6	69.5	72.7	16	25	5.4	9.3	7.2
Over 8–9	156	145	53.6	54.3	53.9	11	19	4.0	5.9	5.0
Over 9–10	152	147	29.4	31.3	30.3	15	18	2.7	3.9	3.2
Over 10–11	49	47	19.3	17.2	18.2	12	8	4.0	3.0	3.5
Over 11–12	36	40	16.6	16.5	16.5	5	12	1.6	4.5	3.0
Over 12–13	43	34	18.9	14.7	16.8	6	14	1.8	4.8	3.2
Over 13–14	46	33	17.5	14.0	15.9	6	17	1.9	5.8	3.7
Over 14–15	30	36	13.6	16.6	15.1	10	15	3.3	5.2	4.3
Total	1008	925	39.0	37.3	38.2	104	172	3.6	6.3	4.9

Note: †, Short-term special training courses were not included.

gender gap of those who have never attended school has widened. The VLSS92–93 indicates that the differences between boys and girls in terms of the proportions of children who have never attended school are less than 2 percent. Five years after, the proportions of girls who have never attended school have exceeded that of boys. Bear in mind that the absolute number of children never attended school is small in 1998.

III.2 Not currently in school

Despite compulsory primary education, the proportion of children not in school begins to increase beyond 9 years of age (Fig. 2). As in many developing countries, compulsory primary education may not be implemented effectively. Figure 1 indicates that the proportion of children not in school at the time of interview increases with age. This trend holds for both survey years. Interestingly, the proportion of children not in school is lower in 1998 than in 1993 for children between 9 and 11 years old. For children older than 11 years of age, the reverse is evident. A closer examination of the data by gender (Figure 3) demonstrates that the proportion of girls not in school is higher than that of boys once they are over 9 years old, irrespective of the survey year. Additionally, the gap widens as children grow older. Taking 1993 as an example, at 15 years of age, over 60 percent of children are no longer in school. Almost 70 percent of girls compared to only 50 percent of boys of that age are not in school. Comparing the two survey periods, the proportion of girls not in school in 1997–1998 rises faster and exceeds that of 1993 for the 10 to 11 years age group. The proportion of

Figure 2 Proportion of children not in school, by age. ◆, 1992-93; ---, 1997-98

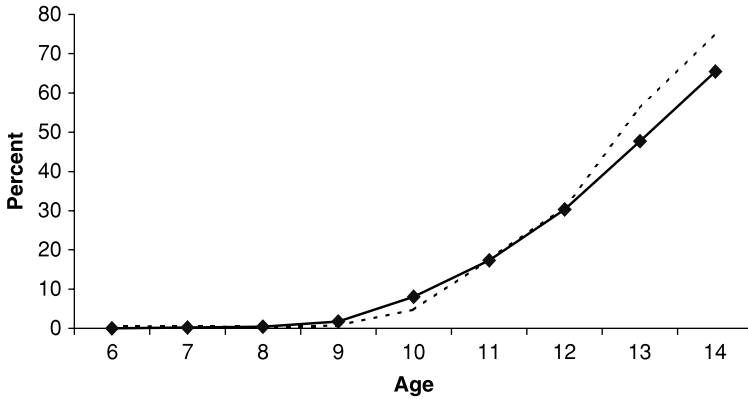
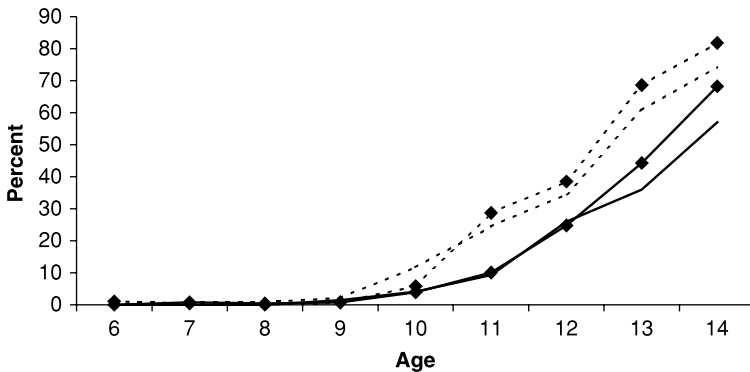


Figure 3 Proportion of children not in school, by gender and age. —, 1992-93 boys; ---, 1992-93 girls; ◆, 1997-98 boys; ◆, 1997-98 girls



boys for the two survey years does not exhibit much difference until over 12 years of age. The acceleration of the proportion of girls not in school is the driving force behind the crossover of the curves evident in Figure 2.

The analyses of Figures 2 and 3 suggest that the proportion of children not in school has declined impressively during the market reforms. However, Vietnam cannot be complacent, as the gender gap remains, despite the possible ease of liquidity constraint in face of an exceptional income growth in Vietnam during the 1993-1998 period.

IV. Model specification

To what extent does the investment in education for boys and girls differ and why? To answer these questions properly, one must first identify the decision-makers and the factors that determine the participation behavior of children.

Economists have developed two approaches to analyze what happens within the households.¹⁰ The traditional approach is based on constrained maximization of consensus parental preferences. The alternative approach is the bargaining approach. This approach views household behavior as the outcome of a non-cooperative or a cooperative game. It argues that individual members in a household may not have the same preferences and interests as assumed by the traditional approach.

The bargaining approach requires separate income for each family member. Most households in rural Vietnam participate in agricultural activities and only household income is reported. Non-wage income is also only reported at the household level. The lack of individual member's income and non-wage income has constrained the present paper to not undertake the bargaining approach in analyzing the intra-family distribution of resources. Nonetheless, most expectations regarding the impacts of factors on girls' and boys' schooling associated with the bargaining approach are also compatible with those associated with the traditional one.¹¹ Furthermore, in Vietnam, it is not uncommon for parents to have a significant influence on their sons and daughters. A Vietnamese saying is that 'children must sit wherever their parents put them'.¹² Parents decide almost every aspect of their children's life. Therefore, this paper adopts the view that parents act as if they are maximizing a single household utility function subject to appropriate constraints. In other words, parents weigh the benefits of schooling against its cost and determine how much they are going to invest in their children.

One reason why parents would invest in the education of their children is that they may receive benefits from their children's human capital accumulated through education. Therefore it is the parents' expected rate of return from their children's schooling that matters. More specifically, the probability of transfer from children to parents is important in investment decisions. Unlike western societies, Vietnamese sons are expected to remit some of their income to their parents. The expected return on a son's education is higher than the return of investment on a daughter's human capital, which is lost upon marriage (Haughton and Haughton, 1994; Hill and King, 1991).¹³ Therefore, demographic characteristics, such as the gender of a child, could partially proxy parents' expected rate of return. While the cultural factor is hard to explicitly model, its importance will be examined in the context of the decomposition of the gender probability gap.

