INTERNATIONAL MONETARY FUND

Intergenerational Transmission of Education in a Developing Country

Evidence from A Mass Education Program in Vietnam

Trung Hoang and Ha Nguyen

WP/22/245

2022
DEC

WORKING PAPER

 WP/22/245

IMF Working Paper
Institute of Capacity Development

Intergenerational Transmission of Education in a Developing Country: Evidence from A Mass Education Program in Vietnam

Prepared by Trung Hoang and Ha Nguyen*

Authorized for distribution by Mercedes Garcia-Escribano
December 2022

ABSTRACT: We study the long-run and multi-generational effects of a mass education program in Vietnam during the First Indochina War (1946-1954). Difference-in-difference estimations indicate that the children of mothers exposed to the education program had an average of 0.9 more years of education. We argue that the impact is via mother's education. An additional year of maternal education increases children's education by up to 0.65 years, a stronger effect than those found in the existing literature. Better household lifestyles and a stronger focus on education are possible transmission pathways

JEL Classification Numbers:	H0, I2, O1, P3
Keywords:	mass education; human capital transmission; mother education; Vietnam

Author's E-Mail Address:	Ha Nguyen: hnguyen7@imf.org; Trung Hoang: hoangxuantrung3012@gmail.com

* Trung Hoang is at Vietnam Academy of Social Sciences and Ha Nguyen is at the International Monetary Fund. The authors are grateful to Hai-Anh Dang for earlier contributions. We would like to thank Lahcen Achy, Andrew Berg, Prashant Bharadwaj, Jose Cuesta, Eric Edmonds, Ousmane Dione, Brigham Frandsen, Tomoki Fujii, Mercedes Garcia-Escribano, Gregg Huff, Keiko Inoue, Kevin Lang, Seonghoon Kim, Michal Kolesar, Aart Kraay, Arthur Lewbel, Norman Loayza, Doug Miller, Viet-Cuong Nguyen, Ngoc Anh Nguyen, Nina Pavcnik, Franco Peracchi, Amber Peterman, Lant Prichett, Martin Rama, Biju Rao, Luis Serven, Damien de Walque, Ha Vu, and participants at a meeting of the Society of Government Economists (Washington, DC), seminars at World Bank's Malaysia Hub (Kuala Lumpur), Singapore Management University, UNICEF Office of Research (Florence), Vietnam Academy of Social Sciences (Hanoi), the World Bank and Vietnam Development Reading Group for helpful comments on earlier drafts.

.

WORKING PAPERS

Intergenerational Transmission of Education in a Developing Country

Evidence from A Mass Education Program in Vietnam

Prepared by Trung Hoang and Ha Nguyen[1]

[1] Trung Hoang is at Vietnam Academy of Social Sciences and Ha Nguyen is at the International Monetary Fund. The authors are grateful to Hai-Anh Dang for earlier contributions. We would like to thank Lahcen Achy, Andrew Berg, Prashant Bharadwaj, Jose Cuesta, Eric Edmonds, Ousmane Dione, Brigham Frandsen, Tomoki Fujii, Mercedes Garcia-Escribano, Gregg Huff, Keiko Inoue, Kevin Lang, Seonghoon Kim, Michal Kolesar, Aart Kraay, Arthur Lewbel, Norman Loayza, Doug Miller, Viet-Cuong Nguyen, Ngoc Anh Nguyen, Nina Pavcnik, Franco Peracchi, Amber Peterman, Lant Prichett, Martin Rama, Biju Rao, Luis Serven, Damien de Walque, Ha Vu, and participants at a meeting of the Society of Government Economists (Washington, DC), seminars at World Bank's Malaysia Hub (Kuala Lumpur), Singapore Management University, UNICEF Office of Research (Florence), Vietnam Academy of Social Sciences (Hanoi), the World Bank and Vietnam Development Reading Group for helpful comments on earlier drafts.

Contents

I. Introduction

"All that I am, or hope to be, I owe to my angel mother."

Abraham Lincoln

"If your plan is for ten years, plant tree. If your plan is for one hundred years, educate children."

Guan Zhong (管仲) (720 – 645 BCE), China

Children of higher educated parents are frequently observed to obtain higher education attainment than those of less-educated parents. However, it is generally not clear to what extent this positive intergenerational correlation is attributable to children truly benefiting from parental education and to what extent this is driven by other underlying factors, such as genetics, that also pass from one generation to another.

This study examines the causal effects of mother education on child education in Vietnam. We exploit a natural experiment of a bimodal education system in Vietnam during the First Indochina (1946-1954). During the war, school-age girls who lived in the Democratic Republic of Vietnam (DRV) areas were exposed to a Mass Education (ME) program run by the DRV. This program helped them obtain significantly higher education attainment than those who lived in French-controlled areas and did not have access to such a program (see our previous work, Dang et al., 2021, for detail). These exposed girls became mothers at the Vietnam Living Standard Survey (VLSS) in 1998. For brevity, we refer to them as ME-mothers. In this paper, we find that thanks to the ME-mothers' better education obtained by their fortunate exposure to the Mass Education program, their adult children, at the interviews in 1998, were significantly more educated than those of the unexposed mothers. Dang et al. (2021) report that the effects of the ME program on school-age boys were muted due to the higher base of education for boys. Therefore, we only focus on the intergenerational transmissions of education from ME-mothers to their children.

We investigate potential mechanisms of transmissions. At the VLSS survey in 1998, husbands of ME-mothers had a healthier lifestyle and better education. ME-mothers' households lived in better conditions and had more durable assets, although they did not have significantly higher incomes. They spent significantly more on education and less on unhealthy items. Interestingly, both ME-mothers and their husbands' income and other labor market outcomes were not significantly improved than those of

unexposed mothers. The findings suggest that family factors, including a better and healthier lifestyle and a stronger focus on education, are transmission pathways to children's education.

The literature on the causal intergenerational spillover of education is relatively new. Moreover, the results of these studies vary markedly, ranging from marginally negative to positive effects of parental education on child education (see Holmlund et al., 2011 for a systematic review)2. The literature typically relies on three approaches to identify the causal impact of parental education on child education. The most popular approach is instrumenting parent education by exogenous education policy changes or differential schooling costs3. Our paper falls into this category. The other two approaches use identical twins4 and adoptees5.

Our research contributes to the literature in three important ways. The first contribution is the finding of a strong effect of maternal education on child education. On average, one additional year of maternal education boosts child education by up to 0.65 years. This finding contributes to the still nascent and unsettled literature on the causal intergenerational transmission of education, which focuses on advanced countries and typically finds statistically insignificant, or statistically significant but small, effects (see footnote 2).

The second contribution is the developing country context. The literature traditionally focuses on developed countries. Our research is one of the recent few that study intergenerational education spillover in a developing country6. Why could findings in a developing country be different? There are many reasons. First, the effect of schooling policy changes on parental education (i.e., the first-stage impact) can be large. As education attainment was and still is lower in many developing countries than in developed countries, policy changes in developing countries could lift children's education more dramatically than in developed countries. Our study finds that the ME program raised female education attainment by 1.5 years, or 48 percent on average, a very large jump. The second reason is labor

[2] For example, Behrman and Rosenzweig (2002) find a (marginally) negative effect of mother education and a positive effect of father education on child education. Similarly, Plug (2004) sees no correlation between mother and child education. Black *et al.* (2005) use school reforms in Norway and find mother has significant causal relationship on son education, but not on daughter education. Suhonen and Karhunen (2019) use expanding university access in Finland and find spillover effects from parental education to child's education.

[3] See for example Black *et al.* (2005); Oreopoulos *et al.* (2006); Maurin and McNally (2008); Carneiro *et al.* (2013); Suhonen and Karhunen (2019).

[4] See Behrman and Rosenzweig (2002) and Behrman *et al.* (2020). This approach assumes that parents who are identical twins have the same genetic endowment. Hence the difference in their children's education is arguably from parental education and other household conditions.

[5]See Plug (2004) and Bjoerklund *et al.* (2006). This approach rests on the argument that adoptees do not inherit genetic endowment from adoptive parents. Hence the adopted child education is caused by parental education and other household conditions.

[6] Few recent studies include Akresh *et al.* (forthcoming), Mazumder et al. (forthcoming), Aguero and Ramachandran (2020), Cui *et al.* (2019) and Behrman *et al.* (2020) with mixed results. Akresh *et al.* (forthcoming) and Mazumder et al. (forthcoming) use a school construction program in Indonesia to show that education benefits are transmitted to the next generation. Aguero and Ramachandran (2020) find very small intergenerational educational spillovers in Zimbabwe. Cui *et al.* (2019) exploit geographical variations in the enforcement of China's compulsory schooling laws to find that mother education increases adolescents' academic and health outcomes. However, Behrman *et al.* (2020) use twin data and find no effect from parental education on child education in urban China.

markets in developing countries are more limited, restricting good labor market opportunities for more educated individuals. In Vietnam, labor allocation was still heavily centrally planned before the 1990s (Irvin, 1995). This may explain why there is little evidence of improved labor market outcomes for more educated ME-mothers and their husbands in our study. The dampened labor market outcomes would increase the time educated mothers spend at home than they would in a more developed country, as discussed by Behrman and Rosenzweig (2002), benefiting their children's education more. In other words, a more substantial presence of women at home and in children's education in developing countries could boost the transmission from mother education to child education. The magnitude of the transmission found in our study, i.e., one additional year of maternal education causing up to 0.65 additional years of child education, is higher than the typical magnitude in the literature for advanced countries[7]. Finally, given tighter education budgets in many developing countries, the findings of our study could help guide policy priorities. If educated parents could create an environment in which children can learn and prosper, efforts to increase schooling of one generation may be worthwhile as it will have long-term consequences through intergenerational effects. However, if parental education has a limited impact on the next generation, governments in developing countries should shift their scarce resources to more direct interventions, such as early childhood programs. Our finding supports the argument for expanding schooling in a developing country setting.

