

Returns to Education and the Demand for Labour in Vietnam¹

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Abstract: Using data from the Vietnam Household Living Standards Survey, this paper examines the returns to education in Vietnam in 2002 and 2010, and how these returns changed over time. Given the economic growth that took place during this time period, the relative demand for labour is also assessed in order to identify if skill-biased technical change played a role in explaining the returns to education in Vietnam at a time of exceptional economic growth. The male and female education returns displayed a linear pattern in both 2002 and 2010, with earnings rising with increased levels of education. Relative to males with no qualifications, the returns to those with a vocational training qualification or below fell between 2002 and 2010, while the economic returns to a college education and above increased. Similar results were observed for females. In relation to relative labour demand, the results indicated that the demand for all levels of education (apart from males with a high school qualification) relative to those with no qualifications grew between 2002 and 2010. However, there was particularly strong growth in the demand for those with a vocational training qualification and above, especially an advanced degree qualification. Findings from the paper show that high levels of economic growth in Vietnam between 2002 and 2010 have facilitated increasing returns to education and demand for high skilled labour. In addition, there appears to be shortages for some types of skilled labour.

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1. Introduction

The extensive research that has been undertaken on the returns to education has established that, in line with the predictions of Becker's (1964) human capital model, earnings rise with educational attainment and that individuals earn a substantial premium from gaining a university qualification (see for example, Rumberger, 1980; Grubb, 1993; Psacharopoulos and Patrinos, 2004; Strauss and Maisonneuve, 2007; Heckman, Lochner, and Todd, 2008; McGuinness, McGinnity, and O'Connell, 2009; and Jensen, 2010). Most of the research in this area relates to returns in developed countries. However, in the mid-1990s interest grew in estimating the returns to education in countries transitioning from socialist systems to more liberal free market states. The initial research in this area focused on Eastern European countries, before and after the introduction of market reforms in the late 1980s (e.g., Rutkowski (1996) for Poland; Večerník (1995) and München, Svejnar, and Terrell (2005) for the Czech Republic; Orazem and Vodopivec (1995) for Slovenia; and Brainerd (1998) for Russia).¹ In more recent times, increased attention has been paid to estimating the returns to education in Asian countries that have undergone significant economic reform. This includes China (see, for example, Fang, Eggleston, Rizzo, Rozelle and Zeckhauser, 2012; and Gao and Smyth, 2012) and Vietnam.

In relation to the Vietnamese studies, the results on the returns to education are mixed. Moock, et al., (2003) reported that returns to education in Vietnam were low by international standard, and that education displayed decreasing returns over the period 1992 to 1993. However, other studies have found greater returns to higher levels of education (for example, Phan and Coxhead, 2013; Liu, 2006; Pham and Reilly, 2007; doan and Stevens, 2011; and Oostendrop and Doan, 2013). In relation to over time estimates, Gallup (2002) found that returns to education in Vietnam increased from 1993 to 1998, while Liu (2006), Pham and Reilly (2007) and Oostendrop and Doan (2013) found similar results for the period 1998 to 2006. However, Phan and Coxhead (2013) reported that returns to education in Vietnam declined between the periods 1993 to 2002 and 2002 to 2008. The mixed findings that have been derived to date are most likely due to the employment of different estimation techniques across the various studies (e.g., Ordinary Least Squares versus Instrumental Variables), along with differences in the defined sample and control variables included in the estimated models.

¹See also Krueger and Pischke (1995) for Eastern Germany after unification with West Germany.

This paper proposes to add to the literature in this area by estimating the returns to education in Vietnam in 2002 and 2010, a period when the economy underwent significant changes and achieved high levels of economic growth. Several macroeconomic policies were introduced in Vietnam in the early 2000s in order to boost the economy and to improve the quality of its labour. These policies seem to have been effective as Vietnam's economic growth averaged above 7 per cent annually between 2002 and 2010 (Vietnam General Statistic Office, 2011a). There was also a positive change in the share of educated employees and increased employment in non-agriculture sectors over the time period. Given this economic context, the objective of this paper is to examine the returns to education and the demand for labour in Vietnam just prior to its period of significant economic growth (2002) and during the period of growth itself (2010). Data from the *Vietnam Household Living Standards Survey* (VHLSS) is used to undertake the analyses, which are conducted separately for males and females. An examination of how the returns have changed between 2002 and 2010 is carried out as well. Given the high economic growth that took place during this time period, the relative demand for labour at each education level is also assessed: this analysis is undertaken in order to identify if skill-biased technical change has played a role in explaining the returns to education in Vietnam at a time of exceptional economic growth.

The remainder of the paper is structured as follows. Section 2 presents Vietnam's economic development, along with an outline of its labour market institutions. Section 3 gives additional detail on some major labour market trends over the 2002 to 2010 period. The data, sample and methodologies used in the paper are discussed in Section 4. The educational and earnings profile of Vietnamese employees is presented in Section 5, while the economic returns to education and results from our relative demand for labour analysis are presented in Sections 6 and 7 respectively. Finally, Section 8 concludes the paper.

2. Economic and Institutional Context

Vietnam's Economic Development

Despite the negative effects of the 1997 to 1999 economic crisis, Vietnam's economy grew by over 7 per cent annually for most of the next decade (Vietnam General Statistic Office,

2011b). In addition to higher growth rates, employment and peoples' living standards have improved considerably since 2001 as well (Vietnam General Statistic Office, 2011b). The implementation of the 2001-2010 National Socio Economic Development Plan has contributed to the economy's performance during the 2000s, as has foreign direct investment, upgraded infrastructure, amended legal and policy systems, and increased participation in the world economy. Given the high economic growth that took place in Vietnam between 2001 and 2010, the country's GDP growth now ranks above Korea, Thailand, Singapore, Indonesia, Malaysia and Philippines, with only China and India recording higher growth levels (Vietnam General Statistic Office, 2011a).

Vietnamese Labour Market Institutions

Vietnam's labour market displays the typical characteristics of a transitional economy; specifically, a concentration of workers in the agricultural sector, low productivity and a large number of low and unskilled workers. Developments in its labour market are subject to both Labour Codes and macroeconomic policies.