10. See the chapter by Behrman (1997) and the article by Alderman et al. (1995) for a detailed review of the two theoretical approaches. See McElroy (1990) and Chiappori (1988) for theoretical work on the intrahousehold decision making using the bargaining approach.

11. See a discussion in Glick and Sahn (2000).

12. This is a translation of '*Bo me dat dau con ngoi do*'.

13. Females realise a higher rate of return to schooling than do males (World Bank, 1996). However, daughters' remittances to parents cease once they marry.

Another factor that provides parents with an incentive to educate their children may be the status or respect that they might enjoy in their village or community if their children are educated and do well in school. Presumably, parents observe how intelligent and how motivated their children are through interacting with them. The innate ability of children and their level of motivation in studying could affect the extent to which parents are willing to invest in an individual child. A survey of the parents in a village in Hai Hau district of the Nam Ha province suggests that the children's competence of learning is one of the important factors when determining what educational level parents would allow them to pursue (Nguyen, 1995).

Furthermore, the extent to which parents value education affects their willingness to invest in their children's education, holding other factors constant. The parents' background, education, occupation and how much they care about their children's education also affects their investment decision about their children's education.

On the cost side, school fees and various contributions are only the direct costs that parents need to consider. In Vietnam, under the government's official fee policy, fees are not paid for primary schooling. However, the official fee policy often plays a minor role in determining the actual costs of sending children to school. Although primary education is free in principle, education can be expensive in reality. Parents are expected to contribute towards improvements in school facilities and teachers' salaries. Nguyen (1995) finds that about 30 percent of the families interviewed spent over 4 percent of their annual total expenditure on their children's education.

In addition to the direct cost of education, indirect costs are an important factor in parents' investment in children's education. In rural Vietnam, children often help out in farm activities such as feeding animals and minding buffaloes. Children also help around the house, for instance sweeping the floor, preparing food and collecting firewood. If children are at school, they can no longer carry out many of these duties. Boys and girls also differ with respect to the indirect cost of education. Boys in rural Vietnam are typically engaged in work activities, while girls are usually in charge of domestic tasks.¹⁴ Despite incurring the same direct educational costs, the more important cost of educating girls may be the foregone hours of housework (Fernandez, 1986; Gertler and Glewwe, 1992; Edmonds and Turk, unpubl. Data, 2000). Conversely, it is more important for boys to engage in work activities. The foregone hours of work are more important for boys. Hence, it is possible that boys and girls may not be equally affected by the market reform (especially by the growth led by the agricultural sector) that brings improvement in living standards, as well increases in the earning opportunities for children.

14. Work activities include both market work and unpaid work, such as helping out on the family farm.

The time spent traveling to and from school represents another opportunity cost that parents have to consider if they decide to send their children to school. Distance from school carries with it a time cost and, to some extent, parents may be unwilling to send daughters to distant schools due to safety considerations (Gertler and Glewwe, 1992).

While there is no doubt that household income is an important constraint that parents have to consider, the number of children in the household and the birth order of a child could affect the resources available for an individual child. Given the limited resources available, the number of children in the household potentially lowers the chance of an individual child attending school (Baucer and Racelis, 1991; Blake, 1989; Steelman and Powell, 1991). Also, the presence of younger children can potentially impinge on the probability of a child going to school through the burden of household responsibilities that are more likely to be imposed on girls more than on boys.

The decision to send children to school is also conditional on the quality of education available. The number of teachers, blackboards and textbooks per student, as well as the teacher–pupil ratio, are often used in the literature to capture the quality of education (Betts, 1995; Gertler and Glewwe, 1992; Glewwe, 1996).¹⁵ If the quality of the schooling that girls receive is poor, the returns to parents from educating girls even before marrying could be low. Hence, parents may not want to educate girls.

From the above discussion, the reduced form of the probability of an individual child being in school is a function of the parents' expected rate of return to schooling, the parents' background, gender, the innate ability of the child, whether the child takes part in work or housework, the direct and indirect cost of education, travel time, household characteristics, the proportion of trained teachers and the teacher–pupil ratio in addition to community characteristics. It is estimated by a probit model.

The parents' expected rate of return to schooling at the time of decision making could be proxied by the children's gender, as gender in many ways determines from which children the parents will receive support in old age. The parents' background information includes their education and occupation. Direct measures of how much parents care about their children's education are not available. Nonetheless, this question was asked in the community survey as one of the possible reasons why children are not in school in a particular community.¹⁶ The variable is included.

A dummy variable indicating whether a child is involved in work-related activities (either on or off-farm) and another denoting whether a child does housework are included in the vector of explanatory variables. In addition, the

15. Behrman Ross, and Sabot (unpubl. Data, 2002) use the cognitive achievement of teachers as a measure of school quality.

16. The community survey was administrated only in rural areas and completed with the help of village chiefs, teachers, government officials and health care workers.

age of a child is included to capture his or her physical ability in undertaking different activities. The empirical work also uses predicted probability of a child being at work and predicted probability of a child doing housework as independent variables. The presence of these two generated regressors renders the standard errors incorrect (Pagan, 1984). They will lead to imprecise statistical inferences. Another consideration for the estimation is that more than one child from the same household results in clustering. Hence, the error terms are unlikely to be independent. White's standard errors are used to give asymptotically consistent values in the empirical study (White, 1980). To test for robustness, bootstrapping is also used to estimate standard errors.

Household expenditure and the proportion of older males in the household are used to capture the resource constraints parents face in making investment decisions. The proportion of older males also reflects the birth order of an individual child. The more older brothers one has, the lower one's birth order. Between the two surveys, household income has improved substantially. The use of a direct measure of household income generally yielded very poor results.^{17,18} Inspection of the data revealed that household income was under-reported. Finally, net annual household expenditure,¹⁹ excluding education expenditure and children's contribution to the households,²⁰ is used to proxy household permanent income. This allows us to address possible endogeneity between children's participation status in work and housework and household income.

17. The annual household income was compiled and consisted of the following components: (i) the annual wage income of individual household members; (ii) the annual gross household income from selling crops; (iii) the annual money value of the crops for self-consumption purposes; (iv) for households having enterprises, the annual value of the products sold and the annual value of the products for self-consumption; (v) remittances received; and (vi) any income generated in a year by land rental, land sales, selling equipment, etc.

