

**ESTIMATING THE RATE OF RETURN TO SCHOOLING IN VIETNAM: A
DIFFERENCE-IN-DIFFERENCE APPROACH^{*}**

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Introduction

The Vietnam primary and secondary education system during the past three decades provides an interesting context to evaluate the rate of returns to schooling. Despite the country reunification in 1975, the primary and secondary school systems continued to be different in the north and the south until the late 1980s. While students in the south had to spend 12 years in school in order to complete high school, students in the north only went through 11 years of schooling. In the 1988-89 academic year, the Ministry of Education decided to add another year to the high school system in the north so that the whole system is unified. Thus, in the north, high school graduates, who were born before 1975, went through 11 years of schooling, while those who were born after 1976 went through 12 years of schooling.

The above government-institute change in the education system provides a basis for estimation of the rate of return to schooling in Vietnam, while avoiding the problem of different innate abilities. Based on the Vietnam Standard Living Standard Survey 2002, I estimate that the imposition of an additional year of high school increases the wages of high school graduates by 11.43 percent.

The paper is organized as follows. Section 1 gives a brief overview of the literature. Section 2 describes the data used in this empirical analysis. Section 3 provides the OLS estimation of the determinants of wages based on the Mincer's earnings function. Section 4 covers the difference-in-difference estimation of the rate of return to schooling. Section 5 is the conclusion.

Past Research

Most empirical works on the rate of return to schooling relies on the Mincer's earning function. Mincer [1974] ran an ordinary least squares regression using the natural logarithm of earnings as the dependent variable, and years of schooling and years of experience and its square as independent variables. The estimated coefficient on years of schooling gives the percent increase in wages given an additional increase of one year in schooling. By assuming that individuals do not differ in their innate ability, the estimated coefficient on years of schooling can be interpreted as the rate of return to schooling. The coefficient on the years of experience measures the estimated impact of on-the-job training on wages. A positive sign on the years of experience coefficient and a negative sign on the years of experience squared coefficient would imply that increases in experience raise wages but at a decreasing rate.

Borjas [2005] reports that the consensus estimate of the rate of return to schooling in the US based on the Mincer earnings function was approximately 9 percent during the 1990s. Psacharopoulos [1994] documents the international evidence on the estimates of the coefficients on the years of schooling. While the average coefficient estimate for developed countries is 6.8 percent, those for developing Asia and Latin America are 9.6 percent and 12.4 percent respectively (see Table 1).

However, estimates for the coefficient on schooling cannot be interpreted as the rates of return to schooling when wage earners differ in their ability. The theory underpinning the

rate of return to schooling is the concave upward-sloping wage-schooling locus. As long as wage earners have the same ability, they lie on the same wage-schooling locus whose slope measures the rate of return to schooling. However, when differences in ability exist, wage earners lie on different wage-schooling loci, and the estimated coefficient on schooling is subject to the so called ability bias. The conventional wisdom is that more able individuals have a higher rate of return to schooling and therefore tend to achieve more years of schooling. Thus, the observed differences in wages among different levels of schooling may be due to differences in ability rather than returns to schooling.

Table 1: International Evidence on the Coefficient on Years of Schooling

Region	Years of schooling	Coefficient (percent)
Sub-Saharan Africa	5.9	3.4
Asia*	8.4	9.6
Europe/Middle East/North Africa*	8.5	8.2
Latin America/Caribbean	7.9	12.4
OECD	10.9	6.8
World	8.4	10.1

* None-OECD

Source: George Psacharopoulos, "Returns to Investment in Education: A Global Update", *World Development*, 22(9), 1994.

A number of recent studies have focused on devising ways to control for the unobserved innate ability. Using the draft lottery number during the Vietnam War period as an instrumental variable, Angrist and Alan Krueger [1992] estimates that an additional year of schooling caused by the draft produces an increase of 6.6 percent in earnings. Duflo [2001] uses the difference-in-difference approach to estimate the impact of the large-scale school construction program during 1973-78 on years of schooling and wages. The rate of return to schooling as implied by those estimates is in the range of 6.8 to 10.6 percent. Ashenfelter and Krueger [1994] rely on the data of identical twins, who are assumed to have the same ability, to find out that an additional year of schooling raises wages by 12-16 percent.

Data

The Vietnam Living Standards Survey (VLSS) in 2002 is the third nation-wide survey conducted by the Vietnam's General Statistical Office with the technical support from the World Bank and other international donors.^{1,2} The VLSS was designed to provide an up-to-date source of data on households to be used in policy design, monitoring of living standards and evaluation of policies and programs. Out of the total number of 16.7 million households in Vietnam, 75,000 households were selected in the VLSS 2002, of which 30,000 households have complete information, including demography, education, health, employment, income and expenditure, and housing and other durable assets. In total, 132,384 individuals with complete information were covered in the VLSS 2002.