Our third contribution is that we provide suggestive evidence about the transmission channels. The richness of VLSS in 1998 allows us to explore a whole host of factors, ranging from father education and lifestyle, household living conditions, and father's and mother's labor market outcomes. The detailed analyses help shed light on the mechanisms of transmissions from maternal education to child education. We discover that non-income factors might have played an important part in transmitting mother education to children in Vietnam. Families of ME-mothers had a better lifestyle and spent significantly more financial resources on education. This finding is consistent with the notion that family environment and parental inputs are important factors in children's education (see Borjas, 1992; Angelucci et al., 2010; Philippies and Rossi, 2021).

II. Country Context and "Mass Education" Program

This section summarizes the context of the Mass Education program. France colonized Vietnam for more than 50 years, from 1887 until 1945. During this colonial time, education was a privilege exclusively offered to local French colons and a tiny group of local elites. When Vietnam won

[7] Besides those that find insignificant effects, Black et al. (2005) report 0.2 to 0.25 for Norway; Suhonen and Karhunen (2019) report 0.54 for Finland.

independence in 1945, the illiteracy rate was estimated between 80 percent (Le, 1955) and 95 percent (Pham, 1995). On September 2, 1945, Vietnam was declared independent. As soon as the new government of Vietnam (known as the Democratic Republic of Vietnam, or DRV, in this period) was formed, a mass education program called "Bình dân học vụ" or "Mass Education" (ME) was launched. Because of the state's budget shortages, the movement was supported mainly by the population. Teachers did not receive salaries, and each province had to supply its teachers. ME classes were set up everywhere, for example, in a private home, at a temple, or in other public places. Nevertheless, the highly inexpensive movement quickly spread across the country and produced fast results, especially in North and Central Vietnam. The DRV's Department of Education reported that more than 2.5 million people (including adults and children) could read and write by 1946 in North and Central Vietnam (Marr, 1984).

The ME program was freely available and mandatory to everyone, including children of schooling age (Decree 20/SL8). This feature is especially beneficial to school-aged girls because their older, less unfortunate cohorts born and grew up under the colonial regime could not or were not allowed to go to schools. This characteristic was influenced by Confucian values instilled in the traditional Vietnamese society, where formal education for girls was considered unimportant. Other skills such as household management were highlighted instead. As a result, female education during the colonial period was minimal. Some researchers estimate the female illiteracy rate to be almost 100 percent before 1945 (Nguyen, 1996).

In 1946, after WWII, the French army returned to Vietnam, attempting to reoccupy the country and reestablish its colony. They faced stiff resistance from a DRV-led local army, who fought vigorously for their country's newly established independence. This period is commonly referred to as the First Indochina War, which began in September 1946 and ended in May 1954. During this period, Vietnam was effectively divided into French-controlled and DRV-controlled areas (see Appendix Figure A1 for the map[9]). In their controlled areas in the North, the DRV continued to promote the ME movement. The DRV also controlled three other provinces in South Vietnam during the war. Because of many reasons, the ME program was not implemented there. In addition, after 1954, the South was under a different regime with a different educational system, making the comparison difficult. Hence, this study focuses on North Vietnam’s provinces only.

During the First Indochina War, school-aged children who lived in DRV areas in the North continued to have mandatory and undisrupted education. The French, in their areas, also implemented some measures to promote education. Yet, they were far from the spirit of universalizing education as with the ME program. The ME program was especially effective in lifting female education, given their low base. As the First Indochina War ended in May 1954, entire North Vietnam was under the DRV’s

[8] Degree 20/SL, issued on September 8, 1945 (six days after independence), requires mandatory and free attendance in illiteracy-eradicating classes for all (men and women). Within one year, everyone would have to be literate, or would be fined. All expenses of the classes would be borne by local communes and provinces.

[9] Three provinces in the north (Nghe An, Thanh Hoa and Ha Tinh) and three provinces in the south (Quang Ngai, Binh Dinh and Phu Yen) were under complete DRV’s control throughout the First Indochina War. Some provinces in the mountainous north (such as Ha Giang, Cao Bang, Tuyen Quang, Bac Can) fell to DRV’s control early in the War.

control. The unexposed mothers who lived in the French control areas during the war could then enroll in the ME program, albeit at an older age. This late enrollment created life-long disadvantages for the unexposed mothers. The Indochina War offers a unique natural experiment for us to study the intergenerational impacts of education.

As Dang et al. (2021) argue, the higher education attainment obtained by female cohorts in the DRV-controlled provinces in the North is plausibly exogenous. It is driven by the pure luck of growing up in the DRV-controlled areas in their school age. We will return to discuss this exogeneity in detail.

III. Empirical Models and Data

III.1. Empirical Models

First-stage regressions: First, we measure the impact of ME exposure on a mother's education. This is the focus of our earlier work (Dang et al., 2021). We use two complementary measures of exposure to the ME program. The first measure of exposure is if a mother lived in Northern provinces under complete DRV-control during the First Indochina War (1946-1954) in her prime schooling age. The econometric specification takes the form:

$$S_M = \alpha + \beta(ME_M * L_M) + \gamma X_M + bp_M + \tau_M + \varepsilon \qquad (1)$$

where S_M is a mother's education; L_M is a dummy variable that equals 1 if a mother was born between 1940 and 1945 (the treatment group) and equals 0 if she was born either before the war in 1924-1935 (the first control group) or after the war in 1950-1961 (the second control group)10. The mother in the treatment group would have been of primary school age during the war. We remove from the estimation sample the cohorts born during 1936-1939 or 1946-1949, who were partially exposed to increased school access (i.e., the "contaminated" treatment cohorts). ME_M is a dummy variable that takes the value of 1 if the mother was born in the three provinces in the North (Nghe An, Thanh Hoa, Ha Tinh) that were under complete DRV's control during the War, and 0 if the mother was born in other Northern provinces. The control variables X_M include dummy variables indicating the mother's ethnicity and religion (i.e., whether the mother is Buddhist, Christian, or has other religious beliefs). Mother's birth province fixed-effects (bp_M) and mother cohort fixed-effects (τ_M) are included.

The use of the first exposure measure implies one assumption: there was no ME program in mixed-occupied provinces. A few mountainous Northern provinces fell to the DRV's control in the middle of the War (see Appendix Figure A1). They are closer to communist China, a key supporter of the DRV government. The first exposure puts mixed-occupied provinces in the "control" provinces. Unfortunately, we do not have exact information regarding the ME programs in these provinces. To the

[10] The second control group is also chosen because after the war, all girls have identical access to education in North Vietnam. As shown in Figure 1, after the war, education outcomes of the treatment group and the control group return to a parallel trend.

extent that the ME program might have been executed, either fully or partially, in these mixed-occupied provinces, the first exposure measure would underestimate the impact of the ME program.

The second exposure measure is the number of years a mother was exposed to the ME program. The specification is as follows:

$$S_M = \alpha + \beta Expose_M + \gamma X_M + bp_M + \tau_M + \varepsilon, \quad (2)$$

where $Expose_M$ is the number of years a mother was exposed to the ME program when she was between 6 and 11 years old, the crucial years of her primary education. This exposure varies between 0 and 5. In other words, we explicitly account for the differential length of exposure to the ME program that school-age girls residing in DRV-controlled areas might have benefited from increased school access. This exposure varies depending on their birth years, and the year a province fell to DRV control during the war. Appendix Table A2 illustrates this exposure, where a mother born in 1939 or later in DRV-controlled areas would have had full five years of exposure11. The number of years of exposure is similarly adjusted for children born in French-controlled provinces or provinces that DRV gained control from around the middle of the war. We restrict the number of years of exposure to five because children would more likely drop out of school if they miss the crucial years of schooling at the primary school level.12 Our second exposure thus includes all the "contaminated" treatment cohorts in the estimation sample. The estimation sample includes all mother's birth cohorts from 1924 to 1961. Other control variables are similarly defined as in equation (1).

Note that the second exposure carries an implicit assumption: in the provinces that fell to the DRV's control in the middle of the War, ME programs restarted in the first year of the DRV occupation. However, given wartime, the ME programs might have been delayed or never carried out systematically in those provinces. If so, the second measure would imply systematic measurement errors and underestimate the ME program's effect, as the first instrument does (see the discussion on the previous page)13.

We exclude from our estimations mothers who had migrated when they were younger than 15 years old in both regressions. This exclusion is to consider only mothers who stayed in the provinces they were born at least until they were 15 years old. Robust standard errors are adjusted for two-way clustering (mother's birth province and household's current commune).

