Return to schooling in Vietnam during economic transition: Does return to schooling in Vietnam reach its peak?

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Abstract

A common phenomenon about transition economies is that the return to schooling improves as economic reform progresses. Existing research suggests that Vietnam is not an exception to the pattern. However, the rate of return in period from 1992 to 1998 is still relatively low, below 5 percent, relative to that of the world and other transitional economies. And it is hard to see a clear trend in the current literature due to different methods applied and sets of variables controlled in the earnings equations (see Appendix B). The low returns may result from the gradual economic reforms applied in Vietnam, whilst in Eastern European countries the "Big Bang" transformation was conducted. Therefore, to test whether the return to schooling in Vietnam is rising and reaches other transitional economies' rate of returns, we re-examine the trend in the rate of return to schooling in Vietnam over the 1998-2008 period, when the reforms have had a longer time to have an effect. We apply the OLS and Heckman selection estimator (Maximum Likelihood approach) and find that the return has increased quickly during the later economic reform but its pace has slowed down when the return reached the global average rate of returns at somewhere between 9 and 10 percent.

Keywords: economic transition, returns to schooling, Vietnam
JEL Classification: J31, O15

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1. Introduction

A key stylized fact about transition economies is that the returns to schooling tend to rise as economic reform progresses (Orazem, & Vodopivec, 1995). The rise marks the movement away from distorted labour markets and the effects of longer-term changes in patterns of human capital formation. Moreover, the increase in returns to schooling in transitional economies is especially marked for women, as found in the Czech Republic and Slovakia (Chase, 1998), and in Russia, Ukraine, Hungary, and Poland (Brainerd, 1998).

Existing research suggests that Vietnam does not follow the pattern completely. Rates of return were very low at the beginning of transition, below 3 percent using basic Mincerian earnings equation and even below 2 percent if further controlled for other variables in 1992 (Glewwe, & Patrios, 1998; Gallup, 2002). Using both the basic and extended Mincerian earnings model, Galllup (2002) show the increasing returns over period 1992-1998. Comparison to the world rate of returns at about 9 to 10 percent around the same time (Psacharopoulos, 1994), however, the rates of returns for Vietnam are still low. Contrary to Gallup, estimates reported by Liu (2006) suggest falling rate of returns for men in Vietnam, from 5.9 percent in 1992 to 3.5 percent in 1998 and little increase for women, from 4.2 percent to 4.8 percent in the same period. [2] One possible reason for the divergence from the patterns in Eastern Europe is that gradual economic reform policies have been applied in Vietnam and the Vietnamese government has intervened in the economy substantially, whilst in Eastern European countries the "Big Bang" reforms were introduced. Therefore, conclusion on the trend of returns to schooling in Vietnam for the period is ambiguous.

To test whether Vietnam is not rewarding education effectively, we re-examine the trend in the rate of return to schooling in Vietnam over the 1998-2008 period, called the later period of the reforms when the reforms may have had longer time to have an effect. Moreover, recent years have seen continued development of the private sector (66% in GDP, and 91% in employment in 2008) which has stimulated competition in the labour market with consequent changes in relative wages. Concurrently, income inequality has also risen during the later reform period, with the Gini index rising from 0.35 in 1994 to 0.418 in 2002, and 0.42 in 2006 (GSO, 2004, 2006). Since participation rates in the wage labour market are rising over the period and wage earners have

[2] Note that our comparison may be inappropriate because the different models, the Heckman selection correction and OLS model, are applied for 1992 and 1998 respectively. In the context of Vietnam, higher educated people tend to work in wage-paid jobs, so the selection models typically yield higher returns to schooling (Doan, & Gibson, 2009). Given the higher returns by selection models, the decrease in males' returns over the period from 1992 to 1998 would be smaller; conversely the improvement in female returns would be greater.

higher education achievement relative to non-wage earners (see Appendix A), the analysis not only relies on the basic Mincerian earnings function but also accounts for sample selection bias.

The next section reviews studies of the returns to schooling in transition economies. Section 3 discusses the data and econometric specifications. Section 4 presents the results. Discussion of possible explanations for the changing returns and conclusions are presented in Section 5.

2. Literature on Return to Schooling in Transition

Existing studies show that rates of return to schooling increase over time in transitional economies. For example, returns to schooling increased from 3.6 percent in 1988 to 12.2 percent by 1993 in China, from 1.5 percent in 1989 to 5.4 percent by 1994 in Estonia, and from 2.9 percent in 1986 to 7 percent by 1996 in Poland (Psacharopoulos, & Patrinos, 2004, Table A4). Most of these studies use Ordinary Least Squares (OLS) estimation which does not allow for endogenous school choice, but when Heckman and Li (2004) use Instrumental Variables (IV) they find even higher rates of return, of around 14 percent for four-year college attendance in China. The return is much higher when comparing to rates of return estimated by Chow (2001) for China in the 1980s which were much closer to zero. Johnson and Chow (1997) note that employment in the stationary public sector which dominated in China's urban areas in the late 1980s leads to lower rates of returns. Zhang et al (2005) also suggest that economic reform and technical changes have enhanced competition among workers in China, with the newly-skilled rewarded at an increasing rate. More evidence of the increasing returns during the reforms in transitional economies can be found in Fleisher (2005) and Fleisher, Sabirianova, and Wang (2005). These authors find that the speed of economic transition and the degree of economic volatility explain the differences in the increase in the rates of return to schooling over time and across the economies.

Yet studies of Vietnam for either the single year 1992 or the period of 1992-1998 find low rates of return to schooling, and show a modest rise over time (Gallup, 2002; Glewwe et al, 1998; Liu, 2006; Moock et al, 2003). It is notable that the study by Liu (2006) was after over ten years of economic reform yet the estimated rate of returns was still relatively low (3.5% and 4.8% for male and female, respectively). However, these studies may not have captured the full effects of the transition to a market-oriented economy given the cautiously gradual nature of early economic reforms in Vietnam. Hence it is important to see the trend in the returns to schooling over the recent period 1998-2008, which is believed long enough to an effect.

