DO RETURNS TO SCHOOLING GO UP DURING TRANSITION? EVIDENCE FROM VIETNAM

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Abstract

This paper provides the estimates of returns to schooling in Vietnam in the most recent years and possible explanations to changing effect of education on earnings in the context of a transitional economy. The authors find that the return to an additional year of schooling has been improved remarkably over time, from 3.76% in 1998 to 9.4% in 2004. Females were paid lower than male counterpart, however, their rate of returns to schooling is much higher than male's regardless of model specifications. Education groups which are above lower-secondary level enjoyed much higher rewards than non-schooling group and the differentials between these groups and non-schooling group remarkably widened over time. On the other hand, the primary and lower secondary education groups seem to gain very little from additional schooling relative to non-education group; however, the returns of these groups have been increased slightly during the studied period. The highly increasing returns may be attributed to the economic transition to market-oriented economy, labour market reform, and economic structural and technical changes in the last recent years.

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1. **Introduction**

In a market economy, particularly in the era of knowledge economy, human capital plays an important role in creating highly valuable products. Singapore and Japan are typical examples; the countries have developed their economies not basing on natural resource exploitation but on human capital of which education is a key element. Moreover, education can be considered as a powerful tool in struggling poverty due to the fact that education can help people to make incomes in their long life. Unlike economic strategies, the impact of education on earnings and poverty eradication tends to be less direct in short run, but education may provide long term benefits (WB, 2001).

Labor markets in the transitional economies tend to be less effective or rigid because of imperfect competition in the market, given that condition education may be implausibly rewarded i.e. low compensation. For instance, the rates of return to schooling in China are 4.5 percent and 5.6 percent for male and female respectively, the rate of returns in Vietnam in 1993 is very low, namely 1.64 percent. Meanwhile, the overall rates of returns of the world are 8.7 and 9.8 percent for men and women, respectively (Psacharopoulos, 1994; Glewwe et al, 1998).

However, according to Orazem et al (1995) and Varga (1995), the returns tend to increase during the economic reform in transitional countries. Liu (2006) adds that the increase in returns to schooling, especially to women's is a common feature of transitional economies. Studies on Czech Republic and Slovakia (Chase, 1998), Russia, Ukraine, Hungary, and Poland (Brainerd, 1998) support the conclusion.

The existing research on returns to schooling in Vietnam show that the return in Vietnam is very low (Glewwe et al, 1998; Moock et al, 1998) relative to other developing countries on average, and even there is a decrease in rate of return on males' education from 1992 to

1998, and a little increase in the return on females' education (Liu, 2006). These findings are opposite to what are found for the Eastern European countries. A possible explanation to the disparity may be the fact that impacts of the reforms were not absorbed enough due to nature of the gradual economic reform policies applied in Vietnam and the Vietnamese government has still intervened in the economy substantially, whilst in Eastern European countries the "Big Bang" reforms were introduced. Briefly, it is likely that up to 1998, the impact of education in labor market was not obvious. More time of the reform therefore should be taken into account to see changes in the rates of returns on schooling in Vietnam.

The greater reform in recent years including wage reform leads to the great development of non-state economic sector. The development of non-state sector has stimulated competition in labor market, and laborers have more choice in employment and are freer to move to other employers who pay higher wage rates. Wage rate is a drive for in labor market. Wage rates are determined basing mainly on individual's knowledge and skills which are derived from education and experience. As a result, income inequality during the reform has widened[1] (GSO, 2004). Given that conditions, we expect that the returns to schooling in the recent years could be improved in relation to in the early transitional period.

This paper examines the returns to schooling and the impact of economic reform on earning through changes in rates of returns to schooling after 15 years of the economic reform with purpose of providing the assessment information. Accordingly, this paper tries to answer following questions: (1) what is the rate of return to schooling in Vietnam in recent years of the economic reform and (2) how much is the change in the returns to schooling in the recent years? To answer the questions, the Mincer earning function (Mincer, 1974) with some recent extensions will be employed to examine the rates of returns to schooling for the

[1] GINI index increased gradually, from 0.35 in 1994 to 0.42 in 2002.

period between 1998 and 2004. Sample selection bias and endogenous treatment effect will be corrected to provide more reliable estimates.

In the next section, we review the existing studies on returns to schooling. Section 3 will discuss data and models used in the analysis. Section 4 is for econometric estimation, and possible explanations to the changing returns. Conclusions and suggestions for further study will be presented in section 5.

2. Literature Background

Since the birth of the human capital theory in 1960s, hundreds of research has applied the theory to empirical studies. From a simple model developed by Becker and Chiswick (1966) and Mincer (1974), the model has been recently extended by adding controlling variables such as gender, region, sector, race and marital status (for example: Keane and Wolpin, 1997; Johnson & Chow, 1997; Chirwa & Zgovu, 2001; Goetz & Rupasingha, 2004; Gibson and Fatai, 2006; many in Psacharopoulos et al, 2004). Estimation method has been improved from the initial simple works by Becker and Chiswick (1966) and Mincer (1974) to a sophisticated econometric technique for estimating the effect of schooling on earnings.