18. Econometrically, household income is an endogenous variable, as children could well contribute to household income if they are not in school and take part in work-related activities. Several approaches were attempted. Firstly, I tried to use household assets, such as non-labor income, as a proxy for household income. The result was not satisfactory, as the variable was not significant. A closer examination found that the variable was not well reported. Not only were there many missing values, but there were also many mismatches. Secondly, I tried instrumental variables to deal with the endogeneity problem, but the lack of appropriate instruments was a problem. Roof and flooring quality, the number of rooms and the type of water source were used as instruments, but the variables were not significant.

19. Household expenditures in the 12 months preceding the interview include the following components: (i) food expenditure: values of annual market purchases, value of home produce consumed during the year; and (ii) non-food expenditure: frequently purchased non-food items (such as cigarettes, tobacco, areca nut, cooking fuel, soap and detergents or parking fees), the use value of consumer durables, utilities (expenditure on electricity, drinking water, laundry and bathing water, etc.), rent, education, health and in-kind wages.

20. Children's contribution to household income is estimated from the reported wage rate of those children with wage jobs. It was found that children's hourly contribution to the family was approximately one-third that of adults. This, combined with the work hours and housework hours reported by children, gave the estimated total income contribution of children to the household.

Other household characteristics, such as region (whether the household is located in the north or the south) and majority (whether the household belongs to the majority, Kinh, ethnic group), are included as control variables.

Direct measures of the innate ability of children and information on school fees are not available. As for distance and travel time, many missing values make the inclusion of these variables impossible. Nonetheless, the community survey has information on why some children are not attending school. Reasons included: school is too far away, school fees are too expensive, children lack ability or they do not like school and parents do not care about their children’s education. This information offers remedies for the lack of information on the direct cost of education, the innate ability of children, distance or travel time and parental attitudes towards their children’s education. They are coded into dummy variables and are also used to control for community heterogeneity.

V. Empirical methodology

A probit model is employed to analyze the probability of a child’s enrolment at school at each survey year. Two probit models are applied to boys and girls separately. Using a likelihood ratio test of the restrictions imposed by pooling children of both sexes provides some evidence of structural differences in girls’ and boys’ participation behavior.

To understand how much of the observed gender difference in children’s behavior is due to cultural factors which have shaped parents’ expected rate of return from educating children, the predicted participation gap between boys and girls has been decomposed. This paper adopts the decomposition technique outlined by Doiron and Riddell (1994) which is applicable to non-linear equations.²¹

Doiron and Riddell (1994) proposed a technique to decompose the unionization gap between males and females using a probit model. Instead of using the average predicted probabilities to decompose the gap, their decomposition method is based on a Taylor series approximation for representative males and females. The predicted probability gap can be decomposed as:

$$\Phi(\hat{Q}_m \hat{\phi}_m) - \Phi(\hat{Q}_f \hat{\phi}_f) \approx \frac{d\Phi(\psi)}{d\psi} (\hat{Q}_m \hat{\phi}_m - \hat{Q}_f \hat{\phi}_f)$$

The first term on the right hand side is the normal probability density function evaluated at ψ , which is the weighted average that the linearization is performed. ψ is defined as:

$$\psi = (N_m \hat{Q}_m \hat{\phi}_m + N_f \hat{Q}_f \hat{\phi}_f) / (N_m + N_f)$$

21. The traditional decomposition technique utilises one of the properties of the least squares regression line: it passes through the sample means of the data. However, in the non-linear case, this property does not necessarily hold.

The second term is a linear function of characteristics and coefficients and can be decomposed in the usual manner. To choose the representative individuals, the sample mean \bar{Q}_j is a natural candidate for \hat{Q}_j . However, evaluating the probability at mean characteristics may not be accurate given the non-linear nature of the model. To avoid this problem, they define \hat{Q} as

$$\hat{Q}_j^k = \bar{Q}_j^k \left[\frac{\Phi^{-1}(\bar{\mu}_j)}{\bar{Q}_j \hat{\phi}_j} \right]$$

for all factor k and for $j = m, f$. They pick the representative male or female who has characteristics \hat{Q}_m^k or \hat{Q}_f^k such that he or she has a probability of unionization equal to the average probability for males or females and such that the endowments are in the same share as the average endowments for males (females). Thus, the gap, which is decomposed, is the gap in the average probabilities.

Applying their methods in the context of this paper, the explained portion of the predicted schooling gap between boys and girls is due to observable characteristics or endowments of boys and girls (differences in their demographic characteristics, household characteristics and parental characteristics). The unexplained part of the gap is due to: (i) unobserved gender differences in characteristics that affect the schooling behavior, such as ability; (ii) omission of variables; or (iii) discrimination due to parents' preferences. Theoretically, discrimination in children's education reflects parents' different expected rates of return of sons and daughters, which could be shaped by cultural factors.

VI. Results

Table 2 presents brief definitions of the variables used while presented in Table 3 are the summary statistics for all the variables used in the sample. The gender gap of the probability of children being in school is about 10 percent in 1993. It has narrowed to 2 percent as indicated in the VLSS97-98. Thanks to market reforms, the net annual household income more than doubled over this 5-year period. How does the increase in the net annual household income impact on the overall probability of children being in school as well as the gender differences in the probability gap? The empirical results will provide some insight into this question. Note that the predicted probability of children working has fallen over time. This may be due to the fact that younger children have been included in the VLSS97-98 sample. It may also reflect the improvement of the living standards as indicated by the doubling of the net annual household income. Also note that the predicted probability of doing housework has declined. Yet, girls are still more heavily involved in domestic tasks than boys are. The pupil-teacher ratio has fallen only slightly to a 30-to-one in 1998 from 33-to-one registered five years earlier.