In addition to the timing issue, some existing studies on Vietnam ignored the important problem of sample selection bias (Gallup, 2002; Glewwe et al, 1998; Moock et al, 2003).[3] Since there was a rising participation rate in the wage labour market during transition the omission may bias not only the level of the estimated rate of returns but also the trend over time. Consequently, in this paper we control for sample selection bias.

3. Data and model specification

Data sets used in current paper are from the 1998, 2002, 2004, 2006, and 2008 rounds of the Vietnam Household Living Standards Survey (VLSS) conducted by General Statistics Office of Vietnam (GSO). There are 5,999 households with 28,624 household members in VLSS1998, 29,542 households with 132,374 members in VLSS2002, 9,188 households with 40,419 household members in VLSS2004, 9,189 households with 39,071 members in VLSS2006, and 9,186 households with 38,247 members in VLSS2008. These samples are representative for the national, rural and urban levels of Vietnam. Sub-samples of wage-earners aged from 15 to 60 are used in the estimations, which yield 3,244 from VLSS1998, 26,268 from VLSS2002, 7,186 from VLSS2004, 7,442 from VLSS2006, and 7,540 from VLSS2008.

3.1 Mincerian earnings model

To estimate the returns to schooling, the Mincerian earnings equation is used:

$$LnY_i = \alpha + \beta_1.S_i + \beta_2 Exp_i + \beta_3 Exp_i^2 + \varepsilon_i \quad (1)$$

where LnY is the natural log of hourly wages including bonuses, allowances, and subsidies (both in cash and in-kind), *S* is years of schooling,[4] *Exp* is potential experience (calculated as age *minus* schooling years *minus* six) and the experience squared term, Exp^2, is added in the model to allow a non-linear pattern in lifecycle earnings. To test increasing rates of returns to schooling over time, we use four pooled datasets obtaining from the base year of 1998 and compared years so called the second year (either 2002 or 2004 or 2006 or 2008) and an interaction term between years of schooling and a year dummy for the compared year. The model for regression is as follow:

[3] Our previous study (Doan, & Gibson, 2009) using datasets of 1998 and 2004 and taking into account the sample selection bias showed the fast increasing trend of returns to schooling in Vietnam. However, we did not test the difference in the returns over time, so the findings may be less conclusive.

[4] In this study, we use official education attainment (general and higher education) and unofficial technical & vocational training, whereas in our previous study (Doan, & Gibson, 2009), we used only the general and higher education attainment; the estimated returns are slightly different. It is consistent with Horowitz and Schenzler (1999); they find that in developing countries the returns of general education track exceed those of technical and vocational training/education.

$$LnY_i = \alpha + \beta_1.S_i + \delta_1.S_i*Year_2 + \beta_3 Exp_i + \beta_4 Exp_i^2 + \upsilon_i \quad (2)$$

where $Year_2$ is the second year survey. However, one may question that the effects of other controlling variables might vary over time. To capture effects of the variations, we include not only interaction terms of years of schooling and a year dummy for the second survey but also interaction terms of other controlling variables and the second year dummy. The estimation model now is as follow:

$$LnY_i = \alpha+\beta_1.S_i+\delta_1.S_i*Year_2+\beta_2 Exp_i+\delta_2 Exp_i*Year_2+\beta_3 Exp_i^2+\delta_3 Exp_i^2*Year_2 + \upsilon_i \quad (3)$$

In addition, to capture the gender difference in earnings, we also include a dummy variable for sex and its interaction term with the second year dummy.[5]

3.2 Sample selection bias-corrected model

Sample selection bias results when the subset of wage earners used for the Mincerian earnings function is not randomly sampled from the general population. To address the problem we apply the Heckman (1979) sample selection model as follows:

$$\text{Wage equation:} \qquad w_i = z_i \beta_1 + u_{1i} \quad (4)$$

Where z_i is a vector of schooling and experience variable for individual i

$$\text{Selection equation:} \qquad h_i^* = x_i \beta_2 + u_{2i} \quad (5)$$

where h_i^* is a latent variable and w_i is observed if $h_i = 1$, and $h_i = 1$ if $h_i^* > 0$, and w_i is not observed if $h_i = 0$, and $h_i = 0$ if $h_i^* \leq 0$. Furthermore, the assumptions about the errors are that:

$$u_{1i} \sim NID(0, \sigma^2) \text{ and } u_{2i} \sim N(0,1) \text{ and } cov(u_{1i}, u_{2i}) = \rho_{12}.$$

In the first estimation stage, a binary Probit model on all observations (those in wage employment and those not) is used to estimate the correction term λ_i, which is the inverse Mill's ratio or Heckman's Lambda: $\lambda_i = \phi(x_i \beta_2)/\Phi(x_i\beta_2)$. The term is then included in the second stage of the augmented earnings function:

$$w_i = z_i \beta_1 + \sigma_{12}. \lambda_i + \eta_i \quad (6)$$

These two equations can also be estimated in one single step using Heckman maximum likelihood estimator, which is more efficient (StataCorp, 2001) than the two-step procedure. Identification is achieved by including variables (X_i) such as household size and household non-wage income in the selection equation. Justification for the identification is that these variables

[5] Including the variables does not change the estimated returns much, so our estimates can be compatible to the conventional basic Mincerian earnings equation estimates

affect wage employment participation probabilities, through changing the opportunity cost of being in the wage labour force, but an employer is unlikely to pay a different wage rate depending on one's household size or non-labour income. Household size may affect wage employment participation because in 2006, 53 percent labour force of the country was working in agricultural sector and the sector contributed only 17.6 percent to Vietnam's GDP (VDR, 2009). Therefore, household size relates to labour surplus and affects wage employment participation. Given the same household size, conversely, households with higher non-wage incomes from self-employed, family businesses, and farming may not send their members out to work in wage employment sector. Therefore, effects of household size and non-wage income on probability of being wage earners in the selection equation are significantly positive and negative, respectively.