Psacharopoulos and his co-authors (2004) collect results of almost all the published research and updates in 2004. Although there exists some differences in methodology and sample coverage, some main points of the studies on returns to schooling can be withdrawn (Psacharopoulos et al, 2004): *Firstly*, the private returns, namely 26.6%, 17% and 19% for primary, secondary and higher education respectively are higher than social returns in all educational levels (those of social returns respectively are 18.9%, 13.1% and 10.9%). *Secondly*, the social rates of return tend to decline with educational level while the private returns tend to be convex. The declining social returns may be explained by the climbing public subsidies at higher educational level. *Thirdly*, the returns will decline when education

supply increases. The highest returns to any level of schooling are therefore found in low-income countries, and inversely the lowest returns are evidenced in high-income countries. For instance, average rates of return (based on Mincer equation) are 10.9% and 7.4% for low and high income group respectively (Psacharopoulos et al, 2004, table 3, p.14). *Fourthly*, return to an additional year of female schooling on average is higher than their male counterparts, namely 9.8 and 8.7 percent for women and men respectively (Psacharopoulos et al, 2004, Fig 6, p.17), even though females are typically rewarded less than males.

The existing studies show that the rates of returns *increase over time in the transitional economies*. For example, China's return to schooling increases from 3.6% in 1988 to 12.2% in 1993, Czech Republic from 8.1% in 1995 to 9% in 1997, Estonia from 1.5% in 1989 to 5.4% in 1994, Poland from 2.9% in 1986 to 7% in 1996 (Psacharopoulos, 2004, Table A4). Research by Heckman and Li (2004) find the remarkably increasing return during the reform in China. Furthermore, the level of competition is believed affecting the returns, Johnson and Chow (1997) in a study of China find that the returns in rural areas are higher than in urban areas, and they argue that the essence of employment in the stationary public sector which dominates in urban areas in late 1980s leads to lower rate of returns in urban areas. Zhang et al (2005) have a similar justification, they believe that economic reform and technical changes have enhanced competition amongst labors, and education and newly-skilled labors therefore are higher rewarded.

There are some recent studies on earnings and schooling in Vietnam (Moock et al*,* 1998 & 2003; Glewwe et al, 1998; Liu, 2006; Gallup, 2002). These studies focus on returns to schooling in either 1993 or period from 1993 to 1998; one common finding is that the return is relative low although they do not have a similar rate of returns (about 1.64% to 5%). Females' return is higher than their male counterpart at higher education. Their finding

agrees with overall trend updated in Psacharopoulos (2004). Furthermore, amongst the authors Liu and Gallup pay attention to changes of the returns over time from 1992 to 1998. Their studies show that after a period of the economic reform the return is *still very low,* even though it was slightly improved. However, the study may have not captured real effects of schooling on earnings in newly income distribution mechanism in the market-oriented economy recently. Because in the 1990s the labor market might be seminal and the influence of egalitarianism in the earlier planned economy has been still existed. Education have not had many opportunities to be effectively exploited because the labor market was still rigid and distorted during the early transition (Johnson and Chow, 1997). Given that conditions, workers lacked working incentives to make efforts in both learning and working. Another shortcoming of some of the studies is that they ignored an important problem of the sample selection bias that may mislead in estimates. In developing countries, people holding wage-earning jobs tend to have higher education, estimates of the returns for only wage-earning observations may be misled due to sample selection bias. Correcting the sample selection bias is needed in wage equation estimation (Heckman, 1979) to yield more reliable estimates.

Liu (2006) indicates that the shift of demand for skilled labors leads to higher wages. However, he shows that the returns in Vietnam declined over period from 1992 to 1998. As earlier discussed, the returns may decrease in the early transition but would recover after a longer period by which the economic reform effect is absorbed enough. The data used in this study covers recent years of the economic reform, so the data may capture the more effect of the reform. Furthermore, this paper will control not only sample selection bias but also endogeneity of self-selection into state sector. The ability bias should have been tested; however, the data did not support our intention. Besides the mentioned shortcomings, in the some previous studies on Vietnam, merging lower secondary and upper secondary

education into one group is implausible because the income differential between two groups is quite large; the estimates in the next section show the differential clearly.

3. Data and analysis models

Data used in this paper are from two rounds of VLSS[2]1998 and VLSS2004. The samples of VLSS1998 and VLSS2004 were selected to be representative for the whole country. The sample size consists of 5,999 households with 28,624 household members (VLSS1998), and 9,188 households with 40,419 household members (VLSS2004). The surveys collected an amount of comprehensive information including demographic characteristics, education, jobs, income, expenditure, employment status, and production activities.

We use only wage-earner observations with age restriction from 15 to 60. Accordingly, 3,365 observations are derived from VLSS1998 (2,009 males and 1,356 females), and 7,177 observations from VLSS2004 (4,499 males and 2,678 females) for the estimation analysis.

