

**EMPIRICAL ESSAYS ON  
DEVELOPMENT ECONOMICS  
THE CASE OF VIETNAM**

By  
Le Thu Huong

A thesis submitted for the degree of

Doctor of Philosophy of

The Australian National University

April, 2011



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## Declaration

Except where otherwise indicated, this thesis is my own work.

Chapter 2 is taken partly by Professor Anne North and the candidate. There was no authorial difference. Some writing and editing was still jointly between the two authors. But the presenting is carried out by the candidate.

Chapter 3 and 4 present the work undertaken solely by the candidate, under the supervision of Professor Anne North, Professor Bob Green, Associate Professor Joe Gonsky and Dr Michael Searcy.

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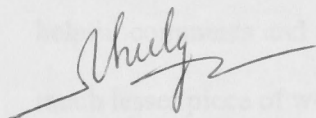
## Declaration

Except where otherwise indicated, this thesis is my own original work.

Chapter 2 is written jointly by Professor Alison Booth and the candidate. Tasks such as problem definition, methodology development and writing were split equally between the two authors. Raw data processing was carried out by the candidate.

Chapter 3 and 4 present the work undertaken solely by the candidate, under the supervision of Professor Alison Booth, Professor Bob Breunig, Associate Professor Tue Gorgens and Dr Mathias Sinning.

The candidate is responsible for all errors.



Le Thu Huong

April 2011



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## Abstract

The thesis comprises three empirical essays. Using up-to-date econometric techniques, they exploit data from the nationally representative Vietnam Living Standard Surveys (VLSS), conducted between 1993 and 2008. My goal is to analyze some important development problems in the Vietnamese economy over the transition period, defined as urban-rural inequality, the gender wage gap, child labour and its impact on children's educational success. The chapters also draw out policy implications as to how Vietnam can better protect its vulnerable groups during the economic transition.

The first essay, Chapter 2, joint work with Professor Alison Booth, investigates inequality in Vietnamese urban-rural living standards between 1993 and 2006. We use real per capita household expenditure for living standard measurement. We find that urban-rural expenditure inequality is the most important single factor in explaining national inequality in Vietnam. Urban-rural expenditure inequality increased in the initial years of economic reform then decreased after 2002. We use the Oaxaca-Blinder decomposition method, applied to the unconditional quantile regression of (Firpo et al., 2009), to isolate factors contributing to the urban-rural expenditure gap across the whole expenditure distribution. Our results suggest that inter-group differences in education, household demographic structure, industrial structure and related returns are the major contributors to these markedly high urban-rural expenditure gaps. Adjusting the average characteristics of rural households to those of urban households will reduce the overall urban-rural expenditure gap by 40%. While expenditure growth is partly explained by changes in average characteristics, it is mainly due to increasing returns and improvements in unobservable factors.

The second essay, Chapter 3, examines wages and the gender wage gap between 1993 and 2008. During this period, real wages of Vietnamese workers doubled and the gender wage gap declined by 58%. The decomposition results using the Oaxaca-Blinder decomposition applied for unconditional quantile regressions (Firpo et al., 2009) suggest that the major part of the gender wage gap is attributed to gender differences in the return to observed characteristics and to unobserved factors, also known as ‘unexplained gap’ or ‘discrimination’. Wage growth is partly explained by changes in average characteristics but is mainly due to increasing returns.

The third essay, Chapter 4, studies the determinants and impact of child labour on children’s educational performance in rural Vietnam in 1998. Of all six available waves of the VLSS, only the 1998-VLSS provides suitable information for my study purposes. I model the determinants of child labour and children’s educational performance as functions of variables observed at individual, household, school, commune and regional levels. I use provincial temperature variation as an instrument for child labour. The joint equation results suggest that child labour has a significantly negative impact on students’ academic performance. Household economic conditions are one of the most important determinants of child labour and children’s educational performance. There exists gender discrimination against girls in the burden of child labour. Children from minority ethnic groups have to work more. Among school infrastructures, the presence of electricity, a library and a good blackboard enhance student’s study results.

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## List of Abbreviations

|        |                                                 |
|--------|-------------------------------------------------|
| ABD    | Asian Development Bank                          |
| AFTA   | ASEAN Free Trade Area                           |
| APEC   | Asia-Pacific Economic Cooperation               |
| ASEAN  | Association of Southeast Asian Nations          |
| FDI    | Foreign Direct Investment                       |
| GDP    | Gross Domestic Product                          |
| GSO    | General Statistics Office                       |
| IMF    | International Monetary Fund                     |
| ILO    | International Labour Organization               |
| LSMS   | Living Standard Measurement Survey              |
| MOET   | Ministry of Education and Training              |
| MOLISA | Ministry of Labour, Invalids and Social Affairs |
| RPCEXP | Household Real Per Capita Yearly Expenditure    |
| SOE    | State Owned Enterprise                          |
| UNDP   | United Nations Development Program              |
| VHLSS  | Vietnam Household Living Standard Survey        |
| VLSS   | Vietnam Living Standard Survey                  |
| VND    | Vietnam's Currency (Vietnam Dong)               |
| WB     | World Bank                                      |
| WTO    | World Trade Organization                        |

# 1 Introduction

Vietnam is a country with a turbulent modern history in the 20<sup>th</sup> century (Arkadie, 2004). After the decades of the Vietnam War ended in 1975, Vietnam was a centrally planned economy. During this period, economic growth was stagnant. By the end of the period in 1985, Vietnam was one of the poorest countries in the world. Poverty was widespread and hunger was a major problem because the production of rice, the main food staple, was insufficient to feed the country's growing population due to population booming right after the end of the Vietnam War (Adams, 2002).<sup>1</sup>

The picture of the Vietnamese economy began to change when the renovation policies called “Doi Moi” were adopted in 1986. “Doi Moi” was a broad development program, carried out in three major elements: agricultural development, macro economic reform and trade liberalization with the aim to move Vietnam from a centrally planned economy to a market-oriented open economy. For example, in rural areas, collective farms were replaced by a direct land allocation to individual households. Private economic activities, once forbidden, were legalized. State controls on most prices were removed, foreign direct investments were encouraged and trade barriers were reduced or eliminated (Glewwe, 2002).

The past two decades witnessed a significant transformation of Vietnam from a centrally planned subsidy economy to an open-market economy. The country continuously achieved high economic growth. Over this period, the average annual GDP growth rate of

---

<sup>1</sup> Even though Vietnam had a long history of rice exportation, stagnant production during the centrally planned made Vietnam a net rice importer from 1961 to 1988 (Nguyen, 2001). It was estimated that 7 out of 10 Vietnamese people lived in poverty in 1985 (Glewwe et al., 2002).



Vietnam has been close to 7% which is among the highest not only in the region but in the world.<sup>2</sup> Vietnam moved from its earlier status of chronic food shortage to a food secure nation and the world's second largest rice exporter; from a country in isolation from many parts of the world, particularly the capitalist countries, to an economy of "high openness" as reflected by the high trade to GDP ratio.<sup>3</sup> Today Vietnam has trade relations with more than 150 countries and territories around the world and has become an attractive destination for foreign direct investment (World Trade Organization, 2010; General Statistical Office, 2010). The net foreign direct investment inflows to Vietnam increased remarkably, especially in recent years after Vietnam joined the World Trade Organization in 2006. Vietnam also experienced a remarkable shift in its industrial structure. Between 1988 and 2008 the GDP share of the industrial sector increased from 24% to 40%, the GDP share of the service sector increased from 29% to 38%, while the GDP share of the agriculture decreased from 46% to 22%. The size of the economy measured in real GDP increased five times (World Bank, 2010). As the Vietnamese became richer, the annual capital formulation increased significantly.<sup>4</sup>

However, many development concerns accompany the transition away from the centrally planned mechanism, with its egalitarian distribution ideology, toward an open-

---

<sup>2</sup> The reported average annual GDP growth rate is based on the author's own calculation using the annual GDP growth rate between 1986 and 2009 released by the GSO in 2010. Key indicators of GDPs and poverty rates over the period 1985 to 2008 are illustrated in Figure 1.1.

<sup>3</sup> The US trade embargo against Vietnam was lifted in 1994. Since 2002, one year after the Bilateral Trade Agreement between Vietnam and the US came into effect, Vietnam's foreign trade (total volume of export and import) surpasses its GDP, and the net inflows of foreign direct investment represents a larger share of GDP than those of China (World Bank, 2002).

<sup>4</sup> Vietnam's annual capital formulation measured as the percentage of GDP increased from 12% in 1990 to 30% in 2000 and 42% in 2006 (World Bank, 2010).

market economy and continuously high economic growth. One of the most important concerns is how the economic gains from continuously high economic growth are distributed among different groups in the society. In particular, to what extent do ‘disadvantaged’ groups benefit from the country’s transition compared to others?<sup>5</sup> Although this question has attracted considerable attention among academics and policy makers, few empirical studies have addressed it. A goal of this thesis is to provide an empirical investigation into some of the important issues related to this question.

This thesis consists of five chapters. In addition to the introduction and conclusion given in the first and the last chapters, Chapters 2 to 4 are three empirical essays on development economics in Vietnam. Chapter 2 investigates inequality in the Vietnamese urban-rural living standards. Chapter 3 explores the gender wage gap in the Vietnamese transition. Chapter 4 examines the determinants of child labour and its impact on children’s educational performance in rural Vietnam. These essays use data from the nationally representative Vietnam Living Standard Surveys carried out between 1993 and 2008. Each essay contributes to the economic literature by applying new econometric techniques to investigate the problems. The following sections include specific research questions and a summary of the main findings.

## **1.1 Inequality in Vietnamese urban-rural living standards, 1993-2006**

The second chapter of this thesis (joint work with Professor Alison Booth) investigates inequality in Vietnamese urban-rural living standard between 1993 and 2006. We use real

---

<sup>5</sup> Disadvantaged individuals are those who have less opportunity than others. Disadvantaged groups can be defined across many dimensions such as economic, spatial, social or psychological (Mayer, 2003). Examples include poor people, people who live in rural or remote areas, women, children, the elderly, disabled or veterans.

per capita household expenditure for to measure living standards. This chapter attempts to answer the following questions:

1. What is the overall picture of urban-rural inequality in Vietnam over the period 1993-2006? How much does inequality between urban and rural areas contribute to national inequality? To what extent is the inequality between urban and rural areas in Vietnam significant in comparison with that of other countries at the same levels of development or the similar aspects of transition?
2. What are the determinants of per capita expenditure in urban and rural areas?
3. What are the contributing factors to the urban-rural expenditure gap and the expenditure growth?

The first question is answered predominantly by the use of descriptive statistics and the analysis of inequality indices. The remaining two questions are answered by regression and decomposition methods. In addition to a detailed investigation of urban-rural inequality, this chapter is comprehensive in that it also provides an overall picture of inequality in Vietnam across other household characteristics and thus highlights the importance of our focus.

In this chapter, we find that urban-rural inequality is the most important factor explaining national inequality in Vietnam. Between-group urban-rural inequality increased significantly from 1993 to 1998, peaked in 2002, fell slightly in 2004, and then fell quickly in 2006. Compared with some other countries in the Asian region, such as India, Indonesia and the Philippines, Vietnam has higher urban-rural inequality. Compared to China, Vietnam has a lower urban-rural inequality and exhibits a lower increase in urban-rural inequality during the economic transition period.

To investigate factors contributing to the urban-rural gap across the whole expenditure distribution, we use an Oaxaca-Blinder type decomposition applied to the newly developed unconditional quantile regression method of Firpo et al. (2009). Our results suggest that a number of factors contribute significantly to the high urban-rural gap. These include inter-group differences in education, the demographic structure of the household, the industrial structure and their related returns. Adjusting the average characteristics of rural households to those of urban households reduces about 40% of the urban-rural expenditure gap. A significant part of the remaining unexplained component lies in the group-specific differences; that is, the inter-group differences in other factors that favor urban households and are not captured by the model. Over the period, expenditure growth comes partly from improvements in the observed characteristics but mainly from improvements in returns and other unobserved factors not captured by the model.

## **1.2 The gender wage gap in the Vietnamese transition, 1993-2008**

The third chapter explores the gender wage gap in the Vietnamese transition from 1993 to 2008. This chapter answers the following questions:

1. What is the overall picture of Vietnamese labour-force behaviour with regard to gender differences (including the evolution of the labour force participation rate, daily working hours, proportions of wage employment and wage distribution) during the observed period?
2. How does the gender wage gap evolve over time at the mean and across the distribution?
3. What are the wage determinants of men and women at the mean and at selected quantiles?

4. What are the contributing factors to the gender wage gap and to gender-specific wage growth at the mean and at selected quantiles?

I find that during this period of accelerated transition and international integration, as the Vietnamese becomes richer, the labour force participation rate (LFP) declined. This is true for both men and women. The share of paid employment increased, indicating that the Vietnamese labour market became more formalized. Real wages of Vietnamese workers doubled and the gender wage gap declined by 58%.

The Oaxaca-Blinder type decomposition for unconditional quantile regressions (Firpo et al., 2009) is employed to isolate factors contributing to the gender wage gap across the whole wage distribution at different points in time. The results suggest that the major part of the gender wage gap is attributed to unexplained parts also known as ‘discrimination’. Wage growth is partly explained by changes in average characteristics but is mainly due to increasing returns to observed characteristics.

### **1.3 Child labour and children’s educational success in rural Vietnam**

The fourth chapter examines the determinants and the impact of child labour on children’s educational performance in rural Vietnam, using data from the 1998-VLSS.<sup>6</sup> This chapter answers the following questions:

1. What is the overall picture of child labour in rural Vietnam? How significant is child labour in rural Vietnam in 1998 in comparison to other countries in the region as well as the developing world?

---

<sup>6</sup> Of all six available waves of the VLSS, only the 1998-VLSS provides suitable information for my study purposes.

2. Which observed individual, household, school and community characteristics are important in determining child labour and children's educational performance?
3. How does child labour affect children's educational performance?

A descriptive analysis is undertaken to answer the first question. Regression models are employed to answer the remaining two questions.

This chapter contributes to the existing literature on the impact of child labour on children's educational performance worldwide by estimating a system of simultaneous tobit (determinants of child work burden) and ordered probit (determinants of children's educational success) equations. This is different from previous studies which estimate the two equations separately or use a bi-probit or multinomial probit model to estimate the simultaneous determinants of child labour and children's educational success, treating child labour and children's educational success (measured by school attendance) as binary outcomes.

I find that in 1998, the proportion of Vietnamese rural children engaged in child labour is high in comparison to the incidence of child labour in other countries in the region as well as the developing world. Using total hours of child work, including hours of doing housework and non-housework labour supply, I evaluate the true work load that a child has to bear.

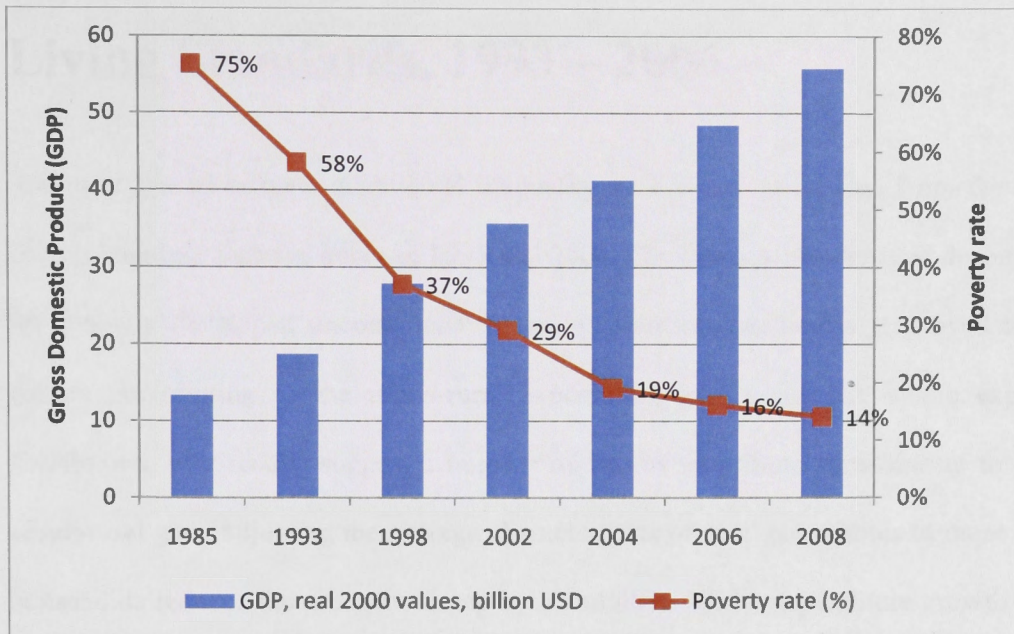
I model child labour and children's educational performance as functions of variables observed at individual, household, school, commune and regional levels. I use annual provincial temperature variations as an instrument for child labour. The results of the joint equations suggest that child labour has a significant impact on children's academic performance. Specifically, children with longer hours of child work have a lower



probability of accomplishing good or excellent academic results and a higher probability of reporting poor academic results.

Household economic conditions are one of the most important determinants of child labour and children's educational performance. Consistent with the literature, I find that both the mother's and father's education have a strong impact on children's academic performance. There exists a gender bias against girls with regard to the child work burden. While the share of experienced teachers reduces child labour, the share of qualified teachers increases the probability that students achieve good or excellent academic results. The academic environment within the community has a highly significant effect on a student's educational performance. Among school characteristics, the school infrastructure, such as the presence of electricity, a library and a good blackboard play an important role in enhancing children's study results.

The final chapter, Chapter 5, proposes policies on what Vietnam can do to protect vulnerable groups during the country's transition, ensuring that benefits from high economic growth are equally distributed among different groups in the society. Additionally, policy implications are presented with regard to Vietnam's investment in human capital accumulation, a decisive factor for the country's long-run development.

**Figure 1.1 Vietnam's Gross Domestic Product and Poverty Rate**

*\*Note: In each year, the poverty rate is the proportion of people who live under the general poverty line. The general poverty line is defined as the minimum amount of money required to purchase basic food items which provide 2100 calories per day and basic non-food items. For further details of basic items, see Haughton (2009).*

*Source: The Gross Domestic Product (GDP) was reported as part of the World Development Indicators – World Bank (2010); Poverty rates are from World Bank (2006) and Rama (2010), calculated from VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008.*

## 2 Inequality in Vietnamese Urban-Rural Living Standards, 1993 – 2006

**Abstract:** We investigate urban-rural inequality in Vietnam using data from the Vietnam Living Standard Surveys between 1993 and 2006. The Oaxaca-Blinder type decomposition for a newly developed unconditional quantile regression method is employed to isolate factors contributing to the urban-rural expenditure gap across the whole expenditure distribution. Our results suggest a number of factors contribute significantly to the high urban-rural gap. Adjusting the average characteristics of rural households to those of urban households reduces the urban-rural gap by about 40%. While expenditure growth is partly explained by changes in average characteristics, it is mainly due to increasing returns and improvements in unobservable factors.

**JEL classification:** O18; D31; O53; P21; C13

**Keywords:** urban-rural inequality; expenditure distribution; Vietnam; transition; unconditional quantile regression; Oaxaca decomposition

## **2.1 Introduction**

Vietnam has experienced continuously high economic growth since the transition from a centrally planned economy to a market economy began in 1986. Over the period, Vietnam has had one of the fastest improvements in living standards and the greatest reduction in poverty in the world.<sup>7</sup> However, this period of transition and opening up of the economy has seen a widening of the gap between the rich and the poor, and between urban and rural areas.<sup>8</sup> Closing the urban-rural gap is now a top priority in the Vietnamese government's development strategy. It is at the centre of public debates and in the press, and a major concern of ordinary Vietnamese people and international donors. Establishing what factors contribute to this urban-rural gap is a primary goal of this paper.

Two earlier studies used data from the first two Vietnam Living Standard Surveys (VLSSs), undertaken in 1992/1993 and 1997/1998, to examine this issue. These papers, by Nguyen et al. (2007) and Le et al. (2008), found a significant increase in urban-rural expenditure inequality between 1993 and 1998, and showed that urban-rural expenditure inequality plays the most important role in explaining national inequality. In our paper, we extend their analysis, using new methods, up to 2006.

First, we use inequality indices and descriptive statistics to establish an overall picture of urban-rural inequality in Vietnam from 1993 to 2006, and compare urban-rural inequality with inequality across other characteristics. We find that urban-rural inequalities increased significantly from 1993 to 1998, peaked in 2002, fell slightly in 2004, and then

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<sup>7</sup> The average annual GDP growth rate between 1989 and 2008 is 7.4% (ADB, 2008). The national poverty rate reduces remarkably from 75% in 1988 to 37% in 1998 and 14% in 2008 (Pincus, 2008 and Rama, 2010). From one of the poorest countries in 1985, Vietnam becomes a middle income country in 2010.

<sup>8</sup> For example, see Mundle et al. (1997), Glewwe et al. (2002), To (2008), Rama (2008), Tran (2008), Ngoc (2009).

fell quickly in 2006. We also briefly compare urban-rural inequality in Vietnam with other countries at the same level of development and with those at a similar stage of transition.

Next, we use the new method of unconditional quantile regression of Firpo, Fortin and Lemieux (2009) to estimate the determinants of per capita household expenditure in urban and rural areas. This is done separately for each of three waves: 1993, 2002 and 2006. We chose these years because 1993 and 2006 are the earliest and the last observed years, while 2002 saw a remarkable change in the evolution of urban-rural inequality.

Finally, the Oaxaca-Blinder type decomposition is applied to the unconditional quantile regression, to isolate factors contributing to expenditure differentials between urban and rural areas along the distribution, at three points in time. We also establish factors contributing to expenditure increase of urban and rural households.

Our results show that a number of factors contributing significantly to the high urban-rural gap. These include the inter-group differences in education, household demographic structure, industrial structure and their related returns. Adjusting the average characteristics of rural households to those of urban households reduces about 40% of the urban-rural expenditure gap. A significant part of the remaining unexplained component lies in the intercept differences; that is, the inter-group differences in other factors not captured in the model that favour urban households. Over the period, expenditure growth partly comes from the improvements in the observed characteristics but mainly from the improvements in returns and other factors not being captured in the model.

The remainder of the paper is set out as follows. Section 2 summarizes Vietnam's transition and urban development, and reviews existing studies on urban-rural inequality in Vietnam. Section 3 describes the data, while Section 4 provides a profile of urban-rural inequality from both descriptive statistics and inequality indices analyses. Variables used



are described in Section 5, followed in Section 6 by exposition of the Firpo, Fortin and Lemieux (2009) method of unconditional quantile regression. Our applications to it of the Oaxaca-Blinder decomposition are presented in section 7. The conclusions and policy implications are given in the final section.

## **2.2 Background**

### **2.2.1 Vietnam's transition and urban development**

The population of Vietnam, situated in Southeastern Asia and bordering the Pacific, stood at 86 million in 2008. With only 28% of the total population living in urban areas (GSO Vietnam, 2009), the urban population rate of Vietnam is low compared to other countries in the East Asia region and the world, and reflects the lack of urban development in the country.<sup>9</sup> As with many countries in the region, Vietnam was an agricultural economy prior to 1945, with over 90% of the population living in rural areas, where rice was the major crop of cultivation. From 1945 to 1975, Vietnam experienced 30 years of war. After the war ended, Vietnam was a centrally command and control economy. During this period, the urban population was kept stable at around 19%. By the end of the centrally planned period, Vietnam was one of the poorest countries in the world.

The transition away from the centrally planned toward a market-oriented economy in Vietnam started in 1986. Since then, Vietnam has experienced continuously high economic growth and a high rate of urbanization.<sup>10</sup> However, there is unbalanced growth between urban and rural areas. The urban areas of Vietnam are benefiting from their initial

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<sup>9</sup> The percentage of East Asian population that is urban is 45%, as compared with 48% for the entire world (UNDP, 2008b).

<sup>10</sup> The proportion of population living in urban areas in Vietnam increase from 19% in 1986 to 28% in 2008 (UNDP, 2008b)



advantages of geographical, infrastructure characteristics and industrial clustering and thus becoming growth centers attracting foreign investment. In contrast, rural areas are viewed as relatively inefficient and by-passed by development. According to the World Bank (2004), while the urban areas of Vietnam contain only 25% of the population, they account for up to 70% of national economic growth. This unbalanced growth creates a marked unevenness between urban and rural areas in terms of employment opportunities and living standard improvements. Therefore, even though the overall standard of living improved remarkably over the last two decades, poverty remains widespread and overwhelmingly found in rural areas. For example, in 2004, 25% of rural people lived in poverty as compared with an urban poverty rate of 3.6% (VASS, 2007). Recent studies about overall inequality in Vietnam - by the Asian Development Bank (2007) using per capita expenditure and McCaig (2009) using per capita income - emphasize that this urban-rural inequality has been the most important contributing factor to overall inequality between 1993 and 2006.

### **2.2.2 Literature review and contribution of our study**

The transition in Vietnam makes the country an interesting case in which to study inequality. While a number of studies of Vietnam focus on poverty and inequality, ethnic inequality, and rural inequality and urban inequality are examined separately. Little attention has been given specifically to urban-rural inequality, the focus of the present paper. As noted above, there are to our knowledge only two studies examining urban-rural inequality: Nguyen et al. (2007) and Le et al. (2008). Both use data from the first two waves of the VLSS undertaken in 1993 and 1998, but they adopt different estimation techniques to that utilized in this paper.

Nguyen et al. (2007) apply the quantile regression-based decomposition proposed by Machado and Mata (2005), while Le et al. (2008) apply the Dinardo et al. (1996) semi-parametric decomposition method. They find that the urban-rural inequality is the most important factor explaining national inequality. In 1993 across all points in the expenditure distribution, most of the urban-rural gap comes from the characteristic gap. As the Vietnamese economy became more marketized in 1998, the returns gap was found to play a more important role in the composition of the overall urban-rural gap. In addition, differences in household structure, human capital and ethnicity were found to be the major contributing factors to the urban-rural gap in 1993 and 1998. The increase in returns to education plays the most important role in the widening the gap during the period (Nguyen et al., 2007).

Although the methods applied by Nguyen et al. (2007) and Le et al. (2008) allow the authors to investigate the urban-rural inequality at different points along the distribution, in both methods, the results of decomposition are sensitive to the choice of the counterfactuals.

What are the contributions of our study to the literature on urban-rural inequality in Vietnam? They are threefold, with the first two being methodological while the last relates to the extended data window we use.

Our first contribution is to use the new method of unconditional quantile regression of Firpo, Fortin and Lemieux (2009) to examine the determinants of urban and rural per capita expenditure at selected percentiles along the distribution. We compare this with OLS at the mean. The advantage of the unconditional quantile regression over the traditional conditional quantile regression of Koenker and Bassett (1978) is that its estimated coefficients are interpreted as the impact of changes in the distribution of explanatory

variables on the quantiles of the unconditional distribution of the dependent variable. Therefore, we can apply the Oaxaca decomposition method directly to the estimation results from the unconditional quantile regression, without having to do many simulations as in the method of quantile regression based decomposition. This represents our second contribution to the literature, since we are the first to apply the Oaxaca-Blinder type decomposition method to the unconditional quantile regression. This allows us to separate the contribution of returns and characteristics from each explanatory variable.