[11] If a mother was born in 1939, she would be 6 in 1945 and could go to first grade in a DRV-controlled area at the right age and had uninterrupted primary education. Hence, her exposure to primary education is 5 years. If a mother was born in 1938, she would be 7 in 1945 and could go to first grade a year late in a DRV-controlled are. Hence, her exposure is 4 years.

[12] Various education studies suggest that late school enrollment is observed to lead to more school dropouts (Wils, 2004; Chen, 2015; No *et al.*, 2016).

[13] We will provide a robustness check where these partially occupied provinces are removed from the estimation. The results remain robust and quantitatively similar, probably because there are few people from these mountainous provinces in the sample. See section IV.1 for detail.

Reduced-form regressions: Next, we examine if a mother's exposure to the ME program would affect her children's education. We follow the same setup above, using the two exposure measures:

$$\bar{Y_C} = \alpha + \beta(ME_M * L_M) + \gamma X_M + bp_M + \tau_M + \varepsilon \quad (3)$$

$$\bar{Y_C} = \alpha + \beta Expose_M + \gamma X_M + bp_M + \tau_M + \varepsilon \quad (4)$$

Equations (3) and (4) show the reduced-form regressions, where the dependent variable $\bar{Y_C}$ represents her children's average education. This variable is the main educational outcome. Two other outcomes are the education of her most educated child and the percentage of her children completing high school. Robust standard errors are also adjusted for two-way clustering (mother's birth province and household's current commune). X_M, bp_M, τ_M are similarly defined as above.

Instrumental Variable (IV) regressions: Finally, we produce IV estimates that capture the effect of a mother's education on her children's education. Maternal education is instrumented by exposure to the ME program.

$$\bar{Y_C} = \theta + \delta\widehat{S_M} + \eta X_M + bp_M + \tau_M + \mu \quad (5)$$

where the dependent variable $\bar{Y_C}$ represents her children's average education, the education of her most educated child, and the percentage of her children completing high school. $\widehat{S_M}$ represents years of maternal education explained by exposure to the ME program, as shown in equations (1) and (2). Robust standard errors are adjusted for two-way clustering (mother's birth province and household's current commune). For the IV instrument to be valid, the exclusion restriction needs to hold, which states that the only way the ME affects child education is through their mother's education. The main challenge regarding the identification strategy is to what extent the impact on the second generation's education is via mother's education. In general, the effects on the second generation's education could work via a mother's health, her economic and political connections, or other programs that the DRV also implemented during the war. In section IV.3, we address the challenge in detail.

III.2 Data

The first type of data is occupation during the First Indochina War. Since each province in Vietnam produced a book on the history of its local communist party and its army, our previous work, Dang et al. (2021), manually compiles data from these books to construct the years the DRV's started to occupy a province. From the occupation data, we build the exposure measures to the ME program, namely whether a school-age child was exposed to it and the duration.

Possible issues might arise with the occupation data. During the war, the territorial divide was not likely as clear-cut. The occupation zones might not have been as exact and limited by the current provincial line. "Gray" zones might have existed, and local people could have been under partial control from both sides. In French control areas, guerilla warfare might have taken place.

Nevertheless, what is needed for our identification strategy is that the ME campaign was relatively more prevalent in treatment provinces than in control provinces.

The primary data set is the 1997-1998 round of the Vietnam Living Standards Survey (VLSS), conducted by the Vietnam General Statistic. The 1997-98 VLSS is nationally representative and collects data on about 6,000 households across the country. The survey covers rich data such as household members' demographics, education, health, labor markets, household consumption, income, and assets. It also collects information on children of household members living regardless if they lived inside and outside the household at the survey time. A unique feature of this round of VLSS is to provide information on respondents' date of birth, place of birth, whether they have moved from their birthplace or not, and the age at migration14. Another advantage of the dataset is that adult children in 1998 can be linked to their parents, even when they do not live with their parents. Appendix Table A1 provides summary statistics for the individuals in our sample.

The key variable, namely “years of education,” is calculated based on the highest grade that an individual completed. For instance, if an individual completed the fifth grade, the years of education would be 5. If an individual attended junior college, university, or post-graduate school, the years of education would be the sum of the highest school grade (which is 12) and the number of years the individual reportedly spent at junior college, university, or post-graduate school.

IV. Multi-Generational Effects of the ME Program

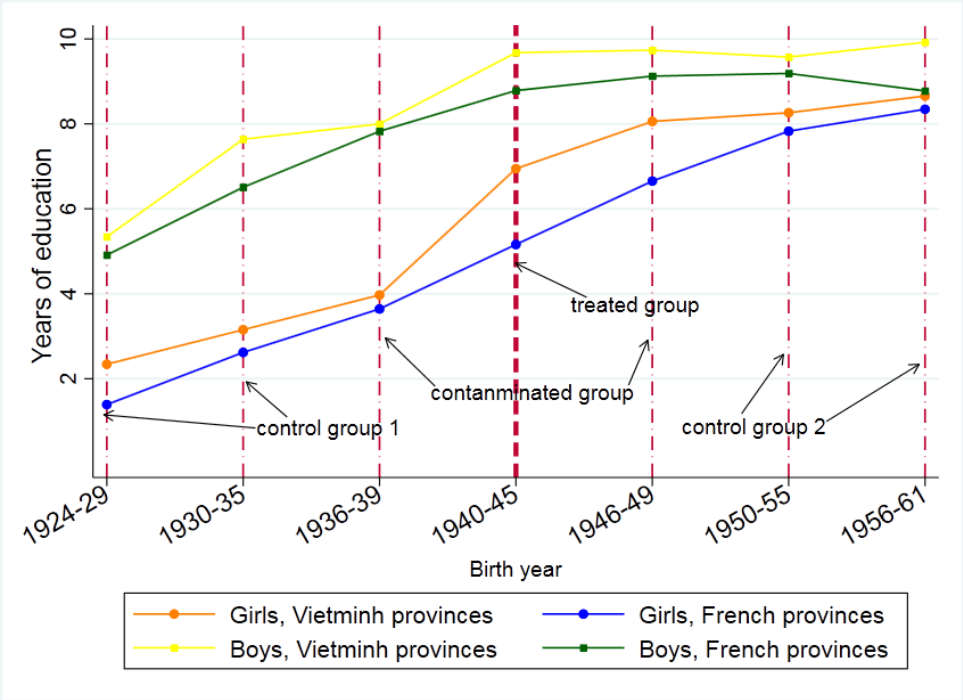
IV.1 ME Exposure and Mother's Education (First-Stage)

We begin by graphically illustrating how the education of a mother born in DRV-controlled provinces differs from that of a mother born in French-controlled provinces before and after the ME program. Figure 1 presents years of maternal education with different control and treatment cohorts. The control cohorts include mothers born in 1924-1935 and 1950-1961. The treatment cohorts contain mothers who were born between 1940 and 1945. Years of maternal education in DRV-controlled areas and French-controlled areas move parallel during the first control period 1924-1935. However, the education gap between DRV-controlled and French-controlled provinces was much larger in the treatment cohort of 1940-1945. Years of maternal education in the DRV-controlled and the French-controlled provinces moved parallel again in the second control period 1950-1961. The visual suggests that mothers exposed to the ME program achieved more educational attainment than those who were not exposed to the ME program.

[14] After 1997-1998 VHLSS, the next VHLSS that asks for respondents’ place of birth and whether they have moved from their birthplace is 2014 VHLSS. However, in 2014, many people born before the first Indochina War, including ME-mothers, have passed away. This results in a much smaller sample size, rendering 2014 VHLSS not useful for the purpose of our analysis.

For completeness, we also show the lines for all male birth cohorts. The difference between those born in DRV-occupied provinces and those born in French-occupied provinces appears negligible. Regression results not shown here corroborate the visuals: educational outcomes of school-age boys in DRV-occupied provinces and those in French-occupied provinces are small and not statistically significantly different. Note that there were already stronger priorities for boy education before the war. The male enrollment rate was far higher than the female enrollment rate in the prewar period, making it harder for the ME program to improve the former than the latter. Available data from Nguyen (2013) and General Statistics Office (2004) show that the average prewar (1932–44) female enrollment rate was 4%, which is five times less than the corresponding male enrollment rate of 22%.

Figure 1: Years of Education for Girls and Boys Born in DRV-occupied Provinces versus Those Born in French-occupied Provinces



Notes: treated period is 1940-45, the control group period is 1924-1935 and 1950-1961, and the contaminated period is 1936-39 and 1946-49.

We now turn to the formal analysis of the impact of the ME program on female education, which is the focus of our previous work, Dang et al. (2021). The first-stage regressions are presented in Table 1 for the first (Panel A) and second (Panel B) exposure measures. The first measure of exposure is if a mother lived in provinces under complete DRV-control during the First Indochina War (1946-1954) in her prime school age. The second measure is the number of years a mother is exposed to the ME program. Section III.1 provides more detail.