The period 2002 to 2010 saw several emendations to Vietnam's Labor Codes² in order to implement international regulations and to better protect the rights of both employees and employers. Even before this time period, the 1994 Labour Code saw the introduction of the minimum wage. According to this Labour Code, a worker's wage is determined by negotiations between employer and employee representatives. However, this negotiated wage is not allowed to be lower than the minimum wage that is regulated on by the State, which is known as the general minimum wage. According to the 1994 Labour Code, the general minimum wage is the lowest payment to unskilled/untrained workers, which is closest to a monthly living wage. Prior to 2006, the State had one general minimum wage that applied throughout the country. However, since 2007 there are FDI firm and non-FDI firm minimum wage rates, which vary according to the region that the firm operates in. There are four defined regions, which are classified according to a socio-economic standards index. Thus, there are eight minimum wages, which cannot be less than the State's general minimum wage. The general minimum wage is mostly

² 2002, 2006, and 2007

applied to State sector employees. Between 1995 and 2011, the general minimum wage increased from USD 13.7 to USD 38.6,³ and increase of 181.8 per cent over the period.

The 1994 Labor Code also included regulation on working time, which is a maximum of 8 hours per day or 48 hours per week. If employees are required to work longer than this, employers have to pay an over-time wage rate, which, as in most countries, is legislated on. The 1994 Labour Code sets out rules in relation to retirement age as well. This is currently 60 for males and 55 for females, but there are a few exceptions to this in some sectors.⁴

In relation to industrial relation representation, trade union membership is large in Vietnam. Similar to other countries, this political-social organisation works to protect the rights of employees. As the Vietnamese economy has grown, the country's trade union movement has developed and played an important role in negotiating wages and employee rights, in both foreign and domestic enterprises.

National Target Programs have also influenced the development of Vietnam's labour market, particularly the national target program on poverty reduction and employment. The objective of this specific program is to create more sustainable job growth and reduce poverty over the 2001 to 2010 time period.

3. Major Trends in the Vietnamese Labour Market

Between 2002 and 2010, Vietnam's labour market has undergone significant changes, some of which are presented in Table 1.

[Insert Table 1 Here]

First, overall labour force participation has increased by 4 percentage points over the time period - from 72.5 per cent to 76.7 per cent. Both males and females' labour force participation

³2002: 1 USD = 15,337 VND; 2010: 1USD = 18,932VND.

⁴ Those working for military or national security sectors normally retire earlier.

rates have increased, with the male rate increasing at a slightly faster pace than the female rate (5 percentage points compared to just over 3 percentage points for females). The employment rate in Vietnam has accelerated as well, growing from 71 per cent in 2002 to just over 80 per cent in 2010. While both male and female employment has increased, there has been a bigger increase in employment among males: their rate increased by 5 percentage points compared to an increase of 4 percentage points for females. Finally, since 2006 published unemployment rate information by Vietnam's official statistical agency, the General Statistics Office (GSO), is based on urban areas only. This is due to an acute problem of underemployment in Vietnam. Thus, the 2002 and 2010 unemployment rate figures presented in Table 1 are not directly comparable. Nevertheless, in general, unemployment tends to be low in Vietnam.

Table 2 shows the composition of employment by industry in 2002 and 2010. Overall, manufacturing and other services are the two largest sectors of employment for both males and females, but employment in these two industries declined for both genders between 2002 and 2010. Employment in commerce also decreased for males and females between 2002 and 2010. On the other hand, male and female employment increased in mining and quarrying, electricity and finance between 2002 and 2010, but the size of the employment increases in mining and quarrying and electricity varied quite noticeably for both genders. Specifically, the share of males employed in electricity increased from 1.6 per cent in 2002 to 20.7 per cent in 2010, while the share of females employed in mining and quarrying increased from 1.1 per cent to 19 per cent over the same time period. The number of males employed in the construction and transport sectors fell between 2002 and 2010, while the number of females employed in these two industries increased, albeit by different magnitudes.

[Insert Table 2 Here]

The big increase in the proportion of individuals employed in electricity, particularly males, and the large share of people employed in both manufacturing and other services is partly due to the 2001-2010 National Socio-Economic Development Plan. One of the objectives of this strategy has been to increase industrialization in Vietnam, and manufacturing and other services are two of the priority industries in this regard (Hung, 2004). Another reason for the large share of males and females employed in both manufacturing and other services is because the

government has been encouraging the movement of labour from low-to-high productivity sectors, two of which are manufacturing and other services.

Table 3 shows the composition of employment by ownership type in 2002 and 2010. The largest share of male and female employment is in the private sector, and these shares have increased between 2002 and 2010. State and collective sector⁵ employment fell for both genders between 2002 and 2010, while the proportions employed by foreign-owned companies increased. The increase in employment in the foreign sector between 2002 and 2010 is most likely due to the increase in Foreign Direct Investment (FDI) into Vietnam over this time period, particularly since Vietnam joined the WTO in 2007. The movement of employment out of the state and collective sectors into both the private and foreign sectors between 2002 and 2010 is due to the macro shift of Vietnam from a centrally planned to market economy.

[Insert Table 3 Here]

4. Data, Sample and Measures

Data from the *Vietnam Household Living Standards Survey* (VHLSS) are used for the analyses conducted in this study. The VHLSS is a nationally representative survey which was first implemented in 1992. A second survey was carried out in 1998, and since 2000 the survey has been conducted biennially. The VHLSS, which is implemented by the General Statistics Office (GSO) of Vietnam,⁶ is part of the living standards measurement study that is carried out in more than 100 countries.

VHLSS collects information on various aspects of the households' living standards and individuals' socio-economic status including income, employment, education, and so on. A face-to-face methodology is employed to carry out the survey and, consequently, has a very high response rate (more than 90 per cent). Household sample sizes of VHLSS were i) 75,000 in 2002; ii) 45,900 in 2004; iii) 46,000 in 2006; iv) 45,945 in 2008; and v) 69,360 in 2010. The micro data

⁵The collective sector is a typical sector under a centrally planned economy, which was the case in Vietnam before 'renovation' (i.e., the move towards a more open economy). The inclusion of this ownership type information in the analysis allows us to explore how the shift from a centrally planned to a market economy affected Vietnam's labour market.

⁶Assistance was received from the World Bank for the first few waves of the survey.

used for this study comprised 29,532 households in 2002 and 9,399 in 2010; however, the data were weighted to ensure that the sample was nationally representative.