Tables 4 and 5 present the detailed estimation result for the 1993 and 1998 surveys respectively. The t-values reported in Tables 4 and 5 are based on White's

Table 2 Brief variable definitions

<i>Variable</i>	<i>Definition</i>
InSch	Dummy variable equal to one if the child is in school
Children	
AGE	Age of the child
GENDER	Gender of a child equals one if he is a boy
WORK	Coded as one if a child worked for paid or unpaid work in the previous 7 days
HSWK	Coded as one if a child did housework in the previous 7 days
Parents	
FOCC1	Father's occupation equals one if he has a technical and trade/clerical related occupation
FOCC2	Father's occupation equals one if he has an agricultural occupation
FOCC3	Father's occupation equals one if he has production related occupation
FSCH	Father's years of schooling
MOCC1	Mother's occupation equals one if she has a technical and trade/clerical related occupation
MOCC2	Mother's occupation equals one if she has an agricultural occupation
MOCC3	Mother's occupation equals one if she has production related occupation
MSCH	Mother's years of schooling
Household	
NETINC	Net annual household expenditures ('00 thousand dong)
POLDM	Proportion of older male siblings excluding oneself
ETHNIC	Kinh majority equals one
REGION	Equal to one if household is in the north; zero otherwise
Community	Why are some children in this community not attending school?
FAR	Coded as one if answered 'school is too far away'
COSTLY	Coded as one if answered 'economic difficulties/school is too expensive'
INABILITY	Coded as one if answered 'children lack ability or do not like school'
NOT CARE	Coded as one if answered 'parents do not care about children's education'
PTRAIN	Proportion of trained teachers in this community
STAFFPUP	Teacher-pupils ratio in this community

standard errors.²² The χ^2/F -statistic indicates the model is of reasonable fit. In addition, the 2×2 hits and misses table (Table 6) suggests that, overall, the model is reasonably good in its predictability.

The probit estimates on all children confirm significant gender differences in children's schooling (the third column in Tables 4 and 5). For instance, the probability of a boy being in school is 3 percent higher than that of a girl in 1993. Over five years, the probability gap has narrowed to 0.5 percent. Note that the negative impact of age is much stronger on girls than on boys in 1993 only. Such gender differences are not obvious in the estimation results for 1998.

The results also confirm the suspicion that children's involvement in work and/or housework adversely affects their chances of staying in school over the

22. Few differences in the t-values are found using bootstrapping.

Table 3 Summary statistics

	1992–1993			1997–1998		
	Boys	Girls	All	Boys	Girls	All
In school or not (Dependent variable)	0.90 (0.30)	0.80 (0.40)	0.85 (0.35)	0.95 (0.20)	0.93 (0.25)	0.95 (0.22)
Age	10.94 (1.42)	11.11 (1.44)	11.03 (1.43)	9.54 (2.03)	9.36 (2.01)	9.45 (2.02)
Gender			0.50 (0.50)			0.53 (0.50)
Predicted probability of working	0.39 (0.25)	0.40 (0.25)	0.39 (0.25)	0.15 (0.19)	0.13 (0.18)	0.14 (0.19)
Predicted probability of doing housework	0.59 (0.18)	0.74 (0.15)	0.67 (0.18)	0.37 (0.25)	0.47 (0.25)	0.42 (0.26)
Father's years of schooling	7.60 (3.59)	7.18 (3.44)	7.39 (3.52)	6.84 (3.64)	6.74 (3.58)	6.79 (3.61)
Mother's years of schooling	6.02 (3.27)	5.59 (3.04)	5.81 (3.16)	5.62 (3.65)	5.64 (3.60)	5.63 (3.63)
Father's occupation dummy 1	0.09 (0.28)	0.07 (0.26)	0.08 (0.27)	0.07 (0.26)	0.09 (0.29)	0.08 (0.28)
Father's occupation dummy 2	0.82 (0.39)	0.83 (0.38)	0.82 (0.38)	0.81 (0.39)	0.79 (0.41)	0.8 (0.40)
Mother's occupation dummy 1	0.13 (0.34)	0.10 (0.30)	0.12 (0.32)	0.11 (0.31)	0.11 (0.32)	0.11 (0.31)
Mother's occupation dummy 2	0.82 (0.38)	0.86 (0.35)	0.84 (0.37)	0.85 (0.36)	0.83 (0.37)	0.84 (0.37)
Net annual household income ('00,000 dong)	54.19 (42.72)	51.89 (34.76)	53.04 (38.95)	110.02 (78.42)	115.16 (84.91)	112.46 (81.58)
Proportion of older brothers	0.25 (0.29)	0.24 (0.29)	0.24 (0.29)	0.27 (0.31)	0.28 (0.32)	0.28 (0.32)
Ethnic	0.88 (0.32)	0.87 (0.34)	0.87 (0.33)	0.75 (0.43)	0.77 (0.42)	0.76 (0.43)
Region	0.59 (0.49)	0.55 (0.50)	0.57 (0.49)	0.48 (0.50)	0.47 (0.50)	0.47 (0.50)
Far	0.20 (0.40)	0.19 (0.40)	0.20 (0.40)	0.18 (0.39)	0.18 (0.39)	0.18 (0.39)
Not care	0.14 (0.35)	0.15 (0.36)	0.15 (0.36)	0.26 (0.44)	0.28 (0.45)	0.27 (0.44)
Costly	0.38 (0.49)	0.43 (0.50)	0.41 (0.49)	0.37 (0.48)	0.35 (0.48)	0.36 (0.48)
Lack of ability/do not like school	0.07 (0.25)	0.05 (0.22)	0.06 (0.24)	0.05 (0.22)	0.06 (0.23)	0.06 (0.23)
Proportion of trained teacher	0.86 (0.25)	0.83 (0.27)	0.84 (0.27)	0.82 (0.21)	0.83 (0.20)	0.82 (0.20)
Pupil–teacher ratio	33.26 (10.11)	34.02 (10.34)	33.64 (10.23)	29.97 (6.73)	30.60 (12.66)	30.00 (6.72)

Notes: Number of observations: 1992–1993, 728 boys and 727 girls; 1997–1998, 1135 boys and 1020 girls. All values are given as mean (SD).

Table 4 Estimated probit results for the gender differences in education, 1992–1993