To estimate the returns to schooling, the Mincer earning equation will be used. The basic Mincer earning equation is as follows:

$$\text{Ln } Y_i = \alpha + \beta_1.S_i + \beta_2 Exp_i + \beta_3 Exp_i^2 + \varepsilon_i \qquad (3.1)$$

Where: LnY is log of hourly wage including bonuses, allowances, and subsidies (both in cash and in-kind). We only use wage earner-observations, drop self-employed, employer observations because incomes of these earners can be from either human capital or properties e.g. interests, rental, dividend of shares or stocks, other investment. Individuals those are younger than age 15 or older than 60 are dropped due to the minimum working and retirement age set by the Vietnamese Labour Code. S is years of schooling. Exp is potential experience. The experience squared Exp^2 is added in the model to check the

[2] Vietnam Living Standard Survey

lifecycle of earnings as non-linear pattern. The variable on experience is calculated basing on data of age and schooling years:

$$\text{Exp} = \text{age} - \text{schooling years} - 6 = \text{age} - (\text{schooling years} + 6) \quad (3.2a)$$

$$= \text{age} - \text{work starting age} \quad (3.2b)$$

Equation 3.2a can be not plausible if one people attained primary education and then quit studying because he can not work until age 15; in such case, the equation 3.2b is more suitable. Accordingly, the work starting age is assumed at age 15 for non-education, primary and lower secondary level, at 18 for upper secondary graduates, 20 for vocational level and at 22 for tertiary graduates.

One drawback of the basic Mincer earning function shown in equation 3.1 is that the coefficient β_1 represents the average rate of returns to one additional year of schooling regardless of the level of schooling. Evidently, rate of returns varies with education levels. Once we concern with returns to various levels of education, an extended earning function will be used by converting continuous years of schooling S into dummies representing the different levels of education. The equation 3.1 can be rewritten:

$$LnY_i = \alpha + \beta_1 Prim_i + \beta_2 lowerSec_i + \beta_3 upperSec_i + \beta_4 Voc_i + \beta_5 Univ_i + \beta_7 Exp_i + \beta_8 Exp^2_i + \varepsilon_i \quad (3.3)$$

Where: Prim, lowerSec, upperSec, Voc, Univ are dummy variables representing primary, lower secondary, upper secondary, vocational, university level of individual *i.* The non-education level will be set as a reference group and dropped when estimating. The estimated coefficients indicate the difference (higher/lower) in earnings of a corresponding education level to the reference group. The rate of returns (r) to each year of schooling of a corresponding each level is calculated as follows:

$$r = \beta_j / S_j \quad (3.4)$$

Where: S_j is the years of corresponding education level j in equation 3.3 (j = 1 - 5 for primary, lower secondary, upper secondary, vocational and university level).

Apart from the variables on years of schooling and experience, some other potential controlling variables will be included into the analysis model. They are gender, marital status, tribe (Vietnamese majority and ethnic minorities), economic sector (state and non-state sector: the state sector includes central and local government, police, military, state owned enterprise, communist party, and social organization; non-state sector includes private enterprise, business cooperative, small household enterprise, joint-stock company, joint venture company, foreign invested firms, and other private businesses).

Our analysis will begin with the basic Mincer earning equations (OLS estimator) for private returns to schooling, then separate regressions for male and female will be conducted, next we will estimate the rate of returns to schooling by educational level. Next, we consider inclusions of some potential covariates in the models. The problem of sample selection bias will be corrected by employing the Heckman Selection Model-Maximum Likelihood estimation (Heckman, 1979). The problem of endogenous treatment effect i.e. self-selection into state sector will also be tested.

4. Changes in returns to schooling

4.1 Changes in rates of returns to an additional year of schooling

Educational attainment of wage earners on average in Vietnam is about 9 years, is higher than the average level of the world (8.3 years), and almost equals to that of OECD (Psacharopoulos et al*,* 2004, Table 4). Interestingly, for wage earners average years of female schooling is very close to that of their male counterparts in VLSS1998 and higher than in VLSS2004. However, females received lower wage rates than males.

Another noteworthy point is that the wage earners are better educated, especially for females, relative to non-wage earners. Intuitively, it is likely that higher educated people hold a greater probability of having wage paid jobs. However, females tend to have a much lower proportion of wage paid jobs in both surveys.

According to Liu (2006), Moock et al (1998, 2003) and Glewwe et al (1998), rates of return to an additional year of schooling in 1993 and 1998 are very low[3] in Vietnam. From 1992 to 1998, the returns changed very little, and even declined (Liu, 2006). However, the average rate of return on an additional year of schooling nearly trebled within six years from 1998 to 2004, namely about 2.7% to 8.6% (Table 4.1). This increasing trend is similar to other transitional economies e.g. China, around 4% to 10% (Zhang et al, 2005), Eastern European countries such as Czech Republic, Estonia, and Poland (Psacharopoulos et al, 2004).

Other interesting finding is that although men tend to earn more than women with the same education and experience, approximately 14.5%[4] (Table 4.1), women are rewarded much higher rates of return than men (Table 4.1). Furthermore, the differential in rates of the returns between females and males seemingly increases over time, namely 1.4% in 1998 and 2.6% in 2004. This finding is consistent irrespective of model specifications, and is similar with the common pattern indicated in some research (e.g. Gibson et al, 2006; Moock et al, 2003; Psacharopoulos et al, 2004).