Our third contribution is to examine a longer period than previous studies, which have used the first two waves of the VLSS (1993 and 1998). We extend the period to use all five waves of the Vietnam Living Standard Surveys covering the period 1993 to 2006. As noted above, this period is important for Vietnam not only because of its continuously high economic growth, but also because of significant changes in the structure of the economy and its accelerated integration into the world market. Vietnam resumed relations with the International Monetary Fund and the World Bank in 1992; established political normalization with the United States (US) in 1994 and the US trade embargo against Vietnam lasting for 19 years were lifted in the same year; became a member of the Association of Southeast Asian Nations (ASEAN) in 1995, ASEAN Free Trade Area in 1996, Asia-Pacific Economic Cooperation in 1998; signed the Bilateral Trade Agreement with the US in 2000; and joined World Trade Organization in 2006. These have led to a marked change in distribution outcome.

### **2.3 Data and Sample**

The first two waves of data that we use are from the Vietnam Living Standard Surveys (VLSSs) undertaken in 1992/1993 and 1997/1998, while the next three waves are from the Vietnam Household Living Standard Surveys (VHLSS) undertaken in 2002, 2004 and

2006. These are nationally representative surveys conducted by Vietnam's General Statistics Office with technical assistance from the World Bank. Although the subsequent VHLSS questionnaires were simplified compared to the first two waves of VLSS, the question design in both follows the standard set for the Living Standard Measurement Surveys of the World Bank. As a result, these surveys contain comprehensive and comparable information across years, in terms of both household characteristics and household expenditure items, thus facilitating welfare analysis at a household level. The sample consists of 4800, 6000, 29530, 9188, and 9189 households in VLSS1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, respectively.

There are 4,000 households surveyed in VLSS 1993 who were re-interviewed in 1998. While there are also panel samples from the last 3 waves - VHLSS 2002, 2004 and 2006 - there are no households re-interviewed between the VLSS and the VHLSS. For our purpose of observing the whole period and making our observed sample nationally representative, we analyze all five waves in separate cross-sections.

Column 2 of Table 2.1 reports the percentage of urban households in the sample, adjusted by household weights.<sup>11</sup> These numbers approximate the actual percentage of urban people.

[Table 2.1 about here]

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<sup>11</sup> The survey samples only cover the registered residence. In VLSS 1993, the total number of surveyed households is 4800, but one household (coded 10301) with data on expenditure exists only for two months and is excluded from the sample, leaving the total number of observations in 1993 at 4799. In VLSS 1998, the total number of households being surveyed in the expenditure sample is 6002, but three households are excluded because two household (coded 1302 and 11916) lack information on some sections and another household (coded 7506) contains only one elderly person who lives alone and has meals with their children's family so there is a lack of information on food expenditure. Thus, there are 5999 observations left in VLSS 1998 - see World Bank (1998 a. b) World Bank (2001) and GSO Vietnam (2006) for more details.

To compare the difference between urban and rural living standards, we use household real per capita yearly expenditure (RPCEXP).<sup>12</sup> This is calculated by dividing total real household expenditure by the household size.<sup>13</sup> Although income is usually the best indicator for measuring inequality, expenditure is preferred for developing countries. The reasons are discussed in depth in Deaton (1997), Van de Walle et al. (2001) and Glewwe et al. (2002). We calculate real per capita expenditure by using the current per capita expenditure adjusted for the monthly and the regional price indices then converting to the current price of Jan 2006 for comparative purposes.<sup>14</sup>

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<sup>12</sup> The calculation of expenditure follows the formula used in the World Bank Living Standard Measurement Survey. Household total expenditure is the sum of expenditure on food and non-food items. Specifically, food expenditure includes both expenditure on purchased items and home-produced products. The value of consumption from home-produced products is calculated using the total quantity of consumed multiplied by the value of such consumption if it was purchased in the market. Non-food expenditure includes expenditures on daily items, utilities, transportation, entertainment, education, health, the imputed values of household appliances or other consumer durables to be consumed in the year, house rent or, for those who live in their own house, the imputed depreciation value of the house in the year for those who live in their own house. Expenditures on consumer durables, house building, social funds, and the purchase of gold, silver, precious gems, stocks or bonds are excluded. Thus the expenditure calculated from the survey is a relatively good measure of living standard - see World Bank (1998b) and Glewwe (2003) for more details.

<sup>13</sup> Households differ in size and in the age of the household members. Theories suggest that larger households are likely to benefit from the economies of scale in household expenditure (i.e., larger households can enjoy the same living standard, with lower per capita expenditure, as smaller households). In addition, adults and children are likely to have different needs and consume a different proportion of the total household expenditure (see Deaton (1997), Anderson (2003) for more details about the problem of equivalent scale in calculating household per capita expenditure). By dividing total household expenditure by the number of people in the household, and then using total household per capita expenditure as the measure of welfare for each member of the household, we assume that everyone in the household is identical and has the same needs.

<sup>14</sup> The yearly price deflator is computed from the monthly price indexes released by the GSO of Vietnam.

## 2.4 Overall picture of urban-rural inequality in Vietnam, 1993-2006

### 2.4.1 Urban-rural inequality from inequality indices analysis

This section uses the Gini and Theil indices to provide a comprehensive picture of urban-rural expenditure inequality in Vietnam during 1993 to 2006 period. Table 2.2 reports inequality indices across years for the whole nation as well as by urban-rural sectors. Using the Gini index, it can be seen that national inequality increased from 1993 to 2002 (the Gini coefficient increased from 0.34 in 1993 to 0.37 in 2002), remained unchanged from 2002 to 2004 and decreased from 2004 to 2006 (the Gini coefficient reduced from 0.37 in 2004 to 0.36 in 2006).

How does this compare with other countries with a comparable level of GDP per capita? Table 2.3 demonstrates that inequality in Vietnam in 2004 is 0.37, which is lower than Cambodia (whose Gini was 0.42 in 2004), is equal to that of India, and is a little bit higher than in Indonesia (whose Gini was 0.34 in 2002). What about other countries at a comparable transition pattern? While Vietnam has the same pattern of economic transition as China, and is similar to some extent to Russia and Poland, the Gini index of Vietnam in 2004 is lower. For example, China had a Gini of 0.47 in 2004; Russia a Gini of 0.40 in 2002; and Poland a Gini of 0.35 in 2002. However, we cannot draw any precise conclusions about the comparative inequality levels between Vietnam and these last countries because each has different level of development as measured by per capita GDP. More positively, the *trend* of inequality in Vietnam from 2002 to 2006 indicates that it remained stable then reduced slightly during the recent period of high economic growth.

[Table 2.2 and 2.3 about here]



Inequality is higher in urban than rural households in all waves. Furthermore, inequality evolves differently between the urban and rural sectors. In the urban sector, inequality increased from 1993 to 2002 then decreased from 2002 to 2006, with the Gini increasing from 0.34 in 1993 to 0.35 in 2002 then decreasing to 0.33 in 2004 and remaining stable in 2006. In contrast, in the rural sector, inequality decreased slightly from 1993 to 1998 then increased from 1998 to 2006, with the Gini dropping from 0.28 in 1993 to 0.27 in 1998, and then increasing steadily to the value of 0.30 in 2006.

While the results based on the inequality indices provide a picture of overall inequality, they do not enlighten us as to the composition of overall inequality nor indicate the contribution of *between-* and *within-*group differences that are the focus of our interest. We address these issues by using the Theil decomposition to look at the components of between- and within-group inequality across different characteristics of the households.<sup>15</sup> These show the following. First, urban-rural between-group inequality makes the largest contribution to overall inequality. Specifically, the between-group urban-rural inequality accounted for 21% of the overall inequality in 1993, and this increased rapidly to 31% in 1998, 33% in 2002 and then fell slightly to 31% in 2004 and decreased to 25% in 2006 (Figure 2.1). Second, consider ethnicity. Inequality between the majority ethnic group (Kinh) and the minority ones increased continuously over time from 2% in 1993 to 8% in 2006 (Appendix 2.1). Third, consider education. Between-groups inequality by household head's education increased remarkably, from 8% in 1993 to 21% in 2006. Fourth, turning to the household head's employment status, within-group inequality is increasing in households where the head is working in the private sector, working in the service sector and households where the head is elderly. Fifth, inequality between groups by other

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<sup>15</sup> See Appendices 2.1 for detail results of Theil decomposition across various household characteristics.

household head characteristics (such as gender, marital status and age group) is small and rather stable between 1993 and 2006. Finally, it is interesting to observe an opposite trend in inequality within groups of male- and female-headed households. While inequality within households headed by males increased steadily from 1993 to 2006, inequality within households headed by females decreased over the same period.

Compared with some other countries in the Asian region, such as India, Indonesia and the Philippines, Vietnam has higher urban-rural inequality. Compared with China, a comparable country in many aspects, Vietnam has lower urban-rural inequality and less increase in urban-rural inequality during the economic transition process.<sup>16</sup>

[Figure 2.1 about here]

The reason why (i) *overall* inequality is higher than inequality in urban or rural sectors alone, and (ii) between-group inequality by urban-rural sectors makes the largest contribution to the national inequality is due to the large differences between urban and rural sectors in levels of per capita expenditure, as will be seen in the next section.

#### **2.4.2 Urban-rural inequality from descriptive statistics and distributional analysis**

Table 2.1 presented expenditure figures at mean and selected percentiles by urban and rural households, and showed that per capita expenditure is higher in urban than rural areas. This pattern holds regardless of the time and the method used to measure expenditure. The urban-rural expenditure ratio at the mean increased from 1.91 in 1993 to 2.36 in 2002, before declining to 2.24 in 2004 and 2.01 in 2006.

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<sup>16</sup> Between urban-rural expenditure inequality in China contributed for 27% to the national inequality in 1985, 40% in 1995, and 44% in 2006. See ADB (2007) for more details.

Table 2.1 also shows that the real per capita expenditure of the top decile of urban households is four to five times higher than the real per capita expenditure of the bottom decile. It is seven to nine times higher than the real per capita expenditure of the bottom decile of rural households. One of the most striking findings from Table 2.1 is that in 1993 the value of the top decile of rural expenditure is almost equal to the median urban expenditure. Moreover, the value of the top decile of rural expenditure is under the median urban expenditure for the years 1998, 2002 and 2004. These figures confirm a long lasting Vietnamese saying, “*Giau nha que khong bang keo le thanh thi*”, meaning the rural rich are not as wealthy as the urban poor who work in the city street.

Additionally, Figure 2.2 illustrates the evolution of the urban-rural natural log RPCEXP gap along the distribution. An important deduction from Figure 2.2 is that the urban-rural gap, in terms of log per capita expenditure, is monotonically increasing from the poorer to the richer groups of the expenditure distribution. From 1993 to 1998, the gap increased at all points in the distribution. From 1998 to 2002, the gap continued to increase in the middle of the distribution but decreased slightly in the two tails. While most of the decrease in the urban-rural log per capita expenditure gap at mean from 2002 to 2004 came from the decrease of the urban-rural gap in the upper half of the expenditure distribution, all of the decrease at mean from 2004 to 2006 came from the decrease of the urban-rural log per capita expenditure gap at all points in the distribution.

[Figure 2.2 about here]

Figure 2.3 illustrates the distribution of the urban and rural real per capita expenditure from 1993 to 2006. It can be seen that the urban distribution is more dispersed while the rural distribution is more concentrated, confirming that there is higher inequality within urban than rural households. In addition, the urban density lies to the right of the

rural one, showing that urban expenditure is consistently higher than the rural counterpart at all points along the distribution.

[Figure 2.3 about here]

There are several possible reasons for the lower per capita expenditure of rural than urban households. Among them are inter-group differences in education, demographic structure, labour market activity, geographic location and the like. For example, as shown in Table 2.4, the heads of urban households have more years of schooling than those of rural households and living standards are positively associated with the years of schooling of the household heads. The urban-rural gap in terms of average years of schooling of the household head increases over time from 2.08 in 1993 to nearly 2.50 in 2006. Furthermore, urban households have more favourable demographic characteristics. These include smaller household size, a lower proportion of children and more labourers. Remarkably, there has been a sharp decrease in the proportion of children from 28% in 1993 to 18% in 2006 in urban households, and from 36% in 1993 to 23% in 2006 in rural ones. In contrast, there has been a rapid increase in the proportion of labourers rising from 60% in 1993 to 67% in 2006 in urban households, and from 52% in 1993 to 62% in 2006 in rural households.<sup>17</sup> Moreover, urban households are more engaged in services and the manufacturing sector where returns are higher, while rural households are more engaged in the agricultural sector where returns are relatively low. Furthermore, urban households receive more remittances.

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<sup>17</sup> Vietnam had a population boom after the end of the war in 1975. According to Haub et al. (2009), the population increased rapidly (by 22.7%), to around 24 million people between 1979 and 1989. During the 1990s, Vietnam had a sharp decline in the population growth rate. According to General Statistics Office of Vietnam (2009a), the annual population growth of Vietnam in the early 1990s is 2%, in 2000 is 1.4% and in 2006 is 1.2%. The population growth rate of Vietnam in 2006 is higher than that of Korea 0.3%, China 0.5%, and Thailand 0.8%; but is lower than that of The Philippines 1.8%, Malaysia 2.0%, and Indonesia 1.3%.

Urban households are located in areas with more favourable geographic and infrastructure conditions.

To what extent are per capita expenditures determined by these characteristics in urban and rural regions? How much of the inter-group expenditure differential is due to the differences in average characteristics, returns and other factors not captured in the model? The regressions and decompositions of the next section will answer these questions.

## **2.5 Variable descriptions**

### **2.5.1 The dependent variable**

Our dependent variable is real per capita yearly total expenditure (RPCEXP). We take the natural log of RPCEXP, to reduce heteroskedasticity. Hence the estimated coefficients give the percentage change in expenditure in response to a unit change in the explanatory variable.

### **2.5.2 The explanatory variables**

We exploit the rich and comparable information across five waves to construct a set of explanatory variables reflecting the demographic, education, employment and other attributes of the household. Details of variable definitions are given in Appendix 2.1. Table 2.4 provides summary statistics of variables.

[Table 2.4 about here]

The first set of explanatory variables are the characteristics of the household head namely sex, ethnicity, marital status, general experience and general experience squared.<sup>18</sup>

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<sup>18</sup> General experience is calculated as age minus years of schooling minus six. Six is the age when children start school in Vietnam.

Following Nguyen et al. (2007), we use average years of schooling of the more educated household head or spouse as a measure of the household education. This is because the most educated household head or spouse is likely to have the bigger impact on household decisions and thus household welfare. We include dummy variables for employment status, sectors and industries of employment of the household head. Other demographic variables include household size and the household proportions of children, labourers, and the elderly.<sup>19</sup>

We estimate the impact of per capita remittances from foreign and domestic sources on household expenditure separately. Finally, we include six dummies to control for seven regional differences -this is more detailed than the two regions (North –South) studied in Nguyen et al. (2007). The reason for doing this comes from our results of the Theil decomposition by North-South and by seven regions. The between North-South difference contributes a modest percentage to the overall inequality around 3% to 8% across the years 1993-2006, compared to the between seven regions difference, which is around 13% to 18% across the years 1993-2006, as will be shown later. So our results will be more accurate at regional levels. Moreover, the inclusion of the six regional dummies allows us to capture part of the geographic differences in prices.<sup>20</sup>

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<sup>19</sup> In Vietnam, at the age of 15 children finish lower secondary school, and then many of them work, especially in rural areas. Article 6 of the Vietnamese Labour Code (1994) regulates that employees are people at least 15 years old who are able to work and have entered in to a labour contract. So we identify labourers are those who are over 15 to retirement age, currently not at school and working. Old people are those who are over the retirement age (currently 60 years for males and 55 years for females).

<sup>20</sup> McCaig (2009) pointed out that the given regional price indices of the survey may not fully capture the regional price differences for the case of the urban South East region in the VLHSS for 2002 and 2004.



## 2.6 Estimation methods, model specifications and estimation results

### 2.6.1 Estimation methods

Our descriptive statistics show that mean expenditure is always higher than the median, that the shape of the expenditure distribution is right skewed, and that it contains extreme values. These characteristics suggest that the use of OLS to examine the expenditure at the mean is not sufficient; investigating expenditure at different points in the distribution is needed. This can be implemented either by using the commonly used (*conditional*) *quantile regression* approach, as introduced by Koenker and Bassett (1978), or a new *unconditional quantile regression* method developed by Firpo, Fortin and Lemieux (2009).

In this paper we use the newly developed unconditional quantile regression method because of its advantage over the traditional (conditional) quantile regression method in evaluating the impact of changes in the distribution of explanatory variables on the *unconditional marginal distribution* of the outcome variable. Technically, the unconditional quantile regression method of Firpo et al. (2009) consists of running a regression of the estimated *recenterd influence function* (RIF) at a given statistic of interest on a set of explanatory variables. The estimated RIF is the sum of the *value function* and the *influence function*.

The influence function is the first derivative of an estimator. For example, let  $T$  be the value function and  $F$  be the probability for which  $T$  is defined. Then a slight perturbation of  $F$  by a point mass at  $y$  is the mixture model from which an observation has probability  $(1 - \varepsilon)$  of being generated by  $F$  and probability  $(\varepsilon)$  of being an arbitrary value  $\delta_y$  is written as:

$$F_\varepsilon(y) = (1 - \varepsilon) \cdot F + \varepsilon \cdot \delta_y \quad (2.1)$$

Then the influence function of an estimator  $T$  with probability distribution  $F$  at point  $y$  is:

$$IF_{T,F}(y) = \lim_{\varepsilon \rightarrow 0} \frac{\{T[F_\varepsilon(y)] - T[F(y)]\}}{\varepsilon} = \lim_{\varepsilon \rightarrow 0} \frac{\{T[(1-\varepsilon).F + \varepsilon.\delta_y] - T(F)\}}{\varepsilon} \quad (2.2)$$

Given the influence function, the recentered influence function of an estimator  $T$  with probability distribution  $F$  at point  $y$  is:

$$RIF(y) = T[F(y)] + IF_{T,F}(y) \quad (2.3)$$

Following the definition, the RIF of a given  $\tau^{th}$  quantile, is:

$$RIF(y; q_\tau) = q_\tau + IF(y; q_\tau) = q_\tau + \frac{\tau - 1\{y \leq q_\tau\}}{f_Y(q_\tau)} \quad (2.4)$$

where  $1\{y \leq q_\tau\}$  indicates the dummy variable for whether the value of  $y$  is below  $q_\tau$ ;  $f_Y(q_\tau)$  is the density of  $Y$  evaluated at  $q_\tau$ .

The Firpo, Fortin and Lemieux (2009)'s new method of unconditional quantile regression can be done through one of three estimation techniques: OLS (called RIF-OLS), logistic (called RIF-logit) or non parametric (called RIF-nonparametric). For simplicity, in this application we use the RIF-OLS. Consistent estimates of this method is obtained under the assumption that:  $Pr[Y > q_\tau | X = x]$  is linear in  $x$ . The estimation of RIF-OLS is similar to OLS:

$$\widehat{\beta}_\tau = (X'X)^{-1}X'\widehat{RIF}(Y, \hat{q}_\tau) \quad (2.5)$$

The only difference is the replacement of the estimated values of RIF at a given quantile as a new dependent variable. If our statistic of interest is the mean, then the estimation of RIF-OLS for the mean becomes exactly OLS.

The estimation of RIF at a given  $\tau^{th}$  quantile involves two estimated components (see equation 4). The first component:  $\hat{q}_\tau$  - the  $\tau^{th}$  population quantile - is estimated as in

Koenker and Bassett (1978). The second component:  $\hat{f}_Y(\hat{q}_\tau)$  is density estimator of  $Y$  at point  $\hat{q}_\tau$  - is estimated using the kernel density:

$$\hat{f}_Y(\hat{q}_\tau) = \frac{1}{N \cdot b} \cdot \sum_{i=1}^N K_Y \left( \frac{Y_i - \hat{q}_\tau}{b} \right) \quad (2.6)$$

where:  $K_Y(z)$  is the Gaussian kernel and  $b$  is the bandwidth.<sup>21</sup>

### 2.6.2 Model specifications and estimation results

We now investigate how the relationship between log RPCEXP and a set of explanatory variables differs between urban and rural areas at the mean and at various quantiles of the expenditure distribution. We do this by estimating a series of OLS and unconditional quantile regression of the form:

$$Y_i = \alpha + \beta X_i + \gamma U_i + \delta U_i * X_i + \varepsilon_i \quad (2.7)$$

where:  $Y_i$  is the natural log of RPCEXP of individual  $i$ ,  $U_i$  is the urban dummy,  $X_i$  is the vector of explanatory variables for individual  $i$ ,  $U_i * X_i$  is the interaction between the urban dummy and the explanatory variables. The vector of coefficients  $\beta$  is the returns to characteristics, and  $\gamma$  and  $\delta$  give the intercept and slope differential associated with urban location.

To begin with, we estimate a restricted version of equation 7 that includes only the intercept, the urban dummy and a set of all explanatory variables at the mean using OLS and at selected quantiles using an unconditional quantile regression. The estimation results suggest that all the urban dummies have positive coefficients and are highly statistically significant implying that, other things constant, an urban household has higher per capita

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<sup>21</sup> Note that other methods of density estimation can be applied.

expenditure than a comparable rural household. Interestingly, the coefficients of the urban dummies increase monotonically from the bottom to the top of the distribution, implying that the urban-rural gap is higher among those with higher per capita expenditures. This is true for all years.

Next, we estimate a full specification of equation 7 - including the intercept, the urban dummy, the set of explanatory variables, plus the interaction terms of the urban dummy with the set of explanatory variables - at the mean using OLS and at various quantiles using unconditional quantile regression. We carry out an F test for the hypothesis that all the coefficients of urban interaction terms are equal to zero. The test results reject the null hypothesis, suggesting that there are indeed significant differences in the return to characteristics between the urban and rural sectors.<sup>22</sup>

We then use the OLS and the unconditional quantile regression to estimate the determinants of expenditure at the mean and at selected quantiles for the urban and rural sectors separately.<sup>23</sup> For parsimony, only the estimation results for 1993, 2002 and 2006 are reported in Tables 2.5, 2.6 and 2.7, respectively. The evolution of selected estimating coefficients along the distribution of urban and rural sectors in 1993 and 2006 are illustrated in Figure 2.4.

[Table 2.5 to 2.7 about here]

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<sup>22</sup> The full regression and test results are not reported here for brevity, but are available from the author on request.

<sup>23</sup> We suspect that households with higher education may have higher variation of expenditure around the mean expenditure value of their education group, or the majority households may have a higher variation of expenditure around the mean value of their group than do the minority ones. We carried out the Breusch-Pagan test for heteroskedasticity. Our test results reject the null hypothesis of homoskedasticity in the error distribution. Therefore, our estimations report robust standard error.

[Figure 2.4 about here]

The values of  $R^2$  from the regression results imply that the fit of the model is higher at the mean and at the middle of the distribution than at the two tails. Over years, the explanatory power of the variables in the model has improved in both urban and rural sectors.

We now turn to a discussion of the impact of the variables included in the regression on household expenditure. First, note that *education* is highly statistically significant. Other things being equal, a household with a more highly educated head has higher per capita expenditure. This is true across all points in the expenditure distribution in both urban and rural areas. Notice that in 2006 the returns to education in urban sector are higher than those in rural sector.<sup>24</sup> Over the period from 1993 to 2006, in both urban and rural sectors, the returns to education increase considerably in the lower part of the expenditure distribution.

Second, consider the *ethnicity of the household head*. In the rural sector, other things being equal, ethnic households have lower expenditure than the majority in all survey years. This finding is consistent with Van de Walle et al. (2001) and Baulch et al. (2002). In the urban sector, ethnic households do not have lower expenditure than the majority in 1993; however, by 2006 these ethnic households have lower expenditure than the majority.

Third, consider the effect of *household demographics*. Household size and the proportion of children in the household are both highly statistically significant. The

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<sup>24</sup> The estimated coefficient of variable years of schooling in the earning equation is often explained as the return to education. Due to limitations in using the income as discussed in previous section, expenditure is used instead of income.

negative coefficients imply that larger households, or those with more children, have lower per capita expenditure. Households with more elderly people also have lower expenditure.

Fourth, consider *industries*. *Ceteris paribus*, households with the head working in agriculture have lower expenditure than households whose head works in the service sector. Although in the upper part of the expenditure distribution the returns to working in agriculture improve significantly, in the lower part of the rural expenditure distribution the returns to working in agriculture remain stable between 1993 and 2006. Notably, in all years, households with the head working in the agriculture industry are those with the lowest expenditure compared to households with the head working in other industries.

Households whose head works in the service industry do not have a significant per capita expenditure difference when compared to similar households with the head working in manufacturing in the urban area in 1993. However, this situation changes over time, as the economy becomes more industrialized and liberalized. Urban households whose head works in the service industry now have a significantly higher expenditure than comparable households whose head works in manufacturing. An explanation for the result comes from the fact that some manufacturing industries, such as gas, petroleum, mining, motor bike and car manufacturing, are government-protected in the initial period of transition. However, as Vietnam continues its road to international integration, the protection rates of these manufacturing industries have been reduced or removed.<sup>25</sup> In addition, light manufacturing industries, such as leather or textile and garment manufacturing, developed quickly over the studied period to exploit Vietnam's relatively cheap and low-skilled labour abundance. Returns in these newly developed labour-intensive light manufacturing industries are low.

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<sup>25</sup> The effective protection rate of manufacturing industry reduced from 121.5 in 1997 to 46.3 in 2003 (Vo, 2005).



The removal of protection barriers and the compositional shifts within the manufacturing industry result in the relative reduction of the manufacturing industry's return compared to the service industry's return.

Fifthly, consider *sectors*. Households whose head works in the private sector consistently have lower expenditure than comparable households whose head works as public servant or in state-owned enterprises (SOE). The private sector plays an increasingly important role in Vietnam, not only in terms of increasing contribution to GDP, but also in terms of job creation. Yet most private enterprises are small scale and labour intensive, so the returns are low.

In the initial stages of our observed period, *ceteris paribus*, households with a self-employed head working in the informal sector in urban areas had higher expenditure than did households where the head worked in the formal private sector. However, by 2006, in the upper part of the urban expenditure, households with a self-employed head have lower expenditure compared to households with the head working in the private sector. This is consistent with the fact that, during the initial period of economic transition with the contraction of the state sector, the informal sector developed quickly to take the advantage of new market opportunities which had previously been restrained during the long period of centrally planned and controlled mechanism. However, as the country continues its transition road, the labour market became increasingly formalized. There is not only a decline in the informal sector return, but also a contraction of the informal sector in the economy.<sup>26</sup>

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<sup>26</sup> The proportion of labourers receiving wages increased from 16% in 1993 to 30% in 2002, and 33% in 2006.