4. Results

The descriptive statistics show that the educational attainment of wage earners in Vietnam averages was about 9 years in 1998,[6] and was slightly higher by 2008, just over 10 years (Appendix A). Non-wage earners' education attainment is lower than that of wage earners in all the years. The average hourly wage rate was 2,569 dong (US$0.187) in 1998 and in nominal terms had risen to 5,779 dong (US$ 0.544) by 2008.

4.1 Basic Mincerian estimates of the returns over time

Table 1 contains the basic earnings function estimates. All of the coefficients are statistically significant at the one percent level but the explanatory power of the model is substantially higher in 2008 than in 1998. The coefficient on years of schooling implies an average private rate of return to an additional year of education of 2.9 percent in 1998 rising to 9.1 percent by 2008. These results obviously show the increasing returns to schooling during the recent economic reforms. The results are also quite consistent with the increasing trend found in other transition economies. For example, Zhang et al (2005) report a seven percentage point rise in the rate of return to schooling in China between 1988 and 2001.

The rate of returns to schooling rises over time. Specifically, the rate of return to an extra year of schooling rose by 6.2 percentage points (from 2.9 to 9.1 percent) (Figure 1). The female wage premium is lower than that of men. According to the coefficient on the sex intercept dummy

[6] Sample size and sampling strategy of VLSS2002 is quite different from the remaining surveys so the number of schooling years is slightly lower (see VHLSS, 2002 and 2004: Basic Information at http://siteresources.worldbank.org/INTLSMS/Resources/3358986-118173055198/3877319-1207074161131/BINFO_VHLSS_02_04.

variable in the first column of Table 1, hourly wages were about 14.8 percent higher for men than for similarly educated and experienced women in 1998.[7] The gap was about 19.9 percent in 2008.

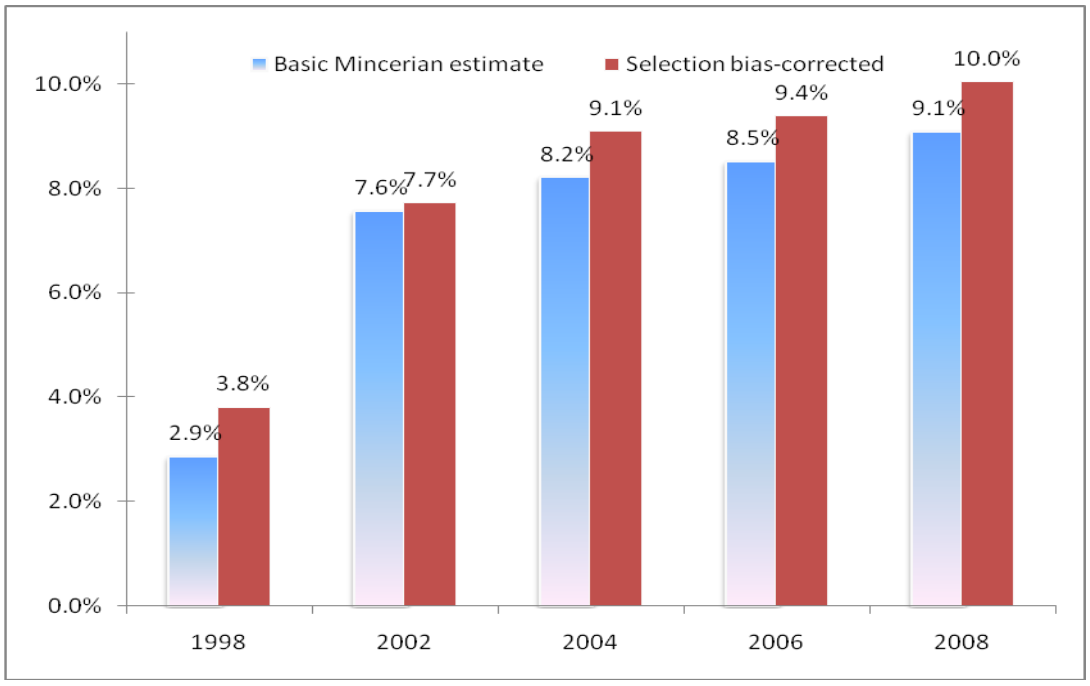
Table 1: Basic Mincerian Earning Function Estimates by years (1998-2008)

Variables	1998	2002	2004	2006	2008
Years of schooling (years)	0.0287	0.0756	0.0821	0.0851	0.0909
	(7.64)**	(43.96)**	(36.84)**	(37.81)**	(38.49)**
Experience (years)	0.0150	0.0178	0.0263	0.0298	0.0393
	(2.90)**	(7.43)**	(8.72)**	(10.59)**	(13.70)**
Experience squared	-0.0006	-0.0004	-0.0006	-0.0007	-0.0009
	(3.69)**	(6.19)**	(7.20)**	(8.44)**	(11.91)**
Sex (male=1)	0.1381	0.1614	0.1389	0.1340	0.1814
	(4.55)**	(10.89)**	(7.38)**	(7.51)**	(10.07)**
Constant	0.2935	0.1387	0.2249	0.4369	0.6851
	(6.01)**	(5.80)**	(6.93)**	(13.39)**	(19.75)**
R-squared	0.04	0.15	0.20	0.22	0.25
F-statistics (all coeffs=0)	23.85	550.93	377.44	388.07	416.81
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	3,244	26,268	7,186	7,442	7,540

Robust t-statistics in parentheses, statistically significant at 10% (+), at 5% (*), and at 1% (**); dependent variable is hourly wage in log, hourly wage is measured in VND 1,000 (and for all Tables hereafter)

4.2 Selectivity-corrected estimates of returns to education

Figure 1: Returns to schooling using cross sectional data sets (Mincerian earnings equation and selection-bias corrected estimates)



[7] For dummy variables in a semi-logarithmic regression the percentage is calculated as 100 x ($e^{\beta i}$ -1)

To overcome the selectivity bias and confirm the increasing trend we apply the Heckman selection-correction model. After correcting for sample selection bias, the estimated rates of return to education are somewhat higher than in the OLS estimates reported in Tables 1. However, the basic feature of the data, of a significant rise in the rates of return between 1998 and 2008, is not altered. The full results of using the correction model are reported in Table 2. The returns in most cases improve about 1% relative to the OLS estimates except 2002. The rise in the average private rate of return to a year of schooling is illustrated in Figure 1, for both the basic Mincerian earnings equation and selectivity-corrected estimates. Both sets of estimates show a rise of about 6.2 percentage points between 1998 and 2008.