4.2 Changes in rates of returns to schooling by educational level

In this section we will pay attention to how the private rates of returns vary with educational level over time. Estimates are presented in Table 4.2. Overall, the return is non-linear. The return increases with educational level, especially very apparent in 2004. The earning

[3] They use the basic Mincer earning equation, Moock et al and Glewwe did not control for selection bias while Liu did the correction, thus their estimated coefficients are very different (from 1.5% to 4.8%).

[4] The percentage can be calculated (for dummy variables in a semi-logarithmic regression) as 100 x ($e^{\beta i}$ -1). However, sometimes researchers just report the estimated coefficients as the returns because if β_i is small, 100 x ($e^{\beta i}$ -1) is approximated to β_i.

differentials of primary and lower secondary group in comparison to the reference group in 1998 are insignificant. However, in 2004 the returns of primary and lower secondary group seem to be obviously improved and statistically significant at 5%. In contrast, the returns of upper secondary and higher education groups are much higher than that of the reference group; all the coefficients are very statistically significant at 1% in both surveys except for vocational education level in 1998. Furthermore, the gaps of wage earnings between higher education groups and non-education group have widened over time. In 1998 the group of upper secondary education was rewarded 21.3% [=100 x ($e^{0.193}$ -1)] more than the no-schooling group, but upper secondary education enjoyed 86% more than the reference group in 2004. The most benefited group is university-graduates, who were rewarded 88% higher returns in 1998 and much greater, namely 245% in 2004 relative to the reference group. An impressive reverse is found at vocational education group, its return is lower than that of upper secondary leavers in 1998, 11.2% and 21.3% respectively; however, the vocational education return dramatically outweighs the upper secondary group's return in 2004. The returns relative to that of non-education group in 2004 are 195% and 86% for vocational and upper secondary school respectively. Moreover, the differential between university graduates' and vocational group's premiums is narrowed down impressively, from about eight times in 1998 to 1.256 times in 2004. This implies that the role of vocational education in earnings changed very positively during the studied period.

In a study on China by Zhang et al (2005), they explain that the increasing returns over time are resulted from the trade and FDI inflow that lead to high demand for skilled labors, and as a result skilled labors are growingly rewarded. Similarly, the changing role of vocational training in Vietnam may partly reflect a need of the economy for skilled employees working directly in factories, and partly indicates inappropriate university graduates' skills as well as university graduate supply surplus relative to vocational education graduates. The return of

vocational education group increases dramatically from 11.2% to 195% (17 times of rise), while the university return rises from 88% to 245% (2.78 times of rise).

In 1998, the rate[5] of return to an additional year by educational level are 1.47%, -0.23%, 1.77%, 0.80% and 5.50% for primary, lower secondary, upper secondary, vocational and university education group respectively while that are 3.5%, 1.9%, 7.2%, 13.9% and 15.3% in 2004. Overall, the trend of the returns increases with education level (very clear in 2004) and agrees with Psacharopoulos et al (2004), Gibson et al (2006) and Todaro et al (2004).

Once again, the figures by sex in Table 4.2 are consistent with all demonstrated in Table 4.1 and the previous discussions, and these figures consolidate the higher rewards for investment in female education. In most cases, family investment in female schooling may harvest much higher returns for their female children. In 1998, the female group who obtained primary, lower secondary and vocational education earned significantly higher than non-education group did while their male counterpart had almost no benefits from education below university level relative to the reference group. In 2004, at primary, lower secondary and upper secondary level the estimated coefficients of female are almost twice as high as males' ones. The differences in the returns by sex are significant in 1998 and 2004. The higher returns for female might reflect the relative shortage of female educated labors since some certain employments are more appropriate for females rather than males.

Another robust finding in both surveys is that the male holders of primary and lower secondary education have benefited nothing in comparison to people who spent no years at schools. This problem may reveal that male children did not perceive useful knowledge at the lower levels of schooling in Vietnam. In addition, a traditional society like Vietnam tend to prefer boys to girls so parents give priority to their boys to school regardless of boys'

[5] These rates can be calculated as 100 x [($e^{\beta i}$ -1)/years of corresponding educational level].

inappropriate attitude to schooling. On the other hand, female schooling has remarkably positive impacts on earnings.

4.3 Sample selection bias-corrected estimation

Sample selection bias is potential because the subset of wage earners from the surveyed population is not randomly sampled. This problem may be solved by using Heckman Selection Model (Heckman, 1979). We may apply the sample selection model as follows:

Wage equation: $w_i = z_i \beta_1 + u_{1i}$ (4.1)

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

Selection equation: $h_i^* = x_i \beta_2 + u_{2i}$ (4.2)

w_i is observed if $h_i = 1$, and $h_i = 1$ if $h_i^* > 0$;

w_i is not observed if $h_i = 0$, and $h_i = 0$ if $h_i^* \leq 0$

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

In the first stage of estimation, a binary Probit model is employed to estimate the correction term λ_i . This term will be included in the second stage of earning equation estimation. In the probit model, the wage earners (coded 1) and non-wage earners (coded 0) observations will be put in the model. Identification will be achieved by including variables (X_i) such as household size, number of children[6] whose age is less than 15 and total household non-wage income. These variables along with variables of education, experience and sex may affect the probability of participation in a particular employment category e.g. wage earning employment, but not wages (Liu, 2006; Gibson et al, 2006; Heckman et al, 2004). Specifically in this stage, we estimate the probit model as follows:

$h_i^* = x_i \beta_2 + u_{2i}$ $h_i = 1$ if $h_i^* > 0$ ($h_i = 1$ if observations are wage earners)

[6] The estimated result reveals very high correlation between household size and number of children, thus we exclude variable on number of children from models

$h_i = 0$ if $h_i^* \leq 0$ ($h_i = 0$ if observations are non-wage earners)

This estimation will yield β_2. In the second stage, the correction term will be included in the earning equation to augment the earning function in order to ensure that the estimation will give consistent estimates.

$$w_i = z_i \beta_1 + \sigma_{12}. \lambda_i + \eta_i \qquad (4.3)$$

Where the inverse Mill's ratio or Heckman's Lambda: $\lambda_i = \phi(x_i \beta_2)/\Phi(x_i\beta_2)$

However, StataCorp (2001) suggests a more efficient estimation of β_1, β_2, ρ and σ with wage and selection equation estimation jointly, that is the maximum likelihood estimation. In addition, the maximum likelihood estimation with Heckman sample selection is suggested for weighted sample survey data. The Wald test will be used to test the independence between wage and selection equation, if the test rejects the null hypothesis $\rho_{12} = 0$, it can be concluded that the sample selection bias exists in a subset of wage observations. The inferences from the OLS estimates therefore may mislead. In contrast, if the test accepts the null hypothesis $\rho_{12} = 0$ it is suggested to apply the OLS regression for the wage equation and independent probit for selection model, that means wage and selection equation are independent [i.e. $cov(u_{1i}, u_{2i}) = \rho_{12} = 0$].

The estimates are presented in Table 4.3. The test reveals that in all equation estimations, the unobservable errors of the wage and selection equations are highly correlated. The hypothesis that the unobservable errors in selection and wage equations are uncorrelated is rejected at 1% level of significance across the survey datasets. In addition, the lambda ratio is positive and very highly significant at 1% level of significance. This means that there exists the sample selection bias in wage equation, and the observed wage is higher than the wage for individuals if the individuals are randomly selected in the survey population. This finding is plausible in the context of a poor agricultural-dominated economy where almost

all the self-employed (non-wage earners) are farmers (VLSS2004) with lower education relative to wage earners (7.64 years in 1998 and 8.2 in 2004, wage earners' education is about 9 in both years). Furthermore, a small fraction of the survey population is wage earners (13% in VLSS1998 and 34% in VLSS2004) so the comparative advantage may reason effectively the higher rewards for wage earners. After correcting the bias by using the Maximum Likelihood estimation, the estimated rate of return to an additional year of schooling is 3.76% and 9.4% for 1998 and 2004 respectively (Table 4.3).

To test the robustness of the correlation between unobservable errors of the wage and selection equations, some potential controlling variables of marital status, tribe and sector are added into the regression models, and the estimated results are presented in Table 4.3. Once again, the hypothesis that the unobservable errors in selection and wage equations are uncorrelated is rejected at 1% level throughout all survey datasets by using the Wald test. The results again consolidate the conclusion about the selectivity bias in wage equation OLS estimates.

We continue testing the selection bias by educational level. The results are demonstrated in Table 4.4. The Wald test rejects the hypothesis that the selection and wage equations are uncorrelated at 1% level. The selection bias-corrected estimates for non-linear educational level returns appear to be quite clear, for both primary and lower secondary group's returns are statistically insignificant at 5% level relative to the reference group while the remaining groups are almost significant at 1% level. However, along with recent greater reforms income distribution and wage setting has increasingly relied more on education and talents, therefore education rewards increase remarkably with education level especially for upper secondary and higher education levels. Meanwhile returns of primary and lower secondary education are positive but still *low*, namely 1.13% and 3.17% for *each* year of schooling in

2004. The low returns of lower education levels may reflect failure of the lower education system in providing useful skills to students before 2000s[7].

Apart from the correcting sample selection bias, the selection model also helps to compute the likelihood of participating into wage-paid employments for a particular individual. On average, one individual with characteristics at mean values owns 13% of a probability for being selected into wage employments in 1998 and 34% in 2004. Marginal effect[8] of one schooling year is 1% in 1998 and 2.5% in 2004. This reflects people with higher education achievement have a higher possibility of finding wage-paid jobs and the probability increases over time. Wage labor market needs more better-educated workers recently (2000s) relative to 1990s. Sex, marital status, tribe and household non-wage income are also factors affecting the probability of participating in wage employment. Ethnic minorities typically live in remote and rural areas where self-employment in small-scale agriculture is popular so that they have fewer chances to work in wage-paid employments, which are available in urban areas. In 2004, the ethnic majorities (Vietnamese and Chinese) hold 11% higher opportunity of working in wage employment relative to ethnic minorities. In addition, higher household non-wage income may lower the wage-paid job probability; each VND 10,000 increases in household non-wage income will lead to a decline of 6.66% in probability of participating in wage-paid employment.

