The Effect of Tuition Fee Reduction and Education Subsidy on School Enrollment: Evidence from Vietnam

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Abstract

This paper examines the impact of two education incentive schemes including tuition fee reduction and the education subsidy on secondary-school enrollment of children in Vietnam. Using Vietnam Household Living Standard Surveys during 2006-2018, we find that both policies significantly increase the school enrollment rate of children. The effect of these policies varies across different groups of children with a greater effect on those from ethnic minority groups, rural areas, poor and low-income households. Our findings suggest that these education incentive programs are an effective way to encourage children to enroll school, especially in low- and middle-income countries.

Keywords: Education subsidy; school enrollment; household surveys; impact evaluation; Vietnam.

JEL Classifications: I21; H52; P26

1. Introduction

Education is one of the most essential aspects of social and economic development because it is not only a human right itself but also a tool to develop human capital and support economic growth (e.g., Dissou, Didic, and Yakautsava, 2016; Saviotti, Pyka, and Jun, 2016; Lenkei, Mustafa, and Vecchi, 2018). The enrollment and the completion rates of children at the primary level in Vietnam have been increasing and reached 99 percent and 92 percent in 2018, respectively.[1] However, geographical and ethnic discrepancies in education are still apparent (Arouri, Ben-Youssef, and Nguyen, 2019). The completion rates also remain low in the mountainous and rural areas such as the Central Highlands (83.8 percent) according to Vietnam's country report "15 Years Achieving the Vietnam Millennium Development Goals" (SRV, 2015).

Several public policy programs have, therefore, been implemented by the government of Vietnam to support the school enrollment of children in poor households, ethnic minorities or children who are living in rural and mountainous areas.[2] The two most important policies include (1) the tuition fee exemption and reduction policy; and (2) an education subsidy program – in a form of the conditional cash transfer program (CCT). The first program has been implemented since 1998 for pupils meeting certain criteria.[3] The education subsidy program provides support in terms of in-kind and/or cash (National Assembly of Vietnam, 2005) with the maximum monthly allowance of 50 percent of the base salary for up to 9 months per year to pupils who are living in poor households and in rural areas. These programs have been commonly claimed as one of the main drivers which increased the enrollment rate. However, to the best of our knowledge, the effect of the programs on the children rate of enrollment in Vietnam has not been empirically investigated thoroughly. In this paper, we attempt to fill this gap by considering the case of Vietnam and relying our empirical investigation on a unique dataset from the Vietnam Household Living Standard Surveys (VHLSS) over the most recent 12-year period of the program implementation.

While it is commonly argued that tuition fees reduction, as well as cash transfers, can reduce the direct education cost to households, the effect of these policies on the decision to

[1] Our estimates from the Vietnam Household Living Standard Survey in 2018.
[2] The Vietnamese Government identifies universal access to education as one of the key targets of Millennium Development Goals and Sustainable Development Goals. Achieving universal primary education is recognized in the Vietnamese Constitution and the Law of Education in Vietnam.
[3] A reduction of up to 100 percent of the tuition fees is applied for poor children or disadvantage children or children who live at poverty or mountainous and remote areas.

enroll in school is still ambiguous. World Bank (2000) shows that, in addition to tuition fees, households might have to pay other fees for children such as contribution to schools. In many poor and countryside households, children at school ages might work in their family's home-based operations or services and contribute to their family income. Thus, attending schools would not only cost them education expenses and but also reduce their time to earn some additional income for their parents, which is considered as the opportunity cost of education for these families.

A number of studies have investigated the impact of different programs on the education of children in various developing countries. The current literature shows that conditional cash transfer (CCT) programs create positive impacts on school enrollment worldwide. Rawlings and Rubio (2005) review the impact of the CCT program on children enrollment in five Latin America and the Caribbean and find that the program increases the enrollment rates in both primary school and secondary school. However, this impact varies across different countries, school levels, and genders. Attanasio et al. (2010) find CCT programs in rural areas in Colombia raised the school enrollment by between 1 percentage point to 7 percentage point for primary school and high school children, respectively. Fiszbein et al. (2009) find an overall positive effect on school enrollment and attendance in various countries although those effects are different among age groups. Chyi and Zhou (2014) report tuition fee waivers, free textbooks, in conjunction with living expense subsidies, had a significantly positive effect on school enrollment of rural girls but not boys in China.

Some other studies examine the effect of other incentive programs on education in a number of countries. Skoufias and Shapiro (2006) find that decisions about improving school resources and decentralizing management lead to a decrease in the dropout rate of pupils by 0.24 percent in Mexico. Muyanga et al. (2010) use the propensity matching scores method to evaluate the impact of a free primary education program which started in 2003 in Kenya, and document the success of this program because it increases not only the primary but also the secondary school enrollment rates. Cheung and Perotta (2011) use the difference-in-differences method to evaluate the impact of a free food program on schooling attendance in Cambodia. They find that the program under consideration has affected the trend of education and increased the proportion of school enrollment. De Brauw and Hoddinott (2011) also measure the impact of conditional cash transfers on school enrollment of children in Mexico and recognize that the program helps households increase welfare and education of children. In a related study, De Brauw et al. (2015) investigate the impact of the "Brazil's Bolsa Familia"

program, which provides monthly cash transfers to poor families with children from 6 to 15 years old upon condition that they are enrolled into schools. The authors report that both the rate of school enrollment and the grade of children increase when the poor families received monthly cash transfers for their children enrolled.[4]

A recent study by Shi (2016) is the closest to our study. Shi (2016) uses survey data (Gansu Survey of Children and Families in 2000, 2004, and 2007) to examine the impact of China's educational fee reduction reform on children's school enrollment in rural areas. The empirical results of the study mainly show that the reform under consideration has insignificant impacts on school enrollment of 9–12 years old children, but significant impacts on school enrollment of 13–16 years old children.

Despite extensive existing research about the impact of various education incentive schemes on school enrollment, the previous literature investigates education in Vietnam but does not directly examine the effects of different education policies on school enrollment thoroughly. For example, Rolleston and Iyer (2019) find inequities in access to education between ethnic minority and majority students at upper secondary level in Vietnam. And they suggest that additional policies to ensure fee exemptions, subsidies or conditional cash transfer schemes to offset opportunity costs of schooling in the most disadvantaged areas is necessary. Doan, Gibson, and Holmes (2014) find exempting tuition and other school contributions are of important to keep poor children in Vietnam to stay in schools longer because the tuition accounts for just less than one-third of total education costs and does not consider income levels of parent. Behrman and Knowles (1999) find school fee exemption in Vietnam grant mostly for children who are in primary school (80.3 percent), those who reside in mountainous areas (8.0 percent), and pupils who are members of ethnic minorities (4.3 percent). Only 1.0 percent of children, who receive school fee exemption, come from poor households. Their study also states that the actual expenses that households pay directly to schools are triple the amount of tuition fee. This fact explains for a limited impact of school fee exemption policy on poor households' decisions about schooling.

There are little if any evidence on the effect of cash transfer or education subsidy programs on children's education in Vietnam. A related study is Nguyen and Nguyen (2015), which investigate the effect of remittances on education. They find a positive effect of international remittances on the number of completed grades. However, they do not find a

[4] Other studies such as Thai and Falaris (2014) and Glewwe and Jacoby (2004)) investigate other aspects of children's enrollment such as child schooling, child health, and the demand for education.

significant effect of remittances, either international or domestics, on school enrollment of children. Remittance is a private and unconditional cash transfers, which can have very different effect from the public cash transfers for education.

In our study, we provide a comprehensive investigation about the impact of two major incentive schemes, namely tuition fee reduction and exemption policy (henceforth referred to as tuition fee reduction) and education subsidy, on children's school enrollment in Vietnam.[5] Furthermore, we analyze the differential impact of these policies across ethnicities, household income levels, and geographical areas.