The joint estimations of the selection and wage equations show that the residuals are positively correlated for all the years. Specifically, the coefficient on the inverse Mills' ratio or λ varies from 0.120 to 0.285 and is always highly statistically significant. It implies a positive correlation between the selection equation errors and the wage equation errors, since $\lambda=\rho\sigma$ (and σ must be positive). In other words, individuals with a comparative advantage in entering the wage-earning labour force also have a comparative advantage in earning more than observationally similar workers. Hence the observed wage is higher than the wage that would prevail for a sample of individuals selected at random from the working-age population.

Table 2: Heckman Selection Estimates by years (1998-2008)

	1998		2002		2004		2006		2008	
	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection	Wage	Selection
Years of schooling	0.0381	0.0500	0.0772	0.0386	0.0909	0.0822	0.0939	0.0851	0.1004	0.0845
	(9.24)**	(12.58)**	(42.47)**	(15.65)**	(31.60)**	(26.03)**	(31.84)**	(23.91)**	(31.89)**	(24.88)**
Experience	0.0155	-0.00002	0.0247	0.0810	0.0407	0.0910	0.0437	0.0976	0.0555	0.1027
	(3.00)**	(0.01)	(8.56)**	(39.48)**	(10.89)**	(30.07)**	(12.06)**	(30.86)**	(13.73)**	(33.11)**
Experience squared	-0.0006	-0.0002	-0.0006	-0.0023	-0.0010	-0.0025	-0.0010	-0.0026	-0.0014	-0.0027
	(4.15)**	(2.62)**	(7.50)**	(40.93)**	(9.49)**	(28.96)**	(10.25)**	(30.16)**	(12.46)**	(31.97)**
Sex (male=1)	0.2448	0.4703	0.2018	0.5052	0.2051	0.4546	0.1947	0.4297	0.2464	0.4348
	(7.20)**	(19.57)**	(11.65)**	(35.41)**	(9.44)**	(21.86)**	(9.40)**	(19.77)**	(11.50)**	(20.44)**
Household size		0.0009		0.0446		0.0374		0.0457		0.0442
		(0.12)		(8.19)**		(5.55)**		(5.24)**		(5.84)**
Non- wage income		-0.0752		-0.2468		-0.1857		-0.1048		-0.0627
(/10,000 VND)		(7.65)**		(11.01)**		(15.18)**		(9.20)**		(10.38)**
Constant	-0.2649	-1.5129	-0.0542	-1.2933	-0.1846	-1.6569	0.0427	-1.8137	0.2499	-1.8608
	(2.97)**	(23.04)**	(1.08)	(31.85)**	(2.52)*	(30.78)**	(0.57)	(28.70)**	(2.95)**	(31.64)**
Lambda (λ)	0.2849		0.1200		0.2166		0.2099		0.2297	
	(7.49)**		(4.39)**		(6.34)**		(6.05)**		(5.82)**	
χ^2 (all coeffs=0)	143.12		1865.33		1031.12		1060.10		1031.11	
Prob > χ^2	0.0000		0.0000		0.0000		0.0000		0.0000	
Selectivity test (ρ=0)		$\chi^2(1)$= 56.67**		$\chi^2(1)$= 19.28**		$\chi^2(1)$= 39.89**		$\chi^2(1)$= 36.41**		$\chi^2(1)$= 33.57**
Observations	3,244	20,627	26,268	80,575	7,186	20,881	7,442	21,218	7,540	21,324

*Robust z statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%; the dependent variable in wage equation is hourly wage in logarithm, and the dependent variable in the selection equation takes value 1 for wage-earners and 0 for non-wage earners.*

The positive coefficients on years of schooling in the selection equations show a benefit of education which is omitted from the standard wage equations, which provides a higher probability of entering into wage employment. To help interpret the effect, the probit coefficients from the selection equation are transformed into marginal effects, showing the change in probability of being in wage employment for a unit change in the explanatory variable; we report the marginal effects of characteristics on probability of wage employment (Table 3).

Table 3: Marginal effects of characteristics on probability of wage employment (1998-2008)

Explanatory variables	1998	2002	2004	2006	2008
Years of schooling (years)	0.0105	0.0133	0.0292	0.0305	0.0305
	(12.23)**	(15.63)**	(26.02)**	(24.12)**	(24.84)**
Experience (years)	0.0001	0.0279	0.0327	0.0353	0.0375
	(0.17)	(39.44)**	(30.05)**	(30.77)**	(33.06)**
Experience squared	-0.0001	-0.0008	-0.0009	-0.0010	-0.0010
	(3.14)**	(40.91)**	(28.97)**	(30.09)**	(31.90)**
Sex (male=1)	0.1028	0.1732	0.1620	0.1549	0.1586
	(18.92)**	(35.41)**	(22.00)**	(19.83)**	(20.57)**
Household size	0.0017	0.0155	0.0149	0.0181	0.0173
	(1.13)	(8.13)**	(6.11)**	(5.50)**	(6.10)**
Non-wage income	-0.0145	-0.0854	-0.0658	-0.0379	-0.0228
(/10,000)	(7.33)**	(10.88)**	(14.57)**	(9.22)**	(10.13)**
Wald χ^2 (6)	698.71	3028.58	1886.85	1684.30	1911.95
Prob > χ^2 (all coeffs=0)	0.0000	0.0000	0.0000	0.0000	0.0000
Prediction of being wage- earners at x-bar	0.14	0.29	0.32	0.33	0.34
Observations	20,836	80,619	20,887	21,218	21,324