Outcome variables include reading literacy, math competency, primary education completion, secondary education completion, and years of education. The treatment effects are positive and statistically significant for different indicators of female educational attainment. Specifically, ME-

mothers were between 19 to 26 percentage points higher in the probability of achieving reading, math literacy, and completing primary education or secondary education (Columns 1 to 4, Panel A) compared to their peers in French-controlled areas. ME-mothers also accomplished 1.5 more years of schooling than those residing in French-controlled areas (Column 5, Panel A), a sizable increase of 48 percent from the average 3.1 years of education in the pre-treatment period. Columns 1 to 4 of Panel B indicate that an additional year of exposure to the ME program leads to a 4 to 9 percent higher probability of reading and math competency and completing primary or secondary education. Column 5 of Panel B shows an additional year of exposure to ME primary education raises education by 0.25 years. Note that all estimation models exclude all girls who had migrated when they were younger than 15. This exclusion ensures we know the girls studied in their birthplaces, as we do not have information about the provinces they first migrated to.

Table 1. ME Exposure and Mother's Education

	Reading Literacy	Math competency	Primary education completion or above	Secondary education completion or above	Years of education
	(1)	(2)	(3)	(4)	(5)
Panel A: First Exposure Measure					
Treated	0.204***	0.192**	0.263***	0.187**	1.474***
	(0.073)	(0.089)	(0.065)	(0.084)	(0.297)
N	1622	1622	1618	1618	1619
adj. R^2	0.460	0.460	0.521	0.395	0.535
Panel B: Second Exposure Measure					
Years of exposure to ME	0.028	0.021	0.043**	0.023	0.253**
	(0.017)	(0.019)	(0.016)	(0.014)	(0.094)
N	1979	1979	1975	1975	1976
adj. R^2	0.414	0.425	0.481	0.371	0.499

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, birth year fixed effects and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

As section III.1 discusses, both of the exposure measures could underestimate the effects of the ME program, because of the assumptions made about the ME-program at the mixed-occupied provinces in the mountainous North. As a robustness check, we remove the mixed-occupied provinces and report the results in Panel A3.1 of Appendix Table A3. The sample size drops but only slightly because the mixed-occupied provinces are in the mountainous North and have fewer households in the VLSS survey. Panel A3.1 shows that the findings remain robust with very quantitatively similar estimates. This robustness check provides some confidence about the two measures.

Is the differential education attainment due to the ME program? The short answer is yes. There could indeed be several potential contamination channels, such as differences in social-economic conditions of the DRV and the French-control areas and selection bias (such as systematic migration out of the country of children under French-control areas). Dang et al. (2021) address them in detail and provide support for the educational impact of the ME program. Most importantly, the educational outcomes of school-aged girls in DRV-controlled areas where the ME program was not implemented (in South Vietnam) were not better than those in French-controlled areas. The finding supports the argument that the ME program—rather than other DRV-related factors (e.g., idealism or political/economic connections)- resulted in better long-term educational outcomes for those who grew up in DRV-controlled regions. Another concern is that more educated school-age children residing in French-controlled areas may have more systematically migrated out of the country after the war. To check this hypothesis, Dang et al. (2021) provide estimates on whether the control group is more likely to receive remittances from their relatives living overseas at the time of the survey in 1998. Estimation results suggest that they do not.

IV.2 ME Exposure and the Next Generation's Education

This section presents the first key finding of our paper. It provides the effects of a mother's exposure to the ME program on children's education. In other words, this is the reduced-form effect. We provide the estimation using three educational outcomes: children’s average years of education, years of education of the most educated child, and the percentage of children completing high school. We do not examine the percentage of children completing primary and middle school because primary and middle school education was almost universal in Vietnam during the 1990s. Note that all children living within and outside the household are included.

Panel A of Table 2 reveals that children of a ME-mother had an average of 0.9 more years of education. They are also 15 percent more likely to finish high school. Note that a ME-mother had 1.5 more years of education on average herself. Panel B shows that an additional year of a mother’s exposure to the ME program is associated with 0.19 more years of her children’s education and 3 percent more likely to finish high school. Note that the coefficients of Panels A and B are quite consistent with each other. The coefficients in Panel A are roughly 5 times the coefficients in Panel B. Recall that that Panel B uses the second exposure measure, where we set the maximum number of exposure years to 5 (see section III.1).

Table 2. Mother's ME Exposure and Children's Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A: First Exposure Measure			
Treated	0.894***	0.808***	0.149***
	(0.249)	(0.191)	(0.039)
N	1206	1206	1206
adj. R^2	0.347	0.385	0.125
Panel B: Second Exposure Measure			
Years of exposure to ME	0.188**	0.129	0.031***
	(0.076)	(0.076)	(0.008)
N	1546	1546	1546
adj. R^2	0.322	0.349	0.123

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

As a robustness check, we remove the mixed-occupied provinces and report the results in Panel A3.2 of Appendix Table A3. The findings remain robust with very quantitatively similar estimates. The only difference is now the coefficient capturing the impact of one more year of mother's ME exposure on the education of the most educated child becomes statistically significant.

IV.3 On the Causal Impact of Maternal Education on Her Children's Education

a. Discussions about Potential Confounding Factors

Exposure to the ME program helps improve mothers' education. It also helps improve children's education. Is the relationship between a mother's education and children's education causal? In this section, we argue that the relationship is causal. We go through our argument in steps.

Confounding factors associated with living under DRV-controlled areas (and not related to mothers' education) could help the next generation obtain high education. For example, the DRV might have implemented other policies (besides the ME program) that affected the lives of young Vietnamese children and hence the way they raised their children. In addition, it is possible that living under the DRV during the First Indochina War could later give mothers better political and economic connections to boost their children's education.

However, we find evidence that helps argue against this type of confounding factor. The evidence is that children of exposed fathers (i.e., ME-fathers) do not have significantly higher education than children of non-ME fathers. If the DRV implemented other policies besides the ME program relevant to the next generation's education, we would expect exposed ME-fathers to affect children's education positively. Similarly, if political or economic connections were to play a significant role in their children's education, we would expect ME-fathers to have at least as great, *if not greater*, political and economic connections as ME-mothers to boost their children's education. After all, politics and business in Vietnam have been dominated by males. As Table 3 indicates, we do not see such effects. A father's exposure to the DRV regime and the ME program at the prime schooling age does not significantly affect his children's education. Although the effects of ME-fathers on their children's education are still positive, they generally have a smaller magnitude than those of ME-mothers, and they are not statistically significant. This finding, together with the finding that ME-fathers do not have significantly higher education than non-ME-fathers, is consistent with the notion that the effect on the next generation's education operates via parental education. Note that we do not rule out the possibility of other policies by the DRV or political and economic connections. We only claim that we do not find evidence for the systematic impacts of such policies or connections on the next generation's education.

The argument presented above against these confounding factors would be invalid if fathers play little role in their children's education and mothers play a much bigger role. However, this is not likely. The literature has pointed out the important roles of fathers in children's education (see, for example, Behrman and Rosenzweig, 2002 and Suhonen and Karhunen, 2019).

Table 3. Father's ME Exposure and Children's Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A: First Exposure Measure			
Treated	0.898	0.565	0.109
	(0.531)	(0.502)	(0.097)
N	974	974	974
adj. R^2	0.431	0.470	0.187
Panel B: Second Exposure Measure			
Years of exposure to ME	0.121	0.069	0.015
	(0.102)	(0.114)	(0.016)
N	1256	1256	1256
adj. R^2	0.394	0.432	0.150

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, paternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Children are restricted to being at least 23 years old. Robust standard errors in parentheses are adjusted for two-way clustering (father's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Another concern is regarding *gender-specific* confounding factors. They include policies implemented by the DRV that only affected how school-age girls would educate their children but did not affect how school-age boys would. It is difficult to think of an example. In the unlikely possibility of such a policy, we find evidence that helps argue against this type of confounding factors. The evidence is as follows. In the South of Vietnam, three provinces were under complete DRV's control during the war. However, the ME program was not systematically carried out there for various reasons[15]. As a result, southern DRV-exposed mothers do not have better educational outcomes than other non-exposed mothers (see Dang *et al.,* 2021). Here, we find that children of southern DRV-exposed mothers do not have significantly higher education than children of non-exposed mothers (see Table 4). If other non-ME, gender-specific policies were carried out in these southern provinces, the next generation's education should benefit as well.

Table 4. Mother's DRV Exposure and Children's Education in South Vietnam

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A: First Exposure Measure			
Treated	0.553	0.453	0.033
	(1.018)	(0.925)	(0.063)
N	1313	1313	1314
adj. R^2	0.268	0.295	0.060
Panel B: Second Exposure Measure			
Years of exposure to ME	0.113	0.126	0.007
	(0.229)	(0.203)	(0.012)
N	1658	1658	1659
adj. R^2	0.261	0.289	0.048

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year, and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Hence, access to schooling at the right age boosted ME-mothers' education compared to non-exposed mothers who had to enroll in the ME program at older ages after the war. In turn, ME-mothers' higher education attainment boosted their children's education. Of course, we cannot completely rule out all other channels, but the falsification tests discussed above help argue against them.

[15] For example, the "History of Quang Ngai" (Provincial Government of Quang Ngai, 2015) talks about difficulties associated with natural disasters. Quang Ngai is a South Vietnamese province occupied by the DRV during the First Indochina War.

b. Inter-generational Impact of Education

If ME mother's education is the dominant channel of impact on children's education, we can run IV estimations to estimate the intergenerational education impact. The estimated coefficient can be interpreted as "the upper bound" of the intergenerational impact.