Using data from Vietnam Household Living Standard Surveys (VHLSS) in 2006, 2008, 2016, and 2018, we find that the tuition fee exemption and reduction policy has a significant effect on children's school enrollment.[6] We also find a positive of education subsidy on children's education enrollment. The effect of the two policies is furthermore not alike among different groups of children with greater effect on children who are either minor ethnic groups, or in poor households, or living in rural areas. Our finding thus implies that tuition fee exemption and reduction policy, as well as the education subsidy program, are still an effective way to encourage children to enroll school. Policymakers could align these policies with other complementary encouraging measures for households having younger children such as the reduction in poverty and distance to schools, the development of microcredit/finance programs, and the alleviation in credit constraints.

The rest of the paper is structured as follows. Section 2 describes the dataset used in the empirical investigation. Section 3 reviews child education and the tuition fee exemption and reduction and the education subsidy program in Vietnam. Section 4 presents the estimation method. Section 5 reports and discusses the empirical findings. Section 6 summarizes the paper and provides some concluding remarks.

[5] A recent study by Shi (2016) is the closest to our study. Indeed, Shi (2016) also uses survey data (Gansu Survey of Children and Families in 2000, 2004, and 2007) to examine the impact of China's educational fee reduction reform on children's school enrollment in rural areas. The empirical results of the study mainly show that the reform under consideration has insignificant impacts on school enrollment of 9–12 years old children, but significant impacts on school enrollment of 13–16 years old children.

[6] Due to the structure differences between the surveys 2006, 2008 with the most recent surveys 2016, 2018, it is impossible to combine construct meaningful panel data for all surveys from 2006 to 2018. Thus, we use two pairs of survey datasets in year 2006, 2008 and 2016, 2018 to examine the impact of these policies over the most recent decade. The first set of two surveys in years 2006 and 2008 cover the data for the same cohort of children aged from 6-18 years old and enrolled schools in 2006. The second set of two surveys in years 2016 and 2018 provide the data for the cohort of children aged 6-18 years old and enrolled in 2016. These two surveys 2016 and 2018 are also the most recent surveys available.

2. Data

We use four of Vietnam Household Living Standard Surveys (VHLSS) which were conducted by the General Statistics Office of Vietnam (GSO) in 2006, 2008, 2016 and 2018. The surveys contain standardized questionnaires developed by the World Bank. The VHLSS data has long been considered to be of high quality and it has also been used in recent studies (see, e.g., McCaig and Pavcnik, 2015; Bui et al., 2014; Nguyen and Nguyen, 2015).

The 2006 and 2008 VHLSS have the same sample size, at 9,189 and households. There are 4,090 households who were surveyed in both the surveys. The 2016 and 2018 VHLSSs sampled 9,399 and 9,168 households. The panel data from the 2016 and 2018 VHLSSs are contained for 4,005 households. The VHLSSs are representative for the whole country, urban/rural areas, and the 8 regions. The data were collected through face-to-face interviews. The surveys contain data on employment and income, expenditure, education, living standard, and demographics. The education section contains information on enrollment, literacy, highest diploma, tuition fee exemption and reduction, and education subsidy for each household member.

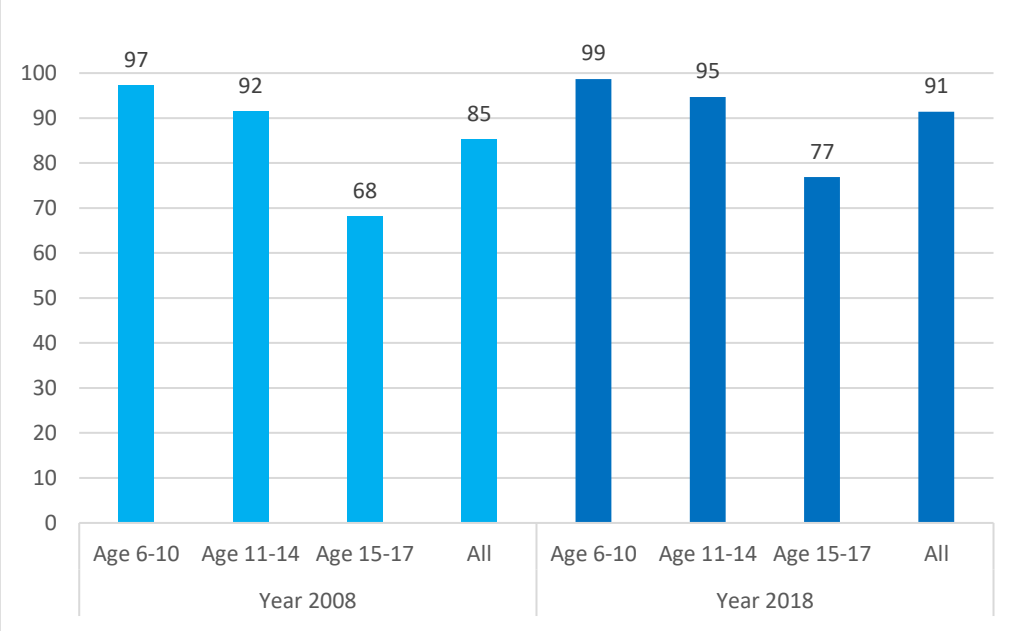
3. Children's education in Vietnam

The school system in Vietnam comprises primary, lower secondary, and upper secondary schools (London, 2011; Glewwe and Patrinos, 1999). Primary education consists of Grades 1 to 5. Children who turn to 6 years old have the right and obligation to start lower primary school, which is the only compulsory level that children must attend. It normally takes four years to complete lower secondary education (Grades 6-9) and three years to complete upper secondary education (Grades 10-12). As the lower secondary level is also aimed to be universal, every primary student who completes primary school can enter Grade 6. However, when children complete their lower secondary school, they need to be "pass" a selection examination to continue to upper secondary school. The selection can be either through a national standard exam or through consideration of learning achievements in Grade 9.

Figure 1 presents the enrollment rates in 2008 and 2018 by age groups. Vietnam's achievement in education is represented by high enrollment rates in both primary and lower secondary school with the corresponding rates of 99 percent and 95 percent in 2018. One explanation for the achievement is the implementation of the Primary Education

Universalization Law (approved in 1991) requiring every child must complete primary school at the age of 14 at the latest. High economic growth that Vietnam has achieved during the recent decades also allows for more investment in education. Although enrollment rate in upper secondary increases significantly from 68 percent in 2008 to 77 percent in 2018, the rate is still lower compared to other countries with similar economic conditions Glewwe et al. (2017).

Figure 1: School enrollment rate by age groups



Source: Authors' estimation from VHLSSs in 2008 and 2018.

Since 2006, the Vietnam Ministry of Education and Training (MOET) has implemented reforms in the education system to improve the quality of learning and teaching at all levels. As such, the MOET raised the standard for the examinations that determine whether students can obtain "completion" degrees and gain admission to a higher level. As expected, the "pass" rate declines at all levels resulting in the overall enrollment rates for the whole country fell significantly, reached the lowest in 2007 before increasing slightly in 2008 and significantly in the period of study. Table 1 presents the estimates of the enrollment ratios, stratified by gender, urban/rural, the 8 geographical regions, ethnicity, and poverty status. As expected, the enrollment rates are higher in all levers in 2018 for both boys and girls confirming the success in education reform. It should be noted that the enrollment rates of female students are higher than those of male students, especially in the upper secondary level. In 2018, 80.5 percent of female students attended school, compared to only 73.5 percent of male students. These findings are consistent with the statistics of other surveys such as Vietnam's General Statistics

Office (GSO) (2009)'s population and housing census. One of reasons for the lower enrollment rate of male students is the fact that young male students have more opportunities to join the labor market. Great effort has been made in narrowing down the gap between urban and rural areas. During our study period, the urban/rural gap in education reduces significantly across age group, even though the enrollment rates in the urban areas are higher than those in rural areas. The difference in enrollment rate between urban areas is 14.4 percentage point (79.1 percent - 64.7 percent) and drops to 12.6 percentage point (86.0 percent -73.4 percent). Despite the education gap between poor and non-poor reduces at primary and lower-secondary group, the gap widens in upper-secondary level. In 2018, only 52.9 percent of children from poor households attended school compared to 79.6 percent from non-poor counterparts.