Robust z-statistics in parentheses, statistically significant at 10% (+), 5% (*), and 1% (**)

There appears to be a substantial rise over time in the effect of education on the probability of wage employment participation. In 1998 an additional year of schooling raised the probability by just over one percentage point. But ten years later the marginal effect of an extra year of schooling had risen to over three percentage points. In other words, people with higher education have a higher likelihood of having wage jobs. It is also notable that the overall rise in the predicted probability of wage employment for an individual with average characteristics, increasing from 14 percent in 1998 to 34 percent by 2008. The rapid increase in the probability of being in wage work probably resulted from the rapid industrialization in Vietnam's urban and peri-urban areas which have helped generate more non-farm jobs and absorb surplus labour from rural areas (demand side). Furthermore, the important Enterprise Law (a law for domestic private enterprises) passed in August 1999 (came into effect from the 1st January, 2000) stimulates mass

establishment of new business especially small businesses which help absorb surplus labour from agricultural sector (mostly self-employed family farming) to wage employment sector (industrial and service sectors). The Vietnam enterprise statistics show that number of enterprises increased impressively, from 42,288 in 2000 to 155,771 by the end of 2007 of which 76% are domestic private and limited liability enterprises.[8] These enterprises are main labour absorbers in Vietnam (Tran, & Doan, 2010). This helps explain the reason behind a great rise in the probability of being wage earners over the studied period. The increasing significance of household size as a positive predictor of wage employment is also consistent with the surplus labour interpretation in rural areas (supply side). The opportunity cost of having a household member work in wage employment is lower for a larger family since other family members are able to continue to work either on-farm or in some non-farm informal enterprises. Finally, availability of other non-wage employment from household business, self-employment, and larger farming, which generates household non-wage incomes, reduces the likelihood of being in wage employment.

4.3 Checking the robustness of the increasing return to schooling over time

One may question the validity of across comparison of estimated returns between each year of 2002, 2004, 2006 and 2008 and the base year of 1998 using separate regressions. To validate the comparison and consolidate the finding of rising returns over time, we use pooled data and the interaction terms as discussed in section 3. Specifically, VLSS1998 is pooled with, one after another, VLSS2002, VLSS2004, VLSS2006, and VLSS2008 to set up four pooled data sets.

Our objective of using the interaction terms is to test whether the returns to schooling is the same over time. The hypothesis is that the slope of hourly wage in log (lnY) with respect to years of schooling (S) is the same for both years (1998 and the second year or compared survey). In other words, we test H^A_0: $\delta_1 = 0$. We also allow the other variables' (including the intercept) effects to change over time by including their interaction terms with the second year survey dummy. The estimation equation is as below:

$$LnY_i = \alpha + \delta_0.Year_2 + \beta_1.S_i + \delta_1.S_i*Year_2 + \beta_2.Exp_i + \delta_2.Exp_i*Year_2 + \beta_3.Exp_i^2 + \delta_3.Exp_i^2*Year_2 + \beta_4.Sex + \delta_4.Sex*Year_2 + \upsilon_i \quad (7)$$

The results of the Mincerian earnings equation estimation are presented in Table 4.

[8] Available at www.gso.gov.vn/default_en.aspx?tabid=479&idmid=4&itemID=8722

Table 4: Basic Mincerian estimates of returns to schooling with the interaction terms

Explanatory variables	1998/2002	1998/2004	1998/2006	1998/2008	2002/2004	2004/2006	2006/2008
Second year dummy (δ_0)	-0.1548	-0.0686	0.1434	0.3916	0.0862	0.2120	0.2482
	(2.85)**	(1.17)	(2.44)*	(6.54)**	(2.14)*	(4.61)**	(5.21)**
Years of schooling (β_1)	0.0287	0.0287	0.0287	0.0287	0.0756	0.0821	0.0851
	(7.64)**	(7.64)**	(7.64)**	(7.64)**	(43.96)**	(36.84)**	(37.81)**
Schooling years*second survey (δ_1)	0.0469	0.0534	0.0564	0.0621	0.0065	0.0030	0.0057
	(11.34)**	(12.21)**	(12.86)**	(13.99)**	(2.32)*	(0.94)	(1.76)+
Experience (β_2)	0.0150	0.0150	0.0150	0.0150	0.0178	0.0263	0.0298
	(2.90)**	(2.90)**	(2.90)**	(2.90)**	(7.43)**	(8.72)**	(10.59)**
Experience*second survey (δ_2)	0.0028	0.0114	0.0148	0.0243	0.0086	0.0034	0.0096
	(0.49)	(1.91)+	(2.52)*	(4.13)**	(2.22)*	(0.82)	(2.38)*
Experience squared (β_3)	-0.0006	-0.0006	-0.0006	-0.0006	-0.0004	-0.0006	-0.0007
	(3.69)**	(3.69)**	(3.69)**	(3.69)**	(6.19)**	(7.20)**	(8.44)**
Experience squared*second survey (δ_3)	0.0001	-0.0001	-0.0001	-0.0004	-0.0002	-0.0001	-0.0003
	(0.88)	(0.32)	(0.65)	(2.23)*	(1.85)+	(0.48)	(2.41)*
Sex (Male=1) (β_4)	0.1381	0.1381	0.1381	0.1381	0.1614	0.1389	0.1340
	(4.55)**	(4.55)**	(4.55)**	(4.55)**	(10.89)**	(7.38)**	(7.51)**
Sex*second survey (δ_4)	0.0233	0.0008	-0.0040	0.0433	-0.0225	-0.0049	0.0474
	(0.69)	(0.02)	(0.11)	(1.23)	(0.94)	(0.19)	(1.87)+
Constant	0.2935	0.2935	0.2935	0.2935	0.1387	0.2249	0.4369
	(6.02)**	(6.01)**	(6.01)**	(6.01)**	(5.80)**	(6.93)**	(13.39)**
Observations	29,512	10,430	10,686	10,784	33,454	14,628	14,982
R-squared	0.14	0.18	0.36	0.49	0.17	0.23	0.29
F-statistics (all coeffs = 0)	305.05	329.72	488.86	840.98	486.23	390.31	488.37
Prob > F (all coeffs = 0)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Test (Prob > F) H^A_0: $\delta_1 = 0$	0.0000	0.0000	0.0000	0.0000	0.0206	0.3480	0.0780
Test (Prob > F) H^B_0: $\delta_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0215
Rate of return for the 2nd year	*7.56%*	*8.21%*	*8.51%*	*9.08%*	*8.21%*	*8.51%*	*9.08%*