Variable	All			Boys			Girls		
	Coef.	dF/dx	t-value	Coef.	dF/dx	t-value	Coef.	dF/dx	t-value
Children's characteristics									
Age	-0.480	-0.044	-4.703*	-0.373	-0.018	-2.185*	-0.604	-0.088	-3.945*
Gender	0.309	0.029	2.247*						
Predicted work status	-1.194	-0.111	-1.305	-2.043	-0.098	-1.696**	-0.446	-0.065	-0.337
Predicted housework status	-1.523	-0.141	-3.008*	-2.085	-0.100	-2.321*	-1.332	-0.195	-1.719**
Parental characteristics									
Father's years of schooling	0.032	0.003	1.460	0.034	0.001	0.911	0.031	0.004	0.913
Mother's year of schooling	0.070	0.006	2.806*	0.052	0.002	1.322	0.079	0.011	2.025*
Father's occupation dummy 1	1.109	0.049	3.301*	0.922	0.022	1.703**	1.311	0.089	2.886*
Father's occupation dummy 2	0.104	0.010	0.447	0.599	0.043	1.253	-0.161	-0.022	-0.509
Mother's occupation dummy 1	0.157	0.013	0.497	0.394	0.014	0.237	-0.142	-0.072	-0.345
Mother's occupation dummy 2	0.803	0.117	2.419	0.816	0.069	0.492	0.742	0.153	1.962*
Household characteristics									
Net annual household income	0.002	0.000	0.629	0.008	0.000	1.037	0.003	0.001	0.800
Proportion of elder brothers	-0.417	-0.039	-1.967**	-0.422	-0.034	-1.948*	-0.153	-0.022	-0.484
Ethnic	-0.145	-0.012	-0.669	-0.222	-0.002	-0.096	-0.176	-0.023	-0.688
Region	0.485	0.048	1.789**	0.082	0.051	1.505	0.244	0.036	0.059
Community variables									
Far	-0.050	-0.011	-0.240	-0.243	-0.010	-0.660	-0.270	-0.044	-0.882
Care	-0.025	-0.005	-0.113	-0.072	-0.004	-0.181	-0.029	-0.004	-0.090
Costly	-0.409	-0.041	-2.052*	-0.172	-0.008	-0.548	-0.580	-0.091	-2.144*
Lack of ability/do not like school	-0.601	-0.099	-2.208*	-0.261	-0.015	-0.693	-1.006	-0.251	-2.360*
Proportion of trained teachers	-0.061	-0.005	-0.293	0.571	0.027	1.419	-0.469	-0.068	-1.451
Teacher-pupil ratio	0.004	0.004	0.709	0.003	0.000	0.356	0.003	0.005	0.469
Constant	6.772		6.222*	-5.335		3.446*	8.551		6.200*
Number of observations	1455			728			727		
χ^2 (Degree of freedom)	315.72 (20)			143.13 (19)			184.90 (19)		
Pseudo R-square	0.4177			0.4044			0.428		

Notes: dF/dx is for discrete change of dummy variable from 0 to 1. Net annual household income is in 100 thousand dong. *, significant at the 5% level; **, significant at the 10% level.

Table 5 Estimated probit results for the gender differences in education, 1997–1998

Variable	All			Boys			Girls		
	Coef.	dF/dx	t-value	Coef.	dF/dx	t-value	Coef.	dF/dx	t-value
Children's characteristics									
Age	-.285	-0.003	-2.25*	-0.639	-0.003	-2.77*	-0.085	-0.001	-0.54
Gender	0.477	0.005	3.02*						
Predicted work status	-0.232	-0.024	-2.44*	0.344	0.001	0.17	-3.755	-0.032	-3.17*
Predicted housework status	-0.622	-0.006	-0.69	0.389	0.002	0.30	-2.241	-0.019	-1.80**
Parental characteristics									
Father's years of schooling	0.029	0.000	1.08	0.017	0.000	0.56	0.091	0.001	2.13*
Mother's year of schooling	0.056	0.001	2.16*	0.040	0.000	1.02	0.077	0.001	2.15*
Father's occupation dummy 1	-0.042	0.000	-0.08	-0.960	-0.016	-1.29	0.981	0.003	1.37
Father's occupation dummy 2	-0.282	-0.002	-0.83	-0.289	-0.001	-0.48	-0.327	-0.002	-0.86
Mother's occupation dummy 1	-0.777	-0.020	-1.73**	-0.908	-0.014	-1.22	-0.981	-0.029	-2.13*
Mother's occupation dummy 2	-0.454	-0.003	-1.15	-1.103	-0.002	-1.68	-0.280	-0.002	-0.73
Household characteristics									
Net annual household income	0.001	0.000	0.61	0.007	0.000	1.83**	-0.001	0.000	-0.94
Proportion of elder brothers	-0.062	-0.001	-0.27	0.383	0.002	0.93	-0.597	-0.005	-1.75**
Ethnic	-0.721	-0.005	-4.12*	-0.827	-0.003	-3.22*	-0.659	-0.004	-2.60*
Region	1.212	0.021	2.84*	-0.086	0.000	-0.11	2.298	0.067	4.04*
Community variables									
Far	0.112	0.001	0.51	0.204	0.001	0.73	0.023	0.000	0.08
Care	-0.054	-0.001	-0.30	-0.047	0.000	-0.19	-0.080	-0.001	-0.31
Costly	0.358	0.003	1.29	0.523	0.002	1.62	0.282	0.002	0.95
Lack of ability/do not like school	0.297	0.002	0.71	0.485	0.001	1.07	0.368	0.002	0.73
Proportion of trained teachers	-0.245	-0.003	-0.61	-0.546	-0.002	-1.06	-0.271	-0.002	-0.55
Teacher-pupil ratio	0.007	0.000	0.43	0.028	0.000	0.90	-0.011	0.000	-0.55
Constant	6.151		4.22*	9.688		3.45*	5.641		3.69*
Number of observations	2155			1135			1020		
F-statistics (Degree of freedom)	11.23	(20,69)		6.70	(19,70)		12.54	(19,70)	

Notes: dF/dx is for discrete change of dummy variable from 0 to 1. Net annual household income is in 100 thousand dong. *, significant at the 5% level; **, significant at the 10% level.

Table 6 Actual and predicted participation rates

<i>Predicted</i>	<i>Actual</i>			
	<i>Boys</i>		<i>Girls</i>	
	<i>In school</i>	<i>Not in school</i>	<i>In school</i>	<i>Not in school</i>
1992–1993				
In school	89.43	47.72	88.10	46.02
Not in school	10.57	52.27	11.89	53.98
1997–1998				
In school	91.89	48.19	91.58	49.60
Not in school	8.11	51.81	8.42	50.40

period from 1993 to 1998. Interestingly, the impact of their involvement on schooling differs for boys and girls and a changing pattern is also observed over time. The predicted probability of a child working matters only for boys in 1993, but becomes important only for girls five years after,²³ lowering the likelihood of girls being in school by 3.2 percent in 1998. Additionally, the predicted probability of a child doing housework is important for all children in 1993. However, in 1998, it is only significant for girls and reduces girls' chances of being in school by 2 percent. The impact is mild compared with a 19 percent reduction in their chance of acquiring education, as was registered in 1993.

The fading influence of children's involvement in housework and the negative impact of work on girls' education may reflect the shift of household resource allocation in response to increasing economic opportunities opened up by the deepening of the market reform. Various studies have confirmed that schooling of girls is regarded more of a luxury than is schooling of boys (for instance, Behrman and Knowles, 1999), and boys are more likely to be working only because of their household's poverty (Edmonds, 2001).²⁴ When affordable, burdens may shift to girls to allow boys to acquire education. While daughters remain responsible for domestic chores, their efforts are now also drawn more towards work activities.