All individuals aged six and older were asked to respond to the questions in the employment section starting with the status of employment in the last seven days and nature of work in the last 12 months. For main work in the last 12 months, information was collected on hours, type of employer, and wages (including basic salaries, overtime compensation, and bonuses).

As Vietnam is still a highly agricultural economy, wage employment accounts for less than 30% of total employment (see Table 2.1). Out of 132,384 individuals surveyed, 20,912 are wage earners aged between 15 and 65 with valid data.

¹ Detailed information about VLSS can be found at http://www.worldbank.org.vn/data/household_survey.htm and http://www.gso.gov.vn/default_en.aspx?tabid=483&idmid=4.

² The first VLSS was conducted in 1992-93 and the second in 1997-98.

Table 2.1: Employment by Type (percent)

	Non-farm wage employment	Farm wage employment	Farm self employment	Non-farm self employment
Whole country	22.29	6.05	53.05	18.61
By area				
Urban	47.50	2.92	14.98	34.60
Rural	15.16	6.94	63.79	14.10
By sex				
Male	27.84	7.35	49.20	15.62
Female	16.84	4.79	56.82	21.56

Source: Vietnam's General Statistical Office, *Vietnam Standard Living Survey*, 2002.

The education section of the VLSS asks about grade attained prior to attending any post secondary school training and post secondary school qualifications (2-year vocation training, 3-year college, 4-year college, 2-year graduate study, and 4-year graduate study). This information is used to calculate the number of years of schooling for each individual wage earners.

The survey does not, however, asks specifically about the years of experience. As a result, the number of years since completion of schooling is used as a proxy for length of experience.

Table 2.2: Summary Statistics for Individual Wage Earners Aged between 15 and 65

	Total	Gender		Geography		
		Male	Female	Hanoi	Ho Chi Minh City	Remaining Areas
Number of observations	20,912	12,658	8,254	900	1,027	18,985
Hourly wage (thousand dong)	4.20* (4.89)**	4.41 (5.13)	3.88 (4.50)	6.09 (5.39)	9.09 (11.39)	3.85 (4.04)
Years of schooling	8.44 (4.39)	8.49 (4.23)	8.36 (4.61)	12.62 (3.23)	10.27 (3.93)	8.14 (4.33)
Years of experience	18.66 (11.28)	18.97 (10.97)	18.19 (11.71)	18.49 (11.59)	18.06 (10.30)	18.70 (11.31)

* Mean; ** Standard Deviation.

Source: Vietnam's General Statistical Office, *Vietnam Standard Living Survey*, 2002.

Determinants of Wages

The standard Mincer's earnings function has the following form:

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{Schooling} + \beta_2 \text{Experience} + \beta_3 \text{Experience}^2 + \text{other variables} + \varepsilon$$

It is expected that wages are positively associated with schooling, implying a positive sign for β_1 . The theoretical justification for the inclusion of the experience term as explanatory variables is that more experience is associated with higher wages, but at a decreasing rate. As a result, β_2 is expected to be positive, while β_3 is expected to be negative.

Other typical variables included in the OLS regression include dummies for gender and geography. In the context of Vietnam, Ho Chi Minh city and Hanoi stand out as the two dominant economic centers with the combined GDP accounting for 35% of the national total. Table 2.2 above reveals substantial differences among the hourly wage rates of Hanoi, Ho Chi Minh city and the rest of the country. As such, the geographical dummies for Hanoi and Ho Chi Minh city are included in the regression. In addition, a dummy variable for agricultural/non-agricultural job is also included.

Significant differences also exist in the compensation of employees between the state sector and the private sector. Since the government instituted the economic reform in the late 1980s, which transformed the Vietnamese economy from a central planning system to the market economy, the state sector has been shrinking steadily. Nevertheless, it still

accounted for 38 percent of the national output in 2002.³ To capture the differences between the state and private sectors, a sectoral dummy variable is introduced.