Sixth, consider *remittances*. Both foreign and domestic remittances have a positive and highly statistically significant impact on the household expenditure. A unit of domestic remittance results in a greater expenditure increase than a unit of foreign remittance. In the upper range of the expenditure distribution, a unit of remittance increases expenditure more than it does at the lower end of the distribution.

Finally, consider *regions*. Both the descriptives and regression results suggest that there are considerable differences by regions in expenditure of both urban and rural households. The urban Southeast has the highest living standard, followed by the Red River Delta, the Mekong River Delta and the South Central Coast. There is no statistical significance for the difference in the living standard of the urban areas of the Northern Upland and the North Central Coast. In the rural areas, the Southeast has the highest living standard, followed by the Central Highland and then the Mekong River Delta, the North Central Coast has the lowest living standard.

## 2.7 Oaxaca decomposition and results

### 2.7.1 Oaxaca decomposition

In this section, we examine the factors contributing to expenditure growth between 1993 and 2006, along with factors contributing to the urban-rural expenditure gap at three points in time (1993, 2002 and 2006), at mean and at selected quantiles. We do this by using a variation of the Oaxaca-Blinder (1973) decomposition of the forms:

$$\hat{Y}_{g2008} - \hat{Y}_{g1993} = \underbrace{(\bar{X}_{g2008} - \bar{X}_{g1993})\hat{\beta}_g^*}_{\text{"Explained"}} + \underbrace{\left\{ \bar{X}_{g2008}(\hat{\beta}_{g2008} - \hat{\beta}_g^*) + \bar{X}_{g1993}(\hat{\beta}_g^* - \hat{\beta}_{g1993}) \right\}}_{\text{"Unexplained"}} \quad (2.8)$$

$$\hat{Y}_{ut} - \hat{Y}_{rt} = \underbrace{(\bar{X}_{ut} - \bar{X}_{rt})\hat{\beta}_t^*}_{\text{"Explained"}} + \underbrace{\left\{ \bar{X}_{ut}(\hat{\beta}_{ut} - \hat{\beta}_t^*) + \bar{X}_{rt}(\hat{\beta}_t^* - \hat{\beta}_{rt}) \right\}}_{\text{"Unexplained"}} \quad (2.9)$$

where:  $\hat{Y}$  is the natural log of real per capita household expenditure;  $\bar{X}$  is a vector of the mean observed characteristics;  $\hat{\beta}$  is a vector of the estimated coefficient in the regression model of log RPCEXP on a set of explanatory variables, including the constant;  $\hat{\beta}^*$  is a vector of the estimated coefficients from the pooled sample with other explanatory variables and a year dummy for the expenditure growth (or urban dummy for the urban-rural expenditure gap);  $g$  in equation 8 is the group indicator for urban ( $u$ ) or rural ( $r$ ) area;  $t$  in equation 9 is the time indicator for one of three points in time.<sup>27</sup>

Equation 8 decomposes the expenditure growth while equation 9 decomposes the urban-rural expenditure gap. In both equations, the first term on the right-hand side is the part of the difference due to different observed productivity-related characteristics - the ‘explained part’. The second term on the right-hand side is the difference in factors other than the observed characteristics – the ‘unexplained part’, sometimes interpreted as discrimination.

In the presence of categorical variables, the results of a detailed decomposition will be sensitive to the choice of the reference group. Gardeazabal and Ugidos (2004), Yun (2005) proposed solutions to this problem by imposing additional restrictions to transform

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<sup>27</sup> The reason for including the urban dummy as a group indicator in estimating the reference structure is extensively discussed in Fortin (2008), Jann (2008), and proved in Elder et al. (2010). An example is that, if the average education of urban households is higher than that of rural ones, then the estimated coefficient of return to education of the pooled sample without urban dummy will capture a part of the mean difference in education between the two groups, resulting in the estimated return to education of the pooled sample being higher than the estimated return to education of urban or rural households alone. This phenomenon will understate the unexplained part and overstate the explained part.

the estimated coefficients. However, doing so will lose the simple meaningful interpretations and preclude comparisons across years (Fortin et al., 2010). To facilitate the interpretation and ensure compatibility, we perform all decompositions with the same reference groups. The standard errors and significant levels of the single components are described by Jann (2005).

### 2.7.2 Decomposition results

#### *Contributions to expenditure growth from 1993 to 2006*

From 1993 to 2006, real per capita household expenditure doubled. Table 2.8 presents the decomposition results of contributing factors to expenditure growth between 1993 and 2006 for urban and rural sectors separately.<sup>28</sup> The numbers suggest that average expenditure growth is higher in urban than in rural sectors. Specifically, average expenditure increased by 0.72 log points (106%) in urban and 0.68 points (97%) in rural.<sup>29</sup> Urban expenditure growth is lowest at the top of the distribution. In contrast, in the rural sector expenditure growth is highest at the top of the distribution and lowest at the bottom of the distribution. The rural poor not only has lower per capita expenditure but also lower expenditure growth.

[Table 2.8 about here]

In both urban and rural areas, the increase in per capita expenditure comes from improvements in characteristics *and* returns. For example, improvements in average characteristics increase 0.18 log points (20%) of total expenditure in urban. The contribution is rather stable along the distribution. The improvements in return to observed

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<sup>28</sup> There is no urban area in the Central High Land in 1993. So we exclude the Central High Land region from our sample of decomposition for the contributing factors to the urban expenditure increase between 1993 and 2006.

<sup>29</sup> An increase of 0.72 log points equals to  $100(e^{0.72} - 1) = 105.5$  with  $e \cong 2.718$

characteristics and other factors not controlled for in the model increase urban expenditure by 0.54 log points at mean (72%), 0.58 log points at the 10<sup>th</sup> and 50<sup>th</sup> quantile (79%) and 0.42 log points at the 90<sup>th</sup> quantile (52%). For rural households, improving characteristics increase 0.19 log points (21%) of expenditure at mean, 0.12 log points (13%) of expenditure at the 10<sup>th</sup> quantile, 0.20 log points (22%) of expenditure at the median and 0.25 log points (28%) of expenditure at the 90<sup>th</sup> quantile. The improvements in return to observed characteristics and other factors not controlled for in the model increase rural expenditure by 0.48 log points (62%) at mean, 0.44 log points (55%) at the 10<sup>th</sup> quantile, 0.49 log points (63%) at the median and 0.48 log points (62%) at the top 90<sup>th</sup> quantile.

Now consider the contribution of some explanatory variables. Education plays important role. From 1993 to 2006, the increase of 1.07 years of schooling for urban heads increases 0.06 log points (6%) of average urban expenditure, and the increase of 0.66 years of schooling for rural heads increases 0.03 log points (3%) of rural expenditure. The increase in return to education increases 0.11 log points (12%) of average urban expenditure and 0.02 log points (2%) of rural expenditure. The changes in the demographic structure of households (including decreases in household size and the proportion of children, and the increase in the proportion of labourers) together increase household per capita expenditure by 0.08 log points (8%) in urban and 0.09 log points (9%) in rural areas.

By industries, while in rural the changes in industrial structure and their related returns raise expenditure by 0.11 in log points (12%), in urban, the changes in returns across industries lower expenditure by 0.06 log points (6%). The increases in household per capita remittance raise expenditure by 0.04 log points (4%). This is true for both urban and rural areas. A large part of the contribution to the overall expenditure increase lies in the

intercept differences, which reflects the improvement in other factors not captured in the model (such as infrastructure and other market conditions).<sup>30</sup>

### ***Contributions to the urban-rural expenditure gap, 1993-2006***

Table 2.9 to 2.11 reports the urban-rural real households' per capita expenditure gap, together with factors contributing to the gap in 1993, 2002 and 2006.<sup>31</sup>

[Table 2.9, 2.10 and 2.11 about here]

In 1993, average expenditure of urban households is 0.61 log points (84%) higher than their rural counterparts at the mean. Along the distribution, the gap is 0.40 log points (49%) at the 10<sup>th</sup> quantile, 0.60 log points (82%) at the median and 0.80 log points (123%) at the 90<sup>th</sup> quantile. Consistent with our previous result of between groups inequality decomposition by urban-rural, from 1993 to 2002, the urban-rural gap increased considerably. The gap peaked in 2002 then decreased from 2002 to 2006. In 2006, urban households' per capita expenditure is 0.64 log points (90%) higher than their rural counterparts at the mean. Along the distribution, the gap is 0.57 log points (77%) at the 10<sup>th</sup> quantile, 0.65 log points (92%) at the median and 0.67 log points (95%) at the 90<sup>th</sup> quantile. Over the whole period, the urban-rural expenditure gap in 2006 is higher than it was in

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<sup>30</sup>According to Nguyen et al. (2008), during the period from 1995 to 2007, Vietnam spent around 10% of GDP on infrastructure investment. In 2007, this rose to 12% of GDP on infrastructure investment, which is equivalent to 45% to 50% of Vietnam's state budget. These figures are well above the average level of the world's developing countries. As a result, the infrastructure system has been significantly improved in both urban and rural areas of Vietnam over the past decades. For example, by the end of 2008, more than 93% of rural households had electricity compared to just over 50% ten years ago (World Bank, 2009a). Given the significant improvements in the infrastructure, we would like to capture the impact of infrastructure investment on the expenditure growth in urban and rural but unfortunately the data on infrastructure investment are only at the aggregated province level not segregated by urban-rural.

<sup>31</sup> In 1993, there was no urban area in the Central High Land, so to allow a comparable comparison between urban and rural areas we exclude the Central High Land region in our sample of decomposition.



1993 at the mean, the middle and the lower half of the distribution. But the urban-rural expenditure gap in 2006 is lower than it was in 1993 at the top of the distribution.

In all waves, the urban-rural expenditure gap comes from both the inter-groups difference in average characteristics and their related returns. At the mean, the inter-groups differences in characteristics contribute 0.33 to 0.34 log points (39% to 40%) to the overall urban-rural expenditure gap. While in 1993 and 2002, the contribution of the characteristics gap increases from the bottom to the top of the distribution. By 2008, the contribution of the characteristics gap is stable along the distribution.

Regarding the contributions of explanatory variables, education plays an important role. For instance, in 1993, an increase in education of rural heads to the level of the urban heads would decrease the overall urban-rural expenditure gap by 0.09 log points (9%) at the mean, 0.07 log points (7%) at the 10<sup>th</sup> quantile and the median and 0.14 log points (15%) at the 90<sup>th</sup> quantile. Moreover, in the same year, adjusting rural sector's return to education to the level of the urban sector would decrease the overall urban-rural expenditure gap by 0.06 log points (6%) at mean, 0.10 log points (11%) at the 10<sup>th</sup> quantile and the median, and 0.01 log points (1%) at the 90<sup>th</sup> quantile. In 2006, adjusting average education of the rural sector to the level of the urban sector would decrease the overall urban-rural expenditure gap by 0.12 log points (13%) at the mean, 0.13 log points (14%) at the 10<sup>th</sup> quantile, 0.11 log points (12%) at the median and 0.15 log points (16%) at the 90<sup>th</sup> quantile. Adjusting the rural sector's return to education to the level of the urban sector would decrease the urban-rural expenditure gap by 0.13 log points (14%) at the mean, 0.10 log points (11%) at the 10<sup>th</sup> quantile, 0.14 log points (15%) at the median and 0.11 log points (12%) at the 90<sup>th</sup> quantile. It can be seen that, as the country moves toward more marketisation and opening

up the economy, the urban-rural difference in education becomes increasingly important in explaining the urban-rural expenditure gap.

The second important explanatory factor is the inter-group difference in industrial structure. In 1993, the urban-rural differences in industrial structure and related industry's returns contribute 0.18 log points (20%) to the urban-rural gap at the mean. Along the distribution, while the contribution is negative at the 10<sup>th</sup> quantile, the contribution is positive at the median and the 90<sup>th</sup> quantile. In 2006, the contribution of the inter-group industrial structure differences between urban and rural sectors is 0.06 log points (6%) at the mean. Along the distribution, the contribution is 0.05 log points (5%) at the 10<sup>th</sup> quantile, 0.08 log points (8%) at the median and 0.02 log points (2%) at the 90<sup>th</sup> quantile. The urban-rural differences in return across industries are not significant in contributing to the urban-rural expenditure gap, except the 10<sup>th</sup> quantile. Between 1993 and 2006, as Vietnam became more industrialized, the part of the urban-rural expenditure gap explained by the inter-group industrial structure differences decline.

Other factors contributing positively to the overall urban-rural gap include the inter-group differences by ethnicity, household demographic structure, remittance and region. For example, urban households are smaller, and comprise a larger proportion of labourers and smaller proportion of children. Moreover, urban households also receive more per capita remittances than rural households. Over the period, the reduction in the proportion of ethnic households in urban areas and the slight increase in the proportion of ethnic households in rural areas, together with the lower per capita expenditure of the minority in rural areas, results in an increase in the contribution of urban and rural difference by ethnicity to the overall urban-rural gap. At the mean, the inter-group differences by ethnicity contribute 0.01 log points (1%) to the overall urban-rural gap in 1993. The rate

increases to 0.03 log points (3%) in 2006. Along the distribution, the increase is especially high at the 10<sup>th</sup> quantile in the expenditure distribution, rising from 0.01 log points (1%) in 1993 to 0.08 log points (8%) in 2006.

As noted earlier, a large part of the unexplained component lies in the intercept, which is the urban-rural difference in other factors not captured in the model.<sup>32</sup> These are likely to include infrastructure, geographic conditions and the like, and to favour the urban sector.

## **2.8 Conclusions and discussions**

In this paper, we analyze urban-rural living standard inequality in Vietnam between 1993 and 2006, a period of accelerated transition with restructuring, marketisation and international integration. Our study contributes to the economic literature in three important ways. First, a new method of unconditional quantile regressions (Firpo et al., 2009) is applied to examine the determinants of expenditure along the distribution. Second, the Oaxaca-Blinder type decomposition for the newly developed unconditional quantile regression method is employed to isolate the factors that contribute to the urban-rural expenditure gap. Third, our study covers a 13-year period, which is longer than previous study studies on urban-rural living standard inequality in Vietnam covering only five years between 1993 and 1998.

We find that urban-rural inequality is the most important factor in explaining national inequality. Between-group urban-rural inequalities increased significantly from

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<sup>32</sup> The sample stratifications for 2002 and 2006 allow us to use regional dummies at the provincial level, which was not possible for the first two VLSSs. Our estimates using these regional dummies at the provincial level show that urban-rural differences in the constants still account for a significant part of the unexplained component. These estimates are available from the authors on request.

1993 to 1998, peaked in 2002, fell slightly in 2004, and then fell quickly in 2006. This is different to China, a comparable country in many aspects. China has experienced continuously increasing urban-rural inequality since its reform in 1978 (ADB, 2007). Recent trends in Vietnam from 2002 to 2006 show signs of reducing urban-rural inequality. The results confirm the assessments of the World Bank (2007), as well as many other international observers, that Vietnam stood out as an example of a development model that has lifted millions of people from poverty while ensuring the benefits of its vibrant market economy were evenly distributed across society.

An important explanation for the recent evolution of Vietnamese urban-rural inequality relates to migration.<sup>33</sup> In the centrally planned period until the early 1990s (when our analysis began), the Vietnamese government tightly controlled migration flows; for example, in order to migrate, a migrant must have a house as well as a permanent job in an urban area. However, in the late 1990s, regulations governing geographic movement became less rigorous, and the registration procedure for people relocating was progressively relaxed. During the period of our study, Vietnam's law on residence was amended twice, first in 2001 and then in 2006.<sup>34</sup> Nowadays, rural migrants can access urban education and health insurance, and purchase a house if they can afford it. These relaxed regulations have created opportunities for labourers to move from low wage to high wage regions - more specifically, from rural to urban areas, and from low productivity to

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<sup>33</sup> In our observed sample, there are 151 households who were registered in a rural area in 2002 and moved to an urban area by 2004, and in 2004 there are 147 households registered in rural areas who moved to an urban area by 2006. Our estimation and decomposition results remain almost the same when we exclude these households from our observed sample. So the expansion of urban areas is not an important explanation for the reduction of the urban-rural gap.

<sup>34</sup> According to Vietnam's Law on Residence, issued in the Constitution (1992) and amended two times in 2001 and 2006, Vietnamese people have the right to freedom of residence in the territory of Vietnam.

high productivity provinces. On the one hand, this helps reduce national inequality and promotes national growth through the productivity increase of those who migrate. On the other hand, too great a concentration of economic activity and population in urban centres may have an adverse impact on regional growth, causing urban congestion and environmental degradation, thereby directly affecting the quality of urban life.<sup>35</sup>

Education is an important determinant of household expenditure. In 2006, the return to education is high for the poor, suggesting that education is an effective channel for inequality reduction. By industries, over the studied period as Vietnam became more industrialized and liberalized, households whose head working in agriculture have significantly lower living standards than comparable households with heads working in services or manufacturing. Particularly in the lower part of the rural expenditure distribution, households whose head working in agriculture have seen little improvement in their returns.

Our decomposition results suggest a number of factors contributing significantly to the high urban-rural expenditure gap. These include the inter-group differences in education, household demographic structure, and industrial structure along with their related returns. The higher endowments of urban over rural households contribute around 40% to the gap. A significant part of the unexplained component lies in the intercept differences, which captures unobserved factors such as geographical, infrastructural characteristics and so on, that favour urban households. Between 1993 and 2006, expenditure growth is partly explained by the changes in average characteristics but mainly

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<sup>35</sup> See Tran (2010) for a comprehensive discussion.

due to increasing returns and the improvements in other factors not controlled for in the model.

Table 2.1 Real per capita expenditure at mean and selected percentiles by urban-rural status

| Urban-rural status | Expenditure at mean and selected percentiles (in VND 1,000/yr) |      |       |       |       | Expenditure at mean and selected percentiles (in VND 1,000/yr) |      |       |       |       |
|--------------------|----------------------------------------------------------------|------|-------|-------|-------|----------------------------------------------------------------|------|-------|-------|-------|
|                    | Mean                                                           | 10th | 25th  | 50th  | 75th  | Mean                                                           | 10th | 25th  | 50th  | 75th  |
| Urban              | 1,200                                                          | 800  | 1,000 | 1,100 | 1,300 | 1,200                                                          | 800  | 1,000 | 1,100 | 1,300 |
| Rural              | 1,000                                                          | 600  | 800   | 900   | 1,100 | 1,000                                                          | 600  | 800   | 900   | 1,100 |
| Total              | 1,100                                                          | 700  | 900   | 1,000 | 1,200 | 1,100                                                          | 700  | 900   | 1,000 | 1,200 |



**Table 2.1 Real per capita expenditure at mean and selected percentiles by urban-rural, 1993-2006**

|                    | % Urban <sup>36</sup> | Expenditure at mean and selected percentiles<br>(Unit: 1.000VND) |       |       |       |       |       |        |       | Urban rural expenditure ratios |       |       |       |
|--------------------|-----------------------|------------------------------------------------------------------|-------|-------|-------|-------|-------|--------|-------|--------------------------------|-------|-------|-------|
|                    |                       | Mean                                                             |       | Q10th |       | Q50th |       | Q90th  |       | Mean                           | Q10th | Q50th | Q90th |
|                    |                       | Urban                                                            | Rural | Urban | Rural | Urban | Rural | Urban  | Rural |                                |       |       |       |
|                    |                       | (3)                                                              | (4)   | (5)   | (6)   | (7)   | (8)   | (9)    | (10)  | (11)                           | (12)  | (13)  | (14)  |
| 1993               | 19.91                 | 4,307                                                            | 2,258 | 1,635 | 1,126 | 3,470 | 1,953 | 8,129  | 3,737 | 1.91                           | 1.45  | 1.77  | 2.18  |
| 1998               | 22.43                 | 6,754                                                            | 3,030 | 2,622 | 1,503 | 5,486 | 2,641 | 12,503 | 4,935 | 2.23                           | 1.74  | 2.08  | 2.53  |
| 2002               | 23.23                 | 7,957                                                            | 3,377 | 2,792 | 1,629 | 6,336 | 2,890 | 15,007 | 5,662 | 2.36                           | 1.71  | 2.19  | 2.65  |
| 2004               | 25.80                 | 9,018                                                            | 4,025 | 3,354 | 1,807 | 7,719 | 3,450 | 16,277 | 6,778 | 2.24                           | 1.86  | 2.24  | 2.40  |
| 2006               | 26.72                 | 9,252                                                            | 4,603 | 3,557 | 1,994 | 7,781 | 3,936 | 16,220 | 7,874 | 2.01                           | 1.78  | 1.98  | 2.06  |
| Ratio<br>2006/1993 |                       | 2.029                                                            | 1.993 | 1.978 | 1.743 | 2.136 | 1.979 | 1.898  | 2.056 |                                |       |       |       |

\*Note: All money values of expenditure are adjusted by spatial and temporal price indexes, converted to the value of Jan 2006. Samples are weighted.

Source: VLSS 1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, own calculation.

<sup>36</sup> Percentage of urban households with the household weight adjustments

**Table 2.2 Inequality indexes of by urban-rural, 1993 – 2006**

|             | Gini       |              |              | Theil      |              |              |
|-------------|------------|--------------|--------------|------------|--------------|--------------|
|             | <i>All</i> | <i>Urban</i> | <i>Rural</i> | <i>All</i> | <i>Urban</i> | <i>Rural</i> |
| <b>1993</b> | 0.34       | 0.34         | 0.28         | 0.20       | 0.19         | 0.14         |
| <b>1998</b> | 0.35       | 0.34         | 0.27         | 0.23       | 0.20         | 0.13         |
| <b>2002</b> | 0.37       | 0.35         | 0.28         | 0.25       | 0.21         | 0.14         |
| <b>2004</b> | 0.37       | 0.33         | 0.29         | 0.24       | 0.18         | 0.15         |
| <b>2006</b> | 0.36       | 0.33         | 0.30         | 0.23       | 0.19         | 0.16         |

\*Note: (1) Samples are weighted.

(2) Inequality indexes are calculated with 500 bootstrap replications. All values are significant at 5% level.

Source: VLSS 1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, own calculation.

**Table 2.3 Gini index of selected countries**

| <b>Country</b>   | <b>GDP per capita (US\$ 2005)</b><br><i>international comparison</i> | <b>Year of Gini</b> | <b>Gini (Consumption)</b> |
|------------------|----------------------------------------------------------------------|---------------------|---------------------------|
| <b>Laos</b>      | 2,039                                                                | 2002                | 0.35                      |
| <b>Cambodia</b>  | 2,727                                                                | 2004                | 0.42                      |
| <b>Vietnam</b>   | 3,071                                                                | 2004                | 0.37                      |
| <b>India</b>     | 3,452                                                                | 2004                | 0.37                      |
| <b>Indonesia</b> | 3,843                                                                | 2002                | 0.34                      |
| <b>China</b>     | 6,757                                                                | 2004                | 0.47                      |
| <b>Thailand</b>  | 8,677                                                                | 2002                | 0.42                      |
| <b>Russia</b>    | 10,845                                                               | 2002                | 0.40                      |
| <b>Malaysia</b>  | 10,882                                                               | 1997                | 0.49                      |
| <b>Poland</b>    | 13,847                                                               | 2002                | 0.35                      |

Source: UNDP 2008, Human Development Report 2007/2008

**Table 2.4 Summary statistics of variables, 1993-2006**

| VARIABLES                     | Urban       |             |             | Rural       |              |             |
|-------------------------------|-------------|-------------|-------------|-------------|--------------|-------------|
|                               | 1993        | 2002        | 2006        | 1993        | 2002         | 2006        |
| Ln(RPCEXP)                    | 15.15       | 15.64       | 15.86       | 14.54       | 14.92        | 15.22       |
| <b>Household head:</b>        |             |             |             |             |              |             |
| Male                          | 0.56        | 0.64        | 0.63        | 0.77        | 0.80         | 0.80        |
| Minority                      | 0.10        | 0.06        | 0.06        | 0.15        | 0.17         | 0.19        |
| Married                       | 0.78        | 0.79        | 0.78        | 0.82        | 0.83         | 0.83        |
| Experience                    | 33.64       | 34.22       | 35.88       | 32.94       | 34.86        | 36.33       |
| Experience square             | 14.02       | 14.21       | 14.97       | 13.71       | 14.72        | 15.51       |
| School year                   | 8.48        | 9.37        | 9.55        | 6.40        | 6.77         | 7.06        |
| Old                           | 0.25        | 0.24        | 0.26        | 0.21        | 0.22         | 0.22        |
| Not working                   | 0.03        | 0.05        | 0.02        | 0.00        | 0.01         | 0.01        |
| Private                       | 0.09        | 0.13        | 0.16        | 0.07        | 0.14         | 0.15        |
| Public servant                | 0.10        | 0.13        | 0.13        | 0.02        | 0.04         | 0.04        |
| SOE                           | 0.08        | 0.09        | 0.06        | 0.01        | 0.01         | 0.02        |
| Self-employed                 | 0.44        | 0.37        | 0.37        | 0.69        | 0.59         | 0.57        |
| Agriculture                   | 0.21        | 0.15        | 0.15        | 0.67        | 0.53         | 0.50        |
| Manufacturing                 | 0.18        | 0.18        | 0.18        | 0.05        | 0.11         | 0.13        |
| Service                       | 0.34        | 0.39        | 0.39        | 0.07        | 0.13         | 0.14        |
| <b>Household demography:</b>  |             |             |             |             |              |             |
| Household size                | 4.94        | 4.26        | 4.10        | 4.97        | 4.55         | 4.30        |
| Proportion of children        | 0.28        | 0.23        | 0.18        | 0.36        | 0.28         | 0.23        |
| Proportion of labourers       | 0.60        | 0.64        | 0.67        | 0.52        | 0.58         | 0.62        |
| Proportion of elderly         | 0.12        | 0.13        | 0.15        | 0.13        | 0.13         | 0.15        |
| <b>Remittances:</b>           |             |             |             |             |              |             |
| Domestic remittance           | 0.19        | 0.67        | 0.82        | 0.06        | 0.38         | 0.61        |
| Foreign remittance            | 0.58        | 0.43        | 0.48        | 0.06        | 0.14         | 0.24        |
| <b>Regions:</b>               |             |             |             |             |              |             |
| Northern Upland               | 0.13        | 0.17        | 0.15        | 0.18        | 0.19         | 0.20        |
| Red River Delta               | 0.20        | 0.17        | 0.18        | 0.25        | 0.23         | 0.22        |
| North Central Coast           | 0.07        | 0.09        | 0.07        | 0.15        | 0.12         | 0.12        |
| South Central Coast           | 0.13        | 0.11        | 0.12        | 0.08        | 0.09         | 0.09        |
| Central Highlands             | -           | 0.07        | 0.07        | 0.03        | 0.05         | 0.06        |
| South East                    | 0.27        | 0.22        | 0.24        | 0.11        | 0.10         | 0.09        |
| Mekong River Delta            | 0.20        | 0.17        | 0.17        | 0.21        | 0.23         | 0.21        |
| <b>Number of observations</b> | <b>1072</b> | <b>6909</b> | <b>2307</b> | <b>3727</b> | <b>22621</b> | <b>6882</b> |

\*Note: (1) These are raw figures without sample weight adjustments

(2) Money values are adjusted by spatial and temporal price indexes, converted to the value of Jan 2006..