*Robust t statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%; the dependent variable is hourly wage in logarithm.*

The estimated returns to schooling using pooled data 1998/2002, 1998/2004, 1998/2006, and 1998/2008 are presented in the 1st, 2nd, 3rd and 4th column in Table 4 respectively. In the first column, the return to schooling for year 1998 is 2.9%. For 2002, the rate of return is as 2.87% + 4.69% = 7.6%. Likewise, the rate of returns is 8.2%, 8.5% and 9.1% for 2004, 2006 and 2008 respectively (the last row in Table 4). The tests for difference in rates of returns between the second compared years and the base year of 1998 are all statistically significant at the 1% level (see the test for H^A_0). Therefore, we conclude that there is strong evidence against the hypothesis that the returns to schooling are constant over the period. From these estimates, the trend of increasing return is observed during the period 1998 to 2008. The trend is consistent with that we found using cross sectional datasets as in Table 1 and Figure 1. Moreover, the parameter test rejects the hypothesis that all interaction terms jointly equals zero, it implies that the effects of not only education but also other factors on earnings especially experience vary over time. However, the return is likely to be slowing down in recent years, investigating three pooled datasets of 2002/2004, 2004/2006 and 2006/2008 reveals the trend (see the 5th, 6th and 7th column in Table 4). The hypothesis that coefficients of an interaction term between schooling year and second survey dummy equals zero (H_0: $\delta_1 = 0$) is rejected for case of 2002/2004 but accepted for cases of 2004/2006 and 2006/2008 at the 5% level.

To strengthen our finding, we apply the selection correction model, and the estimated results are shown in Table 5. In the first stage, Probit model is applied to estimate the correction term, inverse Mills' ratio (λ_i). The identification is achieved by including household size and household non-wage income and their interaction terms with the second survey dummy in the selection equation, and we also include the second survey dummy in the selection equation to capture the time effect on wage employment participation.[9]

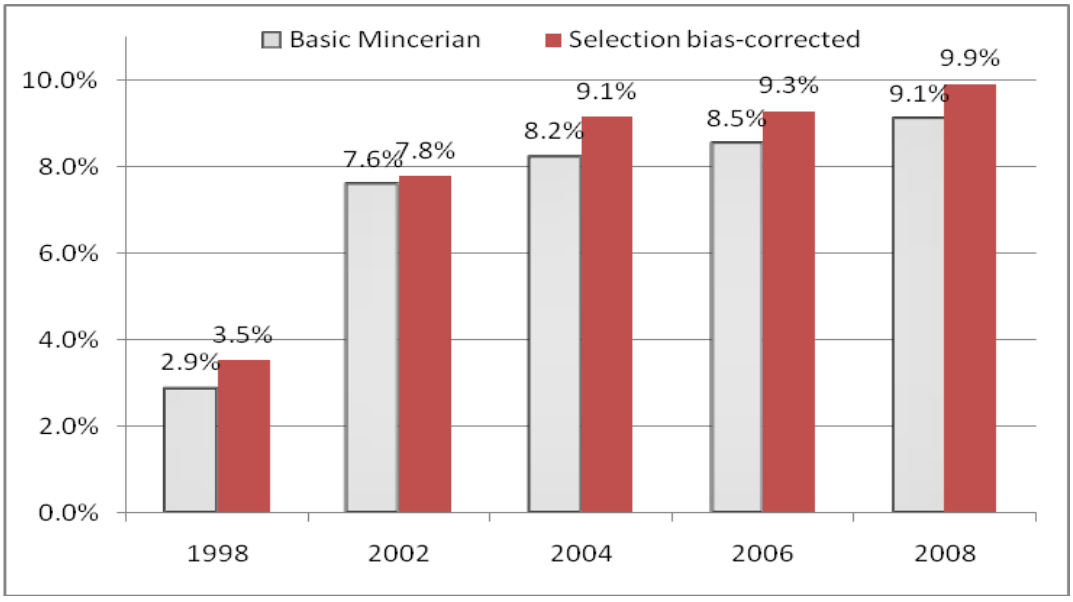
The trend of increasing return is re-confirmed during the period 1998 to 2008 using the selection bias-corrected models with inclusion of the interaction terms. All the differences (δ_1) in rates of returns over time are significantly different from zero. The estimates on the interaction terms are all positive and get larger for later years (2002, 2004, 2006, and 2008) showing a clear rising trend of the returns from 1998 to 2006 (Figure 2); however, the return increased marginally from 2004 to 2008. The interaction term coefficients of schooling year and the second survey for pooled 2004/2006 and 2006/2008 data are not significantly different from zero. Apparently, the estimated returns for each year are not much different between the estimates using single

[9] To present the estimated results concisely, we do not report the selection equation estimates. They would be provided upon request.

cross-sectional datasets and pooled datasets with the interaction terms (comparing Figure 1 and Figure 2). Generally, the estimated results are robust with a trend of obvious increasing returns to schooling over the studied period in Vietnam. Nevertheless, the rate of returns seems to reach that of the world at somewhere between 9% and 10% in recent years (Psacharopoulos, 1994).