Table 3: Regression Results

Dependent variable: ln(hourly wage)

Independent variables	Coefficient estimates			
	(1)	(2)	(3)	(4)
Years of schooling	0.0732 (0.0012)*	0.0675 (0.0012)*	0.0569 (0.0013)*	0.0452 (0.0015)*
Years of experience	0.0270 (0.0014)*	0.0245 (0.0014)*	0.0248 (0.0014)*	0.0221 (0.0014)*
Years of experience squared	-0.0004 (0.00003)*	-0.0004 (0.00003)*	-0.0004 (0.00003)*	-0.0004 (0.00003)*
Male		0.1545 (0.0098)*	0.1491 (0.0097)*	0.1679 (0.0097)*
Hanoi		0.1957 (0.0240)*	0.1761 (0.0239)*	0.1734 (0.0237)*
Ho Chi Minh city		0.7061 (0.0222)*	0.6698 (0.0221)*	0.6900 (0.0220)*
Non-agricultural job			0.2184 (0.0120)*	0.2000 (0.0120)*
Private sector				-0.1943 (0.0129)*
Constant	7.1195 (0.0179)*	7.0569 (0.0181)*	6.9916 (0.0183)*	7.2609 (0.0255)*
Number of observations	20,893	20,893	20,893	20,893
Adjusted R ²	0.1708	0.2182	0.2305	0.2387

* Significant at 1%.

Standard error in parentheses.

Table 3 reports the estimation results. The first column corresponds to the most basic equation which includes only schooling and experience as explanatory variables. All the estimated coefficients have the expected sign and are statistically significant. An additional year of schooling is associated with 7.32 percent increase in wages. Gallup [2004] using the same model and previous VLSSs estimates the schooling confidants to be 2.9 percent in 1992/93 and 5.0 percent in 1997/98. Thus, the magnitude of the impact of schooling on wages in Vietnam tend to increase overtime.

³ Vietnam General Statistical Office website: http://www.gso.gov.vn/default_en.aspx?tabid=468&idmid=3&ItemID=3230.

An additional year of working experience is also associated with significant increases in wages and at a decreasing rate as expected by the theory.

The inclusion of dummy variables substantially reduce the size of the estimated coefficient on schooling, but have little effect on the estimated coefficient on working experience. When all the dummies on gender, geography, non-agricultural job, and sectoral ownership are included, an additional year of schooling is associated with only 4.52 percent increase in wages. This is very low compared to the estimated rate of 9.6 percent for developing Asia as reported by Psacharopoulos [1994].

The results in columns (2), (3), and (4) of Table 3 show that being a male, working in a commercial center of Hanoi or Ho Chi Minh, having a non-agricultural job, and working for the private sector all have statistically and economically significant effects on wages after accounting for differences in schooling and working experience. Other things remaining the same, a male worker earns 16.79 percent more than a female worker. Working in Hanoi and Ho Chi Minh city earns 17.34 percent and 69 percent respectively more than working in the rest of the country. This result reveals the massive attractiveness of Ho Chi Minh city, the largest city in Vietnam, for job seekers.

Other things being equal, a non-agricultural worker earns 20 percent more than an agricultural worker. Interestingly, workers in the state sector (including the government and state-owned enterprises) earn 19.43 percent more than workers in the private sector.

This evidence may sound puzzling at first sight given the popular claims in Vietnam that public workers are underpaid. However, it must be noted that those claims are often based on the basic salary scale. The hour wages in the VLSSs 2002 include also bonuses and other fringe benefits. According to this measure, the wage gap between state and private workers is positive after controlling for other factors.

Rate of Return to Schooling

As noted in Section 2, the estimated coefficient on schooling does not represent the true rate of return to schooling since the unobserved ability of workers is not controlled for. The education reform undertaken in Vietnam during the late 1980s provides a unique opportunity to compare wages among wage-employed workers with similar ability.

During the war time period, Northern Vietnam maintained the primary and secondary schooling system of 11 years, starting from grade 0 and end at grade 10; at the same time, Southern Vietnam maintained the standard system of 12 years from grade 1 to grade 12. Despite the country reunification in 1975, the two systems remained intact until the late 1980s. In the 1988-89 academic year, the Ministry of Education effectively added another year to secondary education in the north, and the schooling system in the whole country was unified. In the north, those who were born before 1975 had to go through 11 years of schooling in order to complete high school, while those who were born after 1976 had to complete 12 years of schooling. Those who were born in 1975 and 1976 in the north were the transitional generation. Some of them took 12 years while others took 11 years.

In the existing sample of wage earners, there are 2,173 individuals, of which 1,118 studied in the south and 1,055 studied in the north, who had a high school degree but no post-school training, and were born either before 1975 or after 1976. Thus, the 1,118 wage earners in the south had exactly 12 years of schooling. Out of the 1,055 wage earners in the north, 746 were born before 1975 and had 11 years of schooling, and 309 were born after 1976 and had 12 years of schooling.