Table 1: School enrollment rate by demographic characteristics

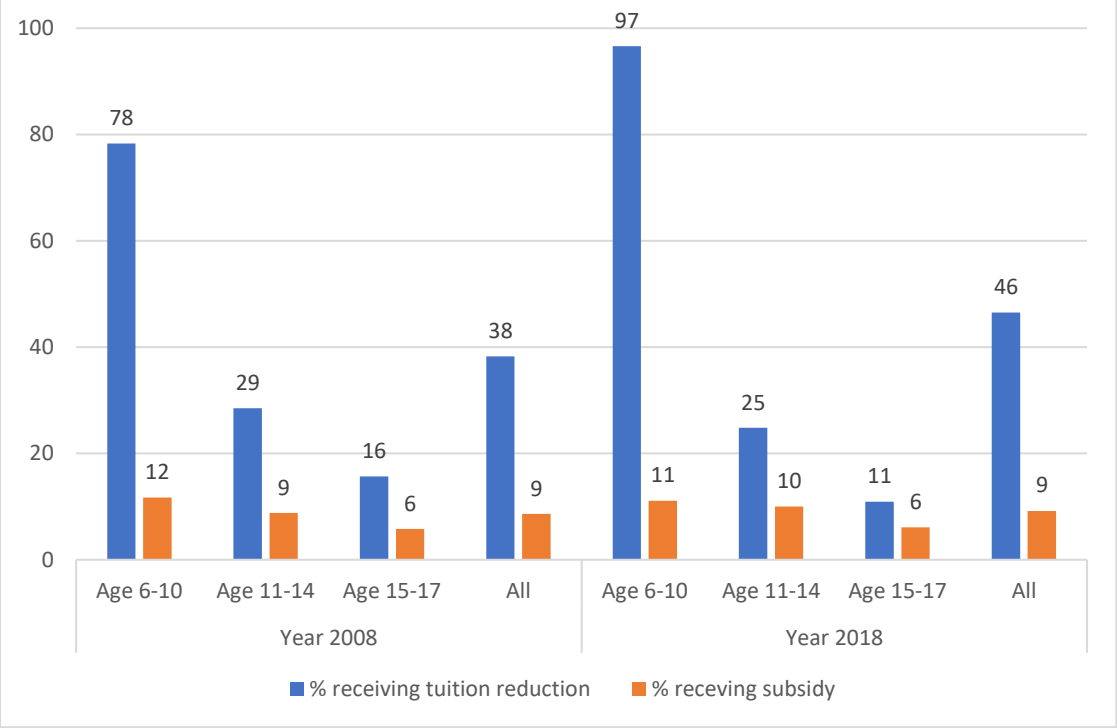
Groups	**2008**			**2018**		
	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)
Gender						
Boys	97.7	91.1	64.1	98.5	94.0	73.5
Girls	96.6	91.9	72.5	98.9	95.4	80.5
Urban/rural						
Rural	96.6	90.7	64.7	98.6	94.1	73.4
Urban	98.9	94.2	79.1	98.9	96.2	86.0
Region						
Red River Delta	99.2	96.1	76.3	99.0	99.1	89.2
North East	97.9	94.3	61.7	98.6	94.6	75.0
North West	90.6	87.8	57.2	98.6	92.7	63.1
North Central	98.8	95.1	75.5	99.1	95.8	78.6
South Centre Coast	98.4	95.2	72.2	99.4	95.4	79.5
Central Highlands	94.6	88.3	68.4	98.3	90.6	67.5
South East	98.2	89.7	71.6	98.5	94.8	75.9
Mekong River Delta	94.6	82.7	54.3	98.3	91.2	70.8
Ethnicity						
Kinh	98.1	92.8	70.9	98.9	96.3	82.0
Ethnic minorities	92.6	84.6	51.8	98.2	88.3	55.6
Poverty						
Non-poor	97.8	93.7	71.8	98.8	95.9	79.6
Poor	94.4	81.7	47.9	97.9	85.8	52.9

Source: Authors' estimation from VHLSSs in 2008 and 2018.

Aiming to achieve the full coverage of primary education in 2020, the revised Constitution of Vietnam (adopted by the National Assembly in 2013) reaffirms that primary education is compulsory, and tuition fee at this level is exempted for all students. In 2018, 97 percent of primary students received tuition fee exemption or reduction (Figure 2). Only a small proportion of students who did not receive the reduction/exemption are mainly those attending private schools.

For secondary education (lower- and upper-secondary education), the government has provided tuition fee exemption or reduction for students from less advantaged groups, mainly the poor and ethnic minorities[7]. Also, eligible students are also provided with education subsidy, in terms of in-kind and cash (National Assembly of Vietnam, 2005) with the maximum monthly allowance of 50 percent of the base salary for up to 9 months per year.[8] Annually, over 3 million poor and ethnic minority students are given exemption and reduction in school-fee and other compulsory fees; 2.5 million minor ethnic poor pupils receive free textbooks and notebooks worth over 100 billion VND. Figure 2 shows that the percentage of children received tuition fee reduction/exemption are stable with the rate of 25 percent and 11 percent granted for lower (aged 11-14) and upper (aged 15-17) in 2018, respectively. Table A.1 and A.2 in Appendix present the detailed estimates of the proportion of students receiving tuition fee reduction and education subsidy by basic demographic characteristics.

Figure 2. Proportion tuition fee reduction and education subsidy by age groups



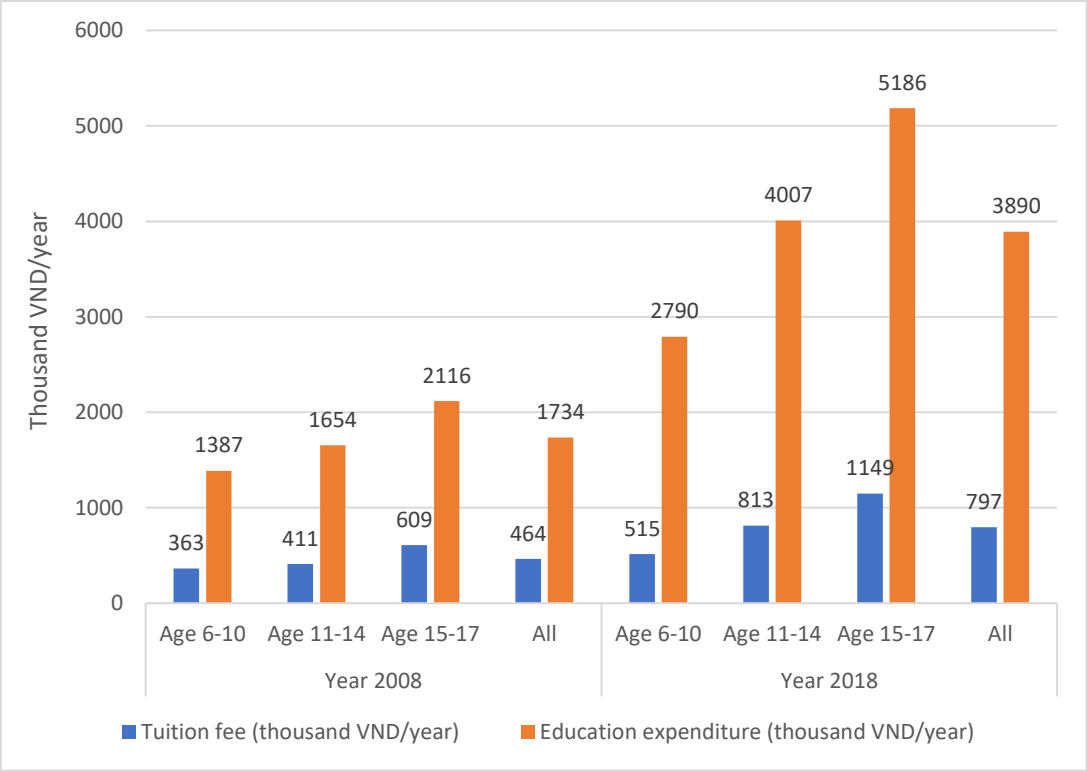
Source: Authors' estimation from VHLSSs in 2008 and 2018.