Effects of the Asian financial crisis and minimum wages on earnings also appear obviously in the time effect coefficients (δ_0) over time in Table 5. Because of the crisis, the government reduced minimum wages in late 1998 (see first column of Table 5), and many enterprises also reduced wage rates to keep costs lower in order to survive. During period from 1999 to 2004, nominal wages were increased slightly, to offset inflation, which lead to increases in the coefficients of the year dummy of regressions between 1998/2002 and 1998/2004 especially from 2002 to 2004. In other words, because of the wage rate cuts in late 1998, average wage rate in 2002 is 9.95% (about 10%) lower than in 1998, but there is an increase of about 4.8% between 2002 and 2004 (see column 5). Therefore, there is still a difference of 5.2% in wage rate between 1998 and 2004; but because of spontaneous mass strikes in late 2005, the government had to raise the minimum wages by 40% in early 2006 (Tran, 2007).[10] The adjustment resulted in a great shift of the time effect (year dummy) in the column 3, 4, 6, and 7 of Table 4 and Table 5.

Figure 2: Returns to schooling using pooled data with the interaction terms



Note: The selection bias-corrected rate of returns for 1998 is an average of four estimates of β_1 in column 1, 2, 3 and 4 in Table 5. The basic Mincerian estimate for the same year 1998 is from estimate of β_1 in either column 1 or 2 or 3 or 4 in Table 4.

[10] The increase in minimum wages was applied for FDI enterprises. Even the government did not set minimum wages for domestic enterprises, but the labour strikes also happened in domestic enterprises, and therefore the enterprises did increase wages for employees to cool down the labour pressure and to keep employees with them.

Table 5: Heckman selection model for earnings equation with the interaction terms

Explanatory variables	1998/2002	1998/2004	1998/2006	1998/2008	2002/2004	2004/2006	2006/2008
Second year dummy (δ_0)	-0.0995	-0.0525	0.1581	0.4042	0.0484	0.2146	0.2444
	(1.81)+	(0.89)	(2.67)**	(6.67)**	(1.17)	(4.50)**	(4.91)**
Years of schooling (β_1)	0.0339	0.0363	0.0347	0.0352	0.0774	0.0907	0.0943
	(8.67)**	(9.15)**	(8.87)**	(8.92)**	(42.75)**	(34.23)**	(34.67)**
Schooling years*second survey (δ_1)	0.0437	0.0551	0.0580	0.0638	0.0102	0.0032	0.0057
	(10.35)**	(12.10)**	(12.79)**	(13.83)**	(3.46)**	(0.96)	(1.63)
Experience (β_2)	0.0152	0.0154	0.0153	0.0153	0.0255	0.0403	0.0444
	(2.97)**	(2.99)**	(2.97)**	(2.98)**	(9.18)**	(11.27)**	(13.30)**
Experience*second survey (δ_2)	0.0116	0.0261	0.0265	0.0378	0.0097	0.0034	0.0105
	(1.98)*	(4.22)**	(4.40)**	(6.15)**	(2.50)*	(0.81)	(2.54)*
Experience squared (β_3)	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0010	-0.0011
	(3.95)**	(4.06)**	(3.98)**	(4.01)**	(8.09)**	(9.86)**	(11.32)**
Experience squared*second survey (δ_3)	-0.0001	-0.0004	-0.0004	-0.0007	-0.0002	-0.0001	-0.0003
	(0.44)	(2.30)*	(2.26)*	(3.98)**	(2.03)*	(0.48)	(2.47)*
Sex (male=1) (β_4)	0.1966	0.2235	0.2056	0.2113	0.2063	0.2034	0.1978
	(6.14)**	(6.90)**	(6.45)**	(6.55)**	(12.33)**	(9.68)**	(10.02)**
Sex*second survey (δ_4)	0.0174	-0.0150	-0.0196	0.0253	-0.0268	-0.0084	0.0460
	(0.51)	(0.42)	(0.55)	(0.71)	(1.11)	(0.32)	(1.78)+
Constant	-0.0127	-0.1535	-0.0602	-0.0900	-0.0755	-0.1736	0.0229
	(0.19)	(2.20)*	(0.91)	(1.28)	(1.67)+	(2.74)**	(0.38)
Lambda (λ)	0.1560	0.2279	0.1803	0.1955	0.1332	0.2107	0.2205
	(6.33)**	(8.96)**	(7.94)**	(7.55)**	(5.64)**	(7.40)**	(8.33)**
Wald χ^2 (all coeffs=0)	2075.12	1968.12	2860.22	4399.80	3429.24	2366.38	3156.96
Prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Selectivity test (ρ=0) $\chi^2(1)$	39.81**	77.04**	62.01**	56.42**	31.76**	54.59**	68.99**
Observations	29,512	10,430	10,686	10,784	33,454	14,628	14,982

*Robust z statistics in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%*

5. Discussions and conclusions

The results reported in the paper on returns to schooling in Vietnam using VLSS1998, 2002, 2004, 2008, and 2008 differ very substantially from the previous literature. The rates of return for 2008 are much higher than estimates for either 1992 or 1998 reported by Gallup (2002), Glewwe and Patrios (1998), Liu (2006), and Moock et al (2003). Moreover, although a rising trend between 1992 and 1998 found by Gallup (2002), or an ambiguous trend examined by Liu (2006), the returns to education for the early economic transition in Vietnam are still relatively low. The current results show a very rapid rise in the rates of return to schooling between 1998 and 2008. The rising trend appears to be robust to the self-selection consideration i.e. the selection into the wage employment.