Children's schooling behavior is affected by parental and household characteristics irrespective of the survey year. Yet, their influence differs for boys and girls. For instance, a higher educated mother has a significantly positive impact

23. The predicted probabilities of a child working and doing housework were derived from two probit equations. Aside from the same explanatory variables used in the probit equation for schooling, these two probit regressions also include a dummy to capture the presence of the grandparent(s), proportion of older female siblings excluding oneself, proportion of adult females and the birth order of an individual child, but exclude community variables.

24. In his studies in Vietnam, Edmonds (2001) finds that child labor for boys drops more in response to an improvement in living standards than it does for girls. For girls, the relationship between child labor and living standards is not clear until living standards are raised to a level of one-half a standard deviation above the poverty line.

on her daughters, but not her sons. This result holds over time. As indicated by the estimation results of the VLSS92–93, a higher proportion of older brothers in the household is found to lower a child's likelihood of being in school. Note that a higher proportion of older brothers present in a household lowers the odds of boys being in school, but not that of girls. However, a mild negative impact is found for girls in 1998.

Household income (proxied by net household expenditures) only impacts on boys in 1998 with a very small marginal effect. Its impact is not evident in 1993. No doubt, this is partly the result of under-reporting. That household income only matters for boys may imply that educating daughters may be contingent on factors such as cultural values, more than resources available to the household. The decomposition results reported later in the present paper should enable further investigation of this proposition.

Now we turn to analyze the community variables. In 1993, the variable which measures the cost of education in the community, namely school being too costly, reduces the likelihood of children staying in school by 4 percent. The inability of children to succeed in school is found to lower the chance of the child being in school by about 10 percentage points. The probability of not being successful at higher levels of schooling becomes an important determinant of continuation at a much earlier stage. Further, as revealed by the separate estimations for boys and girls using the VLSS92–93, the negative effect of the reasons for children not being in school in a particular commune (school being too costly and children lacking in ability or not liking school) is only significant for girls. These two variables register large estimated coefficients, suggesting that the cost of education and the inability of children only deter parents from sending daughters to school. They have no effect on the odds of sons going to school.

The interpretation of the above results indicated by the VLSS92–93 may be that parents prefer to educate their sons. As a result, we observe that negative elements, such as inability and costs, weigh more against a daughters' odds of receiving education. In stark contrast to 1993, these results are no longer found in 1998. One possible explanation is that the heterogeneity of rural communities may have narrowed. It may partly due to the conscious effort of the government in directing resources into the poorer communities through education funding arrangement.

The decomposition results using different reference groups are presented in Table 7. These decompositions are based on linear approximation. The approximation gap is reasonably close to the predicted gap in 1993, with an approximation error of a –1 percentage point. However, the approximation gap is over-estimated in 1998, resulting in an approximation error of a –2 percentage points.²⁵ This should be kept in mind when interpreting the decomposition results for 1998.

25. Inclusion of higher order terms in the Taylor series only reduced the error by a very small amount.

Table 7 Decomposing the gender gap for being at school or not

	1992–1993			1997–1998		
	Actual	Predicted	Percent	Actual	Predicted	Percent
Proportion of children in school						
Boys	0.901	0.901		0.954	0.962	
Girls	0.803	0.858		0.925	0.934	
Gap	0.098	0.043		0.019	0.028	
Doiron and Riddell						
Approximation gap		0.058			0.050	
Approximation error		-0.015			-0.022	
Boys as the base						
Characteristics		0.013	21.37	0.020		37.44
Coefficients		0.046	78.63	0.034		62.56
Total gap		0.059	100.00	0.054		100.00
Girls as the base						
Characteristics		-0.011	18.44	-0.017		34.72
Coefficients		-0.048	81.56	-0.035		65.28
Total gap		-0.059	100.00	-0.054		100.00

The following discussion focuses on boys as the reference group, as the results do not differ much from those using girls as the reference group. The upper half of Table 7 shows that the predicted probability of boys being in school increases from 90 percent in 1993 to approximately 96 percent in 1998. Girls experience a sharper increase in the predicted probability of being in school over the same period rising from 86 percent to 93 percent. Therefore, the gender probability gap narrows over the 5-year period from 4 percent to 3 percent.

The lower portion of Table 7 presents the decomposition of the gap of the children's average predicted probability of being in school into differences in characteristics/endowments (explained) and in coefficients (unexplained). Decomposition results indicate that the unexplained component accounts for most of the predicted gap in each year (about 80 percent and 63 percent in 1993 and 1998 respectively). In other words, it is true for both periods that the gender gap is mostly due to differences in coefficients. Girls would have a higher probability of being in school if they had the same probit coefficients as boys did. The decline in the gender probability gap over time is a result of a combination of an increase in the contribution of differences in characteristics and a decline in the boy-girl gap in coefficients.

Why are girls less likely to stay at school? The decomposition results demonstrate that, at each point in time, most of the predicted probability gap between boys and girls can be attributed to the unexplained rather than the explained component. While the unexplained portion also reflects the impact of omitted variables and measurement error, the possibility that a large portion of the unexplained differential is attributed to gender discrimination should not be discounted too readily.

If the large unexplained portion of gender differences in the probability gap in 1993 merely reflects data limitations, then we should expect to see similar patterns for the decomposition using the second round of the survey data, given the same model specification and the way that variables are compiled. However, the portion of the unexplained differences in the schooling probability gap has narrowed quite substantially. Thus, the possibility of gender discrimination in children's schooling remains a plausible explanation. One may have to look at factors, such as traditions, that contribute to attitudinal differences towards boys and girls.

Confucianism values men more than women and sons more than daughters. Survey evidence in Vietnam suggests that son preference in Vietnam is quite extensive (Goodkind, 1994; Haughton and Haughton, 1994, 1998; Bélanger 2002).²⁶ According to the Confucian saying, 'If you have a son, you can say you have a descendant. But you cannot say that if you have even ten daughters'. Another saying: '*Thi met*' meaning 'Girl's middle name; a cheap basket' means that girls are not valuable.

Most parents in Vietnam rely on sons to provide support for their old age. Besides, sons in the Confucian tradition, which remains strong in Vietnam, maintain the family line. These customs and norms could shape parents' perception of the rate of children's income that is transferred to the parents. If cultural norms dictate that sons provide security to the parents in old age, while daughters marry and provide no support to the parents, then parents can recoup little from educating their daughters.²⁷ Therefore, parents may choose to invest less in their daughters' education.²⁸

At each point in time, the gender education gap is associated primarily with differences in returns to parents between boys and girls. Over time, two features are observed: (i) a narrowing gender education gap; and (ii) differences in boy-girl characteristics (explained portion) that increasingly contribute to the gender gap over time.