Finally, household size variable's effect on the probability is from insignificant in 1998 to significantly positive in 2004. It is noted that in 1998 the likelihood of having a wage paid job is only 13% while that in 2004 is 34%, a considerable increase in the probability can be reasoned by fast industrialization in urban areas where may absorb labor surplus from rural areas and may lead to the greater chances for household members to be selected into wage-

[7] Note that students who have studied lower secondary or primary in 2000s might not join the labor force in the survey in 2004.
[8] The probability can be calculated from Table 4.3 by using STATA® command for marginal effect after Probit, results in Table 4.6

paid employment. The switch in sign of variable on household size from negative to positive (Table 4.3 and 4.4) reflects well the dynamic development of labour market, huge investment in industry and services have generated a number of wage-paid jobs attracting labours from agriculture (the self-employed). This leads to a big rise in probability of participation in wage employment from 13% in 1998 to 34% in 2004. In addition, household size on average declined from 5.5 in 1998 to 4.9 people in 2004. The higher probability of wage employment and lower household size in 2004 make changes in the sign of household size variable's effect from negative to positive. Furthermore, we use the probit for participation in wage employment by sex, and see that household size variable's effect on wage employment participation changes considerably for both male and female from insignificantly negative in 1998 to very high significantly positive in 2004 (Table 4.6). The changing sign of household size variable is reasonable for labour market movement in Vietnam in the recently transitional period. That the higher household size in both surveys leads to higher probability of female participation in wage employment may be justified by the freeing up female labours for market, however, the high increase of household size effect on male probability of wage employment may be explained by an incremental likelihood of wage employment over time.

4.4 Coping with endogenous treatment effect

Self-selection in the workforce of labors into state sector rather than being randomly placed into the sector may lead to the problem of endogenous treatment effect. For instance, favorable conditions in the state sector e.g. job stability, full labor insurance, pension benefit, etc…, encourage workers to self-select into the sector rather than being randomly allocated into the sector. Consequently, the sector itself is a function of explanatory variables, but it does not matter if the error term of sector placement equation is uncorrelated with error term of the wage equation. If this is not the case, the correlation

between two equations will be significantly different from zero ($\rho \neq 0$). In such case, endogenous treatment effect may cause bias in OLS estimated coefficients of the wage equation. To overcome this problem, the Treatment Effect model will be used. Accordingly, Wage equation can be written as follows:

$$w_i = z_i \beta + d_i \psi + u_i \qquad (4.4)$$

Where z_i is a vector of schooling and experience variables of individual i, and coefficient ψ shows the effect on wages of whether or not the treatment is applied i.e. whether or not one wage earner works in the state sector.

Selection equation $k_i^* = y_i \alpha + e_i$ (4.5)

$k_i = 1$ if $k_i^* > 0$ ($k_i = 1$ if observations are in state sector)

$k_i = 0$ if $k_i^* \leq 0$ ($k_i = 0$ if observations are in non-state sector)

and $u_i \sim NID(0, \sigma^2)$, $e_i \sim N(0,1)$, and $cov(u_i, e_i) = \rho$

In the first stage of estimation, a binary Probit model is employed to estimate the correction term or Mills' ratio. This term will be included in the second stage of earning equation estimation. In the Probit model, the state sector (coded 1) and non-state sector (coded 0) observations will be put in the model. Besides variables on education, experience, and sex, number of family relatives in state sector may influence sector placement of labors, hence variable of the public sector share[9] will be included in the selection equation. These variables affect the likelihood of participation in the sector. The estimation procedure is quite similar to the selection correction model in section 4.3, but the Treatment Effect Model (Maximum Likelihood-ML) will be applied instead.

[9] Total members in state sector over total household members at working age

The estimates are shown in Table 4.5; the results reveal the endogeneity of sector variable is very serious, the lambda ratio from the treatment selection equations are all statistically significant at 1% level of significance. The Wald test of independence between wage and sector selection equation rejects the hypothesis of uncorrelation between two equations at 1% level of significance. The estimates show that there appears to be serious endogenous treatment effects in wage equations. The estimates in Table 4.5 show that education and other family relatives affect strongly the selection into state sector. For instance, in 2004 one individual on average with an additional year of education will have 2.8% of the probability higher being self-selected into state sector; while an individual may have a probability of 68% more to be employed by state sector if his/her household has one additional person working for the state sector.

The inclusion of endogenous treatment effect (sector) variable[10] in the models downsizes the rates of returns to schooling considerably in both rounds of the VLSS 1998 and 2004 (Table 4.3). In 1998, people working in state sector earned 16.6% more than others working in non-state sector with the same characteristics did. The effect of sector coefficient is very high significant at 1% level of significance. The higher premium for state sector appears to be consistent over times; the employees in state sector earned 38% more than non-state sector in 2004. Once controlling for the sectoral choices, the returns to schooling change downward significantly, and the differentials of rewards between state sector and non-state sector widen greatly in particular in 2004 to 86% (Table 4.5). This finding is different from Gibson et al (2006) and Heckman et al (2004); however, in the context of Vietnamese economy the higher earnings of state sector can be explainable. Although the state sector provides about 10% employment, it was invested about more than 50% total capital in the economy and contributes 39.3% in GDP (Ngoc Lam, Vietnam Economic Times, 2006,

[10] We checked inclusions of marriage and tribe variable and see that they make small changes in coefficients of schooling

p.12-13). Clearly, the state sector is a capital-intensive relative to non-state sector and receives much investment from state budget as well as privileges from monopoly in the highly profitable sectors of the economy such as mineral and oil exploitation, telecommunication, construction, airlines, transportation, and energy power. These favorable conditions drive labors to self-select into the sector and determine the higher premiums in the state economic sector.