The impact is shown in Table 5, with OLS and the two instruments corresponding to ME exposure measures. The OLS results show that years of maternal education are significantly correlated with all measures of children's education. Higher years of maternal education are correlated with higher average and maximum years of education of her children and a larger percentage of her children completing high school. The correlation between maternal education and her children's average education of 0.31 to 0.35 is not very far from the global average correlation between parent and child's schooling of 0.4, estimated by Hertz et al. (2007).

Table 5. Impact of Maternal Education on Children's Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A. First instrument			
OLS regressions			
Years of maternal education	0.308***	0.245***	0.036***
	(0.042)	(0.043)	(0.005)
IV regressions			
Years of maternal education	0.583**	0.528***	0.097**
	(0.280)	(0.179)	(0.043)
F-test of the excluded instrument	13.04	13.04	13.04
N	1206	1206	1206
Panel B. Second instrument			
OLS regressions			
Years of maternal education	0.350***	0.298***	0.041***
	(0.033)	(0.033)	(0.005)
IV regressions			
Years of maternal education	0.651**	0.445**	0.108**
	(0.312)	(0.213)	(0.050)
F-test of the excluded instrument	7.64	7.64	7.64
N	1545	1545	1545

Note: Each cell presents the results from a separate regression that controls dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

All IV estimates have the same sign as the OLS estimates. However, they are highly significant and have a larger magnitude. The IV estimates suggest that one more year of schooling for the mother can raise her children's average education by about 0.58 additional years if the first instrument is used, or about 0.65 additional years if the second instrument is used (Column 1). The magnitude of the coefficient of the impact of years of maternal education on years of children's education is greater in IV estimates than in OLS estimates. The estimate represents both direct effects from mothers and indirect spillover effects from fathers, which could be driven by assortative mating. The estimate is larger than the previous magnitude reported (for example, Black et al. (2005) report 0.2 to 0.25 for Norway; Suhonen and Karhunen (2019) report 0.54 for Finland; and Agüero and Ramachandran (2020) report less than 0.1 for Zimbabwe). We will argue that this is due to the more limited labor market outcomes for educated individuals in Vietnam, allowing educated parents to spend more time at home and benefit their children's education more. We will explain our argument in more detail in the next section.

V. On Potential Transmission Mechanisms

This section presents our second key finding. It examines potential channels by which intergenerational human capital transmission could take place. We discuss maternal labor market and reproduction outcomes, paternal education, health and labor market outcomes, household living conditions, and spending decisions. These outcomes can be mainly driven by maternal education, but we cannot rule out other channels associated with the exposure to DRV occupation during the war. For that reason, we choose to present the reduced-form regressions for both exposure measures. Results, although suggestive, consistently point to a significant role of family factors, such as better lifestyle and a stronger focus on education, in the intergenerational human capital transmission.

V.1 Maternal labor market and reproduction outcomes

Family income is positively associated with children’s improved education (Masters, 1969; Mayer, 1997; Akee et al., 2010). Mothers with better education might have better income. As more financial resources are available, this may help improve their children's education. Unfortunately, information on individual income is not available in rural Vietnam. Many household members were self-employed. Therefore, we cannot disaggregate household income by individuals. Nevertheless, diversifying into non-farm activities is an effective tool to move out of poverty and increase income in rural Vietnam (Hoang et al., 2014). We use different indicators of participation in non-farm activities to proxy for mother's income: a dummy variable for maternal non-farm participation in the past seven days, a dummy variable for a mother having paid work in the past seven days, a dummy variable for a mother working as a white-collar worker, and a dummy variable for a mother having health insurance, an indication of having had formal work. Findings presented in the first four columns in Table 6 show that a woman’s exposure to the ME program does not affect her labor market outcomes.

A potential reason for the lack of evidence for improved labor market outcomes for more educated ME-mothers is that many of them may no longer be economically active in the 1997-1998 VLSS. The treatment cohort (i.e., born 1940-1945) had been in their late 50s. Nevertheless, even for the variable of having health insurance, an indication of having had formal work, ME-mothers were not significantly more likely to have health insurance more than non-ME-mothers.

A woman with a better education level would likely delay the first child (Black et al. 2008; Silles, 2011; Ozier, 2016; Grönqvist and Hall, 2013; DeCicca and Krashinsky, 2015). This delay may increase child education. Higher female education also reduces fertility (Osili and Long, 2008; Keats, 2018). Put differently, a woman with a better education would have fewer children. Having fewer children can lead to children's higher education (Hanushek, 1992; Li et al., 2008). This literature suggests that maternal education may affect her children's education through fertility mechanisms. To test this hypothesis, Columns 5 and 6 estimate the impact of ME exposure on age at first birth and the number of children. The reduced-formed regressions show statistically insignificant findings, suggesting the exposure to DRV occupation and the ME program did not change the mother's reproduction outcomes.

Table 6. Mother's ME Exposure, Maternal Labor and Reproduction Outcomes

	Non-farm participation in the past seven days	Paid work	White-collar	Health insurance	First birth age	Number of children	Hours of household chores
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
First Exposure							
Treated	0.035	-0.008	0.064	0.069	0.470	-0.025	1.054
	(0.062)	(0.024)	(0.074)	(0.096)	(0.604)	(0.214)	(1.446)
N	1623	1623	1623	1623	1522	1622	1522
adj. R^2	0.115	0.066	0.063	0.095	0.058	0.203	0.089
Second Exposure							
Years of ME exposure	0.009	0.003	0.012	0.010	0.053	0.006	0.235
	(0.014)	(0.006)	(0.015)	(0.014)	(0.146)	(0.053)	(0.271)
N	1980	1980	1980	1980	1869	1979	1857
adj. R^2	0.119	0.069	0.064	0.102	0.058	0.206	0.093

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year, and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Table 6 also reports the results on hours of a mother's household chores such as cleaning the house, preparing meals, washing the family's clothes, buying food or clothes, fetching water or firewood that a mother did in the past seven days (column [7]). Again, ME exposure measures do not change this outcome. This finding is consistent with the maternal labor market above, which shows that maternal education has no significant impact on labor market outcomes.

V.2 Paternal education, labor market outcome, and lifestyle

We turn next to investigating whether a mother's ME exposure has any association with paternal education outcomes. A variety of paternal education measures are used: a dummy variable for reading literacy, a dummy variable for math competency, a dummy variable for primary education completion or above, a dummy variable for secondary education completion or above, and years of education. The reduced-form regressions reveal marginal effects on the husband's education, especially reading literacy and math competency (see Table 7). Note that the education association between mothers and fathers could be driven by assortative mating and/or mutual encouragement and support after marriage.

Table 7. Mother's ME Exposure and Father's Education

	Reading Literacy	Math competency	Primary education completion or above	Secondary education completion or above	Years of education
	(1)	(2)	(3)	(4)	(5)
First Exposure					
Treated	0.075**	0.090**	0.052	-0.026	0.728
	(0.036)	(0.042)	(0.055)	(0.059)	(0.474)
N	1155	1155	1157	1157	1157
adj. R^2	0.176	0.144	0.226	0.241	0.245
Second Exposure					
Years of ME exposure	0.013	0.016	0.005	-0.005	0.158
	(0.009)	(0.011)	(0.009)	(0.014)	(0.114)
N	1425	1425	1427	1427	1427
adj. R^2	0.162	0.148	0.214	0.230	0.246

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year, and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

We then turn to paternal labor market outcomes. The estimates of the impact of maternal education on labor market outcomes are reported in Table 8. A mother's ME exposure does not significantly impact the father's non-farm participation, paid work, the probability of working as a white-collar worker, and health insurance.

Similar to labor market outcomes of ME-mothers, there is little evidence for improved labor market outcomes of their husbands. The little evidence might be explained by the centrally planned nature of labor markets of Vietnam before the beginning of economic reforms in the late 1980s (Irvin, 1995).

This fact is in line with the ruling Communist Party's efforts to build a socialist economy in North Vietnam during 1954-1975 and in the entire country after the country's unification in 1975 (Cima, 1987; Dang, 2008). Labor allocations, especially in the public sector, were largely decided by the government (Dang, 1999). The formal private sector was virtually non-existent before the early 1990s (Schaumburg-Muller, 2000).

However, we do see strong evidence that husbands of ME-mothers had a healthier lifestyle. An educated woman may influence the husband's behavior in positive ways. We use a husband's smoking as a proxy to examine the impact of a mother's education on her husband's lifestyle. A mother's ME exposure is not significantly correlated with her husband's past smoking (column [1] of Table 9). However, it has significant and negative impacts on the likelihood that her husband is smoking now and the number of cigarettes the husband is smoking per day (columns [2] and [3] of Table 9), suggesting a good influence of educated wives. Fathers' good lifestyle and involvement positively influence children's social, behavioral, psychological, and educational outcomes (Sarkadi et al., 2008; Flouri and Buchanan, 2004).