A closer look at Table 7 reveals that the probability of girls being in school has increased more than that of boys over the 1993–1998 period (15 percent vs 6 percent), contributing to the narrowing gender education gap over time. The

26. Bélanger (2002) surveyed 500 households in a village located 40 kilometres from Hanoi. Using the survey data, focus-group and family case studies, he found that there are three superior values of sons: (i) sons give their parents legitimacy in their family and community; (ii) sons carry on the family line; and (iii) they are the providers for their elderly parents.

27. Although girls are generally seen as an additional source of labor power, their value to the family is limited and they can only be relied upon as a source of labor until the day of their marriage.

28. Evidence found in Taiwan (De Vos, 1985) shows that parents expect to rely on sons, not daughters, for old-age support. In his study on Western Kenya, Hodinott (1992) establishes that sons are valuable not only for their own contributions and support to their elderly parents but also because of the help from their family. He finds that sons and their wives and children provide 55.7 percent of total assistance with household tasks. However, daughters are only major contributors before they get married. Therefore, parents may choose to invest less in daughters' education.

Table 8 Contribution of individual and household characteristics to the gender probability gap

<i>Variables</i>	<i>1992–1993</i>	<i>1997–1998</i>	<i>Difference</i>
Children's characteristics			
Age	-0.025	-0.037	-0.012
Predicted work status	-0.005	0.000	0.005
Predicted housework status	-0.008	0.001	0.009
Parental characteristics			
Father's years of schooling	0.002	0.001	-0.001
Mother's year of schooling	0.002	0.001	-0.001
Father's occupation dummy 1	0.001	0.000	-0.001
Father's occupation dummy 2	0.003	-0.001	-0.004
Mother's occupation dummy 1	0.000	-0.001	-0.001
Mother's occupation dummy 2	0.004	-0.006	-0.010
Household characteristics			
Net annual household income	0.000	0.005	0.005
Proportion of elder brothers	-0.001	0.001	0.002
Ethnic	0.000	-0.004	-0.004
Region	0.003	0.000	-0.003
Community variables			
Far	0.000	0.000	0.000
Care	0.000	0.000	0.000
Costly	0.000	0.001	0.001
Lack of ability/do not like school	0.000	0.000	0.000
Proportion of trained teachers	0.003	-0.003	-0.006
Teacher–pupil ratio	0.001	0.002	0.001
Constant	0.033	0.059	0.026
Total	0.013	0.020	0.070

interpretation of the increasing contribution of characteristic differences between boys and girls to the overall gender gap is more complicated. Further information on these trends can be obtained by examining the roles of individual independent variables.

The second and third columns in Table 8 report the breakdown that shows the contribution of each independent variable to the portion of the gender probability gap associated with differences in characteristics.²⁹ It shows that the explained part accounts for about one percent of the gender gap in 1993; this share doubles in 1998. The last column presents the difference of decomposition results between 1998 and 1993. The single most important source of the increase in the explained part is the predicted probability of doing housework. It accounts for 13 percent of the overall increase of the explained part during 1993–1998. It

29. Jones (1983) has demonstrated that a breakdown of the unexplained portion of the gender gap is difficult to interpret.

is then followed by predicted probability of working and household income. Both contribute seven percent of the increase.

In sum, most of the gender probability gap is associated with differences in returns between boys and girls at one point in time. The results imply that in 1993 and 1998, girls would have a higher probability of being in school if they had the same return as boys. Over the 1993–1998 period, the differences in returns between boys and girls have become narrower. Such convergence contributes to the narrowing of the gender probability gap. On the other hand, the male-female differences in characteristics have become more important in explaining the probability gap of being in school for the two gender groups, compared with five years earlier. While the overall gender gap has been narrowing over time, changes in the coefficients of some individual variables tend to increase the explained portion of the gap.

VII. Conclusions

In Vietnam, high dropout rates and low enrollment rates are more evident among girls than boys, with the gender gap widening as children grow older. The present paper has explored the contribution of discrimination to the gender gap in enrolment observed in Vietnam between 1993 and 1998 using a non-linear decomposition approach developed by Doiron and Riddell (1994). This approach involves using a Taylor series approximation of a probit function to decompose the gender differences in the likelihood of being in school into explained and unexplained portions.

Using the two rounds of the Vietnam Living Standards Surveys on children whose highest attained degree is primary education, the results confirm that gender differences are important in determining the likelihood of children being in school. Decomposition results based on separate probit equations on boys and girls have shown that, at each point in time, discrimination accounts for most of the predicted probability gap. The results imply that cultural values may be an important factor and cannot be ignored in understanding the gender gap in education. Cultural values matter in shaping parents' expected return from their children's education, despite the fact that Vietnam has had a socialist regime for more than twenty years. These values dictate that sons should provide security for their parents in their old age. The expected return to sons' education is therefore higher. Additionally, according to Confucianism, girls are valued less than boys. Investment in girls is seen as a loss upon marriage. A lower rate of return is realized from educating girls and girls are disadvantaged in terms of education as a result.

Over time, the probability of girls being in school has risen. Not only has girls' absolute position in receiving education improved, but also their relative position as measured by the gender probability gap has narrowed. Note also that there has been a trend of increasing contribution over time by the gender differences in characteristics that contribute to the gender probability gap.

Involvement in work, housework and household income are the main sources of the increase.

Reducing the direct costs of education, which were found to be important in encouraging investment in girls' education in 1993, was no longer important in 1998. Policy prescriptions in cutting the indirect cost of education in terms of forgone contribution in work and housework are crucial. Furthermore, policies relating to the care of the aged, such as the introduction of pensions, could, to some extent, reduce the reliance on sons to provide old-age security and indirectly lower the opportunity cost of educating girls. Most critically, policies to educate people in general to induce value changes towards girls are essential in order to improve the prospects of girls in receiving education.