In this paper, we focus on the working-age population, which relates to those aged 15 to 65. Given that the focus of the study is on identifying the returns to education and the demand for labour, the sample consists of employees only who were working more than 15 hours per week.⁷ Those employed in the agricultural sector were excluded from the analysis as their working arrangements tend to be more precarious and, consequently, labour demand and educational returns are less clear for this group of workers. After these data restrictions, the final unweighted (weighted) employee sample was 11,090 (7,108,500) individuals in 2002 and 4,907 (12,729,653) in 2010.

For the educational returns analysis, our dependent variable is the natural logarithm of hourly wages.⁸ The main independent variables used were educational attainment, work experience, hours worked in a week, industry,⁹ region,¹⁰ ownership type,¹¹ marital status, and place of residence (urban or rural). Educational attainment is defined according to the educational system in Vietnam, which is: i) no qualifications, ii) primary, iii) secondary, iv) high-school, v) vocational training, vi) college, vii) university, and viii) advanced degree. In general, the structure of the education system in Vietnam, which consists of public and non-public schools, colleges and universities, is broadly consistent with that found in other countries (London, 2011). More specifically, the country's education system consists of two distinct components: i) the academic system and ii) the technical and vocational system. The academic system consists of 6 education levels: (1) pre-primary education;¹² (2) primary education;¹³ (3)

⁷The self-employed and those with no earnings information were excluded from the analysis.

⁸Hourly wage information is not available in the VHLSS, but it can be calculated using the annual earnings and hours worked information that is captured in the dataset. In this paper, the hourly wage formula that was used is: annual earnings/ 12 months/ (number of hours worked*22 days).

⁹Classification of sector is based on the Vietnamese Standard Industrial Classification 2007, which follows the International Standard Industrial Classification (Version 4).

¹⁰ Vietnam is divided into 6 areas in the VHLSS data.

¹¹Ownership type consists of four categories: state, private, collective and foreign.

¹² This education is for children below 6 years of age and includes two types of education; namely, preschool for children below 3 years of age and kindergarten for children aged from 3 to 5.

¹³ The duration of this education level is 5 years (grade 1-5), and it is for pupils aged from 6 to 10 years.

lower-secondary education;¹⁴ (4) upper-secondary education;¹⁵ (5) university;¹⁶ and (6) post graduate education.¹⁷ The technical and vocational system includes: (1) vocational training;¹⁸ (2) college-level technical, technological and specialist skills training;¹⁹ (3) university-level technical, technological and specialist skills training;²⁰ and (4) post graduate training.²¹

5. Education and Earnings Profile of Vietnamese Employees

Table 4 reports the composition of employment by educational attainment for males and females in 2002 and 2010. In 2002, less than 15 per cent of male and female employees in Vietnam had a university or advanced degree education. Instead, the majority of the workforce possessed a high school or less qualification (69 per cent of males and 67 per cent of females). However, the education profile of those in employment has changed as the economy expanded between 2002 and 2010. Specifically, the proportion of males with a third-level qualification (i.e., university or higher) increased by 5.1 percentage points to 19.6 per cent, while the number of females with this qualification rose by 8.6 percentage points to 20.3 per cent. Those with a vocational training and college education have increased over this time period as well, particularly males with a vocational training qualification. The corollary of this development is that the proportion of Vietnamese employees with low levels of education (i.e., no qualifications, primary, secondary, and high school) has fallen considerably over the 2002 to 2010 time period. For example, the percentage of male employees with a primary or less qualification decreased by 8.9 percentage points to 22 per cent from 30.9 per cent between 2002 and 2010, while for female employees the decline was 7 percentage points to 21.7 per cent from 28.7 per cent.

[Insert Table 4 Here]

¹⁴ This education level lasts for 4 years (grade 6-9), and it is for pupils aged from 11 to 15 years.

¹⁵ This education level is for 3 years (grade 10-12), and is for pupils aged from 15 to 18 years.

¹⁶ This education level can take from 4 to 5 years, and is undertaken by those who obtained an upper-secondary education certificate.

¹⁷ This education level is pursued by those who obtained a university degree.

¹⁸ This training lasts for 1 to 2 years (level 2 skilled workers).

¹⁹ The duration of this type of training depends on an individual's previous education and training qualifications.

²⁰ The length of this type of training depends on an individual's previous education and training qualifications.

²¹ In addition, adults with a lower-secondary education certificate who desire to learn professional or new skills can attend short-term vocational training, which lasts less than a year.

Table 5 shows hourly wages by educational attainment in 2002 and 2010, separately for males and females. The table also shows how these wage levels have changed over time. As is seen in most countries, Vietnamese hourly earnings increase with educational attainment. For example, in 2002 males (females) with no qualifications earned 0.2 (0.2) USD per hour, rising to 0.7 (0.7) USD per hour for those with an advanced degree education. Hourly earnings for all educational groups have increased between 2002 and 2010; however, the growth has been particularly large for those with a college and above education qualification. For males with a college education, hourly earnings increased by 0.8 USD per hour between 2002 and 2010, but the rise has been much more substantial for those with an advanced degree – increasing by 3 USD per hour. Females with college and above education levels have also experienced increases in their hourly earnings, but the growth has not been as large as it has been for males.

[Insert Table 5 Here]

One of the reasons for the increase in hourly wages for both men and women between 2002 and 2010, particularly for those with lower qualifications, could be due to the increase in the general minimum wage that took place during this time period: as discussed in Section 2, the general minimum wage increased by 181.8 per cent between 1995 and 2011. The particularly strong wage growth for those with a college and higher education qualification may be attributed to an increasing demand for such workers as the economy has grown between 2002 and 2010: this increased demand has occurred to support the development of the country, and it may, in turn, help to explain this hourly wage growth if the demand for such workers exceeded supply. The introduction of the FDI and Non-FDI minimum wages in 2007 is likely to have played a role in the observed wage increases over this time period as well.