Table 8: Mother's ME Exposure and Father's Labor Market Outcomes

	Non-farm participation in the past seven days	Paid work	White-collar	Health insurance
	(1)	(2)	(3)	(4)
First Exposure				
Treated	0.041	0.007	0.097	0.106
	(0.081)	(0.048)	(0.066)	(0.105)
N	1157	1157	1157	1157
adj. R2	0.159	0.080	0.083	0.147
Second Exposure				
Years of ME exposure	0.014	0.004	0.016	0.010
	(0.013)	(0.007)	(0.012)	(0.019)
N	1427	1427	1427	1427
adj. R2	0.159	0.081	0.080	0.151

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Table 9. Mother's ME Exposure and Father's Lifestyle

	Husband Ever- smoked	Husband Smoking now	Number of cigarettes a day by husband
	(1)	(2)	(3)
First Exposure			
Treated	-0.005	-0.024**	-0.142**
	(0.034)	(0.010)	(0.063)
N	1150	1150	1150
adj. R2	0.024	0.037	0.020
Second Exposure			
Years of ME exposure	-0.001	-0.005***	-0.029*
	(0.005)	(0.002)	(0.015)
N	1420	1420	1420
adj. R2	0.035	0.040	0.031

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

V.3 Household's Income, Expenditure, Assets, and Other Living Conditions

We next consider the impact of a mother's ME exposure on households' income and living standards. Income is typically not precisely measured in household surveys; hence, we also rely on other measures of living standards. Table 10 provides estimates for the impacts on household income, expenditure, assets (all are on a per capita basis and a logarithmic scale), and living conditions, namely living area per capita, house structure, and floor quality16.

The estimates reveal that ME-mothers' households did not have significantly higher income per capita (column [1] of Table 10). This finding is consistent with prior findings that both ME-mothers and her husband did not have significantly better labor market outcomes at the survey in 1998. However, ME-mothers' households had significantly higher expenditure per capita (column [2] of Table 10). Mother's ME exposure boosted the household's expenditure per capita by 15 percent and boosted the household's assets per capita by 26 percent (column [3). Educated mothers' households also lived in houses with better floor quality (columns [5] and [6]).

[16]House structure is a dummy variable which equals 1 if the main construction material of outside walls is (mostly) made of concrete, brick, stone, or wood, and 0 for unfired brick, earth, galvanized iron, bamboo, leaves/branches, and other. Floor quality is also a dummy variable that equals 1 if the flooring material is marble, tile, brick, cement, and 0 for lime and ash, earth, bamboo, etc.

Table 10. Mother's ME Exposure and Household's Living Conditions

	Log of real income per capita	Log of real expenditure per capita	Log of real durable assets' value per capita	Log of living area per capita	House structure	Floor quality
	(1)	(2)	(3)	(4)	(5)	(6)
First Exposure						
Treated	0.298	0.153**	0.269**	0.046	0.056	0.174***
	(0.191)	(0.074)	(0.111)	(0.058)	(0.041)	(0.032)
N	1494	1622	1611	1622	1623	1623
adj. R2	0.061	0.198	0.142	0.128	0.143	0.142
Second Exposure						
Years of ME exposure	0.044	0.030**	0.078***	0.009	0.024**	0.046***
	(0.030)	(0.013)	(0.026)	(0.014)	(0.009)	(0.009)
N	1838	1979	1966	1979	1980	1980
adj. R2	0.055	0.198	0.137	0.128	0.143	0.138

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Why did households of more educated mothers not have significantly higher income but have significantly higher expenditure and assets? There can be several explanations. First, it could be that the income coefficient is simply not precisely estimated. Second, educated mothers' past income might have been higher, although the current income is similar. Third, it is also possible that the higher living conditions are attributable to better political or economic connections that are not precisely captured by reported income (see, for example, the evidence presented by Markussen and Tarp, 2014). Finally, higher expenditure could be thanks to better lifestyle and expenditure decisions, which could lead to stronger asset accumulations over time, even with the same income. Table 9 already shows that husbands of more educated mothers were less likely to smoke now and had fewer cigarettes. Besides, in households of ME mothers, expenditure on cigarettes was sharply lower, and expenditure on education per kid aged 6 to 18 was sharply higher (Table 11). Note that these kids need not be the mothers' children; they include all in households. The estimates imply ME exposure reduced household expenditure on cigarettes by 71 percent (column [1] of Table 11), while increased education expenditure per kid aged 6 to 18 years old by 37 percent.

Table 11. Mother's ME Exposure and Expenses on Tobacco and Education

	Log (expense on tobacco +1)	Educational expense per kid aged 6-18
	(1)	(2)
First Exposure		
Treated	-0.710**	0.369**
	(0.295)	(0.177)
N	1622	1144
adj. R2	0.038	0.134
Second Exposure		
Years of ME exposure	-0.122*	0.131**
	(0.068)	(0.049)
N	1979	1348
adj. R2	0.031	0.162

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

VI. Bringing Together and Conclusions

The results in Section V do not seem to suggest a clear role of labor market outcomes and income in the transmission of maternal education to child education in Vietnam. Instead, the results point to an important role of educated mothers, fathers' better and healthier lifestyles, and a stronger focus on education. However, we also cannot rule out the role of the family's better living conditions and wealth, which may be accumulated over the years thanks to better financial decisions.

Another point for discussion is the extent to which the estimate of multi-generational spillover reflects the direct effects of maternal education versus the indirect role of induced paternal education. Recall that one additional year of maternal education boosts child education by about 0.58 to 0.65 additional years. We find suggestive evidence that the direct role of maternal education in child education is strong. Table 12 presents the impact of maternal education, controlling for paternal education. IV estimates show that when paternal education is controlled, the effect of maternal education is slightly stronger, with a magnitude of about 0.73 to 0.85. Since paternal education is controlled, the estimate can be interpreted as the direct effects of maternal education on child education.

Table 12. Impact of Maternal Education on Children's Education, Controlling for Paternal Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
IV regressions- First instrument			
Years of maternal education	0.730**	0.420	0.115*
	(0.342)	(0.260)	(0.060)
Years of paternal education	0.093	0.149	0.004
	(0.113)	(0.088)	(0.020)
F-test of the excluded instrument	21.68	21.68	21.68
N	882	882	882
IV regressions – Second instrument			
Years of maternal education	0.853*	0.396	0.136
	(0.458)	(0.428)	(0.080)
Years of paternal education	0.065	0.186	-0.004
	(0.152)	(0.156)	(0.028)
F-test of the excluded instrument	10.84	10.84	10.84
N	1145	1145	1145

Note: Each cell presents the results from a separate regression that controls for dummy variables indicating religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

This study is probably the first that examines a long-term and multi-generational impact of a mandatory and free schooling program in a developing country. The cost of this program was very small to the DRV government. However, the identified outcomes are large, persistent, and multi-generational. The ME program and subsequent ME programs after the First Indochina War helped reduce the educational gap between girls and boys in North Vietnam. A similar ME program was also conducted in South Vietnam after the Second Indochina War ended in April 1975. In recent decades, girls' net secondary enrollment rates in Vietnam caught up with and even overtook boys' (Dang and Glewwe, 2018), opening up opportunities for girls and their children.

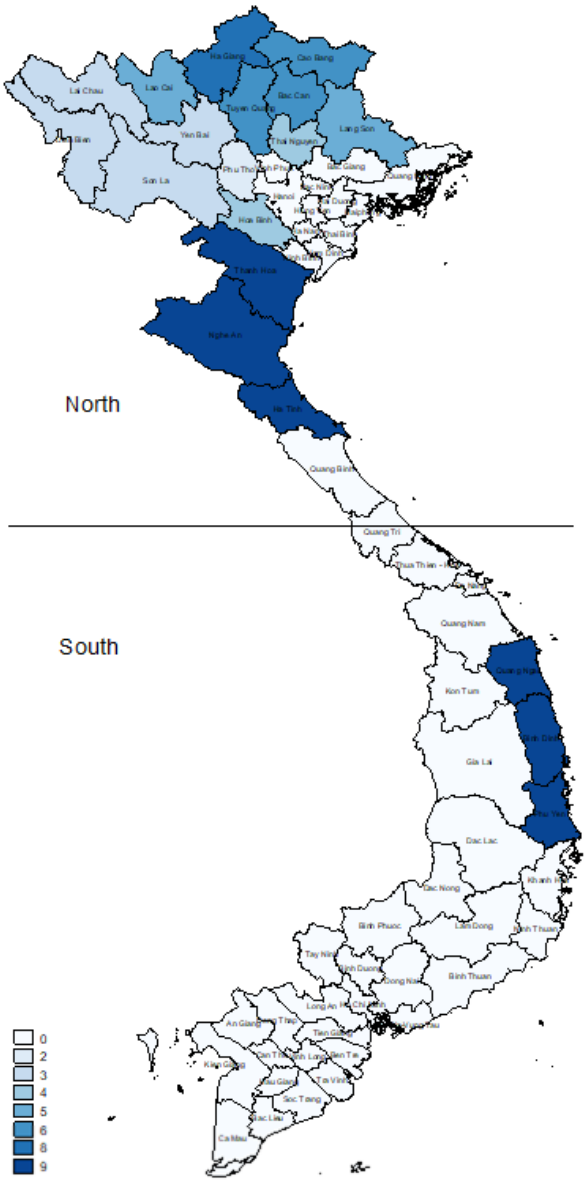
This study also establishes a large intergenerational spillover effect of maternal education on child education in a developing country. One additional year of maternal education boosted child education by up to 0.65 years, larger than what was typically found in the existing literature on intergenerational education spillover in advanced countries. Better household lifestyle and a stronger focus on education are possible transmission pathways.