4.5 Explanations for increasing returns

Like other transitional economies in the Eastern Europe and China, Vietnam reformed its economy to market economy with oriented market-set wages. In theory, competition market economy would allocate resources more efficiently of which labor market determines wage rates and labors are paid every penny they deserve to earn.

The increasing returns to schooling are obviously verified and plausibly explained. Better education leads to higher productivity and then higher rewards; however, education would have not been exploited efficiently if there were not plenty of employment opportunities in the economy. Deeper reforms, more openness and integration into the global economy have helped the economic development. Foreign trade, investment and industrialization have generated much employment especially technical-skilled jobs in Vietnam in the recent years. Investment has grown dramatically from 32%/GDP in 1998 to 38.4%/GDP in 2004 (Vietnam Economic Times, 2007), foreign trade growth is very high, and the openness index of the economy in terms of total foreign trade volume over GDP is very large (127% in 2004) from a modest level under the autonomy economy in late 1980s.

Rewards for higher education levels has been improved significantly (Table 4.4), after correcting sample selection bias the rate of returns to *each* year of schooling are from 2.13%, 1.49% and 7.21% in 1998 to 7.2%, 16.1% and 17.7% in 2004 for upper secondary, vocational and university level respectively. Amongst the greatest improvement, the return

to vocational education rises remarkably resulting partly from a sharp decline in the relative supply of the vocational graduates from 7.4% in total wage labors in VLSS1998 to 3.4% in VLSS2004. On the other hand, the average returns to one year of schooling at lower education levels relative to the non-schooling group have increased considerably from 0.86% and -0.4% to 3.3% and 1.6% for primary and lower secondary education (Figure 4.2), however they are *still* relatively low.

The growing industrialization in the country requires skilled workers especially practical-engineering labors with vocational education level; however, the education and training in Vietnam in recent years seem to be divergently biased. The post upper secondary education is 11.4% in total wage earners in VLSS2004 of which only 3.4% is technical and vocational education graduates and the rest (8%) is the university or higher educated graduates. Moreover, according to Dao Ngoc (Vietnam Economic Times, 2007, p.34) structure of education and training in Vietnam has been inappropriate and Vietnam recently has been facing the problem of "excess of teachers-university graduates *but* shortage of skilled-workers". Training and education system is heavily theory-biased, graduates lack practical skills, and quality of education is very low. These issues partly reflect why Vietnamese literacy rate is very high, namely 94%, but the country has an unaccredited education system. For instance, the introduction of a campaign "saying NO to cheating in examination and performance disease in education" by new educational minister Nguyen Thien Nhan in 2006, the graduation rate of upper secondary school students dropped incredibly from 94% in previous years to 63.06% in 2006. Even some schools in central Vietnam and remote areas the graduation rates were almost zero (Hien Cu, Thai Anh and Nguyen Loc, 2007).

Before 1990s[11], Vietnam was a command economy. The government set wage scales, and state budget was allocated to employees via state enterprises and administrative units. However, the economic reform led to public sector downsizing and non-state economic sector boom. The non-state sector has been expanding and creating much employment including wage-paid jobs for the economy. The sector provided 88.3% of total employment while the state sector contributed only 11.7% in total employment of more than 41 million in 2005 (Duong Ngoc, Vietnam Economic Times, 2006, p.39).

In 1993, wage reform and labor contract system were initially implemented, the government introduced the "basic wage" as the minimum wage. Employers rely on the basic wage to compute practical wages for employees in concerns with education attainment, skills and productivity. In 1994, the Labor Code was typically issued providing the basis for negotiating and signing employment contracts. The code allows employers to be more flexible in hiring and firing labors. However, labor market in Vietnam is still rigid. Although hiring procedure is very easy, firing on the other hand is hard and ranked at the hardest place in the world (Thuy Trang, VnEconomy [12], 28/Sep/2007). Educational attainment and ability still have not been appreciated properly relative to experienced skills. Some questions are raised whether schooling quality is improved during the reform? Do updated knowledge and skills help new labors much in earnings relative to older ones? To check these we compare experience-cohorts (experience groups are built with three groups: experience less than or equal 5 years, from 5 to 10 years, and over 10 years). The selection bias corrected rates of returns for the experience cohorts are 7.3%, 9.1% and 10% for the first, second and third cohort respectively in 2004. This is likely that a combination of education and experience (experience skills) may augment the returns to schooling, in other

[11] Although the reform initiated in 1986, the "real" reform was introduced affirmatively at the Communist Party's Congress VII in December1989.
[12] http://www.vneconomy.vn/PrintView.phtml?id=5be5447198b8bd

words with the same education and sex the younger employees' additional year of schooling is rewarded less than the older ones. It can be therefore said that new knowledge and skills has not had a better role in earnings relative to older ones, the education system may fail to provide useful applicable knowledge in recent years. However, this finding on the other hand may reflect the relatively low competition in labor market. This finding is opposite to what is found by Zhang et al (2005) in a study of China, they find that lower-experience cohorts enjoy higher rates of returns to schooling and argue that improvement in schooling quality over time and new skills can be reasons for the return differentials between the younger and older cohorts.