[7] Degree No. 86/2015/ND-CP regulates policies on tuition fee exemption and reduction and financial support in the Vietnam's national education system and identifies learner's eligibility for tuition fee exemption and reduction

[8] The base salary was 540 thousand VND in 2008 (or 32 US$ in current price). It was increased to 1,300 thousand VND (or 58 US$ in current price) in 2018.

Figure 3 compares the tuition fee and education expenditure of different age groups. Both tuition fee and education expenditure rise dramatically over the period with the latter increase at a faster rate. It should be noted that the fee and expenditure in 2008 have been adjusted to the 2018 price, implying that households are paying more than double the amount for education over the sample period. Also, both tuition fee and education expenses increase when students study a higher level, which partly explains for the higher drop rate at the upper secondary level. Higher tuition fee also implies the important role of the tuition fee reduction policy for low-income households.

Figure 3. Tuition fees and education expense per student by age groups

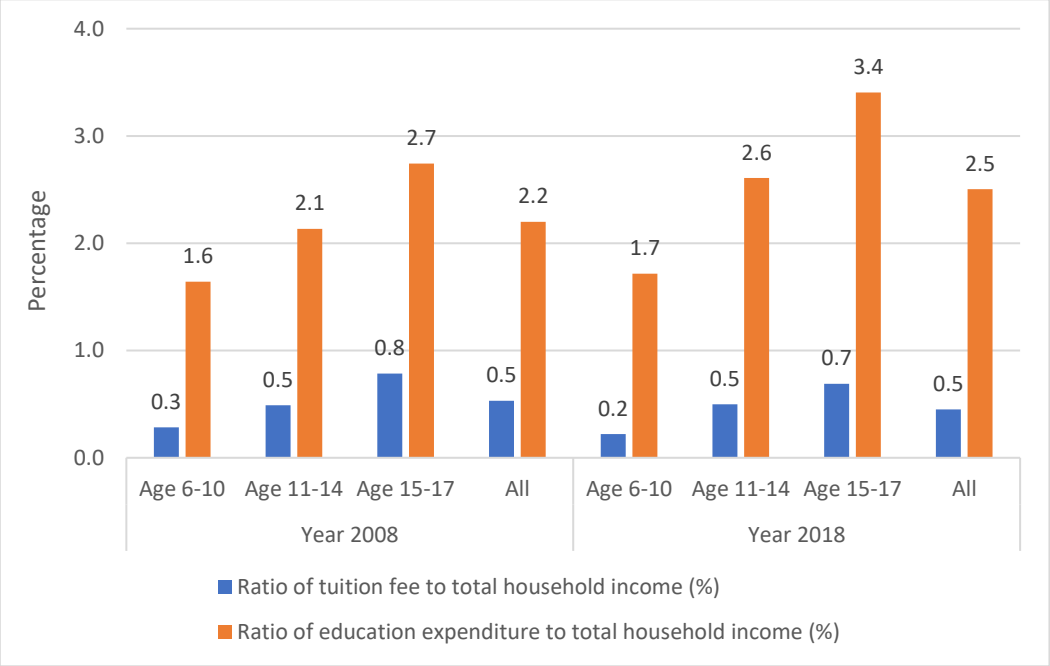


Note: Tuition fee and education expenditure in 2008 are adjusted to the 2018 price using CPI data.
Source: Authors' estimation from VHLSSs 2008 and 2018.

Figure 4 plots the share of tuition fee and total education expenditure as part of household income. Tuition fee account for 0.5 percent and 0.7 percent for children aged 11-14 and 15-17 in 2018 respectively which are similar to the estimates in 2008. Nevertheless, the share of total education expenditure increases over the period for both age groups. In 2018, on average, a typical household spends 2.6 percent and 3.4 percent of their income for education

in lower and upper secondary, respectively. These estimates are consistent with our earlier hypothesis that households are spending more and more on education.

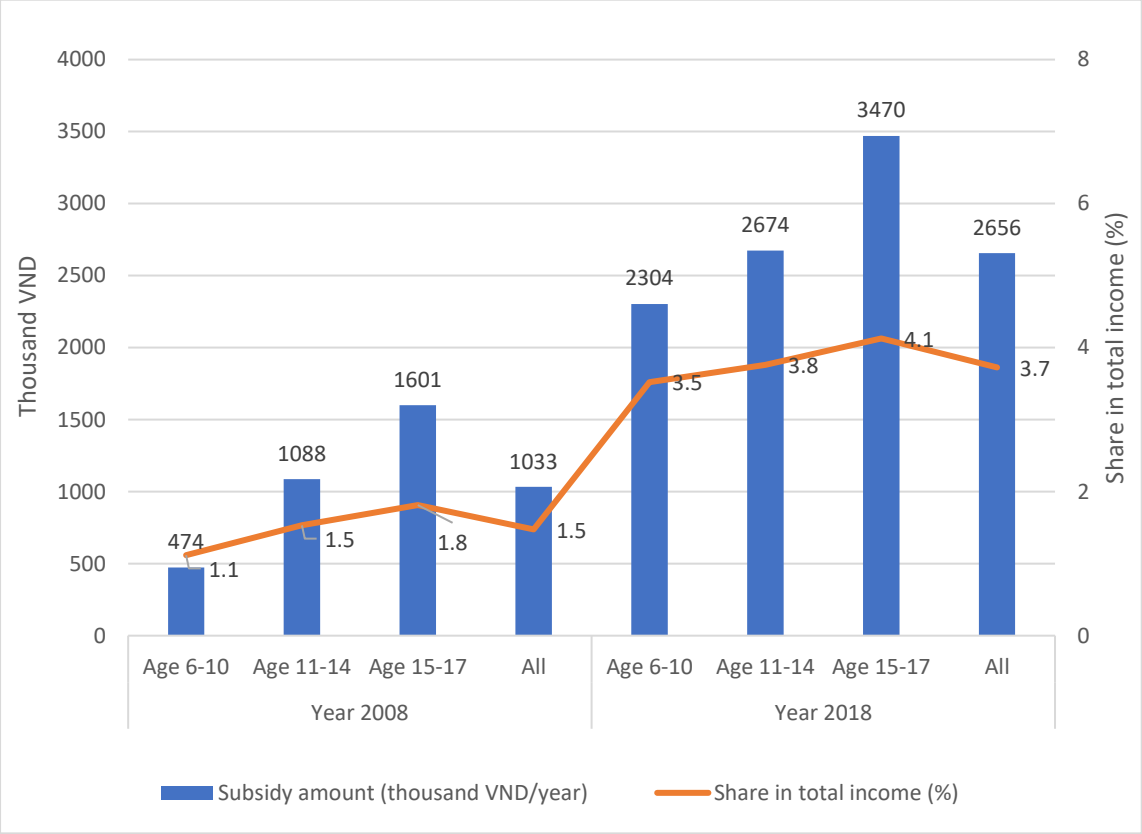
Figure 4. Education expenditure as a share in the total income



Source: Authors' estimation from VHLSSs in 2008 and 2018.