Although the ME program in Vietnam has a unique historical context, the program's lessons might still be relevant, especially for low-income countries. The program was started when Vietnam was first

declared independent. The spread and low cost of the program benefited from the all-out support of the population in a newly independent country during wartime. A lesson from the program is that if an educational policy can gather strong support from the government and society, perhaps via clear and inspirational communication, it can yield large and persistent outcomes with relatively low costs.

Annex I. Additional Figures and Tables

Figure A1: Map of Vietnam under DRV and the French Occupation during the First Indochina War, 1946-1954



Note: Different colors indicate the number of years under the DRV's occupation. Three provinces in the North: Nghe An, Thanh Hoa, and Ha Tinh, and three provinces in the South- Quang Ngai, Binh Dinh, and Phu Yen (darkest-blue color) were under complete DRV's control throughout the First Indochina War. They were nine years under DRV's control. Some provinces in the mountainous North (such as Ha Giang, Cao Bang, Tuyen Quang, Bac Can) fell to DRV's control early in the war.

Disclaimer: Country borders or names do not necessarily reflect the IMF's official position. The dividing line for the North and the South after the First Indochina War was established by the Geneva Accords in 1954. This map is for illustrative purposes only. It does not imply any opinion from the authors and the IMF about the legal status of frontiers or boundaries.

Table A1: Summary Statistics

	1924-1935 and 1950-1961 Mother Cohorts					1940-1945 Mother Cohorts				
	DRV-occupied area		French-occupied area			DRV-occupied area		French-occupied area		
	Mean	S.D.	Mean	S.D.	Difference	Mean	S.D.	Mean	S.D.	Difference
Maternal education										
Reading Literacy	0.72	0.45	0.69	0.46	0.03	0.89	0.32	0.65	0.48	0.235***
Math competency	0.64	0.48	0.65	0.48	-0.005	0.78	0.42	0.59	0.49	0.189**
Primary education completion or above	0.64	0.48	0.58	0.49	0.025	0.70	0.46	0.40	0.49	0.300***
Secondary education completion or above	0.47	0.50	0.42	0.49	0.048	0.46	0.50	0.23	0.42	0.237***
Years of education	6.62	3.90	5.98	4.10	0.643**	6.93	3.26	4.86	3.35	2.066***
Paternal education										
Reading Literacy	0.89	0.32	0.92	0.28	-0.03	0.95	0.22	0.89	0.31	0.062
Math competency	0.85	0.35	0.89	0.31	-0.04	0.93	0.26	0.87	0.34	0.06
Primary education completion or above	0.83	0.38	0.77	0.42	0.052	0.83	0.38	0.74	0.44	0.094
Secondary education completion or above	0.65	0.48	0.57	0.50	0.076**	0.55	0.50	0.52	0.50	0.026
Years of education	8.49	3.59	8.01	3.49	0.471*	8.83	3.82	7.86	3.83	0.978
Children education										
Secondary education completion or above	0.50	0.44	0.52	0.44	0.02	0.61	0.40	0.66	0.38	0.052
High school education completion or above	0.21	0.35	0.22	0.36	0.01	0.29	0.36	0.41	0.39	0.122**
Average years of education of children	7.85	3.54	8.01	3.94	0.16	9.02	3.00	9.96	3.06	0.947*
Education of the most educated children	9.30	4.09	9.65	4.40	0.35	11.06	3.12	12.06	3.00	0.997**

Note: This table presents summary statistics for Mothers belonging to the 1924-1935 and 1950-1961 cohorts, and for their husbands and children, and summary statistics for Mothers belonging to the 1940-1945 cohorts, and for their husbands and children. *,**,*** indicates significant difference in variables between DRV-controlled area and French-controlled areas (*** p<0.01, ** p<0.05, * p<0.1).

Table A2: Number of Years That Individuals Are Potentially Exposed to the ME Program

Birth Year	DRV-occupied Provinces (1945)	French-occupied Provinces (1954)	Mixed-occupation Provinces	
			Example 1 (1947)	Example 2 (1951)
1924	0	0	0	0
…	0	0	0	0
1934	0	0	0	0
1935	1	0	0	0
1936	2	0	0	0
1937	3	0	1	0
1938	4	0	2	0
1939	5	0	3	0
1940	5	0	4	0
1941	5	0	5	1
1942	5	0	5	2
1943	5	0	5	3
1944	5	1	5	4
1945	5	2	5	5
1946	5	3	5	5
1947	5	4	5	5
1948	5	5	5	5
…	5	5	5	5
1961	5	5	5	5

Note: This table shows the number of years of potential schooling for those who reached primary and secondary school age during the 1946-54 Indochina War. An individual is assumed to start attending primary school at six years old. The maximum number of years of potential exposure is restricted to 5 years or the number of years of schooling required to achieve a primary school degree. Individuals are assumed to stop going to school if they are never enrolled at age 11. In the DRV-occupied provinces, the ME program started in 1945. In the French-controlled provinces, the ME program started after the War, in 1954. For the mixed-occupation provinces, Example 1 and Example 2 show the number of years of potential exposure for provinces occupied by Vietminh starting from 1947 and 1951, respectively.

Table A3. Robustness check: Removing Mixed-Occupied Provinces

Panel A3.1: ME Exposure and Mother's Education

	Reading Literacy	Math competency	Primary education completion or above	Secondary education completion or above	Years of education
	(1)	(2)	(3)	(4)	(5)
Panel A: First Exposure Measure					
Treated	0.189**	0.177*	0.260***	0.175*	1.379***
	(0.078)	(0.094)	(0.072)	(0.088)	(0.371)
N	1377	1377	1375	1375	1376
adj. R^2	0.442	0.441	0.503	0.394	0.513
Panel B: Second Exposure Measure					
Years of exposure to ME	0.031*	0.029	0.049***	0.030**	0.276***
	(0.018)	(0.020)	(0.016)	(0.014)	(0.088)
N	1677	1677	1675	1675	1676
adj. R^2	0.395	0.413	0.470	0.370	0.477

Note: Mixed-occupied provinces are removed from the estimation sample. Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, birth year fixed effects and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Panel A3.2. Mother's ME Exposure and Children's Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A: First Exposure Measure			
Treated	0.862***	0.810***	0.145***
	(0.268)	(0.191)	(0.037)
N	1021	1021	1021
adj. R^2	0.329	0.373	0.120
Panel B: Second Exposure Measure			
Years of exposure to ME	0.202***	0.158***	0.035***
	(0.048)	(0.049)	(0.006)
N	1306	1306	1306
adj. R^2	0.304	0.335	0.119

Note: Mixed-occupied provinces are removed from the estimation sample. Each cell presents the results from a separate regression that controls for dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Panel A3.3: Impact of Maternal Education on Children's Education

	Average years of children education	Years of education of the most educated child	Percentage of children completing high school
	(1)	(2)	(3)
Panel A. First instrument			
OLS regressions			
Years of maternal education	0.334***	0.275***	0.039***
	(0.042)	(0.041)	(0.005)
IV regressions			
Years of maternal education	0.569*	0.536**	0.095*
	(0.302)	(0.192)	(0.047)
F-test of the excluded instrument	9.30	9.30	9.30
N	1020	1020	1020
Panel B. Second instrument			
OLS regressions			
Years of maternal education	0.355***	0.306***	0.043***
	(0.034)	(0.034)	(0.005)
IV regressions			
Years of maternal education	0.687**	0.536***	0.120*
	(0.316)	(0.149)	(0.060)
F-test of the excluded instrument	6.73	6.73	6.73
N	1305	1305	1305

Note: Mixed-occupied provinces are removed from the estimation sample. Each cell presents the results from a separate regression that controls dummy variables indicating gender, religion groups (including Buddhism and Christianity), whether the individual belongs to the major ethnic group, maternal birth year and birth province fixed effects. All estimation samples exclude those who had migrated when they were younger than 15. Robust standard errors in parentheses are adjusted for two-way clustering (mother's birth province and household's current commune); *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

References

Agüero, Jorge and Maithili Ramachandran. 2020. "The Intergenerational Transmission of Schooling among the Education-Rationed." Journal of Human Resources, vol. 55(2), pages 504-538

Akresh, Richard, Daniel Halim, and Marieke Kleemans. forthcoming. Long-term and intergenerational effects of education: Evidence from school construction in Indonesia. Economic Journal

Akee, R, K, Q., Copeland, E, W., Keeler, G., Angold, A and Costello, J, E. 2010. "Parents' incomes and Children's Outcomes: A Quasi-Experiment Using Transfer Payments from Casino Profits." American Economic Journal: Applied Economics, 2(1), 86-115.

Angelucci, Manuela, Giacomo De Giorgi, Marcos A. Rangel, and Imran Rasul. 2010. "Family networks and school enrolment: Evidence from a randomized social experiment." Journal of Public Economics 94, no. 3-4: 197-221.