Source: VLSS 1993, VHLSS 2002 and VHLSS 2006, own calculation.

**Table 2.5 Determinants of expenditure at mean and selected quantiles by urban-rural in 1993**

| VARIABLES              | Urban                   |                         |                         |                    | Rural                   |                         |                         |                    |
|------------------------|-------------------------|-------------------------|-------------------------|--------------------|-------------------------|-------------------------|-------------------------|--------------------|
|                        | <i>Q10<sup>th</sup></i> | <i>Q50<sup>th</sup></i> | <i>Q90<sup>th</sup></i> | <i>OLS</i>         | <i>Q10<sup>th</sup></i> | <i>Q50<sup>th</sup></i> | <i>Q90<sup>th</sup></i> | <i>OLS</i>         |
| <b>Household head:</b> |                         |                         |                         |                    |                         |                         |                         |                    |
| Male                   | -0.03<br>(0.06)         | -0.01<br>(0.05)         | 0.02<br>(0.09)          | -0.03<br>(0.04)    | -0.03<br>(0.04)         | 0.02<br>(0.03)          | -0.05<br>(0.05)         | -0.01<br>(0.02)    |
| Minority               | 0.31***<br>(0.09)       | 0.12<br>(0.08)          | 0.21<br>(0.15)          | 0.17***<br>(0.06)  | -0.33***<br>(0.05)      | -0.21***<br>(0.03)      | -0.12***<br>(0.04)      | -0.24***<br>(0.02) |
| Married                | 0.09<br>(0.09)          | 0.06<br>(0.06)          | -0.03<br>(0.11)         | 0.04<br>(0.05)     | 0.02<br>(0.04)          | 0.02<br>(0.03)          | -0.06<br>(0.06)         | -0.01<br>(0.03)    |
| Experience             | 0.01<br>(0.01)          | -0.01<br>(0.01)         | -0.01<br>(0.01)         | -0.00<br>(0.00)    | -0.00<br>(0.00)         | 0.02***<br>(0.00)       | 0.01*<br>(0.00)         | 0.01***<br>(0.00)  |
| Experience square/100  | 0.00<br>(0.01)          | 0.01<br>(0.01)          | 0.02<br>(0.01)          | 0.01<br>(0.01)     | 0.01<br>(0.01)          | -0.02***<br>(0.00)      | -0.00<br>(0.01)         | -0.01**<br>(0.00)  |
| School year            | 0.05***<br>(0.01)       | 0.05***<br>(0.01)       | 0.05***<br>(0.01)       | 0.05***<br>(0.00)  | 0.04***<br>(0.00)       | 0.03***<br>(0.00)       | 0.04***<br>(0.01)       | 0.04***<br>(0.00)  |
| Old                    | 0.09<br>(0.18)          | 0.41***<br>(0.13)       | 0.35*<br>(0.20)         | 0.30***<br>(0.09)  | 0.06<br>(0.08)          | 0.02<br>(0.07)          | -0.14<br>(0.13)         | -0.01<br>(0.06)    |
| Not working            | 0.00<br>(0.24)          | 0.50***<br>(0.13)       | 0.89**<br>(0.35)        | 0.45***<br>(0.13)  | 0.30***<br>(0.09)       | -0.12<br>(0.18)         | -0.31<br>(0.29)         | -0.07<br>(0.11)    |
| Public servant         | 0.16<br>(0.15)          | 0.34***<br>(0.10)       | 0.20<br>(0.16)          | 0.28***<br>(0.07)  | 0.07<br>(0.08)          | 0.23***<br>(0.07)       | 0.15<br>(0.17)          | 0.17***<br>(0.06)  |
| SOE                    | 0.19<br>(0.15)          | 0.27***<br>(0.10)       | 0.22<br>(0.16)          | 0.28***<br>(0.08)  | 0.12**<br>(0.06)        | 0.40***<br>(0.07)       | 0.53**<br>(0.23)        | 0.35***<br>(0.07)  |
| Self-employed          | 0.29**<br>(0.13)        | 0.35***<br>(0.08)       | 0.28***<br>(0.11)       | 0.30***<br>(0.06)  | 0.14***<br>(0.05)       | 0.16***<br>(0.04)       | 0.26***<br>(0.06)       | 0.18***<br>(0.03)  |
| Agriculture            | -0.39***<br>(0.10)      | -0.19***<br>(0.06)      | -0.06<br>(0.09)         | -0.16***<br>(0.05) | -0.12***<br>(0.03)      | -0.23***<br>(0.04)      | -0.53***<br>(0.09)      | -0.28***<br>(0.03) |
| Manufacturing          | -0.08<br>(0.09)         | 0.03<br>(0.07)          | 0.02<br>(0.11)          | 0.03<br>(0.05)     | 0.06<br>(0.05)          | -0.08<br>(0.05)         | -0.30**<br>(0.12)       | -0.09**<br>(0.05)  |

Table 2.5 Determinants of expenditure at mean and selected quantiles by urban-rural in 1993 (cont.)

| VARIABLES                    | Urban              |                    |                    |                    | Rural              |                    |                    |                    |
|------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                              | Q10 <sup>th</sup>  | Q50 <sup>th</sup>  | Q90 <sup>th</sup>  | OLS                | Q10 <sup>th</sup>  | Q50 <sup>th</sup>  | Q90 <sup>th</sup>  | OLS                |
| <b>Household demography:</b> |                    |                    |                    |                    |                    |                    |                    |                    |
| Household size               | -0.04**<br>(0.02)  | -0.06***<br>(0.01) | -0.07***<br>(0.02) | -0.06***<br>(0.01) | -0.02*<br>(0.01)   | -0.03***<br>(0.01) | -0.05***<br>(0.01) | -0.03***<br>(0.00) |
| Proportion of children       | -0.83***<br>(0.18) | -0.52***<br>(0.12) | -0.72***<br>(0.23) | -0.63***<br>(0.10) | -0.45***<br>(0.07) | -0.52***<br>(0.05) | -0.29***<br>(0.10) | -0.46***<br>(0.05) |
| Proportion of old people     | -0.23<br>(0.19)    | -0.37**<br>(0.15)  | -0.36<br>(0.28)    | -0.34***<br>(0.11) | -0.07<br>(0.07)    | -0.09<br>(0.06)    | -0.28***<br>(0.11) | -0.14***<br>(0.05) |
| <b>Remittances:</b>          |                    |                    |                    |                    |                    |                    |                    |                    |
| Domestic remittance          | 0.03*<br>(0.02)    | 0.04**<br>(0.02)   | 0.04<br>(0.06)     | 0.05***<br>(0.02)  | 0.03*<br>(0.02)    | 0.10***<br>(0.02)  | 0.19**<br>(0.09)   | 0.10***<br>(0.02)  |
| Foreign remittance           | 0.00<br>(0.00)     | 0.02***<br>(0.00)  | 0.08**<br>(0.04)   | 0.03***<br>(0.01)  | 0.00<br>(0.00)     | 0.01*<br>(0.00)    | 0.05***<br>(0.02)  | 0.02***<br>(0.01)  |
| <b>Regions:</b>              |                    |                    |                    |                    |                    |                    |                    |                    |
| Red River Delta              | 0.36***<br>(0.11)  | 0.53***<br>(0.07)  | 0.45***<br>(0.10)  | 0.49***<br>(0.05)  | -0.02<br>(0.04)    | -0.10***<br>(0.03) | -0.11***<br>(0.04) | -0.09***<br>(0.02) |
| North Central Coast          | -0.21<br>(0.19)    | -0.03<br>(0.09)    | -0.03<br>(0.04)    | -0.06<br>(0.07)    | -0.07<br>(0.05)    | -0.13***<br>(0.03) | -0.14***<br>(0.04) | -0.12***<br>(0.02) |
| South Central Coast          | 0.12<br>(0.14)     | 0.52***<br>(0.09)  | 0.28***<br>(0.09)  | 0.43***<br>(0.06)  | -0.05<br>(0.06)    | 0.14***<br>(0.04)  | 0.26***<br>(0.07)  | 0.09**<br>(0.03)   |
| South East                   | 0.34***<br>(0.12)  | 0.73***<br>(0.07)  | 0.69***<br>(0.12)  | 0.66***<br>(0.05)  | 0.18***<br>(0.05)  | 0.25***<br>(0.03)  | 0.51***<br>(0.07)  | 0.30***<br>(0.03)  |
| Mekong River Delta           | 0.22*<br>(0.13)    | 0.58***<br>(0.07)  | 0.49***<br>(0.10)  | 0.51***<br>(0.05)  | 0.21***<br>(0.04)  | 0.29***<br>(0.03)  | 0.45***<br>(0.05)  | 0.32***<br>(0.02)  |
| Constant                     | 13.82***<br>(0.26) | 14.47***<br>(0.17) | 15.63***<br>(0.30) | 14.54***<br>(0.13) | 13.86***<br>(0.10) | 14.35***<br>(0.08) | 15.30***<br>(0.15) | 14.45***<br>(0.06) |
| R-squared                    | 0.15               | 0.28               | 0.18               | 0.41               | 0.10               | 0.20               | 0.14               | 0.31               |
| No of observations           | 960                |                    |                    |                    | 3839               |                    |                    |                    |

\*Notes: (1) Household head working in the private sector is the base group for sector; household head working in the service sector is the base group for industries.

Northern Uplands is the base group for regions; no urban area in Central Highland in 1993; proportion of labourers in the household is drop to avoid multicollinearity.

(2) Robust standard errors are in parentheses. P values: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Results are rounded to two digits after decimal.

Source: VLSS 1993, own estimation.



Table 2.6 Determinants of expenditure at mean and selected quantiles by urban-rural in 2002

| VARIABLES              | Urban              |                    |                    |                    | Rural              |                    |                    |                    |
|------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                        | Q10th              | Q50th              | Q90th              | OLS                | Q10th              | Q50th              | Q90th              | OLS                |
| <b>Household head:</b> |                    |                    |                    |                    |                    |                    |                    |                    |
| Male                   | -0.01<br>(0.02)    | -0.06***<br>(0.02) | -0.02<br>(0.03)    | -0.05***<br>(0.01) | -0.03**<br>(0.01)  | -0.01<br>(0.01)    | -0.04*<br>(0.02)   | -0.02**<br>(0.01)  |
| Minority               | -0.21***<br>(0.05) | 0.06<br>(0.03)     | 0.09**<br>(0.04)   | -0.02<br>(0.02)    | -0.49***<br>(0.02) | -0.20***<br>(0.01) | 0.01<br>(0.02)     | -0.22***<br>(0.01) |
| Married                | 0.05<br>(0.03)     | 0.05*<br>(0.03)    | -0.12***<br>(0.04) | 0.00<br>(0.02)     | 0.05***<br>(0.02)  | 0.07***<br>(0.01)  | -0.00<br>(0.03)    | 0.05***<br>(0.01)  |
| Experience             | 0.01<br>(0.00)     | -0.00<br>(0.00)    | -0.01*<br>(0.00)   | -0.00<br>(0.00)    | 0.01***<br>(0.00)  | 0.01***<br>(0.00)  | 0.00<br>(0.00)     | 0.01***<br>(0.00)  |
| Experience square      | -0.01<br>(0.00)    | 0.00<br>(0.00)     | 0.01**<br>(0.01)   | 0.00*<br>(0.00)    | -0.01***<br>(0.00) | -0.01***<br>(0.00) | 0.00<br>(0.00)     | -0.00***<br>(0.00) |
| School year            | 0.05***<br>(0.00)  | 0.07***<br>(0.00)  | 0.07***<br>(0.00)  | 0.06***<br>(0.00)  | 0.04***<br>(0.00)  | 0.04***<br>(0.00)  | 0.05***<br>(0.00)  | 0.04***<br>(0.00)  |
| Old                    | 0.34***<br>(0.07)  | 0.25***<br>(0.05)  | 0.15*<br>(0.08)    | 0.22***<br>(0.04)  | 0.05<br>(0.03)     | 0.05*<br>(0.03)    | -0.01<br>(0.05)    | 0.03<br>(0.02)     |
| Not working            | 0.11**<br>(0.06)   | 0.16***<br>(0.05)  | -0.11<br>(0.08)    | 0.07**<br>(0.03)   | -0.12**<br>(0.05)  | -0.04<br>(0.04)    | 0.02<br>(0.09)     | -0.03<br>(0.04)    |
| Public servant         | 0.17***<br>(0.04)  | 0.22***<br>(0.04)  | 0.06<br>(0.06)     | 0.16***<br>(0.02)  | 0.02<br>(0.02)     | 0.17***<br>(0.02)  | 0.33***<br>(0.05)  | 0.17***<br>(0.02)  |
| SOE                    | 0.23***<br>(0.04)  | 0.36***<br>(0.04)  | 0.23***<br>(0.07)  | 0.27***<br>(0.02)  | 0.01<br>(0.02)     | 0.27***<br>(0.03)  | 0.50***<br>(0.08)  | 0.28***<br>(0.02)  |
| Self-employed          | 0.20***<br>(0.04)  | 0.17***<br>(0.03)  | -0.02<br>(0.04)    | 0.13***<br>(0.02)  | 0.05***<br>(0.02)  | 0.16***<br>(0.01)  | 0.20***<br>(0.02)  | 0.14***<br>(0.01)  |
| Agriculture            | -0.35***<br>(0.04) | -0.24***<br>(0.03) | -0.10***<br>(0.03) | -0.24***<br>(0.02) | -0.11***<br>(0.01) | -0.24***<br>(0.01) | -0.34***<br>(0.03) | -0.23***<br>(0.01) |
| Manufacturing          | -0.03<br>(0.03)    | -0.06**<br>(0.03)  | -0.09**<br>(0.04)  | -0.06***<br>(0.02) | 0.04***<br>(0.01)  | -0.01<br>(0.02)    | -0.14***<br>(0.03) | -0.03***<br>(0.01) |

Table 2.6 Determinants of expenditure at mean and selected quantiles by urban-rural in 2002 (cont.)

| VARIABLES                    | Urban              |                    |                    |                    | Rural              |                    |                    |                    |
|------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                              | Q10th              | Q50th              | Q90th              | OLS                | Q10th              | Q50th              | Q90th              | OLS                |
| <b>Household demography:</b> |                    |                    |                    |                    |                    |                    |                    |                    |
| Household size               | -0.07***<br>(0.01) | -0.05***<br>(0.01) | -0.04***<br>(0.01) | -0.05***<br>(0.00) | -0.05***<br>(0.00) | -0.04***<br>(0.00) | -0.04***<br>(0.00) | -0.04***<br>(0.00) |
| Proportion of children       | -0.49***<br>(0.06) | -0.65***<br>(0.05) | -0.57***<br>(0.08) | -0.58***<br>(0.03) | -0.41***<br>(0.03) | -0.62***<br>(0.02) | -0.73***<br>(0.04) | -0.60***<br>(0.02) |
| Proportion of old people     | -0.53***<br>(0.08) | -0.39***<br>(0.06) | -0.38***<br>(0.10) | -0.39***<br>(0.05) | -0.26***<br>(0.03) | -0.30***<br>(0.03) | -0.39***<br>(0.05) | -0.31***<br>(0.02) |
| <b>Remittances:</b>          |                    |                    |                    |                    |                    |                    |                    |                    |
| Domestic remittance          | 0.02***<br>(0.00)  | 0.04***<br>(0.01)  | 0.07***<br>(0.02)  | 0.04***<br>(0.01)  | 0.02***<br>(0.00)  | 0.06***<br>(0.01)  | 0.20***<br>(0.02)  | 0.09***<br>(0.01)  |
| Foreign remittance           | 0.01***<br>(0.00)  | 0.03***<br>(0.01)  | 0.06***<br>(0.01)  | 0.03***<br>(0.01)  | 0.00**<br>(0.00)   | 0.01**<br>(0.00)   | 0.03*<br>(0.02)    | 0.02**<br>(0.01)   |
| <b>Regions:</b>              |                    |                    |                    |                    |                    |                    |                    |                    |
| Red River Delta              | -0.10***<br>(0.03) | 0.19***<br>(0.03)  | 0.45***<br>(0.04)  | 0.18***<br>(0.02)  | -0.04**<br>(0.02)  | -0.02*<br>(0.01)   | -0.03<br>(0.02)    | -0.03***<br>(0.01) |
| North Central Coast          | -0.25***<br>(0.05) | -0.02<br>(0.04)    | 0.10***<br>(0.03)  | -0.03<br>(0.02)    | -0.13***<br>(0.02) | -0.10***<br>(0.01) | -0.03<br>(0.02)    | -0.09***<br>(0.01) |
| South Central Coast          | -0.03<br>(0.04)    | 0.23***<br>(0.03)  | 0.29***<br>(0.04)  | 0.19***<br>(0.02)  | -0.02<br>(0.02)    | 0.08***<br>(0.02)  | 0.10***<br>(0.02)  | 0.05***<br>(0.01)  |
| Central Highlands            | -0.16***<br>(0.05) | 0.10***<br>(0.04)  | 0.25***<br>(0.04)  | 0.09***<br>(0.02)  | -0.18***<br>(0.03) | 0.04***<br>(0.02)  | 0.15***<br>(0.02)  | 0.01<br>(0.01)     |
| South East                   | 0.12***<br>(0.03)  | 0.53***<br>(0.03)  | 0.76***<br>(0.05)  | 0.48***<br>(0.02)  | 0.12***<br>(0.02)  | 0.29***<br>(0.01)  | 0.39***<br>(0.03)  | 0.26***<br>(0.01)  |
| Mekong River Delta           | -0.01<br>(0.04)    | 0.22***<br>(0.03)  | 0.31***<br>(0.04)  | 0.19***<br>(0.02)  | 0.15***<br>(0.02)  | 0.23***<br>(0.01)  | 0.34***<br>(0.02)  | 0.24***<br>(0.01)  |
| Constant                     | 14.62***<br>(0.08) | 14.99***<br>(0.07) | 15.96***<br>(0.13) | 15.14***<br>(0.05) | 14.23***<br>(0.05) | 14.82***<br>(0.03) | 15.57***<br>(0.06) | 14.87***<br>(0.03) |
| <b>R-squared</b>             | 0.14               | 0.28               | 0.18               | 0.44               | 0.18               | 0.26               | 0.18               | 0.43               |
| <b>Observations</b>          | 6909               |                    |                    |                    | 22621              |                    |                    |                    |

\*Notes: (1) Household head working in the private sector is the base group for sector; household head working in the service sector is the base group for industries.

Northern Uplands is the base group for regions; proportion of labourers in the household is drop to avoid multicollinearity.

(2) Robust standard errors are in parentheses. P values: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Results are rounded to two digits after decimal.

Source: VHLSS 2002, own estimation.

Table 2.7 Determinants of expenditure at mean and selected quantiles by urban-rural in 2006

| VARIABLES              | Urban              |                    |                    |                    | Rural              |                    |                    |                    |
|------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                        | Q10th              | Q50th              | Q90th              | OLS                | Q10th              | Q50th              | Q90th              | OLS                |
| <b>Household head:</b> |                    |                    |                    |                    |                    |                    |                    |                    |
| Male                   | -0.03<br>(0.04)    | 0.03<br>(0.03)     | 0.08<br>(0.05)     | 0.01<br>(0.02)     | 0.02<br>(0.03)     | 0.02<br>(0.02)     | -0.01<br>(0.05)    | 0.01<br>(0.02)     |
| Minority               | -0.34***<br>(0.12) | -0.01<br>(0.05)    | 0.08<br>(0.07)     | -0.07<br>(0.04)    | -0.55***<br>(0.04) | -0.27***<br>(0.02) | -0.08***<br>(0.03) | -0.29***<br>(0.02) |
| Married                | 0.15**<br>(0.07)   | 0.06<br>(0.04)     | -0.14**<br>(0.07)  | 0.01<br>(0.03)     | 0.07*<br>(0.04)    | 0.08***<br>(0.03)  | 0.04<br>(0.05)     | 0.06***<br>(0.02)  |
| Experience             | -0.00<br>(0.01)    | 0.00<br>(0.00)     | -0.00<br>(0.01)    | -0.00<br>(0.00)    | 0.00<br>(0.00)     | 0.01***<br>(0.00)  | 0.00<br>(0.00)     | 0.00***<br>(0.00)  |
| Experience square      | -0.01<br>(0.01)    | -0.01<br>(0.00)    | -0.00<br>(0.01)    | -0.00<br>(0.00)    | -0.00<br>(0.00)    | -0.01***<br>(0.00) | -0.01<br>(0.00)    | -0.01***<br>(0.00) |
| School year            | 0.08***<br>(0.01)  | 0.06***<br>(0.00)  | 0.06***<br>(0.01)  | 0.07***<br>(0.00)  | 0.06***<br>(0.00)  | 0.04***<br>(0.00)  | 0.04***<br>(0.00)  | 0.04***<br>(0.00)  |
| Old                    | 0.39***<br>(0.13)  | 0.11<br>(0.07)     | -0.07<br>(0.12)    | 0.13**<br>(0.06)   | 0.02<br>(0.06)     | 0.08<br>(0.05)     | 0.18**<br>(0.07)   | 0.05<br>(0.03)     |
| Not working            | 0.15<br>(0.15)     | 0.15<br>(0.10)     | 0.03<br>(0.19)     | 0.05<br>(0.09)     | -0.08<br>(0.11)    | 0.00<br>(0.09)     | 0.17<br>(0.20)     | -0.06<br>(0.09)    |
| Public servant         | 0.11<br>(0.08)     | 0.22***<br>(0.05)  | -0.06<br>(0.10)    | 0.14***<br>(0.04)  | 0.02<br>(0.05)     | 0.32***<br>(0.04)  | 0.62***<br>(0.10)  | 0.32***<br>(0.03)  |
| SOE                    | 0.25***<br>(0.09)  | 0.31***<br>(0.06)  | 0.17<br>(0.12)     | 0.26***<br>(0.04)  | 0.10*<br>(0.05)    | 0.24***<br>(0.05)  | 0.44***<br>(0.11)  | 0.24***<br>(0.04)  |
| Self employed          | 0.28***<br>(0.08)  | 0.06<br>(0.04)     | -0.18***<br>(0.06) | 0.08**<br>(0.03)   | 0.11***<br>(0.03)  | 0.24***<br>(0.03)  | 0.20***<br>(0.03)  | 0.18***<br>(0.02)  |
| Agriculture            | -0.44***<br>(0.08) | -0.18***<br>(0.04) | -0.07<br>(0.05)    | -0.23***<br>(0.03) | -0.12***<br>(0.02) | -0.24***<br>(0.02) | -0.11***<br>(0.04) | -0.19***<br>(0.02) |
| Manufacturing          | -0.11*<br>(0.06)   | -0.14***<br>(0.04) | -0.15**<br>(0.06)  | -0.10***<br>(0.03) | 0.07**<br>(0.03)   | 0.00<br>(0.03)     | 0.06<br>(0.06)     | 0.01<br>(0.02)     |

**Table 2.7 Determinants of expenditure at mean and selected quantiles by urban-rural in 2006 (cont.)**

| VARIABLES                     | Urban              |                    |                    |                    | Rural              |                    |                    |                    |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                               | Q10th              | Q50th              | Q90th              | OLS                | Q10th              | Q50th              | Q90th              | OLS                |
| <b>Household demographic:</b> |                    |                    |                    |                    |                    |                    |                    |                    |
| Household size                | -0.09***<br>(0.02) | -0.07***<br>(0.01) | -0.07***<br>(0.02) | -0.07***<br>(0.01) | -0.10***<br>(0.01) | -0.06***<br>(0.01) | -0.05***<br>(0.01) | -0.07***<br>(0.00) |
| Proportion of children        | -0.45***<br>(0.14) | -0.30***<br>(0.08) | -0.25*<br>(0.14)   | -0.34***<br>(0.07) | -0.31***<br>(0.06) | -0.47***<br>(0.05) | -0.41***<br>(0.07) | -0.45***<br>(0.03) |
| Proportion of old age people  | -0.38**<br>(0.16)  | -0.14<br>(0.08)    | -0.05<br>(0.15)    | -0.12*<br>(0.07)   | -0.11*<br>(0.07)   | -0.18***<br>(0.05) | -0.18**<br>(0.08)  | -0.16***<br>(0.04) |
| <b>Remittances:</b>           |                    |                    |                    |                    |                    |                    |                    |                    |
| Domestic remittance           | 0.04***<br>(0.01)  | 0.05***<br>(0.01)  | 0.12***<br>(0.01)  | 0.08***<br>(0.01)  | 0.02***<br>(0.00)  | 0.05***<br>(0.01)  | 0.13***<br>(0.02)  | 0.07***<br>(0.01)  |
| Foreign remittance            | 0.01***<br>(0.00)  | 0.01***<br>(0.00)  | 0.03**<br>(0.01)   | 0.02***<br>(0.01)  | 0.00**<br>(0.00)   | 0.02***<br>(0.00)  | 0.05***<br>(0.01)  | 0.02***<br>(0.01)  |
| <b>Regions:</b>               |                    |                    |                    |                    |                    |                    |                    |                    |
| Red River Delta               | -0.01<br>(0.08)    | 0.17***<br>(0.04)  | 0.38***<br>(0.07)  | 0.17***<br>(0.03)  | 0.04<br>(0.03)     | 0.03<br>(0.03)     | -0.06*<br>(0.04)   | 0.02<br>(0.02)     |
| North Central Coast           | 0.10<br>(0.10)     | -0.06<br>(0.06)    | 0.10<br>(0.07)     | 0.05<br>(0.04)     | -0.19***<br>(0.05) | -0.14***<br>(0.03) | -0.15***<br>(0.03) | -0.15***<br>(0.02) |
| South Central Coast           | 0.21**<br>(0.08)   | 0.06<br>(0.05)     | 0.10*<br>(0.06)    | 0.13***<br>(0.04)  | 0.08*<br>(0.04)    | 0.03<br>(0.03)     | -0.01<br>(0.04)    | 0.05**<br>(0.02)   |
| Central Highlands             | 0.01<br>(0.12)     | 0.08<br>(0.06)     | 0.27***<br>(0.08)  | 0.10**<br>(0.04)   | 0.05<br>(0.06)     | 0.22***<br>(0.03)  | 0.14***<br>(0.04)  | 0.16***<br>(0.02)  |
| South East                    | 0.29***<br>(0.07)  | 0.23***<br>(0.04)  | 0.44***<br>(0.07)  | 0.29***<br>(0.03)  | 0.18***<br>(0.04)  | 0.32***<br>(0.03)  | 0.41***<br>(0.05)  | 0.32***<br>(0.02)  |
| Mekong River Delta            | 0.15*<br>(0.09)    | 0.05<br>(0.05)     | 0.24***<br>(0.06)  | 0.14***<br>(0.03)  | 0.22***<br>(0.04)  | 0.23***<br>(0.02)  | 0.17***<br>(0.04)  | 0.22***<br>(0.02)  |
| Constant                      | 14.52***<br>(0.21) | 15.33***<br>(0.12) | 16.22***<br>(0.23) | 15.43***<br>(0.11) | 14.43***<br>(0.10) | 14.94***<br>(0.07) | 15.63***<br>(0.10) | 15.02***<br>(0.05) |
| <b>R-squared</b>              | 0.17               | 0.29               | 0.19               | 0.44               | 0.23               | 0.29               | 0.18               | 0.47               |
| <b>No of observations</b>     | 2307               |                    |                    |                    | 6882               |                    |                    |                    |

\*Notes: See Table 2.6

Source: VHLSS 2006, own estimations.