6. Returns to Education in Vietnam 2002-2010

In this section of the paper, we apply the standard Mincer equation to explore the economic returns to education in Vietnam in 2002 and 2010. This equation can be specified as follows:

$$\ln W_{ij} = \sum_{j=1}^J Q_{ij}\alpha_j + X_i\beta + \delta x_i + \gamma x_i^2 + \varepsilon_i \quad [1]$$

where W is hourly earnings in Vietnamese dong (thousands);²² Q is a set of dummy variables taking the value of 1 if a person holds a certain education qualification (e.g., no qualification, primary, secondary, etc.) and 0 otherwise; X is a vector of personal characteristics (e.g., marital status, industry, employment sector, region, urban-rural area, etc.); x_i is a proxy for work experience;²³ and ε_i is the error term. Separate male and female earnings equations were estimated, the results for which are presented in Tables 6 and 8 respectively. The female equation was augmented with a sample selection control to account for the truncated nature of the female labour force data.²⁴ One factor that we were not able to control for in estimating our earnings models, which is often included in female wage equations, is ‘time out of the labour market’. However, in the case of Vietnam females tend to stay in the labour market during child bearing and rearing, which results in them spending very little time out of the labour market; thus, this factor is not as important when estimating a Vietnamese female wage equation as it is for other countries. All models were estimated using weights.

The male education return results (Table 6) display a linear pattern, which is observed in most countries.²⁵ Specifically, the returns to education increase with higher levels of educational attainment. This finding is consistent with previous studies on Vietnam (Liu, 2006; Pham and Reilly, 2007; Phan and Coxhead, 2013; and Oostendrop and Doan, 2013). In 2002, males with a primary education earned 15.1 per cent more compared to those with no qualifications. This return rose to 112.1 per cent for those with a graduate degree. There were some interesting changes in the returns to education for males between 2002 and 2010. While those with a vocational training qualification or less continued to earn more than those with no qualifications, the returns to such qualifications fell between 2002 and 2010. On the other hand, the returns to a college education and above increased over the time period, particularly for those with an advanced degree qualification. Again, these findings are in line with some of the studies

²² 1 USD = 21,570 VND (2015)

²³Our work experience measure is age minus 15, which is the minimum working age in Vietnam.

²⁴The sample selection control is derived from a stage one probit model of female labour force participation (number of children in the household was an additional variable that was included in this stage one probit model). The control is then included in the female earnings equation to account for the fact that not all females participate in the labour market, particularly those with lower levels of education. Thus, the omission of this sample selection control would result in biased education return estimates.

²⁵Sector controls are included in all estimated models (results available from the authors upon request).

discussed in Section 1. Whether these over time changes are significant is addressed next. First, though, it is worth noting the results for some of the other covariates included in our model.

We can see from Table 6 that married males earned more than their single counterparts in both 2002 and 2010, as did separated males. Divorced and widowed males also earned more than single males in 2002, but by 2010 such individuals earned less. Male earnings increased with hours worked per week in both 2002 and 2010, but the premium to working more hours per week fell between these two time points. In addition, the square term for this variable in both 2002 and 2010 indicates that the returns to the number of hours worked per week increased at a diminishing rate. Work experience, as measured by the years worked variable, had a positive impact on male earnings in both 2002 and 2010, but again at a diminishing rate (years worked squared term).

Apart from construction, finance and other services, employees in all other sectors earned more than those employed in manufacturing in 2002. However, by 2010 those in construction and finance earned more than their manufacturing counterparts, while (along with those in other services), mining and quarrying and electricity sector workers earned less. In 2002, males working in the private sector earned less than those employed by the state, collective or foreign organizations, but by 2010 only those employed by the state or foreign organisations were earning more than private sector male employees.

The results from Table 6 indicate that male earnings vary by region, and that the economic returns in some regions have changed over time. In particular, males employed in the South East and in the Mekong River Delta regions of Vietnam earned more than their male counterparts working in the Red River Delta region in 2002, but by 2010 only males employed in the South East were earning more than males employed in the Red River Delta area. Perhaps unsurprisingly, males employed in urban areas had higher earnings than their rural counterparts in both 2002 and 2010.

[Insert Table 6 Here]

The change in returns to education for males relative to the reference category (i.e., no qualifications) between 2002 and 2010, along with the change in incremental returns i.e., the return to obtaining a particular education qualification relative to the education level just previous to it, are presented in Table 7.

Relative to males with no qualifications, the returns to those with a primary, secondary, high school or vocational training qualification all fell between 2002 and 2010 – by 2.0 percentage points for those with a primary qualification to 4.7 percentage points for males with a vocational training qualification. On the other hand, the returns to males with a college education and above increased over the time period, with those with a graduate qualification experiencing the largest increase relative to the no qualifications base case.

In relation to the incremental returns, the return to males with a secondary qualification over those with a primary qualification decreased by just over 3 percentage points between 2002 and 2010, as did the incremental returns to a high school education (relative to secondary school). The incremental returns to males with a college qualification (relative to vocational training), university (relative to college) and advanced degree (relative to university) all increased between 2002 and 2010.

Overall, the general finding of greater returns to higher levels of education, and increases in such returns over time, is confirmed in Table 7. Thus, Vietnamese males that have obtained higher levels of education are being rewarded for this investment decision, and the economic return to this investment has grown over time.

[Insert Table 7 Here]

Results from the female education return models for 2002 and 2010 are shown in Table 8. As was found for males, the returns to education rise with educational attainment. In 2002, females with a primary education earned 25.1 per cent more compared to their counterparts with no qualifications. This rose to 71.9 per cent for those with a university qualification, and to 120 per cent for those with an advanced degree qualification. The same linear education returns pattern is observed in 2010, but the returns to some qualifications – such as primary, high school, college and university, appear to have changed over time. Whether these over time changes are

significant is addressed next, but first it is interesting to note the results for some of the other covariates included in the earnings model. As with males, female earnings increased with experience and hours worked, but at a decreasing rate. In 2002, widowed females were the only marital status category that single females earned more than, but by 2010 all marital status categories earned more than single female employees.

In relation to the industry results, apart from females employed in mining and quarrying, commerce and transport, females employed in all the other sectors earned less than those employed in manufacturing in 2002. However, by 2010 the industry earnings results had changed to some extent with females employed in construction and finance now earning more than those in manufacturing, while those employed in mining and quarrying and commerce earned less. Similar regional and urban results were derived for females as for males, while females employed in the private sector earned less than those in the other three sector categories (state, collective and foreign) in both 2002 and 2010.