Banerjee, A., Duflo, E., Vinay, G, P and Watts, T., 2010, "Long-run Health Impacts of Income Shocks: Wine and Phylloxera in Nineteenth-Century France." Review of Economics and Statistics, 92(4), pp. 714-728.

Barker, D. J. P., 1992, "Fetal and Infant Origins of Later Life Disease," British Medical Journal, 311, pp. 171–174.

Behrman, Jere and Rosenzweig, Mark. 2002. "Does Increasing Women's Schooling Raise the Schooling of the Next Generation?" American Economic Review, 92(1), pp. 323–34.

Behrman, Jere, Yuan Hu, Junsen Zhang. 2020. The causal effects of parents' schooling on children's schooling in urban China. Journal of Comparative Economics

Bjoerklund, Anders, Mikael Lindahl, and Erik Plug. 2006. "The Origins of Intergenerational Associations: Lessons from Swedish Adoption Data." The Quarterly Journal of Economics, 121, 999–1028.

Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes. 2005. "Why the Apple Doesn't Fall Far: Understanding the Intergenerational Transmission of Human Capital." American Economic Review, 91(1), 437–449.

Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes. 2008. "Staying in the Classroom and out of the Maternity Ward? The Effect of Compulsory Schooling Laws on Teenage Births." Economic Journal. 118:1025–54.

Borjas, George J. 1992. "Ethnic capital and intergenerational mobility." The Quarterly Journal of Economics 107.1: 123-150.

Carneiro, Pedro, Costas Meghir, and Matthias Parey. 2013. "Maternal education, home environments, and the development of children and adolescents." Journal of the European Economic Association 11, 123-160.

Chen, Qihui. 2015. "Ready for School? Impacts of Delayed Primary School Enrollment on Children's Educational Outcomes in Rural China." International Journal of Educational Development, 45:112-128.

Cima, Ronald. 1989. "Vietnam: a country study" Federal Research Division, Library of Congress.

Cui Ying, Hong Liu, Liqiu Zhao. 2019. Mother's education and child development: Evidence from the compulsory school reform in China. Journal of Comparative Economics 47:3, 669-692

Dang, Anh Nguyen. 1999. "Market reforms and Internal Labor Migration in Vietnam" Asian and Pacific Migration Journal, Vol 8(3), pp 381-409

Dang, Hai-Anh and Paul Glewwe. 2018. “Well Begun, But Aiming Higher: A Review of Vietnam’s Education Trends in the Past 20 Years and Emerging Challenges”. Journal of Development Studies, 54(7): 1171-1195.

Dang, Hai-Anh, Trung X. Hoang, Ha Nguyen. 2021. "The Long-Run and Gender-Equalizing Impacts of School Access: Evidence from the First Indochina War." Economic Development and Cultural Change, vol 70(1)

Dang, Phong. 2008. "Tu Duy Kinh te Viet Nam: Chang Duong Gian Nan va Ngoan Muc: 1975- 1989" (Vietnam's Economic Philosophy: A Challenging and Remarkable Journey: 1975-1989). Nha Xuat Ban Tri Thuc

De Philippis, Marta, and Federico Rossi. 2021. "Parents, schools and human capital differences across countries." Journal of the European Economic Association 19.2 (2021): 1364-1406.

DeCicca, Philip, and Harry Krashinsky. 2015. "Does Education Reduce Teen Fertility? Evidence from Compulsory Schooling Laws", Journal of Health Economics, 69.

Flouri E, Buchanan A. 2004. Early father's and mother's involvement and child's later educational outcomes. British Journal of Education Psychology, 74: 141–53.

General Statistics Office. 2004. Vietnam Statistical Data in the 20th Century, vol. 2. Hanoi: Statistical Publishing House.

Goldin, Claudia. 1992. The meaning of college in the lives of American women: The past one hundred years. NBER Working Paper 4099.

Grönqvist, Hans, and Caroline Hall. 2013. "Education Policy and Early Fertility: Lessons from an Expansion of Upper Secondary Schooling." Economics of Education Review. 37: 13–33.

Hanushek, A, E. 1992. "The Trade-off between Child Quantity and Quality," Journal of Political Economy, 100(1), 84-117.

Hoang, T. X., Pham, C. S., & Ulubaşoğlu, M. A. 2014. "Non-farm activity, household expenditure, and poverty reduction in rural Vietnam: 2002–2008". World Development, 64(C), 554–568

Holmlund, Helena, Mikael Lindahl, and Erik Plug. 2011. "The Causal Effect of Parents' Schooling on Children's Schooling: A Comparison of Estimation Methods." Journal of Economic Literature, 49 (3): 615-51.

Irvin, George. 1995. "Vietnam: Assessing the achievements of Doi Moi," The Journal of Development Studies, 31:5, 725-750

Keats, A. 2018. "Women's Schooling, Fertility, and Child Health Outcomes: Evidence from Uganda's Free Primary Education Program." Journal of Development Economics, 135, 142-159.

Le, Thanh Khoi. 1955. Le Viet Nam: Histoire et Civilisation. Paris: Les Editions de Minuit.

Li, H., Zhang, J and Zhu, Y. 2008. "The Quantity-Quality Trade-off of Children in a Developing Country: Identification Using Chinese Twins." Demography, 45(1), 223-243.

Markussen, Thomas and Finn Tarp. 2014. "Political connections and land-related investment in rural Vietnam," Journal of Development Economics, Elsevier, vol. 110(C), pages 291-302.

Marr, David. 1984. Vietnamese Tradition on Trial, 1920-1945. University of California Press.

Masters. 1969. "The Effect of Family Income on Children's Education: Some Findings on Inequality of Opportunity." Journal of Human Resources, 4(2), 158-175.

Mayer, S, E. 1997. "What Money Can't buy: Family Income and Children's Life Chances." Cambridge, MA: Harvard University Press.

Maurin, Eric, and Sandra McNally. 2008. "Vive la revolution! Long-term educational returns of 1968 to the angry students." Journal of Labor Economics 26.1: 1-33.

Mazumder, Bhashkar, Margaret Triyana and Maria Fernanda Rosales. (forthcoming). Social Interventions, Health and Wellbeing: The Long-Term and Intergenerational Effects of a School Construction Program. Journal of Human Resources

Nguyen, Manh Tung. 1996. Công cuộc xóa nạn mù chữ và bổ túc văn hoá ở Bắc Bộ (1945 - 1954). (The Campaign to Eradicate Illiteracy and Promote Supplementary Education in North Vietnam, 1945-1954). Unpublished Ph.D. thesis. Hanoi: Hanoi Pedagogical University.

Nguyen, Thuy Phuong. 2013.“L’école française au Vietnam de 1945 à 1975: de la mission civilisatrice à la diplomatie culturelle.” PhD diss., Université René Descartes

No, Fata, Kyoko Taniguchi, and Yukiko Hirakawa. (2016). "School Dropout at the Basic Education Level in Rural Cambodia: Identifying its Causes through Longitudinal Survival Analysis." International Journal of Educational Development, 49: 215-224.

Oreopoulos, Philip, Marianne E. Page, and Ann Huff Stevens. 2006. “The Intergenerational Effects of Compulsory Schooling.” Journal of Labor Economics, 24, 729–760.

Osili, O, U and Long, T, B. 2008. “Does Female Schooling Reduce Fertility? Evidence from Nigeria.” Journal of Development Economics, 87, 57-75.

Ozier, Owen. 2016. “The Impact of Secondary Schooling in Kenya: a Regression Discontinuity Analysis.” Journal of Human Resources, 53(1), 157-188.

Pham, Minh Hac. 1995. “The Education System of Vietnam.” In David Sloper and Le Thac Can. (Eds.) Higher Education in Vietnam: Change and Response. New York: St. Martin’s Press.

Plug, Erik. 2004. “Estimating the Effect of Mother’s Schooling on Children’s Schooling Using a Sample of Adoptees.” American Economic Review, 94(1), 358–368.

Provincial Government of Quảng Ngãi. (2005). “Quảng Ngãi trong Thời Kỳ Kháng Chiến Chống Pháp, 1946-1954”. (Quảng Ngãi during the Resistance War against the French, 1946-1954).

Sarkadi, A., Kristiansson, R., Oberklaid, F and Bremberg, S., 2008, Fathers’ involvement and children’s developmental outcomes: a systematic review of longitudinal studies, Acta Padiatrica, 97, 153-158.

Schaumburg-Muller, Henrik. 2005. “Private-sector Development in a transition economy: the case of Vietnam” Development in Practice, vol 15(3): pp 349-361.

Strauss, John, and Duncan Thomas. 2008. “Health over the Life Course.” In Handbook of Development Economics, vol. 4, ed. Paul Schultz and John Strauss. Amsterdam: North-Holland.

Suhonen, Tuomo and Hannu Karhunen. 2019. The intergenerational effects of parental higher education: Evidence from changes in university accessibility. Journal of Public Economics 176, 195-217

Wils, Annababette. 2004. "Late Entrants Leave School Earlier: Evidence from Mozambique." International Review of Education, 50(1): 17-37.

PUBLICATIONS

Intergenerational Transmission of Education in a Developing Country: Evidence from A Mass Education Program in Vietnam

Working Paper No. WP/2022/245