Table 2.8 Contributions to expenditure increase from 1993 to 2006

| VARIABLES                       | Urban               |                      |                     |                      | Rural                |                      |                      |                      |
|---------------------------------|---------------------|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                 | 10th                | 50th                 | 90th                | Mean                 | 10th                 | 50th                 | 90th                 | Mean                 |
| <b>Total predicted increase</b> | 0.74 <sup>***</sup> | 0.76 <sup>***</sup>  | 0.61 <sup>***</sup> | 0.72 <sup>***</sup>  | 0.56 <sup>***</sup>  | 0.69 <sup>***</sup>  | 0.72 <sup>***</sup>  | 0.68 <sup>***</sup>  |
| <b>Due to characteristics</b>   |                     |                      |                     |                      |                      |                      |                      |                      |
| Sex                             | 0.00                | -0.00                | -0.00               | -0.00                | 0.00                 | -0.00                | -0.00                | 0.00                 |
| Ethnicity                       | -0.01*              | -0.00                | -0.00               | -0.00**              | -0.01 <sup>***</sup> | -0.01 <sup>***</sup> | -0.01 <sup>***</sup> | -0.01 <sup>***</sup> |
| Marital status                  | -0.00               | -0.00                | 0.00                | 0.00                 | -0.00                | 0.00                 | -0.00                | 0.00                 |
| Experience                      | 0.01                | 0.00                 | -0.00               | -0.00                | 0.01**               | 0.02 <sup>***</sup>  | 0.02 <sup>***</sup>  | 0.02 <sup>***</sup>  |
| School year                     | 0.06 <sup>***</sup> | 0.07 <sup>***</sup>  | 0.06 <sup>***</sup> | 0.06 <sup>***</sup>  | 0.02 <sup>***</sup>  | 0.03 <sup>***</sup>  | 0.03 <sup>***</sup>  | 0.03 <sup>***</sup>  |
| Sectors                         | -0.01               | -0.01                | 0.01                | -0.01                | -0.01 <sup>***</sup> | -0.02 <sup>***</sup> | -0.00                | -0.01 <sup>***</sup> |
| Industries                      | 0.02**              | 0.01**               | 0.01                | 0.01 <sup>***</sup>  | 0.02 <sup>***</sup>  | 0.04 <sup>***</sup>  | 0.03 <sup>***</sup>  | 0.03 <sup>***</sup>  |
| Household size                  | 0.06 <sup>***</sup> | 0.04 <sup>***</sup>  | 0.02**              | 0.04 <sup>***</sup>  | 0.03 <sup>***</sup>  | 0.03 <sup>***</sup>  | 0.02 <sup>***</sup>  | 0.03 <sup>***</sup>  |
| Age structure                   | 0.04 <sup>***</sup> | 0.05 <sup>***</sup>  | 0.03**              | 0.04 <sup>***</sup>  | 0.05 <sup>***</sup>  | 0.08 <sup>***</sup>  | 0.06 <sup>***</sup>  | 0.06 <sup>***</sup>  |
| Remittance                      | 0.01                | 0.03 <sup>***</sup>  | 0.08 <sup>***</sup> | 0.04 <sup>***</sup>  | -0.00 <sup>***</sup> | 0.03 <sup>***</sup>  | 0.09 <sup>***</sup>  | 0.04 <sup>***</sup>  |
| Region                          | -0.02**             | -0.01**              | -0.01*              | -0.01**              | 0.01**               | 0.01**               | 0.01**               | 0.01**               |
| <b>Total</b>                    | 0.17 <sup>***</sup> | 0.18 <sup>***</sup>  | 0.19 <sup>***</sup> | 0.18 <sup>***</sup>  | 0.12 <sup>***</sup>  | 0.20 <sup>***</sup>  | 0.25 <sup>***</sup>  | 0.19 <sup>***</sup>  |
| <b>Due to coefficients</b>      |                     |                      |                     |                      |                      |                      |                      |                      |
| Sex                             | -0.02               | 0.01                 | 0.02                | 0.01                 | 0.03                 | -0.01                | 0.02                 | 0.01                 |
| Ethnicity                       | -0.03**             | -0.01                | -0.01               | -0.01**              | -0.04 <sup>***</sup> | -0.01                | 0.01                 | -0.01*               |
| Marital status                  | 0.00                | -0.05                | -0.13               | -0.07                | -0.00                | 0.01                 | 0.04                 | 0.01                 |
| Experience                      | -0.40*              | 0.17                 | 0.02                | -0.09                | 0.05                 | -0.11                | -0.16                | -0.11**              |
| School year                     | 0.14                | 0.09                 | 0.04                | 0.11**               | 0.12 <sup>***</sup>  | 0.03                 | -0.05                | 0.02                 |
| Sectors                         | 0.13                | -0.20**              | -0.33**             | -0.13**              | -0.01                | 0.07*                | -0.05                | 0.01                 |
| Industries                      | -0.03               | -0.03                | -0.05               | -0.06*               | 0.01                 | -0.01                | 0.38 <sup>***</sup>  | 0.08**               |
| Household size                  | -0.08               | 0.07                 | 0.23*               | 0.07                 | -0.23 <sup>***</sup> | -0.03                | 0.11*                | -0.04                |
| Age structure                   | -0.00               | 0.01                 | 0.11                | 0.03                 | -0.05                | -0.06**              | -0.08                | -0.07 <sup>***</sup> |
| Remittance                      | 0.02 <sup>***</sup> | -0.00                | -0.01               | -0.00                | 0.01 <sup>***</sup>  | 0.00                 | -0.03 <sup>***</sup> | -0.00                |
| Region                          | 0.00                | -0.33 <sup>***</sup> | -0.14*              | -0.25 <sup>***</sup> | 0.02                 | -0.03                | -0.14 <sup>***</sup> | -0.03                |
| Constant                        | 0.85 <sup>***</sup> | 0.86 <sup>***</sup>  | 0.68*               | 0.94 <sup>***</sup>  | 0.53 <sup>***</sup>  | 0.64 <sup>***</sup>  | 0.41**               | 0.60**               |
| <b>Total</b>                    | 0.58 <sup>***</sup> | 0.58 <sup>***</sup>  | 0.42 <sup>***</sup> | 0.54 <sup>***</sup>  | 0.44 <sup>***</sup>  | 0.49 <sup>***</sup>  | 0.48 <sup>***</sup>  | 0.48 <sup>***</sup>  |

\* Note: (1) For urban sample, Central Highland region is dropped in decomposition since there is no urban in this region in 1993.

(2) Decompositions are carried out with 500 bootstrap replications. P values for two-side test: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: VLSS 1993 & VHLSS 2006, own estimation.

**Table 2.9 Contributions to the urban-rural expenditure gap, 1993**

| VARIABLES                     | 10th           | 50th           | 90th           | Mean           |
|-------------------------------|----------------|----------------|----------------|----------------|
| Predicted increase            | 0.40***        | 0.60***        | 0.80***        | 0.61***        |
| <b>Due to characteristics</b> |                |                |                |                |
| Sex                           | -0.00          | 0.00           | -0.01          | -0.00          |
| Ethnicity                     | 0.01***        | 0.00**         | -0.01**        | 0.01***        |
| Marital status                | -0.00          | -0.00*         | 0.00           | -0.00          |
| Experience                    | 0.00           | 0.01**         | 0.00           | 0.00*          |
| School year                   | 0.07***        | 0.07***        | 0.14***        | 0.09***        |
| Sectors                       | -0.02**        | 0.02**         | 0.02           | 0.01*          |
| Industries                    | 0.05***        | 0.09***        | 0.10***        | 0.09***        |
| Household size                | 0.00           | 0.00           | 0.00           | 0.00           |
| Age structure                 | 0.04***        | 0.04***        | 0.02**         | 0.04***        |
| Remittance                    | 0.00           | 0.01***        | 0.07***        | 0.03***        |
| Region                        | 0.03***        | 0.07***        | 0.12***        | 0.07***        |
| <b>Total</b>                  | <b>0.18***</b> | <b>0.31***</b> | <b>0.46***</b> | <b>0.33***</b> |
| <b>Due to coefficients</b>    |                |                |                |                |
| Sex                           | -0.00          | -0.02          | 0.06           | -0.01          |
| Ethnicity                     | 0.06***        | 0.03***        | 0.04***        | 0.04***        |
| Marital status                | 0.05           | 0.03           | -0.00          | 0.03           |
| Experience                    | 0.14           | -0.41***       | -0.43*         | -0.25***       |
| School year                   | 0.10           | 0.11           | 0.01           | 0.06           |
| Sectors                       | 0.20           | 0.18**         | -0.03          | 0.12**         |
| Industries                    | -0.16**        | 0.03           | 0.37***        | 0.09**         |
| Household size                | -0.12          | -0.13**        | -0.08          | -0.12**        |
| Age structure                 | -0.13*         | -0.03          | -0.12          | -0.07**        |
| Remittance                    | 0.00           | 0.00           | -0.04          | -0.01          |
| Region                        | 0.14           | 0.31***        | 0.11           | 0.26***        |
| Constant                      | -0.05          | 0.20           | 0.44           | 0.14           |
| <b>Total</b>                  | <b>0.22***</b> | <b>0.29***</b> | <b>0.34***</b> | <b>0.28***</b> |

\* Note: See Table 2.8

Source: VLSS 1993, own estimation.



**Table 2.10 Contributions to the urban-rural expenditure gap, 2002**

| VARIABLES                     | 10th           | 50th           | 90th           | Mean           |
|-------------------------------|----------------|----------------|----------------|----------------|
| Predicted increase            | 0.56***        | 0.73***        | 0.87***        | 0.72***        |
| <b>Due to characteristics</b> |                |                |                |                |
| Sex                           | 0.00           | 0.00***        | 0.01***        | 0.01***        |
| Ethnicity                     | 0.06***        | 0.02***        | -0.03***       | 0.02***        |
| Marital status                | -0.00***       | -0.00***       | 0.00           | -0.00***       |
| Experience                    | -0.00**        | -0.00**        | -0.00*         | -0.00**        |
| School year                   | 0.10***        | 0.10***        | 0.18***        | 0.12***        |
| Sectors                       | -0.01***       | 0.02***        | 0.08***        | 0.03***        |
| Industries                    | 0.05***        | 0.09***        | 0.07***        | 0.07***        |
| Household size                | 0.01***        | 0.01***        | 0.01***        | 0.01***        |
| Age structure                 | 0.03***        | 0.04***        | 0.04***        | 0.03***        |
| Remittance                    | 0.00***        | 0.02***        | 0.06***        | 0.03***        |
| Region                        | 0.01***        | 0.03***        | 0.06***        | 0.03***        |
| <b>Total</b>                  | <b>0.25***</b> | <b>0.33***</b> | <b>0.48***</b> | <b>0.34***</b> |
| <b>Due to coefficients</b>    |                |                |                |                |
| Sex                           | 0.02           | -0.04**        | 0.01           | -0.02*         |
| Ethnicity                     | 0.01**         | 0.02***        | 0.03***        | 0.02***        |
| Marital status                | -0.00          | -0.02          | -0.09**        | -0.03**        |
| Experience                    | -0.12*         | -0.12**        | -0.15          | -0.13***       |
| School year                   | 0.09**         | 0.27***        | 0.15***        | 0.19***        |
| Sectors                       | 0.25***        | 0.07**         | -0.21***       | 0.04**         |
| Industries                    | -0.12***       | -0.02          | 0.14***        | -0.00          |
| Household size                | -0.08**        | -0.02          | -0.02          | -0.03          |
| Age structure                 | -0.06**        | -0.02          | 0.04           | -0.01          |
| Remittance                    | 0.01**         | -0.00          | -0.07***       | -0.02***       |
| Region                        | -0.05*         | 0.12***        | 0.17***        | 0.09***        |
| Constant                      | 0.38***        | 0.16**         | 0.39***        | 0.27***        |
| <b>Total</b>                  | <b>0.32***</b> | <b>0.40***</b> | <b>0.39***</b> | <b>0.38***</b> |

\* Notes: (1) Decompositions are carried out with 500 bootstrap replications.

P values for two-side test: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: VHLSS 2002, own estimation.

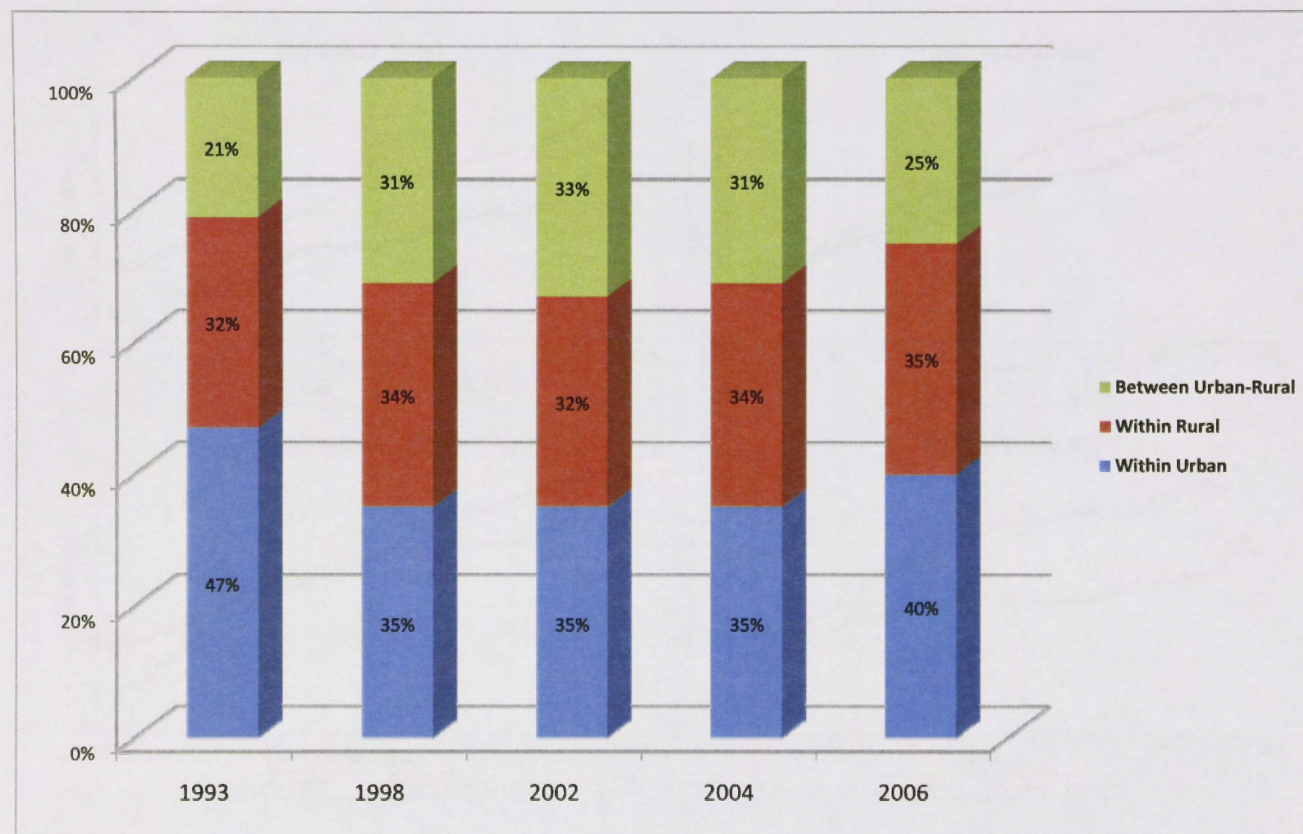
**Table 2.11 Contributions to the urban-rural expenditure gap, 2006**

| VARIABLES                     | 10th     | 50th    | 90th     | Mean     |
|-------------------------------|----------|---------|----------|----------|
| <b>Predicted increase</b>     | 0.57***  | 0.65*** | 0.67***  | 0.64***  |
| <b>Due to characteristics</b> |          |         |          |          |
| Sex                           | -0.00    | 0.01    | 0.00     | 0.00     |
| Ethnicity                     | 0.08***  | 0.03*** | -0.02*** | 0.03***  |
| Marital status                | -0.00    | -0.00*  | 0.00     | -0.00    |
| Experience                    | -0.00    | 0.00    | 0.00     | 0.00     |
| School year                   | 0.13***  | 0.11*** | 0.15***  | 0.12***  |
| Sectors                       | -0.01**  | 0.01**  | 0.06***  | 0.02***  |
| Industries                    | 0.05***  | 0.08*** | 0.02**   | 0.06***  |
| Household size                | 0.01***  | 0.01*** | 0.01***  | 0.01***  |
| Age structure                 | 0.03***  | 0.03*** | 0.02***  | 0.03***  |
| Remittance                    | 0.01***  | 0.02*** | 0.04***  | 0.02***  |
| Region                        | 0.03***  | 0.04*** | 0.06***  | 0.04***  |
| <b>Total</b>                  | 0.33***  | 0.34*** | 0.34***  | 0.33***  |
| <b>Due to coefficients</b>    |          |         |          |          |
| Sex                           | -0.03    | -0.01   | 0.04     | -0.01    |
| Ethnicity                     | -0.00    | 0.02*** | 0.04***  | 0.02***  |
| Marital status                | 0.07     | -0.02   | -0.15**  | -0.05    |
| Experience                    | -0.26    | -0.15   | -0.19    | -0.24*** |
| School year                   | 0.10     | 0.14**  | 0.11     | 0.13***  |
| Sectors                       | 0.30***  | -0.08*  | -0.32*** | -0.02    |
| Industries                    | -0.19*** | -0.00   | -0.01    | -0.03    |
| Household size                | 0.03     | -0.02   | -0.03    | -0.01    |
| Age structure                 | -0.10**  | 0.02    | 0.03     | 0.01     |
| Remittance                    | 0.02***  | -0.00   | -0.01    | 0.00     |
| Region                        | 0.04     | -0.02   | 0.15***  | 0.04     |
| Constant                      | 0.27     | 0.45*** | 0.66***  | 0.48***  |
| <b>Total</b>                  | 0.24***  | 0.32*** | 0.34***  | 0.31***  |

\* Notes: See Table 2.10

Source: VHLSS 2002, own estimation.

**Figure 2.1** Theil decomposition by urban-rural, 1993-2006

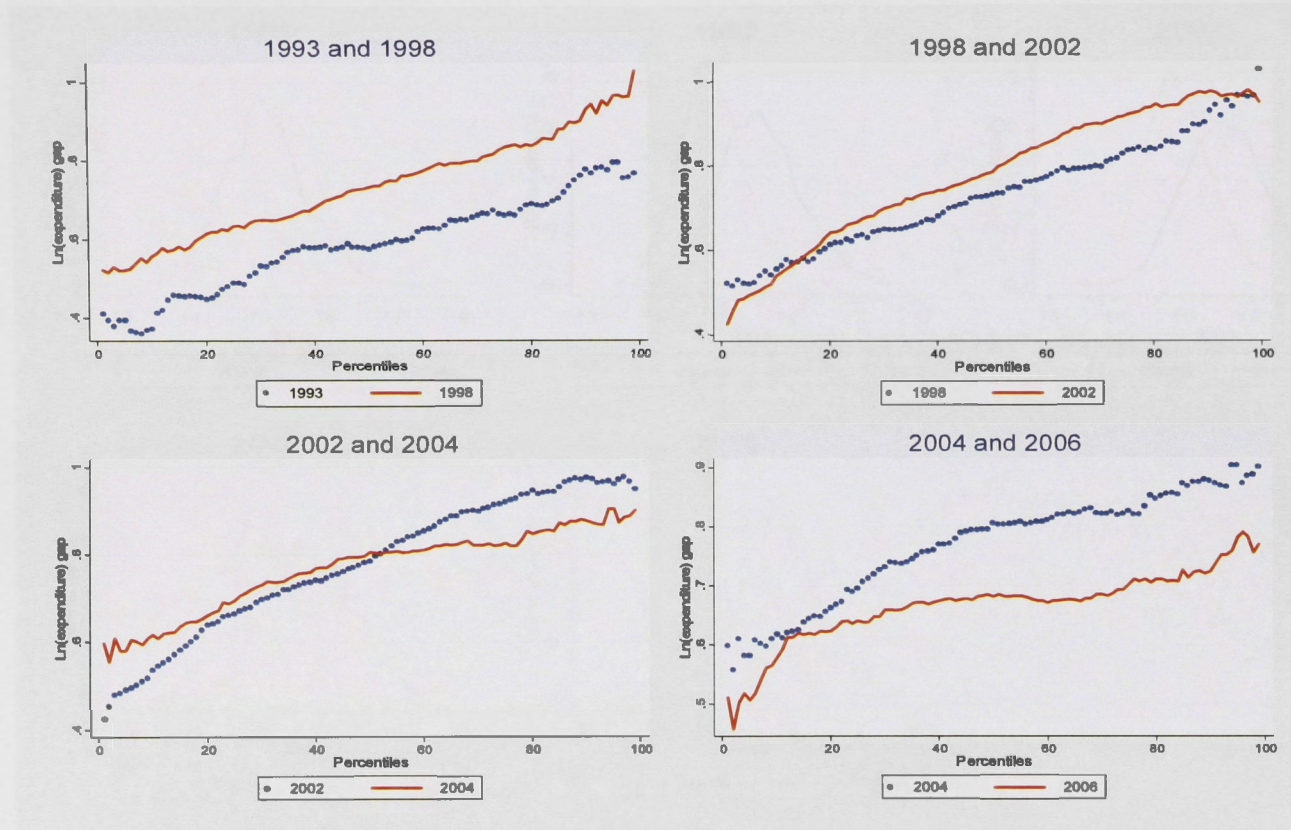


\*Note: The decomposition results are calculated with 100 bootstrap replications using Biewen (2002) method.

Source: VLSS 1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, own calculations.



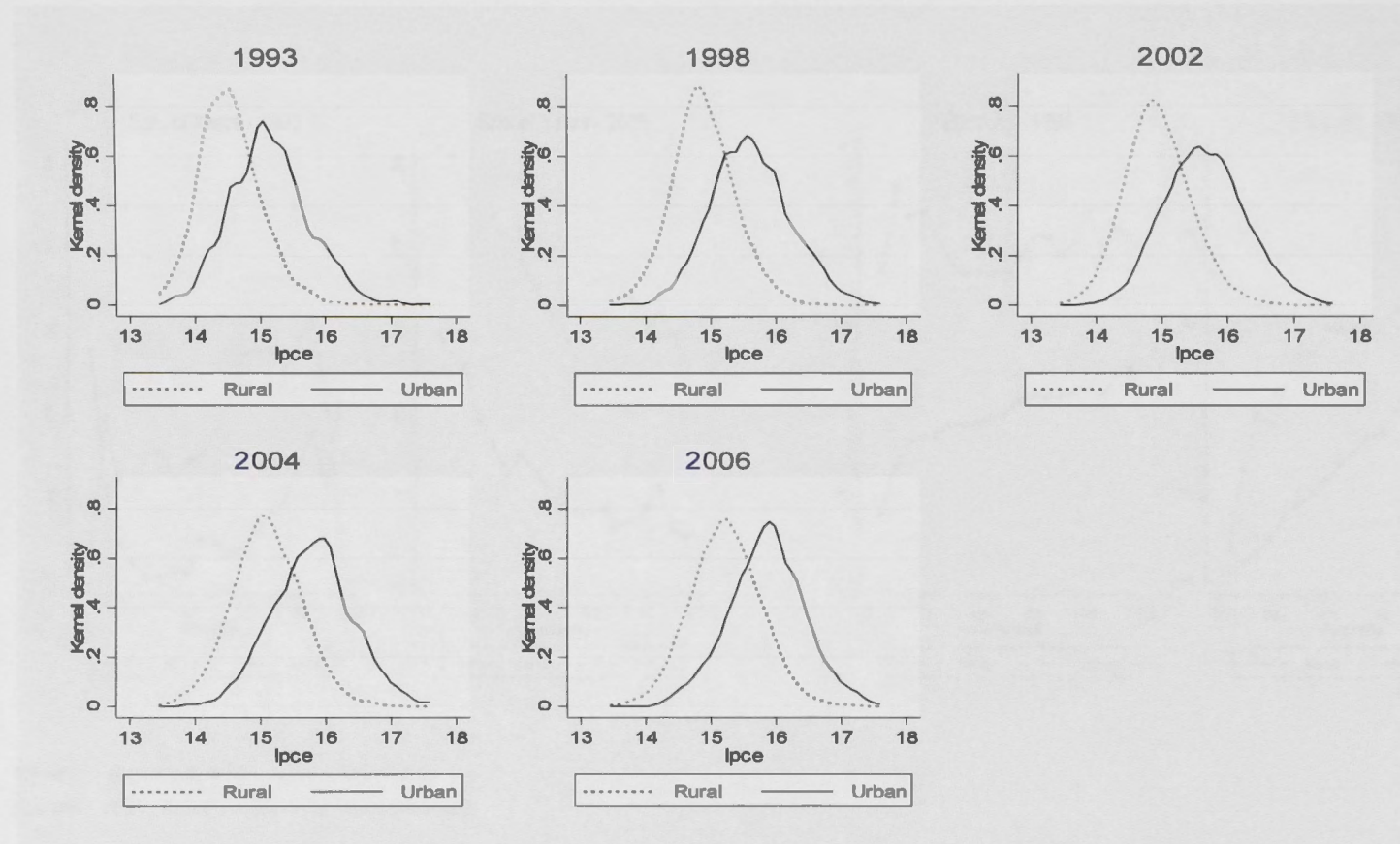
**Figure 2.2 Ln(expenditure) gap between urban & rural across percentiles, 1993-2006**



\*Note: All values are adjusted by spatial and temporal price indexes, converted to January 2006 values

Source: VLSS 1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, own calculations.