Structural change can be another drive of changing rate of returns. Economic structure has changed greatly during the research period, for example, contribution of industry in GDP was from 32.5% in 1998 to 40.2% in 2004 while low-productivity agriculture (traditional & small-scale farming) reduced its role in GDP contribution from 26% to 22% (Vietnam Economic Times, 2006, p.64). The downsizing of agriculture and enlarging of industry might therefore improve returns of education. The technical changes resulted from industrialization, increasing investment and FDI inflows also have created opportunities for education to bring into play its roles. Total investment in 2004 obtained 38.4% GDP of which 91.5% was invested in industry and services. Total accumulative FDI was more than 60 billion USD (equivalent to Vietnam's GDP), and the investment is commonly followed by technical and managerial-skill transfers, which need and stimulate improvement of education. In China, some studies argue that technical change is a possible explanation, and increasing intra-industry competition improves the education returns rather than shifting labors from state sector to higher completive non-state sectors (Zhang et al, 2005; Heckman and Li, 2004).

5. Conclusions and suggestions for further study

This paper uses two rounds of VLSS1998 and VLSS2004 to examine the returns to schooling and its changing effect during the recent reform in Vietnam. The paper employs various approaches from basic Mincerian wage equation to sophisticated methods which correct sample selection bias and endogenous treatment effect.

The bias corrected rates of returns to schooling increase remarkably over times for both sex and education level groups. The estimates of the returns are much higher than conventional OLS estimates and the return estimates for Vietnam from 1993 to 1998 reported by Moock et al (2003), Liu (2006), Glewwe et al (1998) and Gallup (2002). The great improvements in the returns are found at higher education levels: upper secondary and higher groups of which vocational education graduates harvest the fastest increasing returns to an additional year of schooling during the studied period.

Women account for less than 40% in wage-paid employments and earned at least 22% less than men with the same education and experience; however, their return to an additional year of schooling is much higher than that of men counterpart regardless of model specifications. The estimates are robust and consistent in all models.

The conventional OLS estimates of the return are biased downward relative to the sophisticated estimation that controls for sample selection bias. After correcting the selection bias, the return to an additional year of schooling improves significantly from 2.7% to 3.76% in 1998 and from 8.6% to 9.4% in 2004. This improvement is resulted from eliminating the downward bias in the OLS estimator. The paper also checks the sensitivity of the estimated returns by adding weekly working hours into right hand side of the models (Table 4.7). In 1998 intensity of weekly working hours affect monthly wage rate, however, this effect declined sharply over time. This fall may show that during the recent reform education has a better role to play. The growing return to schooling as well as the decline in role of weekly working hour intensity in earnings indicates the increasing role of education

in earnings relative to intensity of working in the recent economic reform. On the other hand, the strong effect of weekly working hour in log on monthly earning may reflect that more stable jobs (greater weekly working hour) tend to go with higher wages, while workers who lacked workload to do were rewarded lower wage rates.

The paper also controls for endogeneity of self-selection into state sector, the estimates show that favourable conditions in state sector have stimulated employees to self-select into the state sector. Controlling for sector self-selection changes estimates downward substantially, the Wald test outputs show how serious the endogenous treatment effect is in the wage equation. Furthermore, family relatives affect the probability of being self-selected into the state sector strongly. This reflects relative advantages of having family relatives in state sector and higher likelihood of being employed as well as the less competition in employment recruitment in the state sector.

Another shortcoming of conventional OLS estimate of wage equation is that the individual omitted ability, which is in error term of the wage equation, may be correlated with years of schooling. Students themselves may self-select into schooling to maximize their lifetime earnings, and students with better ability are likely to get involved in more education and then earn higher wage. Consequently, students' motivation and ability affect their schooling and then affect income. In other words, schooling is potentially endogenous. Unfortunately, data do not support to proxy for ability bias in our analysis.

Interestingly, Vietnam joined WTO in 2006 with more commitments for opening the economy further including labour market. These therefore allow more competitions amongst firms as well as amongst labours. Therefore, skills, knowledge and talents would be rewarded deservedly. The labour market has been changing very fast, and education increasingly has an important role to play in the more competitive economy. Future updates of this study will capture the impact of the WTO integration and dynamic of labour market.

Future studies should also take into account the geographic regions of the country because level of labour market competition (O'Connor, 1996) and education quality varies largely nationwide (Thu Hong, B.Thanh, 2007). In addition, further studies should decompose the economic sectors into more specific sectors with different competition status such as state owned enterprise, public administration, private enterprise, collectives and cooperatives, foreign invested enterprises since different technical advancements and labour competition in the specific sectors would lead to heterogeneous rewards to schooling.