Amount of subsidy and its share as a percentage of total income for households that received the subsidy is plotted in Figure 5. Even after adjusted for inflation, both the values and its shares are much higher in 2018. On average, an upper secondary student receives VND 3,470 thousand per year (equivalent to 4.1 percent of the total household income) in the form of education subsidy in 2018 compared to VND 1,610 thousand (1.8 percent of total income) in 2008. Of students who receive education subsidy, the amount of subsidy is, on average, higher than education expense (see Figure 4).

Figure 5. Amount and share of education subsidy by age groups



Note: Education subsidy in 2008 are adjusted to the 2018 price using CPI data. This table is computed for students who received education subsidy.
Source: Authors' estimation from VHLSSs 2008 and 2018.

As mentioned earlier, the tuition fee exemption/reduction and education subsidy aim to support students from disadvantaged groups which are mainly the poor and ethnic minorities. Table 2 presents how tuition fee and education subsidy are allocated between ethnicity and poverty status groups. The proportion of ethnic minority students receiving tuition fee reduction dropped in 2018, meanwhile, more students in poor families receive tuition fee reduction for both lower secondary and upper secondary levels. This movement reflects the fact that the policy focuses more on poor households. The same trend is observed in the subsidy policy. Finally, the last panel of Table 2 shows significant increases in the percentages of subsidy over total household income. Interestingly, the amount of subsidy accounts for similar percentage of income for both ethnic minorities and poor households. In 2018, the value of the subsidy to poor household equals 4.8 percent of their income, increased 3.1 percentage point

compared to 2008. The estimates of the share of education subsidy in total income by other characteristics of students are presented in Table A.3 in Appendix.

Table 2. Tuition fee and education subsidy by ethnicity and poverty status

Indicators	Groups	2008			2018		
		Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)
Proportion of students receiving tuition fee reduction (%)	*Ethnicity*						
	Kinh	76.1	21.6	11.8	96.3	16.6	6.9
	Ethnic minorities	89.3	65.9	38.4	97.5	56.8	27.7
	Poverty						
	Non-poor	76.4	20.4	11.8	96.4	17.2	6.8
	Poor	86.5	65.1	36.9	97.7	80.5	48.0
Proportion of students receiving education subsidy (%)	*Ethnicity*						
	Kinh	5.2	4.0	3.1	3.5	3.7	2.7
	Ethnic minorities	44.4	35.3	21.4	39.3	34.7	20.0
	Poverty						
	Non-poor	7.5	6.3	4.9	4.7	5.0	3.5
	Poor	30.2	20.0	10.4	56.9	47.1	28.8
Education subsidy as a share in total household income (%)	*Ethnicity*						
	Kinh	0.8	1.2	1.8	0.9	1.0	1.6
	Ethnic minorities	1.3	1.8	1.8	4.4	4.9	5.5
	Poverty						
	Non-poor	0.9	1.5	1.9	1.9	2.4	3.3
	Poor	1.3	1.6	1.7	4.5	4.8	5.0

Source: Authors' estimation using data from VHLSSs in 2008 and 2018.

4. Methodology

In this study, we estimate the effect of education tuition fee reduction and subsidy policies on students' school enrollment. In impact evaluation terms, there are two treatments: one is the tuition fee reduction, and another is the provision of education subsidy. The outcome in this study is the school enrollment, which is expressed as a function of the treatments and characteristics of students and their households as follows:

$$Y_{i,j,t} = \alpha + \beta Reducation_{i,j,t-1} + \gamma Subsidy_{i,j,t-1} + X'_{i,j,t}\theta + H'_{j,t}\delta + \varepsilon_{i,j,t}, \quad (1)$$

where $Y_{i,j,t}$ is a dummy variable which equals 1 for student *i* in household *j* who enrolls in a school in year *t*, and equals 0 otherwise. $Reducation_{i,j,t-1}$ is a dummy variable representing education tuition fee reduction status in year *t-1* which takes the value of 1 if students received

tuition fee reduction and 0 otherwise. Similarly, $Subsidy_{i,j,t-1}$ is the dummy variable indicating whether students received education subsidy in year *t-1*. $X_{i,j,t}$ is a vector of characteristics of students, and $H_{j,t}$ is a vector of characteristics of their households. $\varepsilon_{i,j,t}$ denotes unobservable variables.

The control variables include age, gender of students, characteristics of household heads, per capita income, urban and regional dummies. These control variables have been widely used in the literature (see, e.g., Deolalikar, 1993; Rosati and Rossi, 2003; Dostie and Jayaraman, 2006; Connelly and Zheng, 2003; Orazem and King, 2007; Lincove, 2009). For impact evaluation of the education policies in this study, we also control for the poverty status in year *t-1* and ethnicity of students, since these two variables are the main criteria to select beneficiaries. The poverty status is classified by local authorities using the national poverty line. Information on poverty status of households is available in VHLSS data. Summary statistics of the control variables are presented in Table A.4 in Appendix.

It is worth noting that tuition fee reduction and subsidy only apply to students who are enrolling in school. Thus, if we define the treatment group as those who currently receive tuition fee reduction and subsidy, the rate of education enrollment for this treatment group is 100%. To avoid this reverse causality, we measure the treatment variable in year *t-1*, and the education enrollment in year *t*. In other words, we use lagged treatment variables instead of current treatment ones. In this study, we use panel data from VHLSSs 2006 and 2008, and panel data from VHLSSs 2016 and 2018 for impact evaluation. We regress the enrollment status in 2008 (and 2018) on the receipt of tuition fee reduction and the receipt of education subsidy in 2006 (and 2016).

We estimate the model (1) using linear probability and probit models. Linear probability models can be used for binary outcomes (Angrist and Pischke, 2008). In addition, we use the probit model which fits equation (1) using a cumulative probability function of the standard normal distribution:

$$Y_{i,j,t} = \Phi(\alpha + \beta Reducation_{i,j,t-1} + \gamma Subsidy_{i,j,t-1} + X'_{i,j,t}\theta + H'_{j,t}\delta), \qquad (2)$$

where Φ denotes the cumulative probability function of standard normal distribution. The interpretation of the coefficient in the probit model is not straightforward. Thus, we estimate the marginal effect of the tuition fee reduction and education subsidy variables on student's enrollment as follows:

$$ME(reduction)_{i,j,t} = \partial Y_{i,j,t}/\partial Reducation_{i,j,t-1}$$

$$= \beta\varphi\left(\alpha + \beta Reducation_{i,j,t-1} + \gamma Subsidy_{i,j,t-1} + X'_{i,j,t}\theta + H'_{j,t}\delta\right), \quad (3)$$

$$ME(subsidy)_{i,j,t} = \partial Y_{i,j,t}/\partial Subsidy_{i,j,t-1}$$

$$= \gamma\varphi(\alpha + \beta Reducation_{i,j,t-1} + \gamma Subsidy_{i,j,t-1} + X'_{i,j,t}\theta + H'_{j,t}\delta), \quad (4)$$

whether φ is the standard normal density function. The above marginal effect varies across students. Using Stata software, we estimate the marginal effect evaluated at the mean of explanatory variables.