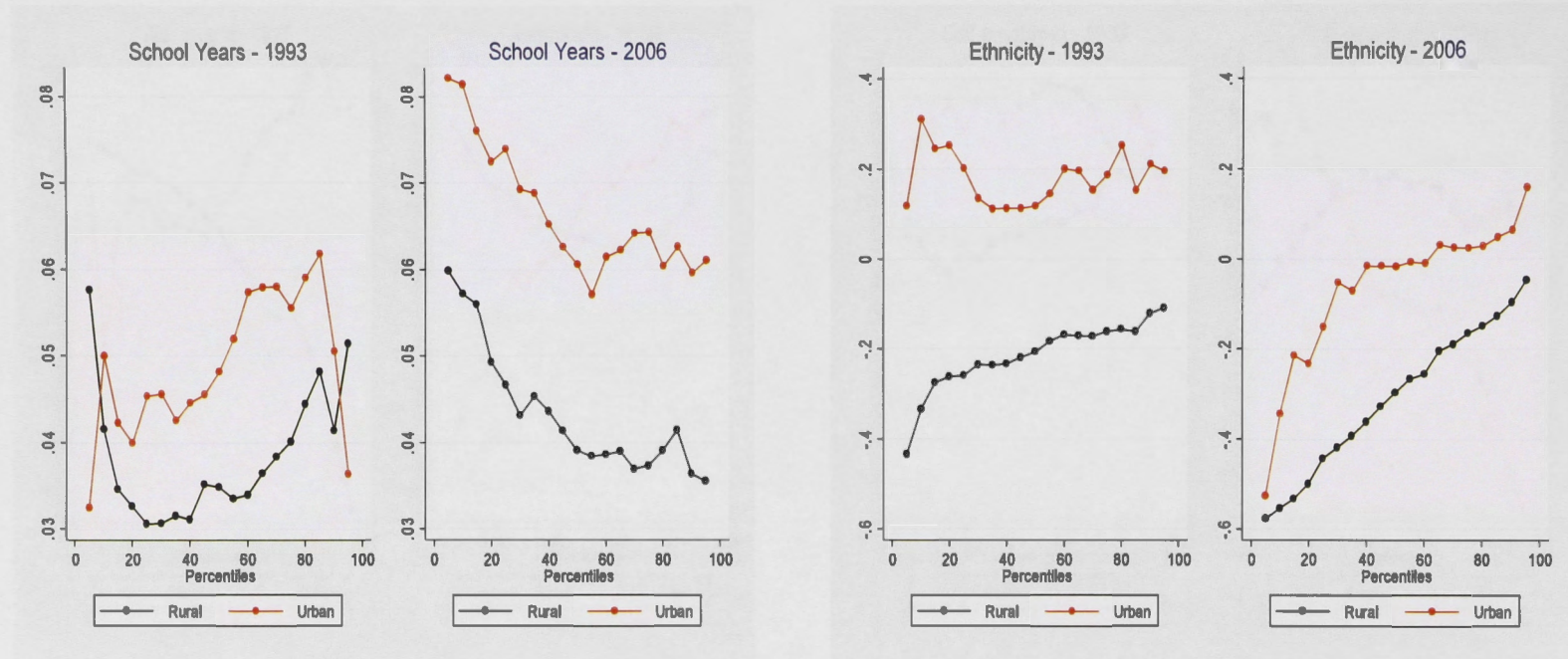
**Figure 2.3 Distribution of expenditure by urban-rural, 1993-2006**



\*Note: Gaussian kernel is estimated with a common bandwidth=0.08

Source: VLSS 1993, VLSS 1998, VHLSS 2002, VHLSS 2004 and VHLSS 2006, own calculations.

**Figure 2.4 Selected estimation coefficients along the distribution by urban-rural, 1993 & 2006**



\*Note: Majority is the base group for ethnicity.

Source: VLSS 1993 & VHLSS 2006, own estimations.



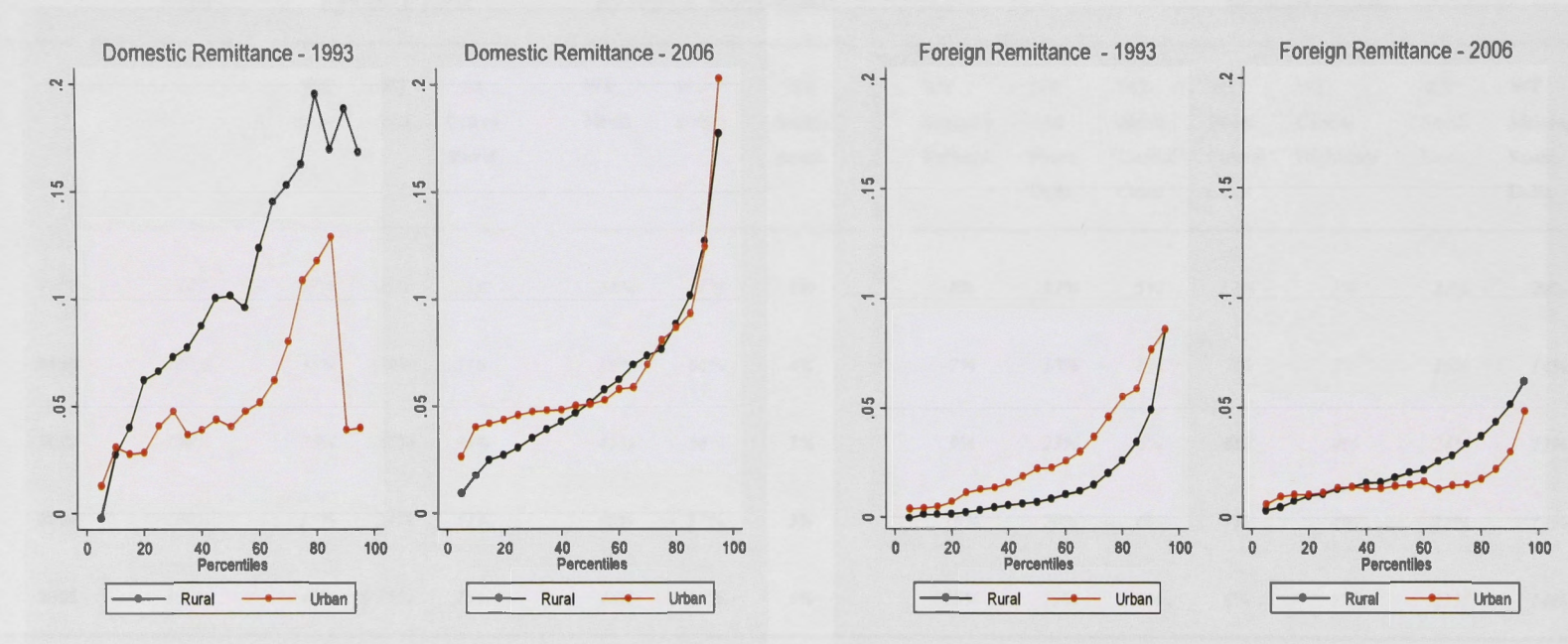
**Figure 2.4 Selected estimation coefficients along the distribution by urban-rural, 1993 & 2006 (cont.)**



*\*Note: Household head working in service sector is the base group for industries.  
Household head working in private sector is the base group for sectors of employment.*

*Source: VLSS 1993 & VHLSS 2006, own estimations.*

Figure 2.4 Selected estimation coefficients along the distribution by urban-rural, 1993 & 2006 (cont.)



Source: VLSS 1993 & VHLSS 2006, own estimations.

## Appendix 2.1 Theil decomposition by the contribution of within and between groups, 1993-2006

|      | Total | By Urban-rural |             |                      | By region: North-South |             |                       | By seven regions          |                             |                                 |                                 |                            |                     |                                |                        |
|------|-------|----------------|-------------|----------------------|------------------------|-------------|-----------------------|---------------------------|-----------------------------|---------------------------------|---------------------------------|----------------------------|---------------------|--------------------------------|------------------------|
|      |       | WT<br>urban    | WT<br>rural | BT<br>Urban<br>Rural | WT<br>North            | WT<br>South | BT<br>North-<br>South | WT<br>Northern<br>Uplands | WT<br>Red<br>River<br>Delta | WT<br>North<br>Central<br>Coast | WT<br>South<br>Central<br>Coast | WT<br>Central<br>Highlands | WT<br>South<br>East | WT<br>Mekong<br>River<br>Delta | BT<br>Seven<br>Regions |
| 1993 | 100%  | 47%            | 32%         | 21%                  | 31%                    | 61%         | 8%                    | 6%                        | 22%                         | 5%                              | 12%                             | 1%                         | 21%                 | 20%                            | 12%                    |
| 1998 | 100%  | 35%            | 34%         | 31%                  | 36%                    | 60%         | 4%                    | 7%                        | 18%                         | 8%                              | 7%                              | 2%                         | 26%                 | 14%                            | 18%                    |
| 2002 | 100%  | 35%            | 32%         | 33%                  | 41%                    | 56%         | 3%                    | 9%                        | 23%                         | 6%                              | 6%                              | 4%                         | 24%                 | 13%                            | 16%                    |
| 2004 | 100%  | 35%            | 34%         | 31%                  | 40%                    | 57%         | 3%                    | 10%                       | 20%                         | 6%                              | 7%                              | 4%                         | 22%                 | 14%                            | 17%                    |
| 2006 | 100%  | 40%            | 35%         | 25%                  | 44%                    | 53%         | 3%                    | 10%                       | 23%                         | 7%                              | 6%                              | 5%                         | 22%                 | 14%                            | 13%                    |

\*Note: (1) Samples are weighted by sample weights.

(2) All figures are calculated with 500 bootstrap replications using the method of Biewen (2002) and are significant at the 5% level.

(3) WT and BT are abbreviations for within-group and between-groups respectively.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculation.

## Appendix 2.1 Theil decomposition by the contribution of within and between groups, 1993-2006 (cont)

|             |             | Ethnicity of the household head |             |                | Sex of the household head |            |                | Marital status of the household head |                |                         |
|-------------|-------------|---------------------------------|-------------|----------------|---------------------------|------------|----------------|--------------------------------------|----------------|-------------------------|
|             |             | WT majority                     | WT minority | BT major-minor | WT Male                   | WT Female  | BT Male-female | WT married                           | WT not married | BT Married- not married |
| <b>1993</b> | <i>100%</i> | <i>85%</i>                      | <i>13%</i>  | <i>2%</i>      | <i>66%</i>                | <i>32%</i> | <i>2%</i>      | <i>6%</i>                            | <i>22%</i>     | <i>5%</i>               |
| <b>1998</b> | <i>100%</i> | <i>83%</i>                      | <i>13%</i>  | <i>4%</i>      | <i>67%</i>                | <i>30%</i> | <i>3%</i>      | <i>7%</i>                            | <i>18%</i>     | <i>8%</i>               |
| <b>2002</b> | <i>100%</i> | <i>86%</i>                      | <i>8%</i>   | <i>6%</i>      | <i>67%</i>                | <i>28%</i> | <i>4%</i>      | <i>9%</i>                            | <i>23%</i>     | <i>6%</i>               |
| <b>2004</b> | <i>100%</i> | <i>85%</i>                      | <i>8%</i>   | <i>7%</i>      | <i>69%</i>                | <i>27%</i> | <i>4%</i>      | <i>10%</i>                           | <i>20%</i>     | <i>6%</i>               |
| <b>2006</b> | <i>100%</i> | <i>84%</i>                      | <i>8%</i>   | <i>8%</i>      | <i>72%</i>                | <i>26%</i> | <i>2%</i>      | <i>10%</i>                           | <i>23%</i>     | <i>7%</i>               |

\*Note: (1) Samples are weighted by sample weights.

(2) All figures are calculated with 500 bootstrap replications using the method of Biewen (2002) and are significant at the 5% level.

(3) WT and BT are abbreviations for within-group and between-groups respectively.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculation.



## Appendix 2.1 Theil decomposition by the contribution of within and between groups, 1993-2006 (cont)

|             |             | By age group of the household head |                 |                      |                   |                  | Education of household head |               |                 |                   |                        |                        |
|-------------|-------------|------------------------------------|-----------------|----------------------|-------------------|------------------|-----------------------------|---------------|-----------------|-------------------|------------------------|------------------------|
|             |             | WT less<br>than 30                 | WT age<br>30-40 | WT age<br>40-retired | WT retired<br>age | BT Age<br>groups | WT less<br>than<br>primary  | WT<br>primary | WT<br>secondary | WT high<br>school | WT college<br>& higher | BT Education<br>levels |
| <b>1993</b> | <b>100%</b> | <b>11%</b>                         | <b>29%</b>      | <b>37%</b>           | <b>21%</b>        | <b>2 %</b>       | <b>29%</b>                  | <b>24%</b>    | <b>22%</b>      | <b>12%</b>        | <b>5%</b>              | <b>8%</b>              |
| <b>1998</b> | <b>100%</b> | <b>5%</b>                          | <b>29%</b>      | <b>46%</b>           | <b>19%</b>        | <b>1%</b>        | <b>24%</b>                  | <b>21%</b>    | <b>24%</b>      | <b>13%</b>        | <b>5%</b>              | <b>13%</b>             |
| <b>2002</b> | <b>100%</b> | <b>5%</b>                          | <b>24%</b>      | <b>49%</b>           | <b>20%</b>        | <b>2%</b>        | <b>22%</b>                  | <b>18%</b>    | <b>21%</b>      | <b>10%</b>        | <b>12%</b>             | <b>17%</b>             |
| <b>2004</b> | <b>100%</b> | <b>4%</b>                          | <b>17%</b>      | <b>53%</b>           | <b>24%</b>        | <b>2%</b>        | <b>18%</b>                  | <b>19%</b>    | <b>24%</b>      | <b>14%</b>        | <b>7%</b>              | <b>19%</b>             |
| <b>2006</b> | <b>100%</b> | <b>3%</b>                          | <b>16%</b>      | <b>55%</b>           | <b>23%</b>        | <b>2%</b>        | <b>16%</b>                  | <b>19%</b>    | <b>21%</b>      | <b>16%</b>        | <b>7%</b>              | <b>21%</b>             |

\*Note: (1) Samples are weighted by sample weights.

(2) All figures are calculated with 500 bootstrap replications using the method of Biewen (2002) and are significant at the 5% level.

(3) WT and BT are abbreviations for within-group and between-groups respectively.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculation.



## Appendix 2.1 Theil decomposition by the contribution of within and between groups, 1993-2006 (cont)

|      |      | By employment status & sector of the household head |        |           |                  |                |            |                | By employment status & industry of the household head |                |            |                |     |            |                |
|------|------|-----------------------------------------------------|--------|-----------|------------------|----------------|------------|----------------|-------------------------------------------------------|----------------|------------|----------------|-----|------------|----------------|
|      |      | WT Working age                                      |        |           |                  |                | WT Old age |                |                                                       | WT Working age |            |                |     | WT Old age | Between groups |
|      |      | WT Working                                          |        |           |                  | WT not working |            |                | WT Working                                            |                |            | WT not working |     |            |                |
|      |      | WT Private                                          | WT SOE | WT Public | WT self employed |                |            | Between groups | WT Agri                                               | WT Manu        | WT Service |                |     |            |                |
| 1993 | 100% | 6%                                                  | 4%     | 5%        | 57%              | 2%             | 19%        | 7%             | 29%                                                   | 8%             | 21%        | 5%             | 21% | 15%        |                |
| 1998 | 100% | 6%                                                  | 3%     | 6%        | 53%              | 1%             | 21%        | 9%             | 20%                                                   | 10%            | 24%        | 4%             | 21% | 21%        |                |
| 2002 | 100% | 10%                                                 | 5%     | 9%        | 38%              | 3%             | 22%        | 13%            | 17%                                                   | 8%             | 31%        | 5%             | 22% | 17%        |                |
| 2004 | 100% | 12%                                                 | 4%     | 8%        | 38%              | 3%             | 26%        | 10%            | 18%                                                   | 8%             | 29%        | 4%             | 26% | 14%        |                |
| 2006 | 100% | 15%                                                 | 4%     | 6%        | 39%              | 2%             | 24%        | 10%            | 22%                                                   | 8%             | 30%        | 3%             | 25% | 12%        |                |

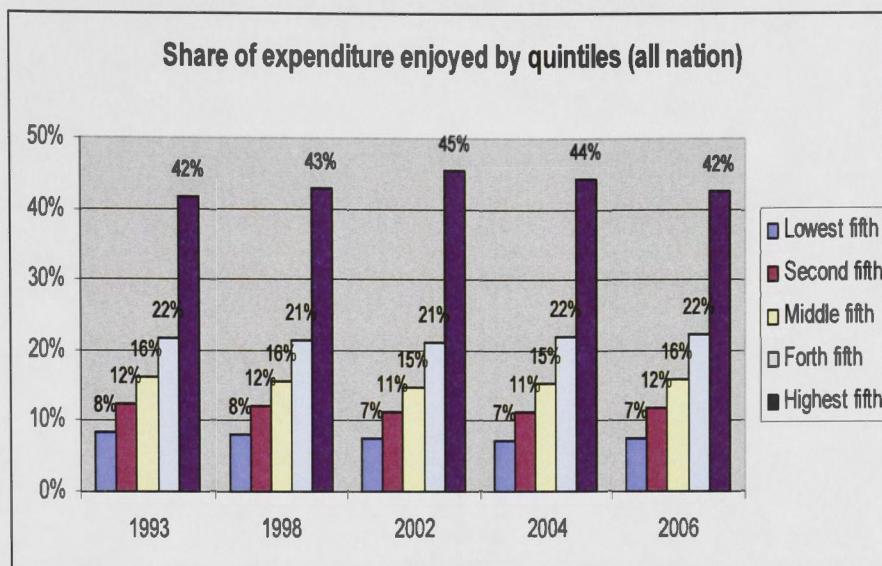
\*Note: (1) Samples are weighted by sample weights.

(2) All figures are calculated with 500 bootstrap replications using the method of Biewen (2002) and are significant at the 5% level.

(3) WT and BT are abbreviations for within-group and between-groups respectively.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculation.

## Appendix 2.2 Share of expenditure enjoyed by quintiles, 1993-2006



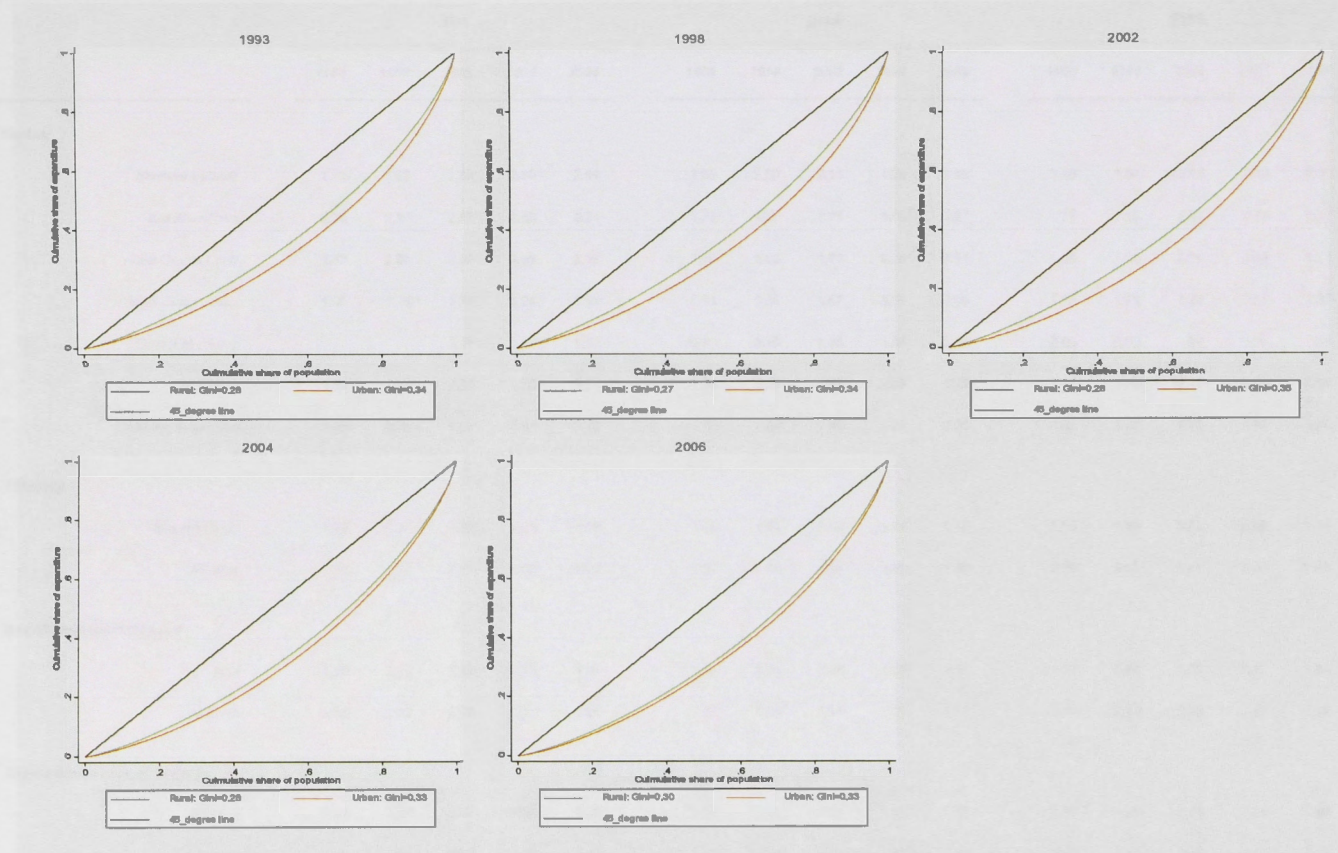
**Share of RPCEXP by quintiles by urban – rural (%)**

|      | Lowest fifth |       | Second fifth |       | Middle |       | Forth fifth |       | Highest fifth |       |
|------|--------------|-------|--------------|-------|--------|-------|-------------|-------|---------------|-------|
|      | Urban        | Rural | Urban        | Rural | Urban  | Rural | Urban       | Rural | Urban         | Rural |
| 1993 | 8.11         | 9.55  | 12.43        | 13.72 | 16.53  | 17.33 | 22.4        | 22.18 | 40.54         | 37.21 |
| 1998 | 7.72         | 9.73  | 12.12        | 14.05 | 16.44  | 17.53 | 22.56       | 22.32 | 41.16         | 36.37 |
| 2002 | 6.87         | 9.23  | 11.57        | 13.45 | 16.22  | 17.14 | 23.44       | 22.29 | 41.9          | 37.89 |
| 2004 | 7.33         | 8.77  | 12.32        | 13.3  | 17.14  | 17.25 | 23.04       | 22.69 | 40.16         | 37.99 |
| 2006 | 7.53         | 8.55  | 12.52        | 13.11 | 16.94  | 17.17 | 22.66       | 22.7  | 40.35         | 38.46 |

\*Notes: Results are weighted by sample weight.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculations

## Appendix 2.3 Lorenz curves by urban-rural, 1993-2006



\*Note: All values are adjusted by spatial and temporal price indexes.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculations.

## Appendix 2.4 Urban-rural expenditure ratio across various fields, 1993-2006

|                                      | Mean |      |      |      |      | Q10th |      |      |      |      | Q50th |      |      |      |      | Q90th |      |      |      |      |
|--------------------------------------|------|------|------|------|------|-------|------|------|------|------|-------|------|------|------|------|-------|------|------|------|------|
|                                      | 1993 | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 |
| <b>Region</b>                        |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Northern Uplands                     | 1.51 | 1.89 | 2.34 | 2.30 | 2.19 | 1.39  | 2.02 | 2.11 | 1.86 | 1.98 | 1.52  | 1.94 | 2.37 | 2.37 | 2.50 | 1.51  | 1.72 | 2.28 | 2.25 | 1.98 |
| Red River Delta                      | 2.30 | 2.10 | 2.57 | 2.33 | 2.24 | 1.73  | 1.57 | 1.73 | 1.56 | 1.57 | 2.03  | 1.92 | 2.38 | 2.17 | 2.17 | 2.83  | 2.50 | 2.93 | 2.79 | 2.39 |
| North Central Coast                  | 1.57 | 2.05 | 2.09 | 1.96 | 2.19 | 1.68  | 1.50 | 1.71 | 2.00 | 2.31 | 1.58  | 1.81 | 2.14 | 2.05 | 2.14 | 1.54  | 2.54 | 2.15 | 1.73 | 2.45 |
| South Central Coast                  | 1.90 | 1.98 | 1.99 | 1.99 | 1.82 | 1.71  | 1.88 | 1.47 | 1.96 | 1.85 | 1.77  | 1.76 | 1.82 | 1.98 | 1.82 | 1.64  | 1.97 | 2.34 | 2.13 | 1.84 |
| Central Highlands                    |      |      | 2.05 | 1.90 | 1.62 | 0.00  | 0.00 | 1.35 | 1.88 | 1.39 | 0.00  | 0.00 | 1.94 | 1.97 | 1.78 | 0.00  | 0.00 | 2.41 | 1.81 | 1.62 |
| South East                           | 1.89 | 1.92 | 2.35 | 2.05 | 1.72 | 1.68  | 1.79 | 1.83 | 2.23 | 1.70 | 1.91  | 1.92 | 2.41 | 2.18 | 1.58 | 2.05  | 2.01 | 2.45 | 1.91 | 1.98 |
| Mekong River Delta                   | 1.63 | 1.88 | 1.59 | 1.61 | 1.42 | 1.25  | 1.22 | 1.35 | 1.24 | 1.26 | 1.51  | 1.77 | 1.55 | 1.48 | 1.43 | 1.83  | 2.10 | 1.73 | 1.75 | 1.51 |
| <b>Ethnicity</b>                     |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Majority (Kinh)                      | 1.70 | 2.07 | 2.25 | 2.11 | 1.90 | 1.43  | 1.52 | 1.60 | 1.64 | 1.59 | 1.75  | 1.92 | 2.11 | 2.10 | 1.85 | 2.08  | 2.41 | 2.56 | 2.30 | 2.02 |
| Minority                             | 1.84 | 3.51 | 2.71 | 2.82 | 2.33 | 2.55  | 2.80 | 1.34 | 1.83 | 1.35 | 2.79  | 3.19 | 2.44 | 3.00 | 2.48 | 3.85  | 3.72 | 3.17 | 3.18 | 2.62 |
| <b>Sex of the household head</b>     |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Male                                 | 1.89 | 2.15 | 2.29 | 2.17 | 1.93 | 1.55  | 1.74 | 1.76 | 1.98 | 1.90 | 1.77  | 1.98 | 2.30 | 2.21 | 1.89 | 2.09  | 2.36 | 2.37 | 2.24 | 1.93 |
| Female                               | 1.98 | 2.22 | 2.29 | 2.20 | 2.01 | 1.57  | 1.64 | 1.64 | 1.78 | 1.72 | 1.87  | 2.12 | 2.13 | 2.16 | 1.99 | 2.32  | 2.45 | 2.64 | 2.45 | 2.07 |
| <b>Employment status of the head</b> |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Working                              | 1.96 | 2.24 | 2.34 | 2.25 | 2.02 | 1.59  | 1.75 | 1.67 | 1.85 | 1.77 | 1.83  | 2.09 | 2.16 | 2.24 | 1.98 | 2.18  | 2.56 | 2.67 | 2.39 | 2.05 |
| Not working                          | 2.85 | 1.80 | 2.15 | 1.83 | 1.70 | 1.25  | 1.54 | 1.99 | 1.93 | 2.48 | 2.43  | 1.52 | 2.32 | 1.89 | 1.86 | 3.38  | 1.63 | 2.08 | 2.18 | 1.68 |

\*Note: All values are adjusted by spatial, temporal price indexes and weighted by sample weights.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculations.