[Insert Table 8 Here]

Table 9 presents the change in returns to education for females between 2002 and 2010, along with the change in incremental returns. Compared to females with no qualifications, there was a fall in the returns to those with a primary and vocational training qualification between 2002 and 2010, while there was an increase in economic returns to those with a secondary school, high school, college and university qualification over the time period. Interestingly, the pattern of female results differs somewhat to those derived for males. In particular, the returns to a secondary and high school qualification declined between 2002 and 2010 for males, while the returns to a graduate qualification increased.

Regarding the incremental returns, slightly different results emerged for females than for males. Specifically, between 2002 and 2010 the economic returns to females with a secondary and a high school qualification increased relative to the education level immediately below each, while for males the incremental returns to these two qualifications fell. On the other hand, the return to females with a graduate qualification relative to a university fell between 2002 and

2010, whereas for males this incremental return increased. The reason for the fall in the return to this qualification for females between 2002 and 2010 could be due to the government's policy that encouraged females to obtain an advanced degree qualification over this time period: this government strategy may then have resulted in an excess supply of females with this skill level compared to what was demanded in the labour market.

[Insert Table 9 Here]

7. Relative Demand for Labour in Vietnam 2002-2010

We saw in Table 4 how the education composition of the Vietnamese labour market has changed between 2002 and 2010, with an increase in the number of both male and female employees with higher levels of education. Given this transformation, our estimated wage equations cannot tell us anything about the nature of labour demand in Vietnam as the equations cannot account for the change in the composition of the supply of labour in the country. To address this issue, we estimate the change in the demand for educated labour relative to the no qualifications reference category. This work is undertaken using the methodology developed by Katz and Murphy (1992), which has been applied in a number of studies (e.g., Harkness and Machin, 1999, Liu, 2006, McGuinness, et al., 2009) to identify the direction and strength of relative labour demand. The approach is based on a number of strong assumptions that are centered on a constant elasticity of demand; therefore, the approach is not flawless. However, it still provides a good picture of the general nature of relative labour demand.

The relative demand for labour between 2002 and 2010 is estimated using equation [2]:

$$\frac{\Delta D}{D} = \frac{\frac{\Delta W_{ij}}{W_{ij}} + \frac{1}{\sigma} \left(\frac{\Delta S}{S} \right)}{\frac{1}{\sigma}} \quad [2]$$

where W is the wage return to a particular education level over the no qualification base case, which come from Tables 8 and 10; S represents the relative labour market shares; and σ is the assumed rate at which employers can substitute between the different types of labour. Following other authors, such as McGuinness *et al.*, (2009), we assume that σ will take the value of 1.4.

However, research shows that relative labour demand analyses are generally not responsive to different values of σ (Harkness and Machin, 1999).

Results from the estimation of equation [2] are presented in Table 10, which reports not only wage and supply changes but also the relative yearly demand for each education qualification. In the male labour market, demand for all levels of education, except for those with a high school qualification, relative to those with no qualifications grew between 2002 and 2010. There was particularly strong growth in the demand for males with vocational training qualifications and above, especially those with an advanced degree qualification. Based on the wage change results, it would appear that the supply of medium-to-high skilled labour – defined here as a college qualification and above, has not kept pace with demand and, as a result, there has been a rise in the earnings premiums to males with these qualifications.

In relation to the female labour market results, demand for all levels of education relative to those with no qualifications grew between 2002 and 2010. The relative demand for vocational training, university and graduate qualifications was particularly strong. However, based on the wage change results, the supply of females with these qualifications has been quite close to the demand for such labour. In fact, the wage discount associated with vocational training would indicate that the supply of females with this qualification has been greater than demand, while the small wage premiums associated with the other two qualifications would suggest that supply has been quite near to the demand for such skilled labour.

Overall, these results reflect the fact that the Vietnamese economy has required both medium and high skilled labor (i.e., vocational training and above) as the economy has grown between 2002 and 2010; however, more emphasis has been placed on high skilled labor, which can be seen from the results in Table 13. These results also indicate that the Vietnamese Government has been realizing its policy of achieving economic growth and industrialization over the time period examined with higher levels of labour productivity.

8. Conclusion

Using data from the VHLSS, this paper examined the returns to education in Vietnam in 2002 and 2010, and how these returns changed over time. In addition, the paper assessed the change in demand for educated labour relative to those with no qualifications between 2002 and 2010. In Vietnam, this time period was characterized as a period of relative high economic growth.

The male and female education returns displayed a linear pattern in both 2002 and 2010, with earnings rising with increased levels of education. Relative to males with no qualifications, the returns to those with a vocational training qualification or below fell between 2002 and 2010, while the economic returns to males with a college education and above increased over the time period. Males with an advanced degree qualification experienced the largest increase in earnings between 2002 and 2010. For females, the returns to those with secondary and high school qualifications increased between 2002 and 2010, as did the returns to those with a college and above qualification, with the economic returns to a primary and vocational training education falling over the 2002-2010 time period.

The results on how the returns to education in Vietnam have changed as the economy has grown between 2002 and 2010 would seem to support the theory of skill-biased technological change. According to this view, as an economy grows technology favours skilled labour over unskilled; and there is research that shows a strong relationship between the increased use of computer-based technologies in conjunction with college and university educated labour within industries (Katz & Autor, 1999).

In relation to relative labour demand, the results indicated that the demand for all levels of education (apart from males with a high school qualification) relative to those with no qualifications grew between 2002 and 2010. However, there was particularly strong growth in the demand for those with a vocational training qualification and above, especially an advanced degree qualification.

Findings from this paper show that high levels of economic growth in Vietnam, which averaged just above 7 per cent between 2002 and 2010, have facilitated increasing returns to

education and demand for high skilled labour. In addition, there appears to be shortages for some types of skilled labour, particularly males with a college and above qualification, and females with a university qualification. Given this, the economic returns to these levels of education are likely to continue to grow strongly until the supply of such skilled labour falls into line with the demand that exists for workers with these education qualifications.

Findings from this paper would also provide support for individuals in Vietnam, both male and female, to invest in higher levels of education, given the large economic returns that have been found for such qualifications. However, the returns to females with graduate qualifications appear to have remained constant over time, and actually fell relative to females with a university qualification. Nevertheless, the returns are still greater for females with such qualifications compared to those with no or basic levels of education.