It should be noted that although we use the lagged treatment variables to avoid the reverse causality, there is still a problem of endogenous problem. Children receiving and those not receiving tuition fee reduction and education subsidy can differ in unobserved characteristics, which affect both school enrollment and the receipt of tuition fee reduction and education subsidy. To the extent that we are seeking evidence of a causal effect of these education policies, we are acutely aware of the difficulties in estimating causal effects when lacking randomization and are therefore cautious in interpreting our findings. We expect that the estimation bias is small since we control for a large number of explanatory variables including the poverty status and ethnic minorities, which are the key eligibility criteria for tuition fee reduction and education subsidy.

Finally, since students in the same commune share similar unobservable characteristics such as quality of education, infrastructure, job opportunity for young children, the assumption that observations are independent and identical distributed is violated. To overcome the problem, we estimate standard errors clustered by communes so that our estimation results are robust to both heteroskedasticity and correlation within communes.

5. Empirical results

5.1 Impact of the tuition fee reduction and education subsidy on school enrollment

Table 3 presents the estimation of the impact of tuition fee reduction and education subsidy on school enrollment of students. We focus on the effect of children in secondary schools because almost all children attend primary schools in Vietnam and primary students are eligible for tuition fee exemption. We estimate both OLS and probit models. For each model, two sets of data are deployed: one set of panel data from VHLSSs 2006 and 2008 and another set of panel

data from VHLSSs 2016 and 2018. The results show similar estimates for the 2006-2008 and the 2016-2018 periods. The point estimate of the effect of education subsidy from the OLS model is higher than that of tuition fee reduction. However, the difference is not statistically significant. The estimations using the probit model show similar effects of tuition fee reduction and education subsidy programs. According to the probit model (column 2 of Table 3), students who received tuition fee reduction and education subsidy in 2006 have the probability to enroll in secondary school 5.3 and 6.0 percentage points higher in 2008, respectively. The magnitude of the effect in the 2016-2018 period is very similar to that in the 2006-2008 period. Although the school enrollment of children as well as household income has increased over time, tuition fee reduction and education subsidy have still played an important role in increasing education for children, especially for the poor and ethnic minorities.

Table 3: Regressions of education enrollment

Explanatory variables	VHLSSs 2006 and 2008		VHLSSs 2016 and 2018	
	OLS	Probit	OLS	Probit
	(1)	(2)	(3)	(4)
Receiving tuition fee reduction	0.0394**	0.0525***	0.0430*	0.0526**
	(0.0196)	(0.0184)	(0.0261)	(0.0238)
Receiving education subsidy	0.0929***	0.0600***	0.0872**	0.0502**
	(0.0341)	(0.0231)	(0.0391)	(0.0252)
Age	-0.0593***	-0.0594***	-0.0244***	-0.0213***
	(0.0057)	(0.0054)	(0.0065)	(0.0055)
Boy (boy=1; girl=0)	-0.0550***	-0.0474***	-0.0384**	-0.0339*
	(0.0163)	(0.0155)	(0.0190)	(0.0174)
Ethnic minorities (yes=1, no=0)	-0.0705*	-0.0719**	-0.0468	-0.0379
	(0.0361)	(0.0358)	(0.0391)	(0.0335)
Head is male	-0.0193	-0.0206	0.0114	0.0064
	(0.0210)	(0.0191)	(0.0277)	(0.0279)
Age of household head	-0.0001	-0.0002	0.0014	0.0013
	(0.0010)	(0.0009)	(0.0012)	(0.0010)
Head less than primary level	*Reference*			
Head completed primary level	0.0727**	0.0488**	0.1123***	0.0702***
	(0.0299)	(0.0203)	(0.0348)	(0.0210)
Head completed lower secondary level	0.1562***	0.1117***	0.1172***	0.0750***
	(0.0302)	(0.0205)	(0.0364)	(0.0213)
Head completed upper secondary level	0.2028***	0.1412***	0.1458***	0.0947***
	(0.0304)	(0.0160)	(0.0381)	(0.0199)
Head of completed post-secondary level	0.1835***	0.1072***	0.1541***	0.1067***
	(0.0463)	(0.0217)	(0.0419)	(0.0208)
Log of per capita income	0.0259*	0.0316**	0.0055	0.0081
	(0.0143)	(0.0152)	(0.0195)	(0.0176)
Household size	-0.0140**	-0.0136***	-0.0211**	-0.0187**
	(0.0058)	(0.0051)	(0.0098)	(0.0074)
Proportion of members under 15	0.0071	0.0274	-0.1342	-0.1538*
	(0.0566)	(0.0516)	(0.1211)	(0.0932)
Proportion of members above 65	0.2481***	0.2350**	0.1429**	0.1589***
	(0.0928)	(0.0971)	(0.0653)	(0.0602)
Poor households classified by authorities	-0.1558***	-0.1638***	-0.1329***	-0.1236***
	(0.0255)	(0.0280)	(0.0384)	(0.0386)

Explanatory variables	VHLSSs 2006 and 2008		VHLSSs 2016 and 2018	
	OLS	Probit	OLS	Probit
	(1)	(2)	(3)	(4)
Urban areas	0.0262	0.0254	0.0451**	0.0388*
	(0.0208)	(0.0204)	(0.0218)	(0.0209)
North West	*Reference*			
Red River Delta	0.0010	0.0006	0.0129	0.0240
	(0.0517)	(0.0435)	(0.0611)	(0.0481)
North East	-0.0064	0.0041	-0.0312	-0.0239
	(0.0476)	(0.0372)	(0.0587)	(0.0510)
North Central	0.0422	0.0387	-0.0026	-0.0047
	(0.0531)	(0.0382)	(0.0650)	(0.0531)
South Central Coast	0.0071	0.0100	-0.0236	-0.0190
	(0.0575)	(0.0479)	(0.0647)	(0.0566)
Central Highlands	0.0113	0.0090	-0.0597	-0.0488
	(0.0513)	(0.0399)	(0.0638)	(0.0601)
South East	-0.0255	-0.0290	-0.0502	-0.0493
	(0.0527)	(0.0484)	(0.0608)	(0.0589)
Mekong Delta River	-0.0808	-0.0806	-0.0586	-0.0563
	(0.0549)	(0.0555)	(0.0625)	(0.0592)
Constant	1.3187***		1.0054***	
	(0.1727)		(0.2456)	
Observations	2,593	2,593	1,632	1,632
R-squared	0.204	0.232	0.133	0.157

Notes: Robust standard errors in parentheses. The standard errors are corrected for sampling weight and cluster correlation.
The marginal effects are reported in probit models
***, **, and * indicate significance at 1%, 5%, and 10% levels.
Source: Authors' estimation using VHLSS data.

Table 3 also reveals several important findings on factors associated with children's school enrollment. The enrollment rate of girls is significantly higher than boys. According to the probit model, the enrollment probability of girls is 4.7 and 3.4 percentage points higher than boys for the 2006-2008 period and the 2016-2018 period, respectively. This finding is consistent with the descriptive finding in Table 1. With respect to the age of students, this variable has a negative and significant impact on the probability of school enrollment. For each additional year, the probability that students enroll in a school decrease by 6 percentage points, potentially reflecting the fact that the older students have more chance to quit schools and join the job market as they can earn higher wages. As seen in Table 1, students from ethnic minorities have a significantly lower rate of school enrollment than Kinh students. However, this difference is not statistically significant in the 2016-2018 period after the explanatory variables are controlled for (column 4 in Table 3). This implies that the gap in education between Kinh and ethnic minority students can be explained by the gap in the observed characteristics between Kinh and ethnic minority households.

Education of household heads, as expected, is positively related to children enrollment rate. The probit model in Table 3 shows that children in a household with the head completing post-secondary education have the probability of school enrollment around 10 percentage points higher than those with the head having less than primary education (the reference group). Household income is positively and significantly correlated with the school enrollment of children in the 2006-2008 period but not in the 2016-2018 period.