## Appendix 2.4 Urban-rural expenditure ratio across various fields, 1993-2006 (cont)

|                                        | Mean |      |      |      |      | Q10th |      |      |      |      | Q50th |      |      |      |      | Q90th |      |      |      |      |
|----------------------------------------|------|------|------|------|------|-------|------|------|------|------|-------|------|------|------|------|-------|------|------|------|------|
|                                        | 1993 | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 | 1993  | 1998 | 2002 | 2004 | 2006 |
| <b>Sector of the head</b>              |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Private                                | 1.83 | 2.00 | 2.08 | 2.22 | 2.14 | 1.64  | 1.50 | 1.34 | 1.58 | 1.41 | 1.71  | 1.79 | 1.89 | 2.13 | 1.85 | 1.98  | 2.42 | 2.44 | 2.84 | 2.52 |
| SOE                                    | 1.74 | 1.90 | 2.22 | 2.23 | 2.07 | 2.17  | 1.70 | 1.71 | 1.51 | 2.31 | 1.60  | 1.69 | 2.09 | 1.89 | 2.05 | 1.57  | 2.03 | 2.71 | 2.48 | 2.04 |
| Public                                 | 1.82 | 2.05 | 2.22 | 1.94 | 1.89 | 1.84  | 1.93 | 1.94 | 1.88 | 1.70 | 1.88  | 1.95 | 2.00 | 1.81 | 1.70 | 2.27  | 2.01 | 2.37 | 2.08 | 1.54 |
| Self-employed                          | 1.89 | 2.17 | 2.19 | 2.15 | 1.87 | 1.52  | 1.68 | 1.87 | 1.85 | 1.73 | 1.77  | 2.01 | 2.05 | 2.12 | 1.85 | 2.10  | 2.44 | 2.46 | 2.21 | 1.86 |
| <b>Industry of the household head</b>  |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Agriculture                            | 1.59 | 1.66 | 1.82 | 1.52 | 1.54 | 1.36  | 1.51 | 1.37 | 1.51 | 1.23 | 1.55  | 1.59 | 1.49 | 1.42 | 1.51 | 1.70  | 1.73 | 1.73 | 1.54 | 1.59 |
| Manufacturing                          | 1.89 | 1.99 | 2.23 | 2.16 | 1.79 | 1.43  | 1.50 | 1.75 | 1.61 | 1.39 | 1.84  | 1.79 | 2.20 | 2.10 | 1.67 | 2.16  | 2.21 | 2.52 | 2.26 | 1.83 |
| Service                                | 1.82 | 1.85 | 2.10 | 2.07 | 1.86 | 1.37  | 1.41 | 1.58 | 1.68 | 1.63 | 1.56  | 1.78 | 2.04 | 2.02 | 1.79 | 1.76  | 2.05 | 2.23 | 2.25 | 1.97 |
| <b>Marital status of the head</b>      |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Couple                                 | 1.86 | 2.10 | 2.16 | 2.23 | 1.95 | 1.44  | 1.63 | 1.54 | 1.77 | 1.63 | 1.73  | 1.97 | 2.02 | 2.23 | 1.84 | 2.08  | 2.35 | 2.45 | 2.33 | 2.06 |
| Single                                 | 2.00 | 2.26 | 2.39 | 2.24 | 2.02 | 1.59  | 1.74 | 1.76 | 1.87 | 1.84 | 1.88  | 2.10 | 2.24 | 2.24 | 2.02 | 2.31  | 2.57 | 2.67 | 2.42 | 2.05 |
| <b>Education of the household head</b> |      |      |      |      |      |       |      |      |      |      |       |      |      |      |      |       |      |      |      |      |
| Less than primary                      | 1.70 | 1.94 | 2.18 | 1.90 | 1.64 | 1.52  | 1.74 | 1.57 | 1.70 | 1.53 | 1.65  | 1.84 | 2.00 | 1.87 | 1.65 | 1.70  | 2.08 | 2.40 | 1.88 | 1.55 |
| Primary                                | 1.84 | 2.06 | 1.92 | 1.95 | 1.68 | 1.51  | 1.62 | 1.55 | 1.61 | 1.48 | 1.81  | 1.99 | 1.81 | 1.87 | 1.68 | 1.93  | 2.43 | 2.08 | 2.11 | 1.68 |
| Secondary                              | 1.89 | 2.00 | 2.12 | 2.02 | 1.81 | 1.35  | 1.57 | 1.61 | 1.73 | 1.73 | 1.80  | 1.91 | 2.04 | 2.01 | 1.64 | 2.01  | 2.22 | 2.41 | 2.06 | 1.78 |
| High school                            | 2.28 | 2.30 | 2.34 | 2.03 | 1.83 | 1.68  | 2.06 | 1.99 | 1.81 | 1.87 | 2.18  | 2.30 | 2.25 | 2.11 | 1.79 | 2.68  | 2.22 | 2.58 | 2.02 | 1.90 |
| College & higher                       | 2.11 | 2.27 | 2.18 | 2.18 | 1.74 | 2.30  | 2.07 | 1.80 | 1.82 | 1.75 | 1.81  | 2.20 | 2.05 | 2.07 | 1.68 | 2.16  | 2.43 | 2.44 | 2.27 | 1.75 |

\*Note: All values are adjusted by spatial, temporal price indexes and weighted by sample weights.

Source: VLSS 1993, VLSS1998, VHLSS2002, VHLSS2004 and VHLSS2006, own calculations.



## Appendix 2.5 Variable definitions

| VARIABLES                    | Variable Definition                                                  |
|------------------------------|----------------------------------------------------------------------|
| Ln(RPCEXP)                   | Natural log of real per capita expenditure                           |
| <b>Household head:</b>       |                                                                      |
| Male                         | = 1 if Male, = 0 if Female                                           |
| Minority                     | = 1 if <i>minority ethnic</i> , = 0 if majority <sup>37</sup>        |
| Married                      | = 1 if <i>married</i> , = 0 if single                                |
| Experience                   | = <i>age-schyear-6</i>                                               |
| Experience square            | Exp square/100                                                       |
| School year                  | <i>Years of schooling</i> of the more educated head or spouse        |
| Old                          | = 1 if household head is at <i>retired age</i>                       |
| Not working                  | = 1 if household head in <i>working age</i> but not working          |
| Private                      | = 1 if household head working in <i>private sector</i> <sup>38</sup> |
| Public servant               | = 1 if household head working as <i>public servant</i> <sup>39</sup> |
| SOE                          | = 1 if household head working in <i>state owned enterprises</i>      |
| Self-employed                | = 1 if household head working as <i>self-employed</i>                |
| Agriculture                  | = 1 if household head working in <i>agriculture</i>                  |
| Manufacturing                | = 1 if household head working in <i>manufacturing</i>                |
| Service                      | = 1 if household head is working in <i>service sector</i>            |
| <b>Household demography:</b> |                                                                      |
| Household size               | Number of people in the household                                    |
| Proportion of children       | The proportion of children aged <i>under 15</i>                      |
| Proportion of labourers      | The proportion of people <i>from 15 to retired age</i>               |
| Proportion of old people     | The proportion of people <i>from retired age &amp; over</i>          |
| <b>Remittances:</b>          |                                                                      |
| Domestic remittance          | The amount of <i>per capita domestic remittance</i>                  |
| Foreign remittance           | The amount of <i>per capita foreign remittance</i>                   |
| <b>Regions:</b>              |                                                                      |
| Northern Upland              | = 1 if living in the <i>Northern Uplands</i>                         |
| Red River Delta              | = 1 if living in the <i>Red River Delta</i>                          |
| North Central Coast          | = 1 if living in the <i>North Central Coast</i>                      |
| South Central Coast          | = 1 if living in the <i>South Central Coast</i>                      |
| Central Highlands            | = 1 if living in the <i>Central Highlands</i>                        |
| South East                   | = 1 if living in the <i>South East</i>                               |
| Mekong River Delta           | = 1 if living in the <i>Mekong River Delta</i>                       |

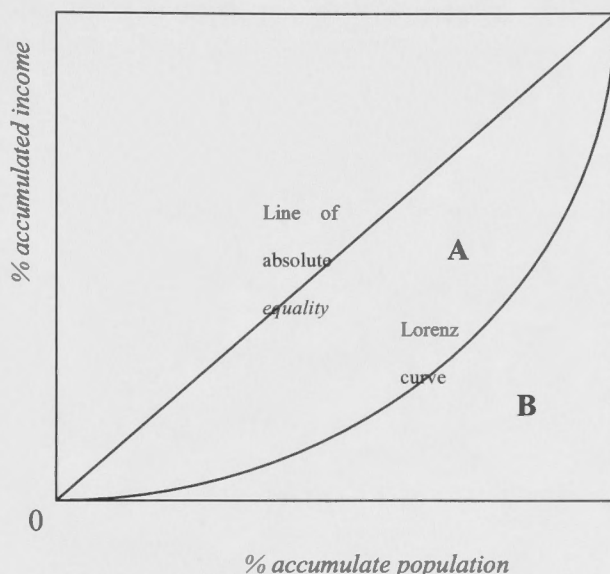
<sup>37</sup> Vietnam has 54 ethnic groups; the Kinh group is the majority one.

<sup>38</sup> Private sector includes those who work for private companies, foreign investment sectors, collectives or other households and being paid

<sup>39</sup> Public servants are those who work for the government, the communist party or social organizations.

## Appendix 2.6 Lorenz curve and Gini index

If we draw the percentage of population on the horizontal axis, arranging from the poorest to the richest and the percentage of income enjoyed by the bottom x% of the population on the vertical axis, then we have a Lorenz curve which reflects the distribution of income in the population. An example of a Lorenz curve is:



Clearly, at the origin, zero percent of population enjoys zero percent income. At the other end, 100% population enjoyed all income. If income is equally distributed among individuals, the Lorenz curve will be the 45 degree line. Any actual Lorenz curve must lie on the right hand side of the diagonal and its slope will increase as we move to the richer sections of the population.

From the Lorenz curve, the Gini coefficient is ratio of the areas between the line of absolute equality and the Lorenz curve:

$$G = \frac{\text{Area}(A)}{\text{Area}(A+B)} \quad (\text{A2.1})$$

It is calculated as the as:

$$G = \frac{1}{2n^2\bar{y}} \sum_{i=1}^n \sum_{j=1}^n (y_i - y_j) \tag{A2.2}$$

where  $y_i$  and  $y_j$  is income of individual ‘i’ and ‘j’. The value of Gini coefficient ranges from 0 to 1. A higher value of Gini coefficient illustrates a more unequal distribution.

## Appendix 2.7 Theil coefficient & its decomposition

The Theil coefficient is calculated as:

$$T = \sum_{i=1}^n s_i \log(ns_i) \quad (\text{A2.3})$$

where  $s_i = \frac{y_i}{n\bar{y}}$  is the income share of individual 'i'.

Theil coefficient can also be written as:

$$T = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right) \quad (\text{A2.4})$$

Both Gini and Theil coefficients have the basic characteristics of a good inequality measure such as, mean independence, population size independence, symmetry, and Pigou-Dalton Transfer sensitivity. However, the advantage of the Theil measure over Gini is that it is not only satisfied the Pigou-Dalton principle of transfers but also satisfies the “strong principle of transfer”.<sup>40</sup> Being in a class of the Generalized Entropy Measures, the Theil coefficient is additively decomposable into inequality between groups and within group as:

$$T = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right) = \underbrace{\sum_{j=1}^J \left( \frac{Y_j}{Y} \right) T_j}_{WT} + \underbrace{\sum_{j=1}^J \left( \frac{Y_j}{Y} \right) \ln \left( \frac{Y_j}{\frac{Y}{N_j}} \right)}_{BT} \quad (\text{A2.5})$$

---

<sup>40</sup> *Mean independent* implies that if all incomes were doubled, the measure would not change.

*Population size independence* implies that if the population were to change, the measure of inequality would not change, ceteris paribus.

*Symmetry* implies that if you and I swap incomes, there should be no change in the measure of inequality.

*The Pigou-Dalton principle of transfer* implies that the transfer of income from the rich to the poor reduces measured inequality.

*Strong principle of transfer* implies that the measure of inequality is more sensitive to transfer of income in lower tail of distribution than in upper tail. See Sen (1997) for more details.

where:  $J$  is number of groups,  $Y_j$  is total income of all people in group  $j$ ;  $Y$  is total income of all people in the sample;  $T_j$  is Theil coefficient of group  $j$ ;  $N_j$  is number of people in group  $j$ ;  $N$  is number of people in the sample;  $WT$  and  $BT$  are inequality within and between groups, respectively.



## **Appendix 2.8 Data notes**

In our estimation model, we use  $\ln(\text{RPCEXP})$  as dependent variable. The missing values for  $\ln(\text{RPCEXP})$  in each years are given in footnote 5. Our sets of independent variables are characteristics of the household head, household demography, per capita remittances and regions.

Regarding our independent variables, there are no missing values for the following variables: male, minority ethnic, married, household size, proportion of children, proportion of labourers, proportion of old people, remittance and regions. Years of schooling of the more educated household head are calculated as the maximum years of schooling of the head or head's spouse.

In 1993, we calculate years of schooling from the information on highest grade completed (s2q06), the period of time being trained (s2q11y & s2q11m) and the highest diploma or degree obtained (s2q08) from files: Scr008.dta, Scr009.dta. For those who report (s2q05=2: never attend school), we set years of schooling=0. There is no missing value for school year.

In 1998, years of schooling are calculated from the information on current schooling, previous schooling, the training time & the time repeated school. These are in s2aq04, s2aq06, s2aq11, s2aq12, s2aq15, s2aq16, s2aq19, s2aq20, s2bq01, s2bq07, s2bq11, s2cq03, s2cq05 and s2cq07, s2eq06, s2eq12y and s2eq12m of files: Scr02b.dta, Scr02c.dta and Scr02e.dta. However, we make an approximation of schooling years for those who have missing values but report the school they last attended, as follows:

replace schyear =5 if schyear=. & s2aq04=3 (if they attend lower secondary school, they must finish primary school-class 5, so their minimum school year is 5 even they have missing value of school year in previous calculation).

replace schyear=9 if schyear=. & s2aq04=4 | s2aq04=5 (if they attend upper secondary school or vocational training, they must finish lower secondary school-class9, so their minimum school year is 9).

replace schyear=12 if schyear==. & s2aq04==6 ((if they attend university, they must finish upper secondary school-class12, so their minimum school year is 12).

By doing so, there are no missing values for schooling years.

For 2002, 2004: years of schooling is calculated from the grade finished (m2c1), the highest degree obtained (m2c3) in files: muc2.dta, and m1\_2\_3a.dta, respectively. There is no missing value on school year.

For 2006: the calculation is the same as in 2002 & 2004. Years of schooling are calculated from the grade finished (m2ac1) and the highest degree obtained (m2ac3a) in file muc2a.dta. There is no missing value on school year.

Variables reflecting the household head's employment status, sectors and industry of working are identified as categorical variables. First we divide the sample into groups of head old, head not working and head working. Among those who are working, we identify their sectors and industry of working. By doing so, we avoid the problem of missing values of industry & sector of the head because most missing values of household head's sectors & industry of working occurs in the group of old household head.

### 3 The Gender Wage Gap in the Vietnamese Transition, 1993 – 2008

**Abstract:** This paper uses data from the Vietnam Living Standard Surveys to examine wages and the gender wage gap between 1993 and 2008. During this period of accelerated transition and international integration, real wages of Vietnamese workers have doubled and the gender wage gap has declined by 58%. A Blinder-Oaxaca type decomposition for unconditional quantile regressions (Firpo et al., 2009) is employed to isolate factors contributing to the gender wage gap across the whole wage distribution at different points in time. The results suggest that the major part of the gender wage gap attributes to gender differences in the return to observed characteristics and to unobserved factors, also known as the ‘unexplained gap’ or ‘discrimination’. Wage growth is partly explained by changes in average characteristics but is mainly due to increasing returns.

**JEL classification:** J31; J71; P20; C13.

**Keywords:** Gender wage gap; Vietnam; transition; unconditional quantile regression; Oaxaca decomposition.

### **3.1 Introduction**

Over the last 25 years, Vietnam has made a remarkable transition from a centrally planned subsidy economy to an open market economy. The country has experienced strong economic growth, substantial improvements in living standards and one of the greatest reductions in poverty in the world.<sup>41</sup> The transition away from a centrally planned economy and the concurrent strong economic growth, have both triggered enormous changes in the functioning of the Vietnamese labour market. Although it seems likely that these changes have had different effects on the labour market success of men and women, very little is known about gender differences in the Vietnamese labour market. Against this background, this paper aims to fill a void in the economic literature by investigating the gender wage gap during the Vietnamese transition, using data from the Vietnam Living Standard Surveys (VLSS).

Studies on gender differences in labour market outcomes provide rather mixed results. While empirical evidence suggests that women may have benefitted from the transition in Eastern Europe, the transition process in Russia and Ukraine has made women more vulnerable. Specifically, studies by Brainerd (2000), Jolliffe (2002), Jolliffe et al. (2005), Keane et al. (2006) and Newell et al. (2007) have consistently found that relative wages of female workers have improved significantly and discrimination declined remarkably in most Eastern European countries during the

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<sup>41</sup> Since the start of the transition in 1986, the average annual growth rate of Vietnam has been nearly 7%. Once one of the poorest countries in the world, by 2010 Vietnam had progressed to being a middle income country. The national poverty rate also reduced remarkably from 75% in 1988 to 37% in 1998 and 14% in 2008 (Pincus, 2008 and Rama, 2010)

transition process.<sup>42</sup> In contrast, a substantial decline in women's relative wage was found during transition in Russia and Ukraine (Brainerd, 1998; Brainerd, 2000; Ganguli, 2006). The existing evidence for China is also mixed. While Maurer-Fazio et al. (2002) and Chi et al. (2008) find that the wage gap in urban China increased over the course of the reform, Meng (1998) finds that the marketisation helped to reduce the gender wage discrimination in the newly developed rural industrial sector.

Due to the changes that took place since 1986, Vietnam is an interesting country on which to base a study of the gender wage gap. Empirical evidence on the gender wage gap in Vietnam is rather scarce. Liu (2004) uses data from the first two waves of the VLSSs and finds that the gender wage gap in Vietnam declined significantly between 1993 and 1998. Interestingly, most of the reductions in the gender wage gap come from improvements in observed characteristics. Pham and Reilly (2007) examine the Vietnamese gender wage gap along the wage distribution using quantile regression analysis, and extend the studied period to 2002. They also find a reduction in the gender wage gap during the period 1993 to 2002, with most of the decline occurring in the initial period from 1993 to 1998. Along the distribution, the narrowing of the gender wage gap occurs at most points of the wage distribution and is greatest at the top of the distribution. The treatment effect is stable across the distribution. Interestingly, little evidence of a glass-ceiling effect is detected in the Vietnamese gender wage gap.<sup>43</sup>

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<sup>42</sup> For example, during the transition period from 1986 to 1992, relative wages of female workers increased from 71% to 77% in Slovakia (Brainerd, 2000), from 72% to 81% in Poland (Newell et al., 2007) and from 64% to 79% in Hungary (Jolliffe et al., 2005).

<sup>43</sup> Booth et al. (2003) defined "glass-ceiling" as the phenomenon when the gender wage gap is wider at the top of the distribution. The opposite phenomenon when the gender wage gap is wider at the bottom of the distribution is called "sticky-floor".



This paper contributes to the economic literature in two important ways. First, a new method of unconditional quantile regressions (Firpo et al., 2009) is employed to examine the determinants of male and female hourly wages at selected quantiles along the distribution. The advantage of the unconditional quantile regression over the traditional conditional quantile regression of Koenker and Bassett (1978) is that its estimated coefficients are explained as the impact of changes in the distribution of explanatory variables on the quantiles of the unconditional marginal distribution of the dependent variable. Therefore, the Blinder-Oaxaca type decomposition can be applied directly to the estimation results of the unconditional quantile regression in order to isolate the contribution of returns and characteristics from each explanatory variable without having to do as many simulations as required by the quantile regression-based decomposition method. The second contribution is the examination of the gender wage gap for a 15-year period from 1993 up to 2008.

The findings suggest that in Vietnam women could benefit from the remarkable increase in real wages relative to men as the economy has become more marketized and integrated into the world. Between 1993 and 2008, the average gender wage gap declined by 58%. The gender wage gap increased in the lower part of the distribution but decreased in the upper part. I find no evidence of glass-ceiling effects in the Vietnamese labour market. In 2008, the last year of the observed transition period, there is evidence of sticky-floors. The phenomenon of sticky-floors in the Vietnamese gender wage gap is similar to China, as shown by Chi et al. (2008). Most of the gender wage gaps comes from gender differences in the returns to characteristics and other factors not captured by the model, also known as the ‘unexplained gap’ or ‘discrimination’. Improvements in average characteristics of Vietnamese women relative to men play an

important role in narrowing the average gender wage gap. The observed wage growth is partly explained by changes in average characteristics but mainly due to increasing returns.

The remainder of the paper is structured as follows. Section 2 summarizes possible channels which are likely to affect the gender wage gap in Vietnam during its transition. Section 3 describes the data and the changes in wages and labour force participation of men and women. Section 4 presents the empirical strategy and discusses the regression results. Section 5 provides the framework of the Oaxaca decomposition method with application to the Firpo et al. (2009) unconditional quantile regression and presents the decomposition results. Section 6 concludes.

### **3.2 Gender differences in the Vietnamese labour market**

There are many reasons why wages are different for male and female workers in the labour market. Labour economists group these into three categories: (i) differences in productivity-related characteristics that men and women bring to their jobs, (ii) differences in characteristics of the jobs in which men and women work and (iii) discrimination by employers or co-workers.<sup>44</sup> Internationally, the gender difference in pay is an interesting problem. It is of particular importance in transitional countries, where the changes in political and economic structure resulted in significant changes in the performance of the labour market. In this respect, Vietnam is an excellent example for the analysis of the gender wage gap.

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<sup>44</sup> See Becker (1985), Blau and Kahn (1992), Gregory and Borland (1999), Booth et al. (2003), Breunig and Rospabe (2007), Cobb Clark and Tan (2009), Baron and Cobb Clark (2010) for further discussions.

During its long period as a centrally planned economy, Vietnam did not have a ‘labour market’ in the sense of market-determined employment and payment. Employment was planned and assigned by the government, the only employer in the economy. Once taken, employment was for life (ADB, 2006). The non-existence of competition in the labour market and the egalitarian distribution mechanism provided no incentive for people to work hard or to be innovative. By the end of the period (in 1985) Vietnam was one of the poorest countries in the world.

The country’s transition and accelerated integration into the world economy appears to have created opportunities and challenges which have had different effects on the labour market success of men and women.<sup>45</sup> On one hand, the elimination of the centrally determined wage system may have contributed to a widening gender wage gap. The state-owned enterprises (SOE) restructuring in the late 1980s and early 1990s resulted in a large number of workers losing their jobs - about two third of the laid-off workers were women (Bales and Rama, 2002; Dollar and Litvack, 1998). The shrinking of the state sector also reduced a variety of support services and job guarantees, such as generous maternity benefits, extensive provision of childcare centers, flexible working hours, higher job security, lower effort levels and a more generous old-age pension regime. These services were particularly relevant for female workers. Due to the strong social protection of the SOE, female workers were vulnerable to the massive downsizing of the state sector (Pham and Reilly, 2007). In addition, between 1988 and

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<sup>45</sup> Vietnam resumed relations with the International Monetary Fund and the World Bank in 1992, established political normalization with the United States in 1994, became a member of the Association of Southeast Asian Nations (ASEAN) in 1995, ASEAN Free Trade Area (AFTA) in 1996, Asia-Pacific Economic Cooperation (APEC) in 1998, signed the Bilateral Trade Agreement with the US in 2000, and joined the World Trade Organization in 2006.

1992 about a half million soldiers were demobilized and returned to the civilian labour force (Dollar, 1994; Adams, 2002). This phenomenon created employment pressure and also the potential for the development of both the formal and informal private sectors.

On the other hand, Vietnam's shift from its centrally planned and self-reliance economy to a market-oriented economy along with exposure to international markets is likely to offer better prospects for women. For example, the development of newly emerged export-oriented light industries is more likely to create jobs for women (Rama, 2001).<sup>46</sup>

In order to regulate the newly emerged labour relations in transition and to protect women, Vietnam improved its legal framework significantly. The Vietnamese labour code, first issued in 1994 and amended two times in 2002 and 2006, includes a separate chapter on provisions concerning female workers ("Chapter X"). According to this regulation, female workers are entitled to four to six months of maternity leave (article 114). During the period of maternity leave, female workers who have paid social insurance contributions are entitled to social security benefits equivalent to 100% of their wage and to an additional allowance of one month's wage for the first and second maternity period (article 144). Employers are not allowed to dismiss or terminate the employment contract of female workers unilaterally because of marriage, pregnancy, maternity leave or breast-feeding a child under 12 months of age, except in cases where the enterprise ceases its activities (article 111). With these regulations, the employment of female workers produces extra costs and therefore it seems likely that employers would prefer to employ male workers (Pham and Reilly, 2007). As a result, there might

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<sup>46</sup> The share of light industrial and handicraft of Vietnam's total export value increased from 20% in 1995 to 46% in 2008 (GSO, 2010).

be discrimination against females by employers, and consequently a potential for widening the gender wage gap.

From the country's demographic characteristics, it can be seen that Vietnamese women have been over-represented in the country's population as consequences of the Vietnam War and because of higher life expectancy of women compared to men. In addition, Vietnam had a big jump in its birth rate after the Vietnam War in 1975. As a result, there was a remarkable increase in the number of young people entering the labour force during the period between the late 1990s and early 2000s.<sup>47</sup> This phenomenon created a strong competitive pressure for the youth in the labour market. Given the above channels, it is uncertain whether Vietnamese women have lost or gained from the country's transition and international market integration.