Finally, it is recommended that policy makers should provide measures to reform education and training, as well as disseminate information on the rewards to education so as to mobilize investment in education and training. Vietnam has implemented several policies to improve its labour force's productive capacity, but the findings in this paper would suggest that there is still room for improvement in this area, which, in turn, would assist the country on its current upward economic growth trajectory.

References

- Doan, T., & Stevens, P. (2011). Labour Market Returns to Higher Education in Vietnam. *Economics The Open-Access, Open-Assessment E-Journal*, 5(2011-2012).
- Gallup, J.L. (2002). The Wage Labor Market and Inequality in Viet Nam in the 1990s. *World Bank Policy Research*, Working Paper No. 2896.
- Harkness S., & Machin S. (1999). Graduate Earnings in Britain, 1097-1995. *Department for Education and Employment*, Research Report No. 95.
- Heckman, J.J, Lochner, L.J, & Todd, P.E. (2008). Earnings Functions and Rates of Return. *Journal of Human Capital*, 2(1): 1-31.
- Holsinger, D.B, & Jacob, W.J. (2008). *Inequality in Education: Comparative and International Perspectives*. Hong Kong: Springer.
- Hung, N.M. (2004). *Sector Development Strategy - Planning and Priority Program in Vietnam's Socioeconomic Development Strategy to the Year 2010, Orientation toward the Year 2020 and the System of Guiding Document*. Hanoi: Statistical Publishing House.
- Jensen, R. (2010). The (Perceived) Returns to Education and the Demand for Schooling. *Quarterly Journal of Economics*, 125(2): 515-548.
- Jonathan D. London. (2011). *Education in Vietnam*. Singapore: Institute of Southeast Asian Studies.
- Katz, L. F., & Autor, D. H. (1999). Changes in the Wage Structure and Earnings Inequality. In Ashenfelter O. & Card D. (Eds.), *Handbook of Labor Economics* (Vol. 3A, pp. 1463-1555). Amsterdam: North Holland.
- Liu, A. Y. C. (2006). Changing Wage Structure and Educatin in Vietnam 1993-1998: The Roles of Demand. *Economics of Transition*, 14(4): 681-706.
- McGuinness, S., McGinnity, F., & O'Connell, P. J. (2009). Changing Returns to Education During a Boom? The Case of Ireland. *LABOUR*, 23 (1): 197-221.
- Moock, P.R., Patrinos, H.A., & Venkataraman, M. (2003). Education and earnings in a transition economy: the case of Vietnam *Economics of Education Review* 22, 503-510.
- Oostendrop, R.H, & Doan, Q.H. (2013). Have the Returns to Education Really Increased in Vietnam? Wage versus Employment Effect. *Journal of Comparative Economics*, 41 (2013): 923-938.

- Pham, T.-H., & Reilly, B. (2007). The Gender Pay Gap in Vietnam, 1993–2002: A Quantile Regression Approach. *Journal of Asian Economics*, 18(5): 775-808.
- Phan D, & Coxhead, I. (2013). Long-run Costs of Piecemeal Reform: Wage Inequality and Returns to Education in Vietnam. *Journal of Comparative Economics*, 41 (2013), 1106-1122.
- Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to Investment in Education: A Further Update. *Education Economics*, 12(2): 111-134.
- Strauss, H., & de la Maisonneuve, C. (2007). *The Wage Premium on Tertiary Education: New Estimates for 21 OECD Countries*. Paris: OECD Publishing.
- Vietnam General Statistic Office. (2011a). *Vietnam Socioeconomic Development 2001-2010*. Hanoi: Statistical Publishing House.
- Vietnam General Statistic Office. (2011b). *Statistical Yearbook of Vietnam 2010*. Hanoi: Statistical Publishing House.

Tables

Table 1: Principal Changes in Vietnam's Labour Market: 2002 and 2010 (%)

	2002			2010		
	Overall	Male	Female	Overall	Male	Female
Labour force participation rate	72.5	76.2	69.0	76.7	81.3	72.4
Employment rate	70.9	74.8	67.4	75.3	80.1	70.8
Unemployment rate*	2.1	1.9	2.3	2.9	3.9	4.7

Source: Vietnam General Statistic Office and Institute of Labour Science and Social Affairs.

Note: * The 2010 unemployment rates are based on urban areas only.

Table 2: Composition of Employment by Industries: 2002 and 2010 (%)

	Male	Male	Female	Female
	2002	2010	2002	2010
Mining and Quarrying	2.9	7.2	1.1	19.0
Manufacturing	27.3	21.4	39.5	19.3
Electricity	1.6	20.7	0.5	3.2
Construction	21.4	18.2	3.6	11.3
Commerce	11.3	5.2	15.1	7.6
Transport	10.5	3.3	2.5	2.6
Finance	1.1	1.7	1.3	2.4
Other Services	24.0	22.3	36.4	34.7

Source: Calculated from *Vietnam Household Living Standards Survey (VHLSS) 2002 and 2010*.

Note: The Agricultural sector is excluded (see Section 4).

Table 3: Composition of Employment by Employment Sector: 2002 and 2010 (%)

	Male	Male	Female	Female
	2002	2010	2002	2010
State	40.0	29.8	49.2	35.8
Private	55.3	63.1	41.5	49.5
Collective	1.5	0.9	1.5	0.8
Foreign	3.2	6.2	7.7	13.9

Source: Calculated from *Vietnam Household Living Standards Survey (VHLSS) 2002 and 2010*

Table 4: Composition of Employment by Education Level: 2002-2010

		2002	2010	2002-2010
		%	%	Percentage Point Δ
Males:	No qualification	9.9	6.5	-3.4
	Primary	21.0	15.5	-5.5
	Secondary	23.0	20.3	-2.6
	High school	15.5	11.0	-4.5
	Vocational training	13.8	23.0	9.2
	College	2.4	4.2	1.7
	University	13.7	18.1	4.4
	Advanced degree	0.7	1.5	0.7
Females:	No qualification	10.0	6.9	-3.1
	Primary	18.7	14.8	-3.9
	Secondary	20.0	17.2	-2.8
	High school	17.9	14.3	-3.6
	Vocational training	16.6	19.2	2.6
	College	5.2	7.3	2.1
	University	11.1	19.3	8.1
	Advanced degree	0.5	1.0	0.5

Source: Calculations based on *VHLSS* data.