The following regression is used for the differencing and isolation of the “treatment effect”.

$$\ln wage = \beta_0 + \beta_1 \text{Cohort} + \beta_2 \text{SchoolArea} + \beta_3 (\text{Cohort} * \text{SchoolArea}) + \varepsilon$$

where Cohort = 0 if an individual was born before 1975; and 1 if after 1976

SchoolArea = 0 if an individual went to school in the south; and 1 if in the north.

Differential effect on $\ln wage$ of being born after 1976 compared to before 1975: β_1

Differential effect on $\ln wage$ of going to school in the north compared to the south: β_2

Differential effect on $\ln wage$ of being born after 1976 and going to school in the north: β_3

Table 4.1: Difference-in-difference approach

	Ln(Hourly Wage)		
	Wage earners born before 1975	Wage earners born after 1976	Difference
School in the south	β_0	$\beta_0 + \beta_1$	β_1
School in the north	$\beta_0 + \beta_2$	$\beta_0 + \beta_1 + \beta_2 + \beta_3$	$\beta_1 + \beta_3$
	Difference-in-difference		β_3

There are two assumptions for the analysis to be valid. Firstly, no difference in ability exists between individuals born before 1975 and individuals born after 1976. This is a

very reasonable assumptions since there is no reason to believe that people born in different years have different innate abilities. Secondly, people in the north have the same innate ability as people in the south. This is also likely to be true since Vietnamese in the north and the south both mainly belong to the same predominant racial group (the Kinh).

Table 4.2: Regression ResultsDependent variable: $\ln(\text{Hourly wage})$

Independent variables	Coefficient estimates
Cohort (β^1)	-0.3930 (0.0452)*
SchoolArea (β^2)	-0.3513 (0.0346)*
Cohort*SchoolArea (β^3)	0.0948 (0.0645)†
Constant (β^0)	8.3598 (0.0241)*
Number of observations	2,173
Adjusted R ²	0.0994

* Significant at 1%; † Not significant at 10%.
Standard error in parentheses.

Table 4.3: Impact of school reform on wages

	Ln(Hourly Wage)		Difference
	Wage earners born before 1975	Wage earners born after 1976	
School in the south	8.3598	7.9669	-0.3930
School in the north	8.0085	7.7104	-0.2981
Difference-in-difference			0.0948

In the south, those who were born after 1976 earned 39.3 percent less than those who were born before 1975. In the north, hourly wages decreased by 29.8 percent between the younger and older cohorts. Thus, the addition of one year to the high school system instituted by the government in 1989 resulted in an increase of 9.5 percent in wages, which is the rate of return to an additional year of schooling.

However, as indicated in Table 4.2, the difference-in-difference estimate is not statistically different from zero. This may be due to the fact that the estimation has not controlled for other factors affecting wages. This is done in Table 4.4 below.

Table 4.4: Regression Results (controlling for other factors affecting wages)
Dependent variable: $\ln(\text{hourly wage})$

Independent variables	Coefficient estimates
Cohort (β^1)	-0.0254 (0.0796) [†]
SchoolArea (β^2)	-0.0368 (0.0814) [†]
Cohort*SchoolArea (β^3)	0.1143 (0.0607)**
Years of experience	0.0460 (0.0088)*
Years of experience squared	-0.0009 (0.0002)*
Male	0.1741 (0.0286)*
Non-agricultural job	0.4126 (0.0480)*
Private sector	-0.0980 (0.0290)*
Geographical dummies	-
Constant (β^0)	8.3598 (0.0241)*
Number of observations	2,173
Adjusted R ²	0.2138

* Significant at 1%; ** Significant at 5%; [†] Not significant at 10%.
Standard error in parentheses.

After controlling for other factors, the rate of return to an additional year of schooling at the high school level raises wages by 11.43 percent, which is statistically different from zero.

Conclusion

The school reform in Vietnam undertaken by the government in the late 1980s in which an additional grade was added to the high school system in the north, provides a unique opportunity to evaluate the return to schooling. After controlling for other factors such as work experience, gender, non-agricultural job, sectoral ownership, and geography, the difference-in-indifference approach suggests that the rate of return to an additional year of secondary schooling is 11.43 percent.

The above result, however, needs to be interpreted with care. Besides adding one more year of schooling, the reform also involved changes in teaching curricula at all grades, including introduction of revised textbooks. As a result, the estimated effect on wages may be due to both the increase in the years of schooling and changes in school quality. The direction of the impact of changes in school quality remains unclear. The question of whether the school quality increased and decreased as a result of the introduction of new textbooks remains very debatable. This adds to the difficulty of finding a way to control for changes in the school quality in order to better isolate the effect of schooling on wages. Nevertheless, if one takes the view that the school quality in Northern Vietnam improved then the rate of return to schooling of 11.43 percent may be overestimated.

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