What could account for such a rapid rise in the rates of return to schooling, especially given the previously sluggish change reported in the literature? The period studied here coincides with further market opening and integration into the global economy, deeper reforms, and a consequent investment boom with accelerated structural change that has generated many technical-skilled jobs in Vietnam. Investment grew dramatically, from 32 percent of GDP in 1998 to 41 percent in 2008, with almost all of the investment into industry and services, about 94% in 2008. Consequently, the growth rate of industry sector is very high, about 15.4% per annum during period 1998 to 2008, the industrial growth helped absorb surplus labour from the traditional sector. There was also considerable growth in foreign trade, such that overall openness (the ratio of exports plus imports to GDP) reached over 160 percent by 2008.[11]

On the labour supply side, changes in labour market laws from the early 1990s were having increasing effects in the early period of the reforms. Initial reforms in 1993 to the labour contract system introduced the "basic wage" as the minimum wage. But employers often relied on the basic wage to compute actual wages for employees without concern for appropriate differentials for educational attainment, skills and productivity. Further impetus for negotiating and signing employment contracts came in 1994 when the Labour Code was passed, allowing employers more flexibility in hiring and firing workers. The greater flexibility is also likely to have offered greater mobility for workers, allowing the more highly educated employees to seek out jobs which paid appropriate wage premium for their skills. On the labour demand side, resulting from the further economic reforms especially the first Enterprise Law issued in late 1999 and a Unified Enterprise Law issued in 2005, investment in industrial production and service sector was untied. A huge increase in the number of enterprises and investment in industrial and service sector as discussed

[11] The information used in the paragraph are available at www.gso.gov.vn/default_en.aspx?tabid=470&idmid=3

earlier generated more wage-paid jobs for labours. Moreover, higher-educated workers may have benefitted from recent technological modernization and the transfers of technical and managerial skills from FDI-invested enterprises which resulted from the boom of FDI in the opening period are likely causes of increasing returns to schooling.

The estimate of returns is likely showing that the returns to schooling in Vietnam had reached their peak around period 2004-2006. However, Vietnam joined the WTO in January 2007 with a commitment to further opening of markets, including the labour market, so growing competition between employers is likely to affect the returns to schooling. The rate of returns was improved about 0.6% between 2006 and 2008,[12] it is higher relative to that for period 2004 and 2006, only 0.3% (Table 4 and 5, Figure 1 and 2). As discussed in Fleisher, Sabirianova, and Wang (2005), the returns during the reforms in transitional economies are improved over time. The speed of economic transition and the economic violability in labour market explain the differences in the increase in the rates of return to schooling over time and across the transitional economies. Hence a continued rise in the rate of returns to schooling is likely until the country becomes a universally recognized-market economy,[13] making Vietnam full of a common case to the pattern observed in other transitional economies.

Finally, one may think about endogeneity of education due to unobservable individual ability, hence the estimated returns to schooling would be biased. Fixed effect models with panel data can overcome the bias. In that case, one may estimate returns to changes in schooling overtime (two periods of time). If there is an increase in individual education attainment overtime, however, the increase would come from unofficial training or in-service training (technical and vocational training/education) because most wage-earners had stopped studying from the official education system to work. Estimated rate of returns to schooling in this case would be lower since the return to unofficial education is lower relative to official education (Horowitz, & Schenzler, 1999). Consequently, one should not apply fixed effect models in estimating returns to education since the estimates would not reflect properly the returns to schooling in Vietnam.

[12] However, the difference is not statistically significant at the 5% level.
[13] By May 2010, only 22 countries had recognized Vietnam's market economy (Vietnamnet.vn, 28 May 2010)

Appendix A: Means and standard deviations (in parentheses) of some main variables of wage earner sub-sample

Variables	1998	2002	2004	2006	2008
Hourly wage rate	2.569 (2.399)	3.781 (5.534)	4.442 (4.154)	5.779 (5.266)	8.967 (10.561)
Years of schooling	9.180 (3.833)	8.216 (4.308)	9.708 (3.971)	9.819 (3.903)	10.049 (3.967)
Experience (year)	15.224 (10.397)	16.487 (10.348)	16.476 (10.605)	16.622 (11.080)	16.888 (11.321)
Age (year)	31.581 (10.777)	32.845 (10.538)	33.494 (10.887)	33.860 (11.148)	34.402 (11.288)
Non-wage earners' schooling years	7.965 (3.474)	7.443 (3.572)	8.413 (3.064)	8.622 (3.010)	8.831 (3.018)
No of wage earners[(a)]	3,244	26,268	7,186	7,442	7,544
Fraction[(b)] of wage earners (aged 15-60)	15.3%	32.8%	35.2%	35.5%	36.4%

Sources: VLSS1998, 2002, 2004, 2006, and 2008. Hourly wage rates are in 1,000 Vietnam Dong, and in 1998 the average exchange rate was 13,765 Dong/USD, 15,244 Dong/USD in 2002, 15,705 Dong/USD in 2004, and 15,965 in 2006, 16,481Dong/USD in 2008. [(a)]Excluding some extreme outliers; [(b)]Observation probability after Probit for the selection equation.

Appendix B: Existing studies on rates of returns to schooling in Vietnam for 1992-1998

Author(s)	Year	Coefficient	Method	Other controlled variables
Glewwe et al (1998)	1992/93	0.0164	OLS	Experience, experience squared, sex, types of school, regions
Gallup (2002)	1992/93	0.029	OLS	Experience, experience squared
	1998	0.050		
	1992/93	0.019	OLS	Experience, experience squared, sex, minority, Chinese, non-agricultural employment, private, employer, HCMC, Hanoi
	1998	0.035		
Moock et al (2002)	1992/92	0.048	OLS	Experience, experience squared, log week hours worked
Liu (2006)	1992/93	Male: 0.059 Female: 0.042	Heckman selection	Experience, experience squared, married, migrant, urban, regions, majority, state employees, SOEs employees, industries
	1998	Male: 0.035 Female: 0.048	OLS	

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