Table 5: Hourly Wages of Males and Females by Education Level in Vietnam: 2002 and 2010 (USD)

	2002	2010	Change 2002-2010 (%)	2010-2002 (absolute change-USD)
Males				
No qualification	0.2	0.6	178.0	0.4
Primary	0.3	0.6	140.9	0.4
Secondary	0.3	0.7	135.0	0.4
High school	0.4	0.8	118.5	0.5
Vocational training	0.4	1.0	130.3	0.5
College	0.4	1.2	221.7	0.8
University	0.6	1.9	209.4	1.3
Advanced degree	0.7	3.8	406.2	3.0
Females:				
No qualification	0.2	0.5	163.8	0.3
Primary	0.2	0.5	131.8	0.3
Secondary	0.3	0.6	130.1	0.3
High school	0.3	0.6	93.3	0.3
Vocational training	0.4	0.9	125.5	0.5
College	0.4	1.0	144.4	0.6
University	0.5	1.5	196.5	1.0
Advanced degree	0.7	2.3	242.5	1.7

Source: Calculations based on *VHLSS* data.

Notes: 2002: 1 USD = 15,337VND; 2010: 1 USD = 18,932 VND.

Table 6: Returns to Education, Males 2002 and 2010

	2002	2010
<i>Education and experience controls:</i>		
Years worked	0.034*** (0.000)	0.056*** (0.000)
Years worked squared	-0.001*** (0.000)	-0.001*** (0.000)
<i>Education attainment (Ref: No qualification)</i>		
Primary	0.151*** (0.001)	0.131*** (0.001)
Secondary	0.239*** (0.001)	0.187*** (0.001)
High school	0.391*** (0.001)	0.303*** (0.001)
Vocational training	0.514*** (0.001)	0.467*** (0.001)
College	0.593*** (0.002)	0.670*** (0.001)
University	0.808*** (0.001)	1.016*** (0.001)
Graduate	1.121*** (0.003)	1.576*** (0.002)
<i>Other controls</i>		
Hours worked in a week	0.029*** (0.000)	0.007*** (0.000)
Hours worked in a week squared	-0.000*** (0.000)	-0.000*** (0.000)
Urban	0.202*** (0.001)	0.160*** (0.000)
<i>Marital status (Ref: Single)</i>		
Married	0.117*** (0.001)	0.117*** (0.001)
Widowed	0.072*** (0.004)	-0.130*** (0.004)
Divorced	0.080*** (0.004)	-0.145*** (0.003)
Separated	0.027*** (0.005)	0.081*** (0.003)

Table 6: Continued

	2002	2010
<i>Economic industries (Ref: Manufacturing)</i>		
Mining and quarrying	0.151*** (0.002)	-0.047*** (0.001)
Electricity	0.060*** (0.002)	-0.062*** (0.001)
Construction	-0.017*** (0.001)	0.060*** (0.001)
Commerce	0.025*** (0.001)	0.081*** (0.001)
Transport	0.163*** (0.001)	0.091*** (0.001)
Finance	-0.029*** (0.003)	0.066*** (0.002)
Otherservices	-0.170*** (0.001)	-0.239*** (0.001)
<i>Sector types (Ref: Private)</i>		
State	0.129*** (0.001)	0.038*** (0.001)
Collective	0.131*** (0.002)	-0.160*** (0.002)
Foreign	0.330*** (0.002)	0.188*** (0.001)
<i>Location (Ref: Red river Delta)</i>		
Northern Midland and Moutainous	-0.128*** (0.001)	-0.127*** (0.001)
North Central Coast and South Central Coasth	-0.027*** (0.001)	-0.154*** (0.001)
Central Highland	-0.106*** (0.002)	-0.128*** (0.001)
South East	0.516*** (0.001)	0.282*** (0.001)
Mekong river Delta	0.150*** (0.001)	-0.048*** (0.001)
Constant	-0.312*** (0.003)	1.530*** (0.003)
Observations	4,250,958	7,033,297
R-squared	0.398	0.428

Note: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 7: The Change in Male Educational Returns, 2002 and 2010

	2002	2010	2010-2002	2002/2010 Incremental delta
Years worked	0.034**	0.056**	0.022**	
Years worked square	-0.001**	-0.001**	-0.000**	
<i>Education attainment (Ref: No qualification):</i>				
Primary	0.151**	0.131**	-0.020**	
Secondary	0.239**	0.187**	-0.052**	-0.032**
High school	0.391**	0.303**	-0.088**	-0.037**
Vocational training	0.514**	0.467**	-0.047**	0.042**
College	0.593**	0.670**	0.077**	0.124**
University	0.808**	1.016**	0.208**	0.132**
Graduate	1.121**	1.576**	0.455**	0.247**
<i>Other controls</i>				
Hours worked in a week	0.029**	0.007**	-0.022**	
Hours worked in a week square	-0.000**	-0.000**	0.000**	
Urban	0.202**	0.160**	-0.042**	
<i>Marital status (Ref: Single):</i>				
Married	0.117**	0.117**	0.000	
Widowed	0.072**	-0.130**	-0.202**	
Divorced	0.080**	-0.145**	-0.226**	
Separated	0.027**	0.081**	0.055**	
<i>Economic industries (Ref: Manufacturing):</i>				
Mining and quarrying	0.151**	-0.047**	-0.198**	
Electricity	0.060**	-0.062**	-0.122**	
Construction	-0.017**	0.060**	0.077**	
Commerce	0.025**	0.081**	0.056**	
Transport	0.163**	0.091**	-0.073**	
Finance	-0.029**	0.066**	0.095**	
Other services	-0.170**	-0.239**	-0.069**	
<i>Sector types (Ref: Private)</i>				
State	0.129**	0.038**	-0.091**	
Collective	0.131**	-0.160**	-0.291**	
Foreign	0.330**	0.188**	-0.143**	
<i>Region (Ref: Red river Delta)</i>				
Northern Midland and Mountainous	-0.128**	-0.127**	0.001	
North Central Coast and South				
Central Coast	-0.027**	-0.154**	-0.126**	
Central Highland	-0.106**	-0.128**	-0.022**	
South East	0.516**	0.282**	-0.233**	
Mekong river Delta	0.150**	-0.048**	-0.198**	
Constant	-0.312**	1.530**		
Observations	4,250,958	7,033,297	11,284,255	
R-squared	0.398	0.428	0.641	