References

- Alderman, H., J. R. Behrman, D. R. Ross and R. Sabot, 1996, Decomposing the gender gap in cognitive skills in a poor rural economy. *Journal of Human Resources*, **31**, pp. 229–54.
- Alderman, H., P. A. Chiappori, L. Haddad, J. Hoddinott and R. Kanbur, 1995, Unitary versus collective models of the household: Is it time to shift the burden of proof? *World Bank Research Observer*, **10**, pp. 1–19.
- Alderman, H. and E. King, 1998, Gender differences in parental investment in education. *Structural Change and Economic Dynamics*, **9**, pp. 453–68.
- Baucer, J. and R. Racelis, 1991, *Household Characteristics, Earnings and the Activity Status of Filipino Youth*, Paper presented at the 1991 Annual meeting of the Population Association of America, 21–23 March, Washington DC.
- Behrman, J., 1997, Intrahousehold distribution and the family. In: *Handbook of Population and Family Economics* (eds Rosenweig M. R. and Stark O.) pp. 125–87. Elsevier Science B. V., Amsterdam.
- Behrman, J. R. and J. C. Knowles, 1999, Household income and child schooling in Vietnam. *The World Bank Economic Review*, **13**, pp. 211–56.
- Bélangier, D., 2002, Son preference in a rural village in North Vietnam. *Studies in Family Planning*, **33**, pp. 321–34.
- Betts, J. R., 1995, Does school quality matter? Evidence from the National Longitudinal Survey of Youth. *Review of Economics and Statistics*, **77**, pp. 231–50.
- Blake, J., 1989, *Family size and achievement*. University of California Press, Berkeley.
- Chiappori, P. A., 1988, Nash-bargained households decisions: A comment. *International Economic Review*, **29**, pp. 791–6.
- Davies, J. B. and J. Zhang, 1995, Gender bias, investments in children, and bequests. *International Economic Review*, **36**, pp. 795–818.
- De Vos, S., 1985, An old-age security incentive for children in the Philippines and Taiwan. *Economic Development and Cultural Change*, **33**, pp. 793–814.
- Doiron, D. J. and W. C. Riddell, 1994, The impact of unionisation on male-female earnings differences in Canada. *Journal of Human Resources*, **29**, pp. 504–534.
- Edmonds, E., 2001, Does child labour decline with improvements in living standards? NBER Working Paper 10134, NBER, Cambridge, MA.
- Fernandez, H., 1986, The willingness to pay for education in developing countries: Evidence from rural area. Working Paper No. 54. World Bank, Washington DC.
- Gertler, P. and P. Glewwe, 1992, The willingness to pay for education for daughters in contrast to sons: Evidence from rural Peru. *The World Bank Economic Review*, **6**, pp. 171–88.

- Glewwe, P., 1996, The relevance of standard estimates of rates of return to schooling for education policy: A critical assessment. *Journal of Development Economics*, **51**, pp. 267–90.
- Glewwe, P., 1999, Why does mother's schooling raise child health in developing countries? Evidence from Morocco. *Journal of Human Resources*, **34**, pp. 124–59.
- Glewwe, P. and H. A. Patrinos, 1999, The role of the private sector in education in Vietnam: Evidence from the Vietnam Living Standards Survey. *World Development*, **27**, pp. 887–902.
- Glick, P. and D. E. Sahn, 2000, Schooling of girls and boys in a West African country: The effects of parental education, income, and household structure. *Economics of Education Review*, **19**, pp. 63–87.
- Goodkind, D., 1994, Sex preference for children in Vietnam. Paper presented at the Paper presented at the UNFPA symposium on Issues Related to Sex Preferences for Children in the Rapidly Changing Demographic Dynamics in Asia, Seoul, South Korea.
- Handa, S., 1996, Maternal education and child attainment in Jamaica: Testing the bargaining power hypothesis. *Oxford Bulletin of Economics and Statistics*, **58**, pp. 119–37.
- Haughton, J. and D. Haughton, 1994, *Measuring son preference in Vietnam: methodology and evidence*. Paper presented at the Northeast Universities Development Conference. Economic Growth Center, Yale University.
- Haughton, J. and D. Haughton, 1998, Are simple tests of sons preference useful? An evaluation using data from Vietnam. *Journal of Population Economics*, **11**, pp. 495–516.
- Hill, M. A. and E. King, 1991, Women's education in the third world: An overview. In: *Women's Education in Developing Countries*. M. (eds Hill A. and King E.) World Bank, Washington.
- Hoddinott, J., 1992, Rotten kids or manipulative parents: Are children old age security in Western Kenya? *Economic Development and Cultural Change*, **40**, pp. 545–66.
- Jones, F. L., 1983, On decomposing the wage gap: A critical comment on Blinder's method. *Journal of Human Resources*, **18**, pp. 126–30.
- King, E. M. and M. A. Hill, 1993, *Women's Education in Developing Countries: Barriers, Benefits, and Policies*. Johns Hopkins University Press, Baltimore.
- McElroy, M. B., 1990, The empirical content of Nash-Bargained household behaviour. *Journal of Human Resources*, **25**, pp. 559–634.
- Ministry of Education and Training, 2000, Education Ten-Year Strategy 2001–2010. Ministry of Education and Training, Hanoi, Vietnam.
- Nguyen, N. N., 2002, Trends in the education sector from 1993–98. World Bank Policy Research Working Paper 2891, World Bank, Washington DC.
- Nguyen, T. K., 1995, Education of children in the family in the countryside at present, *Social Sciences*, **45**, pp. 69–78.
- Pagan, A., 1984, Econometric issues in the analysis of regression with generated regressors, *International Economic Review*, **25**, pp. 221–47.
- Rorris, A. and K. Evans, 1995, *Towards universalised primary education in Vietnam: A study of the cost and cost effectiveness of the primary education system*. UNICEF, Hanoi.
- Rosenzweig, M. R. and R. Evenson, 1977, Fertility, schooling, and the economic contribution of children in rural India: An econometric analysis. *Econometrica*, **45**, pp. 1066–1079.
- Sahn, D. E. and H. Alderman, 1997, On the determinants of nutrition on Mozambique: The importance of age-specific effects. *World Development*, **25**, pp. 577–88.
- Schultz, P. and K. Benefo, 1995, Fertility and child mortality in Cote d'Ivoire and Ghana, Yale Economic Growth Centre Discussion Paper 738, Yale University, New Haven, CT.
- Steelman, L. C. and B. Powell, 1991, Parental willingness to pay for higher education. *American Journal of Sociology*, **96**, pp. 1505–529.
- Tansel, A., 1993, School attainment, parental education and gender in Cote d'Ivoire and Ghana, Yale Economic Growth Center Discussion Paper 692, Yale University, New Haven, CT.
- Thomas, D., J. Strauss and M. H. Henriques, 1991, How does mother's education affect child height? *Journal of Human Resources*, Spring, **26**, pp. 183–211.

- White, H., 1980, A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, **48**, pp. 817–38.
- World Bank Human Resources Operation Division, Country Department 1, East Asia and Pacific Region, 1996, Vietnam Education Financing Sector Study (15925-VN), World Bank, Washington DC.