Our result is consistent with the 'quantity-quality' tradeoff theory that larger household sizes are correlated with lower probabilities that children attend school (e.g., Becker and Lewis, 1973; Becker and Tomes, 1976). For any additional household member, the probability to enroll school of children decreases by about 2 percentage points in the 2016-2018 period. Children in households with a higher proportion of older members are more likely to enroll school than other children.

Children from poor households have a lower school enrollment rate than other children, though observed variables are controlled for. According to the probit model, the probability of school enrollment of poor students is around 12 percentage points lower than that of non-poor students in the 2016-2018 period. The negative correlation between poverty status and school enrollment is also found for the 2006-2008 period.

Differences in the school enrollment rates among geographic regions are not statistically significant. However, urban children have a higher school enrollment rate than rural children in the 2016-2018 period with the difference of around 4 percentage points.

5.2 Heterogenous effect of the tuition fee reduction and education subsidy

An important issue is the heterogeneous effect of the tuition fee reduction and education subsidy. To examine this issue, we include interactions between these two treatment variables and several explanatory variables. We use OLS to estimate linear probability models. We do not use a probit or logit model since the magnitude of the interaction effect in nonlinear models does not equal the marginal effect of the interaction term (Ai and Norton, 2003). Table 4 reports the models with interactions using the panel data of VHLSSs 2016 and 2018. The results using data from the 2006 and 2008 VHLSSs are quite similar and presented in Table A.5 in Appendix. In this section, we use the results from Table 4 for interpretation.

Models 1 and 2 show that interactions between the two education treatments and age as well as the gender of students are not statistically significant at the conventional levels. This

indicates that the effect of the tuition fee reduction and education subsidy does not differ between boys and girls and between younger and older students.

In model 3, interactions between ethnic minorities and the tuition fee reduction and education subsidy are positive and statistically significant. It means that the effect of the tuition fee reduction and education subsidy on school enrollment is higher for ethnic minority children than Kinh ones. In model 4, the interaction between the receipt of a tuition fee reduction and the urban dummy is negative and statistically significant. It suggests the tuition fee reduction policy has a lower effect on urban students than rural ones. The interaction between log of per capita income and tuition fee reduction is also negative and significant (model 5). Children from high-income households are less affected than those from low-income households. Interactions between the receipt of education subsidy and the urban dummy as well as log of per capita income are not statistically significant. However, both the interactions have a negative sign. It is consistent with the finding that the education subsidy has a lower effect on children from urban and high-income households.

Table 4: OLS regressions of education enrollment with interactions

Explanatory variables	Dependent variable is the education enrollment (yes=1, no=0)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Receiving tuition fee reduction	-0.1568	0.0532*	-0.0039	0.0641**	0.9489***
	(0.1473)	(0.0291)	(0.0266)	(0.0295)	(0.2914)
Receiving education subsidy	0.3477*	0.0780*	-0.0306	0.0901**	0.7177
	(0.1943)	(0.0409)	(0.0559)	(0.0418)	(0.4816)
Receiving tuition fee reduction * Age	0.0180				
	(0.0133)				
Receiving education subsidy * Age	-0.0232				
	(0.0168)				
Receiving tuition fee reduction * Boy		-0.0205			
		(0.0403)			
Receiving education subsidy * Boy		0.0196			
		(0.0589)			
Receiving tuition fee reduction * Ethnic minorities			0.2575***		
			(0.0602)		
Receiving education subsidy * Ethnic minorities			0.1220*		
			(0.0726)		
Receiving tuition fee reduction * Urban dummy				-0.0911**	
				(0.0378)	
Receiving education subsidy * Urban dummy				-0.0752	
				(0.0866)	
Receiving tuition fee reduction * Log of per capita income					-0.0883***
					(0.0277)
Receiving education subsidy * Log of per capita income					-0.0662
					(0.0486)

Explanatory variables	Dependent variable is the education enrollment (yes=1, no=0)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Age	-0.0297***	-0.0244***	-0.0274***	-0.0250***	-0.0255***
	(0.0086)	(0.0065)	(0.0065)	(0.0066)	(0.0065)
Boy (boy=1; girl=0)	-0.0381**	-0.0317	-0.0397**	-0.0378**	-0.0381**
	(0.0188)	(0.0276)	(0.0186)	(0.0189)	(0.0189)
Ethnic minorities (yes=1, no=0)	-0.0485	-0.0462	-0.2194***	-0.0524	-0.0598
	(0.0392)	(0.0390)	(0.0595)	(0.0392)	(0.0396)
Log of per capita income	0.0056	0.0056	0.0053	0.0043	0.0507**
	(0.0197)	(0.0195)	(0.0184)	(0.0195)	(0.0239)
Urban areas	0.0451**	0.0457**	0.0464**	0.0835***	0.0383*
	(0.0218)	(0.0218)	(0.0218)	(0.0290)	(0.0221)
Other control variables	Yes	Yes	Yes	Yes	Yes
Constant	1.0792***	1.0003***	1.0778***	1.0175***	0.5514*
	(0.2717)	(0.2449)	(0.2313)	(0.2464)	(0.2847)
Observations	1,632	1,632	1,632	1,632	1,632
R-squared	0.135	0.133	0.155	0.136	0.143

Notes: Robust standard errors in parentheses. The standard errors are corrected for sampling weight and cluster correlation.
Other control variables are the same as the model in Table 2. These variables include characteristics of household heads, household composition, and regional dummies.
***, **, and * indicate significance at 1%, 5%, and 10% levels.
Source: authors' estimation using data from VHLSSs 2016 and 2018.

6. Conclusion

One of the objectives of the Millennium Development Goals in Vietnam is to achieve universal primary education and increase secondary education. To achieve this objective, the government of Vietnam has implemented several important policies to provide support for the school enrollment of children of poor households or children who are living in rural and mountainous areas. Those policies include, among others, tuition fee exemption and reduction and education subsidy. An evaluation of the effectiveness of the two policies is important and opportune to develop further policies to achieve the Goal 4 of the United Nation Sustainable Development Program by 2030, which consists of ensuring an inclusive education policy and promoting lifelong learning opportunities for all.

Our results show that both tuition fee reduction and education subsidy policies play an important role in encouraging children to enroll in a school, especially for those from less advantaged groups including poor and ethnic minority households. The receipt of tuition fee reduction and education subsidy helps students to increase the probability of school enrollment by around 5 percentage points.

Our findings provide two major implications for future policies. First, tuition fee reduction and education subsidy should target children at higher education levels as the opportunity cost to enroll school is much higher for older children than for younger children. Second, the effect of the tuition fee reduction and education subsidy on the school enrollment is higher in for rural and ethnic minority children. However, the enrollment rate of rural and ethnic minority children is still low, implying that other factors such as improving infrastructure, quality of the teachers, and job opportunity after education should be considered in the rural areas and areas with a high proportion of ethnic minorities.

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Appendix

Table A.1. Proportion of students receiving tuition fee exemption and reduction

Groups	2008			2018		
	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)
Gender						
Boys	79.2	28.3	14.1	96.5	24.2	10.2
Girls	77.2	28.7	17.6	96.7	25.4	11.7
Urban/rural						
Rural	83.6	33.5	17.8	97.1	28.8	13.4
Urban	61.1	13.0	9.2	95.2	14.6	4.5
Region						
Red River Delta	84.8	14.8	7.5	94.1	13.4	5.2
North East	79.1	38.6	23.8	97.9	35.2	19.0
North West	87.4	72.4	42.3	98.2	58.3	27.8
North Central	86.5	32.9	22.4	98.5	33.1	19.8
South Centre Coast	83.7	29.0	14.1	98.5	24.8	12.3
Central Highlands	90.7	48.6	27.7	95.4	34.4	11.2
South East	51.0	15.3	8.1	95.8	14.6	3.3
Mekong River Delta	78.1	29.7	11.4	97.1	21.0	9.1

Source: Authors' estimation using data from VHLSSs 2008 and 2018.