Note: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 8: Returns to Education, Females 2002 and 2010

	2002	2010
Years worked	0.025*** (0.000)	0.070*** (0.000)
Years worked squared	-0.000*** (0.000)	-0.001*** (0.000)
<i>Education attainment (Ref: No qualification):</i>		
Primary	0.251*** (0.001)	0.138*** (0.001)
Secondary	0.282*** (0.002)	0.302*** (0.001)
High school	0.233*** (0.002)	0.373*** (0.001)
Vocational training	0.531*** (0.002)	0.507*** (0.002)
College	0.718*** (0.002)	0.799*** (0.002)
University	0.719*** (0.002)	0.845*** (0.002)
Graduate	1.200*** (0.006)	1.204*** (0.003)
<i>Other controls</i>		
Hours worked in a week	0.017*** (0.000)	0.009*** (0.000)
Hours worked in a week squared	-0.000*** (0.000)	-0.000*** (0.000)
Urban	0.170*** (0.001)	0.142*** (0.001)
<i>Marital status (Ref: Single):</i>		
Married	0.040*** (0.001)	0.124*** (0.001)
Widowed	-0.046*** (0.002)	0.042*** (0.002)
Divorced	0.026*** (0.003)	0.010*** (0.002)
Separated	0.014*** (0.005)	0.078*** (0.003)

Table 8: Continued

	2002	2010
<i>Economic Industries (Ref: Manufacturing):</i>		
Mining and quarrying	0.140*** (0.004)	-0.125*** (0.001)
Electricity	-0.052*** (0.005)	-0.037*** (0.002)
Construction	-0.116*** (0.002)	0.064*** (0.001)
Commerce	0.008*** (0.001)	-0.011*** (0.001)
Transport	0.269*** (0.002)	0.255*** (0.002)
Finance	-0.010*** (0.003)	0.194*** (0.002)
Otherservice	-0.093*** (0.001)	-0.186*** (0.001)
<i>Sector types (Ref: Private)</i>		
State	0.202*** (0.001)	0.151*** (0.001)
Collective	0.221*** (0.003)	0.113*** (0.003)
Foreign	0.246*** (0.002)	0.310*** (0.001)
<i>Region (Ref: Red river Delta)</i>		
Northern midland and Moutainous	-0.035*** (0.002)	-0.156*** (0.001)
North Central Coast and South Central Coasth	-0.010*** (0.001)	-0.151*** (0.001)
Central Highland	-0.037*** (0.002)	-0.067*** (0.002)
South East	0.556*** (0.001)	0.371*** (0.001)
Mekong river Delta	0.141*** (0.001)	-0.066*** (0.001)
Constant	-0.138*** (0.004)	1.239*** (0.004)
Observations	2,843,467	5,273,906
R-squared	0.363	0.441

Note: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 9: The Change in Female Educational Returns, 2002 and 2010

	2002	2010	2010-2002	2002/2010 Incremental delta
Years worked	0.025**	0.070**	0.044**	
Years worked squared	-0.000**	-0.001**	-0.001**	
<i>Educational attainment (Ref: No qualification):</i>				
Primary	0.251**	0.138**	-0.114**	
Secondary	0.282**	0.302**	0.020**	0.134**
High school	0.233**	0.373**	0.140**	0.119**
Vocational training	0.531**	0.507**	-0.024**	-0.164**
College	0.718**	0.799**	0.081**	0.105**
University	0.719**	0.845**	0.126**	0.045**
Graduate	1.200**	1.204**	0.004	-0.122**
<i>Other controls</i>				
Hours worked in a week	0.017**	0.009**	-0.008**	
Hours worked in a week square	-0.000**	-0.000**	-0.000**	
Urban	0.170**	0.142**	-0.028**	
<i>Marital status (Ref: Single):</i>				
Married	0.040**	0.124**	0.085**	
Widowed	-0.046**	0.042**	0.088**	
Divorced	0.026**	0.010**	-0.016**	
Separated	0.014**	0.078**	0.064**	
<i>Economic industries (Ref: Manufacturing):</i>				
Mining and quarrying	0.140**	-0.125**	-0.266**	
Electricity	-0.052**	-0.037**	0.015**	
Construction	-0.116**	0.064**	0.180**	
Commerce	0.008**	-0.011**	-0.019**	
Transport	0.269**	0.255**	-0.015**	
Finance	-0.010**	0.194**	0.204**	
Other Services	-0.093**	-0.186**	-0.093**	
<i>Sector types (Ref: Private)</i>				
State	0.202**	0.151**	-0.051**	
Collective	0.221**	0.113**	-0.108**	
Foreign	0.246**	0.310**	0.065**	
<i>Location (Ref: Red river Delta)</i>				
Northern Midland and Mountainous	-0.035**	-0.156**	-0.121**	
North Central Coast and South				
Central Coast	-0.010**	-0.151**	-0.141**	
Central Highland	-0.037**	-0.067**	-0.030**	
South East	0.556**	0.371**	-0.185**	
Mekong river Delta	0.141**	-0.066**	-0.208**	
Constant	-0.138**	1.239**		
Observations	2,843,467	5,273,906	8,117,373	
R-squared	0.363	0.441	0.612	

Note: Standard errors in parentheses. *Significant at 10%; **Significant at 5%; ***Significant at 1%.

Table 10: Annual Average Relative Demand 2002-2010

	Wage change	Supply change	Relative demand per annum
Men			
Primary/ no qualification	-2.00%	12.42%	1.20
Secondary/ no qualification	-5.20%	34.43%	3.39
High school/ no qualification	-8.80%	8.09%	-0.53
Vocational/ no qualification	-4.70%	153.85%	18.41
College/ no qualification	7.70%	166.54%	22.16
University/ no qualification	20.80%	101.22%	16.29
Graduate/ no qualification	45.50%	226.37%	36.26
Women			
Primary/ no qualification	-11.30%	27.52%	1.46
Secondary/ no qualification	2.00%	56.15%	7.37
High school/ no qualification	14.00%	-5.46%	1.77
Vocational/ no qualification	-2.40%	113.16%	13.73
College/ no qualification	8.10%	24.26%	4.45
University/ no qualification	12.60%	150.87%	21.06
Graduate/ no qualification	0.40%	361.54%	45.26

Source: Own calculations based on the VHLSS 2002, 2010.

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