Table A.2. Proportion of students receiving education subsidy

Groups	2008			2018		
	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)
Gender						
Boys	11.7	8.1	5.6	10.4	9.3	5.4
Girls	11.7	9.5	5.9	11.8	10.8	6.8
Urban/rural						
Rural	13.7	10.5	6.4	14.0	12.4	7.7
Urban	5.3	3.7	3.7	3.8	4.1	1.9
Region						
Red River Delta	1.3	0.3	2.5	2.2	2.4	2.6
North East	18.3	14.2	12.8	21.0	19.0	11.6
North West	44.3	47.9	25.4	41.6	41.1	24.7
North Central	8.2	6.4	4.3	13.8	13.5	7.2
South Centre Coast	10.5	7.2	3.7	14.6	11.4	7.9
Central Highlands	33.4	22.3	10.7	15.8	12.2	5.0
South East	5.3	5.3	2.3	3.1	3.9	2.6
Mekong River Delta	10.0	8.6	4.1	6.8	5.9	4.2

Source: Authors' estimation using data from VHLSSs 2008 and 2018.

Table A.3. Share of education subsidy in total household income

Groups	2008			2018		
	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)	Age 6-10 (Primary)	Age 11-14 (Lower-secondary)	Age 15-17 (Upper-secondary)
Gender						
Boys	1.2	1.8	1.6	3.5	3.9	4.7
Girls	1.0	1.3	2.1	3.5	3.6	3.7
Urban/rural						
Rural	1.2	1.6	1.9	3.8	4.2	4.4
Urban	0.6	1.0	1.4	0.5	0.7	0.9
Region						
Red River Delta	0.8	0.1	4.0	0.7	0.9	1.1
North East	1.3	1.3	1.2	5.2	5.1	5.6
North West	1.5	2.1	2.0	5.9	6.6	6.8
North Central	1.6	2.0	2.6	3.0	3.2	4.3
South Centre Coast	1.2	2.3	2.5	2.9	4.0	3.9
Central Highlands	1.2	1.4	1.3	1.9	2.1	2.3
South East	0.3	0.9	2.3	0.5	0.9	1.8
Mekong River Delta	0.5	1.1	0.8	0.7	1.2	2.4

Source: authors' estimation using data from VHLSSs in 2008 and 2018.

Table A.4. Summary statistics of explanatory variables

Variables	Models using VHLSSs 2006 and 2008				Models using VHLSSs 2016 and 2018			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Age	14.240	1.946	11	17	13.901	1.974	11	17
Boy	0.495	0.500	0	1	0.493	0.500	0	1
Ethnic minority	0.150	0.357	0	1	0.208	0.406	0	1
Head is male	0.805	0.396	0	1	0.818	0.386	0	1
Age of household head	46.11	10.34	16.00	97.00	46.96	11.36	25	93
Head of completed under primary level	0.232	0.422	0	1	0.231	0.422	0	1
Head of completed primary level	0.274	0.446	0	1	0.298	0.457	0	1
Head of completed lower secondary level	0.286	0.452	0	1	0.255	0.436	0	1
Head of completed upper secondary level	0.178	0.383	0	1	0.152	0.359	0	1
Head of completed post-secondary level	0.030	0.172	0	1	0.065	0.246	0	1
Log of per capita income	8.900	0.684	6.89	12.49	10.250	0.717	7.69	13.44
Household size	4.991	1.549	2	14	4.775	1.436	2	12
Proportion of members under 15	0.277	0.187	0	0.75	0.313	0.183	0	0.83
Proportion of members above 65	0.044	0.098	0	0.67	0.060	0.120	0	0.75
Poor households	0.171	0.376	0	1	0.168	0.374	0	1
Urban dummy	0.216	0.412	0	1	0.256	0.436	0	1
Red River Delta	0.199	0.399	0	1	0.197	0.398	0	1
North East	0.110	0.313	0	1	0.117	0.322	0	1
North West	0.031	0.173	0	1	0.050	0.218	0	1
North Central	0.157	0.364	0	1	0.153	0.360	0	1
South Centre Coast	0.096	0.295	0	1	0.082	0.275	0	1
Central Highlands	0.078	0.268	0	1	0.084	0.277	0	1
South East	0.157	0.364	0	1	0.148	0.356	0	1
Mekong River Delta	0.171	0.377	0	1	0.169	0.375	0	1

Source: Authors' estimation using data from VHLSSs.

Table A.5: OLS regressions of education enrollment with interactions in 2006-2008

Explanatory variables	Dependent variable is the education enrollment (yes=1, no=0)				
	Model 1	Model 2	Model 3	Model 4	Model 5
Receiving tuition fee reduction	-0.2369**	0.0350	-0.0099	0.0507**	1.0465***
	(0.1107)	(0.0249)	(0.0192)	(0.0218)	(0.2103)
Receiving education subsidy	0.2411	0.1287***	0.0835*	0.0940**	-0.3951
	(0.1800)	(0.0370)	(0.0459)	(0.0371)	(0.3856)
Receiving tuition fee reduction * Age	0.0235**				
	(0.0098)				
Receiving education subsidy * Age	-0.0125				
	(0.0154)				
Receiving tuition fee reduction * Boy		0.0091			
		(0.0314)			
Receiving education subsidy * Boy		-0.0675			
		(0.0503)			
Receiving tuition fee reduction * Ethnic minorities			0.3474***		
			(0.0532)		
Receiving education subsidy * Ethnic minorities			-0.0948		
			(0.0657)		
Receiving tuition fee reduction * Urban dummy				-0.0607*	
				(0.0346)	
Receiving education subsidy * Urban dummy				-0.0133	
				(0.0923)	
Receiving tuition fee reduction * Log of per capita income					-0.1138***
					(0.0231)
Receiving education subsidy * Log of per capita income					0.0547
					(0.0439)
Age	-0.0687***	-0.0592***	-0.0603***	-0.0591***	-0.0601***
	(0.0074)	(0.0057)	(0.0057)	(0.0057)	(0.0057)
Boy (boy=1; girl=0)	-0.0542***	-0.0533**	-0.0543***	-0.0545***	-0.0511***
	(0.0163)	(0.0217)	(0.0159)	(0.0162)	(0.0161)
Ethnic minorities (yes=1, no=0)	-0.0754**	-0.0707*	-0.2706***	-0.0731**	-0.0768**
	(0.0362)	(0.0361)	(0.0503)	(0.0359)	(0.0353)
Log of per capita income	0.0269*	0.0258*	0.0238*	0.0259*	0.0618***
	(0.0143)	(0.0143)	(0.0142)	(0.0143)	(0.0163)
Urban areas	0.0258	0.0261	0.0231	0.0442*	0.0242
	(0.0208)	(0.0208)	(0.0205)	(0.0246)	(0.0206)
Other control variables	Yes	Yes	Yes	Yes	Yes
Constant	1.4306***	1.3172***	1.3537***	1.3095***	1.0103***
	(0.1869)	(0.1743)	(0.1715)	(0.1728)	(0.1896)
Observations	2,593	2,593	2,593	2,593	2,593
R-squared	0.206	0.204	0.221	0.204	0.211

Notes: Robust standard errors in parentheses. The standard errors are corrected for sampling weight and cluster correlation.
Other control variables are the same as the model in Table 2. These variables include characteristics of household heads, household composition, and regional dummies.
***, **, and * indicate significance at 1%, 5%, and 10% levels.

Source: Authors' estimation using data from VHLSSs 2006 and 2008.