### **3.3 Data and descriptive statistics**

#### **3.3.1 Data**

The empirical analysis uses data from six waves of the Vietnam Living Standard Surveys. The first two waves were undertaken in 1992/1993 and 1997/1998, called VLSS-1993 and VLSS-1998 respectively. The next four waves were undertaken biennially between 2002 and 2008, and called VHLSS-2002, VHLSS-2004, VHLSS-2006 and VHLSS-2008. These are nationally representative surveys conducted by Vietnam's General Statistics Office with technical assistance from the World Bank. Although the subsequent VHLSS questionnaires were simplified compared to the first

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<sup>47</sup> The annual number of new entrants to the Vietnamese labour market during this period is about 1.6 million. Vietnam is ranked among the countries with the highest labour force expansion in the ASEAN region, only behind Indonesia and the Philippines. It is predicted that the Vietnamese labour force will continue to expand until 2015. See MOLISA-Vietnam and ILO (2010) for further details.



two waves of VLSS, the questionnaire design in both is based on the Living Standard Measurement Surveys of the World Bank. In each wave, the survey contains detailed and comparable information on an individual's human capital and current labour market activity. There are panel samples between the first two waves - VLSS 1993 and 1998 and also panel samples among the last four waves VHLSS 2002, 2004, 2006 and 2008. However, households are not re-interviewed between the VLSS and the VHLSS. For the purpose of observing the whole period and making the observed sample nationally representative, all waves are analyzed in separate cross-sections.

To give an overall picture of the labour force behavior of male and female workers in Vietnam between 1993 and 2008, all six waves are considered initially. The remaining analysis focuses on the year of the earliest survey (VLSS-1993) and the year of the most recent available survey (VHLSS-2008) to examine contributing factors of the gender wage gap and how these change over time. I also perform a separate analysis of the factors that contribute to wage increase for men and women between 1993 and 2008.

The observed wage sample includes those who are in the labour force (aged between 15 and 55 years) working and whose main job in the last 12 months was as in paid employments.<sup>48</sup>

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<sup>48</sup> Article 6 of the Vietnamese Labour Code (1994) regulates that employees are persons who are at least 15 years old, able to work and who have a labour contract. The current retirement age in Vietnam is 60 years for men and 55 years for women. To allow comparisons between the two groups, we restrict the sample to men and women below 55 years.

### **3.3.2 Changes in labour force participations and wages of men and women, 1993 to 2008**

Figure 3.1 and 3.2 present the overall labour force participation (LFP) rates, and the rates segregated by gender, between 1993 and 2008. It can be seen that the overall LFP rates declined steadily over the studied period from 88.2% in 1993 to 79.5% in 2008. When the data is segregated by gender, I see that the LFP rate of Vietnamese women is just slightly lower than that of men. As the economy becomes more market-oriented, the overall LFP rate declines. The LFP rate of women declines more rapidly from 86.7% in 1993 to 77.7% in 2008. Even with a rate of 77.7% in 2008, the female LFP rate is still much higher than the female LFP rate of other countries in the region. For example, according to the ILO (2010), the female LFP rate in 2008 was 69% in China, 57% in Bangladesh, 50% in the Philippines, 49% in Indonesia, 48% in Korea, 45% in Malaysia, 45% in Japan, 34% in India and 22% in Pakistan.

[Figure 3.1 and 3.2 about here]

Figure 3.3 presents the reasons for non-labour force participation. In 1993, 30% of those who are in the labour ages but not working are disabled or ill. The rate decreased to 15% in 1998 and to around 7% in 2008. One reasonable explanation for this trend is that in 2008 people who became invalided during the Vietnam War have reached retirement age.

Another interesting trend is that the proportion of those who are not employed because they are studying increases steadily over time, from 46% in 1993 to 59% in 1998, 62% in 2002 and 70% in 2008. These numbers reflect that, in the transformed Vietnamese labour market, people tend to invest more in education to catch up with new

skill requirements. Moreover, the proportion of male students is higher than the proportion of female students. The proportion of women who are doing house duties is around 30% in 1993 and 25% in 2008, while the corresponding proportions of men are only 2% in 1993 and 3% in 2008, respectively.

[Figure 3.3 about here]

### ***Daily working hours***

The average daily working hours of wage workers increased from 7.7 hours in 1993 to 8.1 hours in 2008. Segregated by gender, average male workers in 1993 worked 0.5 hours a day longer than female workers. The gap decreases to 0.2 hours a day in 2008 due to the increase in average daily working hours of female workers over the studied period.

[Figure 3.4 about here]

It seems likely that Vietnamese women could have benefitted from the transition in many ways. For example, the availability of goods and services saves women many hours of queuing for food to feed the family, allowing them to have more time to participate in the labour market, care for their children and relax. In this aspect, Vietnamese women could have benefitted in the same way as women in other transitional economies (see Brainerd, 2000).

In the observed wage sample, women spent on average more than 2 hours a day in doing housework between 1993 and 2008. About 40% of Vietnamese men report that they do not do any housework. For those who report doing housework, the average daily they spend are about 1.5, which is still lower than that of women.

[Figure 3.5 about here]

### ***Wage employment***

Table 3.1 shows the evolution of the proportion of wage employment from 1993 to 2008. In 1993, around 17% of working people are wage employed in their main job. Over time, as the economy becomes more marketized, the private sectors are recognized and encouraged to develop, and the Vietnamese labour market becomes more formalized. Consequently, the informal sector shrinks and the proportion of wage employment increases to 20% in 1998, 28% in 2002 and nearly 30% in 2008.<sup>49</sup> In each year, the proportion of men in paid employment is higher than that of women. Over the period, the proportion of men in paid employment also increases faster than that of women. For example, over a 15-year period, the share of wage employment increases by 15% for men but only 10% for women. As a result, at the end of the observed period, in 2008, there are 35% of men but only 24% of women in wage employment. The fact is that labourers in wage employment are protected through the labour regulations. They receive benefits such as: health care, maternity leave and employer contributions to the social insurance fund for their old age pension. A vast majority of the predominantly female Vietnamese labour force is self-employed. Their incomes are seasonal and their jobs are not protected by labour regulations.<sup>50</sup> The analysis of these workers is beyond the scope of this study.

[Table 3.1 about here]

### ***Distribution of wages***

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<sup>49</sup> In the sample, there are some people who report a work wage but do not spend most of their work time in paid employment. If I include these people in the wage sample, the percentage of those in paid employment is 17% in 1993, 20% in 1998, 30% in 2002 and 34% in 2008.

<sup>50</sup> See Coxhead et al. (2009) and Vietnam's MOLISA and ILO (2010)

Table 3.2 shows wage levels at the mean and at selected quantiles in 1993 and 2008. It can be seen that average real wages of Vietnamese workers have doubled over the 15-year period. At the mean, the wage increase is higher for women than for men. Along the distribution, the rate of wage increase is highest in the bottom 10<sup>th</sup> percentile of the wage distribution.

[Table 3.2 about here]

Figure 3.6 further illustrates the wage distribution by gender.<sup>51</sup> There are some interesting points to note. First, in both years - 1993 and 2008 - the male wage density often lies to the right of the female one, indicating that male wages are higher than female wages at almost all points of the distribution. Second, from 1993 to 2008, the wage distribution of both men and women becomes more and more concentrated, suggesting that the wage distribution becomes more equal within groups of male and female wage earners. This is consistent with the evolution of the ratio of the wages of the 90<sup>th</sup> percentile over those of the 10<sup>th</sup> percentile seen in Table 3.2, and the wage inequality indexes. For example, the wage at the 90<sup>th</sup> percentile is more than six times the wage at the 10<sup>th</sup> percentile in 1993. This factor declines to about four times for men and five times for women in 2008. The Gini coefficient also decreases from 0.44 in 1993 to 0.37 in 2008. By gender, the Gini coefficient of women decreases from 0.44 in 1993 to 0.40 in 2008. The Gini coefficient of men decreases even more, from 0.43 in 1993 to 0.35 in 2008.

[Figure 3.6 about here]

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<sup>51</sup> The estimation is based on the natural log of wage using a Gaussian kernel density with a common bandwidth of 0.1.



### ***The gender wage gap***

It can also be seen from Table 3.2 that average male workers in 1993 receive 24% higher wages than average female workers. The rate decreases by more than half to 10% in 2008. Along the distribution, the gender wage gap evolves differently. While the gender wage gap increases at the bottom of the distribution, it decreases in the middle and at the top of the distribution. For example, at the 10<sup>th</sup> percentile the gender wage gap increases by 84% but at the 50<sup>th</sup> and the 90<sup>th</sup> percentile, the gender wage gap decreases by 29% and 96%, respectively.

Figure 3.7 illustrates more clearly the evolution of the gender wage gap along the distribution in 1993 and 2008. The gap increased significantly from the bottom up to the 19<sup>th</sup> percentile. The gap decreased from the 20<sup>th</sup> percentile to the 25<sup>th</sup> percentile. The gap is rather stable from the 26<sup>th</sup> to the 39<sup>th</sup> percentile. Then from the 40<sup>th</sup> percentile to the upper half of the distribution, the gap decreases remarkably.

[Figure 3.7 about here]

### **3.3.3 Variable descriptions**

#### ***The dependent variable***

The dependent variable is the natural log of the real hourly wage. The calculated hourly wage includes the basic wage and all other in cash and in kind payments such as lunch, extra pay for working overtime, responsibility for working in hazardous conditions, other bonuses, allowances, honoraria or holidays. I take the log to reduce heteroskedasticity. The coefficients from the estimation give the percentage change in hourly wage in response to a unit change in the explanatory variable.

### ***The explanatory variable***

The paper exploits the rich and comparable information across two waves of the VLSS-1993 and the VHLSS-2008 to construct a set of explanatory variables reflecting detailed information on an individual's human capital and current labour market activity. For example, I include variables reflecting an individual's years of schooling and a quadratic function for potential labour market experience.<sup>52</sup> In addition to human capital, variables on the other demographic characteristics are also included, such as an ethnicity dummy to identify whether an individual belongs to the minority group and a dummy variable indicating an individual's marital status. To control for heterogeneity of job characteristics, I include two dummies indicating the industry (manufacturing-service-agriculture) and two dummies denoting sectors of employment (Public servant-SOE-Private enterprises). I also include an urban dummy indicating if an individual lives in an urban area. Finally, I include six dummy variables to control for regional differences.

Variable descriptions and summary statistics are presented in Table 3.3. Over the period from 1993 to 2008, education increased for both men and women. However, education increased faster for female than for male workers. Average years of schooling increased by 1.2 and 1.8 years for men and women, respectively. In both years, female workers are better educated than male workers and the gap increases over time. The higher levels of education of female over male workers observed in the Vietnamese wage sample is similar to the phenomenon observed in developed countries as shown in studies of Brainerd (2000), Arulampalam, Booth and Bryan (2007). However, people in

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<sup>52</sup> Potential labour market experience is calculated as age minus years of schooling minus six. Six is the age that children start going to school.

paid employment constitute a highly educated group in Vietnamese society. In contrast, self-employed households in rural areas still exhibit a gender bias with regard to educational investments which favor sons over daughters. As a result, the educational attainment of females is expected to be much lower than that of males (International Labour Organization, 2008).

### 3.4 Estimation methods, model specification and estimation results

#### 3.4.1 Estimation methods

The descriptive statistics show that the mean wage is always higher than the median, that the shape of the wage distribution is right skewed, and that it contains extreme values. These characteristics of the data suggest that the use of OLS to examine the expenditure at mean is not sufficient; an evaluation of the determinants of expenditure at different points in the distribution is needed. This can be achieved either by using a commonly used (*conditional*) *quantile regression*, as introduced by Koenker and Bassett (1978), or a new *unconditional quantile regression* method developed by Firpo, Fortin and Lemieux (2009).

In this paper I use the newly developed unconditional quantile regression method because of its advantage over the traditional (conditional) quantile regression method in evaluating the impact of changes in the distribution of explanatory variables on the *unconditional marginal distribution* of the outcome variable. Technically, the new unconditional quantile regression method proposed by Firpo et al. (2009) consists of running a regression of the estimated *re-centered influence function* (RIF) at a given statistic of interest on a set of explanatory variables. The RIF is the sum of the *value function* and the *influence function*.

The influence function is the first derivative of an estimator. For example, let  $T$  be the value function and  $F$  be the probability for which  $T$  is defined. Then a slight perturbation of  $F$  by a point mass at  $y$  is the mixture model from which an observation has probability  $(1 - \varepsilon)$  of being generated by  $F$  and probability  $(\varepsilon)$  of being an arbitrary value  $\delta_y$  is written as:

$$F_\varepsilon(y) = (1 - \varepsilon).F + \varepsilon.\delta_y \quad (3.1)$$

Then the influence function of an estimator  $T$  with probability distribution  $F$  at point  $y$  is:

$$IF_{T,F}(y) = \lim_{\varepsilon \rightarrow 0} \frac{\{T[F_\varepsilon(y)] - T[F(y)]\}}{\varepsilon} = \lim_{\varepsilon \rightarrow 0} \frac{\{T[(1-\varepsilon).F + \varepsilon.\delta_y] - T(F)\}}{\varepsilon} \quad (3.2)$$

Given the influence function, the re-centered influence function of an estimator  $T$  with probability distribution  $F$  at point  $y$  is:

$$RIF(y) = T[F(y)] + IF_{T,F}(y) \quad (3.3)$$

Following the definition, the RIF of a given  $\tau^{th}$  quantile, is:

$$RIF(y; q_\tau) = q_\tau + IF(y; q_\tau) = q_\tau + \frac{\tau - 1\{y \leq q_\tau\}}{f_Y(q_\tau)} \quad (3.4)$$

where  $1\{y \leq q_\tau\}$  indicates the dummy variable for whether the value of  $y$  is below  $q_\tau$ ;  $f_Y(q_\tau)$  is the density of  $Y$  evaluated at  $q_\tau$ .

The Firpo, Fortin and Lemieux (2009)'s new method of unconditional quantile regression can be done through one of three estimation techniques: OLS (called RIF-OLS), logistic (called RIF-logit) or non parametric (called RIF-nonparametric).<sup>53</sup> For simplicity, in this application I use the RIF-OLS. Consistent estimates of this method is

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<sup>53</sup> Firpo et al. (2009) shows that the three estimation techniques give similar estimation results

obtained under the assumption that:  $Pr[Y > q_\tau | X = x]$  is linear in  $x$ . The estimation of RIF-OLS is similar to OLS:

$$\widehat{\beta}_\tau = (X'X)^{-1}X'\widehat{RIF}(Y, \hat{q}_\tau) \quad (3.5)$$

The only difference is the replacement of the estimated values of RIF at a given quantile as a new dependent variable. If our statistic of interest is the mean, then the estimation of RIF-OLS for the mean becomes exactly OLS.<sup>54</sup>

The estimation of RIF at a given  $\tau^{th}$  quantile involves two estimated components (see equation 4). The first component:  $\hat{q}_\tau$  - the  $\tau^{th}$  population quantile - is estimated as in Koenker and Bassett (1978). The second component:  $\hat{f}_Y(\hat{q}_\tau)$  is density estimator of  $Y$  at point  $\hat{q}_\tau$  - is estimated using the kernel density:

$$\hat{f}_Y(\hat{q}_\tau) = \frac{1}{N.b} \cdot \sum_{i=1}^N K_Y\left(\frac{Y_i - \hat{q}_\tau}{b}\right) \quad (3.6)$$

where:  $K_Y(z)$  is the Gaussian kernel and  $b$  is the bandwidth.<sup>55</sup>

### 3.4.2 Model specifications and estimation results

In this section, I investigate how the wage determination differs between men and women at the mean and at various quantiles of the wage distribution. I do this by estimating a series of OLS and unconditional quantile regressions for the pooled male and female sample of the form:

$$Y_i = \alpha + \beta X_i + \gamma M_i + \delta M_i * X_i + \varepsilon_i \quad (3.7)$$

<sup>54</sup> See Firpo et al. (2009) for further discussions. Other applications of the new unconditional quantile regression method, for example, are Chi et al. (2008); Kassenbohmer and Sinning (2010).

<sup>55</sup> Other methods of density estimation can be applied.



where:  $Y_i$  is the natural log of the hourly wage of individual  $i$ ,  $M_i$  is a gender dummy,  $X_i$  is the vector of explanatory variables for individual  $i$ ,  $M_i * X_i$  is the interaction between the gender dummy and the explanatory variables. The vector of coefficients  $\beta$  are the returns to characteristics, and  $\gamma$  and  $\delta$  denote the intercept and the slope differential by gender.

To begin with, I estimate a restricted version of equation 7 that only includes the intercept, the gender dummy and a set of all explanatory variables at the mean using OLS and at selected quantiles using an unconditional quantile regression. The estimation results suggest that all the gender dummies have positive coefficients and are highly significant, implying that *ceteris paribus* male workers are significantly more than female workers.

Next, I estimate a full specification of equation 7 including the intercept, the gender dummy, the set of explanatory variables, plus the interaction terms of the gender dummy with the set of explanatory variables at the mean using OLS and at various quantiles using unconditional quantile regression. I carry out an F test for the hypothesis that all the coefficients of interaction terms are jointly significant. The test results reject the null hypothesis, suggesting that there are indeed significant differences in the return to characteristics between male and female workers.<sup>56</sup>

I then use the OLS and the unconditional quantile regression to estimate the wage determinants at the mean and at selected quantiles for males and females

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<sup>56</sup> The full regression and test results are not reported here for brevity, but are available from the author on request.

separately. The estimation results for the years 1993 and 2008 are reported in Tables 3.4 and 3.5.<sup>57</sup>

[Table 3.4 and 3.5 about here]

The values of  $R^2$  from the regression results imply that the fit of the model is higher at the mean and at the middle of the distribution than at the two tails. During the studied period, the explanatory power in wage variation of these observed productivity related characteristics has improved. This is true for workers in both sexes.

Among explanatory variables, first *education* is highly significant with a positive impact on wage. Other things being equal, having one more years of education increases a worker's wages by 3% in 1993.<sup>58</sup> Over time, the returns to education increase remarkably at the top of the distribution. As illustrated in Figure 3.8, for example, at the 90th percentile, the returns to education double for females and increase up to five times for males. This increase is consistent with the results found in other transitional economies.

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<sup>57</sup> Wages are only observed for those people in paid employment who account for around 17% of Vietnamese workers in 1993 and 30% of workers in 2008. Wage workers might be a selective group. People in paid employment could be different from others. For example, they could be more talented or from a better family background with a better social network. Following Heckman (1979), we estimated a sample selection model. The exclusion restrictions for the wage participation equation are the dependency ratio, daily hours of doing housework, per capita cultivated land area, non-labour income and the number of people in paid employment in the household. The estimation results show that the sample selections are not statistically significant, suggesting that either the exclusion restrictions are weak or that the wage samples are already a random subset of the overall population of workers. To ensure comparability, all estimations and decompositions are carried out without sample selection (see Appendix Table A1).

<sup>58</sup> From the estimated coefficient, this percentage is calculated as:  $100(e^{\hat{\beta}} - 1)$  with  $e \cong 2.718$ .

Second, consider *general experience*. This variable has no significant effect on wages in 1993 but is significantly positive in 2008. Moreover, in 2008, experience squared is significantly negative, confirming a wage increase at a declining rate, as suggested by the theory.

Third, consider *sectors*. Women working as *public servants* received significantly higher wages than comparable female workers in the *private sector*. This is true for all years. For example, in 1993 average female workers in the public sector earn 22% more than female workers in the private sector. This finding is consistent with those findings of Bales and Rama (2002). Along the distribution, the rate is 45%, 21% and 5% at the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles, respectively. Over the period 1993-2008, the wage premium for female public servants increases remarkably. In 2008, average female public servants receive 54% higher wages than comparable female workers in the private sector. Along the distribution, the rate is 40% at the 10<sup>th</sup> and 90<sup>th</sup> percentiles and up to 65% at the median.

The result is different for male workers. In 1993, male workers in the public sector received significantly lower wages than their counterparts in the private sector. This is true both at the mean and at other points of the distribution. In contrast, in 2008 male public servants receive on average 9% higher wages than comparable male workers in the private sector.

There is almost no difference in hourly wages between comparable workers in *state-owned enterprises* and private enterprises in the initial year of the observed period. In 2008, average female workers in SOE receive 14% higher wages than those in the private sector. For male workers, at the mean and the median there is no significant difference in the hourly wage between SOE and private sector workers. At the 90<sup>th</sup>

percentile, male workers in SOE receive 17% higher wages than comparable male workers in the private sector. In contrast, at the 10<sup>th</sup> percentile, male workers in SOE receive 39% lower wages than comparable male workers in the private sector.

Fourth, consider *industries*. In 1993, average male workers in the *manufacturing* sector earn 16% more than average male workers in the *agriculture* sector. In contrast, wage differentials between industries are insignificant among female workers. Over the studied period, there is a relative decline in the returns to working in the manufacturing industry in comparison to the agriculture industry. In 2008, average male workers in the manufacturing industry earn 9% less than their counterparts in the agriculture industry, while average female workers in the manufacturing industry earn 23% less than average female workers in the agriculture industry.

A possible explanation for the deterioration in the returns to working in the manufacturing industry comes from the fact that, at the beginning of the transition period, the manufacturing industry is protected by the government. However, at the end of the observed period as the Vietnamese economy becomes more integrated into the world economy, the protection rate for the manufacturing industry decreases. For example, according to Vo (2005), while the effective protection rate of the agriculture industry increased from 7.7 to 14.7 between 1997 and 2003, the effective protection rate of the manufacturing industry declines from 121.5 in 1997 to 46.3 in 2003. Moreover, the development has been in the light manufacturing export-oriented industries, such as food processing, leather, textile and garment and these mostly employ low-skilled workers thus pay low wages.

### 3.5 Oaxaca decomposition and results

#### 3.5.1 Oaxaca decomposition

In this section, I examine the factors contributing to wage growth between 1993 and 2008 for each of two groups (men and women), along with factors contributing to the gender wage gap at two points in time (1993 and 2008) across the entire distribution. I do this by using the following variations of the Oaxaca-Blinder (1973) decomposition:

$$\hat{Y}_{g2008} - \hat{Y}_{g1993} = \underbrace{(\bar{X}_{g2008} - \bar{X}_{g1993})\hat{\beta}_g^*}_{\text{"Explained"}} + \underbrace{\left\{ \bar{X}_{g2008}(\hat{\beta}_{g2008} - \hat{\beta}_g^*) + \bar{X}_{g1993}(\hat{\beta}_g^* - \hat{\beta}_{g1993}) \right\}}_{\text{"Unexplained"}} \quad (3.8)$$

$$\hat{Y}_{mt} - \hat{Y}_{ft} = \underbrace{(\bar{X}_{mt} - \bar{X}_{ft})\hat{\beta}_t^*}_{\text{"Explained"}} + \underbrace{\left\{ \bar{X}_{mt}(\hat{\beta}_{mt} - \hat{\beta}_t^*) + \bar{X}_{ft}(\hat{\beta}_t^* - \hat{\beta}_{ft}) \right\}}_{\text{"Unexplained"}} \quad (3.9)$$

where:  $\hat{Y}$  is the natural log of hourly wages,  $\bar{X}$  is a vector of the mean observed characteristics,  $\hat{\beta}$  is a vector of the estimated coefficients in the regression model of log of hourly wages on a set of explanatory variables, including the constant,  $\hat{\beta}^*$  is a vector of the estimated coefficients from the pooled sample with other explanatory variables and a year (or gender dummy) for the wage growth (or the gender wage gap) model.<sup>59</sup>

Equation 8 decomposes the wage growth, while equation 9 decomposes the gender wage gap. In both equations, the first term on the right-hand side is the part of the

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<sup>59</sup> The reason for including the gender dummy as a group indicator in estimating the reference structure is discussed in Fortin (2008), Jann (2008). An example is that, if the average education of women is higher than that of men, then the estimated coefficient of the returns to education of the pooled sample without gender dummy will capture a part of the mean difference in education between the two groups, resulting in the estimated returns to education of the pooled sample being higher than the estimated returns to education of the male or female sample alone. This phenomenon will understate the unexplained part and overstate the explained part.



difference due to different observed productivity-related characteristics – the ‘explained part’. The second term on the right-hand side is the difference in factors other than the observed characteristics – the ‘unexplained part’, sometimes interpreted as discrimination.

In the presence of categorical variables, the results of a detailed decomposition will be sensitive to the choice of the reference group. There are some solutions to solve this problem by imposing additional restrictions to transform the estimated coefficients. However, doing so will lose the simple meaningful interpretations and preclude comparisons across years (Fortin et al., 2010). To facilitate the interpretation and ensure compatibility, I perform all decompositions with the same reference groups. The standard errors and significant levels of the single components are described by Jann (2005).

### 3.5.2 Decomposition results

#### *Contributions to wage growth from 1993 to 2008 of male and female workers*

Average wages have more than doubled over the period 1993-2008. Table 3.6 presents the decomposition results of factors contributing to the wage growth between 1993 and 2008 for female and male workers separately. The numbers suggest that the average wage increase is higher for female workers than for male workers. Over this period, real wages of female workers increased by 0.81 log points (125%) and real wages of male workers increased by 0.73 log points (108%).<sup>60</sup> Moreover the wage growth is higher at the bottom than at the top of the distribution. This is true for both male and female workers. From 1993 to 2008, wages of female workers increased by 0.88 log points

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<sup>60</sup> An increase of 0.81 log points equals a percentage of  $100(e^{0.81} - 1) = 107.5$  with  $e \cong 2.718$ .

(141%) at the 10<sup>th</sup> percentile and 0.78 log points (118%) at the median and the 90<sup>th</sup> percentile. Wages of male workers increased by 1.01 log points (175%) at the 10<sup>th</sup> percentile, 0.73 log points (108%) at the median and 0.56 log points (75%) at the 90<sup>th</sup> percentile.

[Table 3.6 about here]

For both male and female workers, wage growth comes from both the improvements in characteristics and returns. The increase in returns explains the major share. This is true for both male and female workers, both at the mean and at almost all other points of the distribution, except for the bottom 10<sup>th</sup> percentile of the female wage distribution.

Consider the contribution of some explanatory variables; here, education plays the most important role. Higher levels of education between 1993 and 2008 contribute 0.10 log points (11%) to the wage growth for women on average, while the contribution is 0.04 log points (4%) at the 10<sup>th</sup> percentile, 0.08 log points (8%) at the median and 0.19 log points (21%) at the 90<sup>th</sup> percentile. For men, the contribution of higher levels of education to the wage increase is 0.11 log points (12%) at the 90<sup>th</sup> percentile, 0.05 log points (5%) at the mean, the 10<sup>th</sup> percentile and the median. The increase in the returns to education plays a particularly important role in raising the wages of female workers. Specifically, the increase in the returns to education contributes 0.29 log points (34%) at the mean and the median, 0.26 log points (30%) at the 10<sup>th</sup> percentile and up to 0.46 log points at the 90<sup>th</sup> percentile. For male workers, while the increase in the returns to education significantly increases the wage by up to 0.76 log points (138%), the contribution is not significant at the mean and other points.

While the change in the sectoral structure decreases wages of female workers by 0.03 log points (3%), it has no impact on the wages of male workers. The change in returns by sectors lowers the wages of male workers by 10% and by 3% for female workers.

On average, the change in the industrial structure lowers the wages of female workers by 0.02 log points (2%). However, the change in the industrial structure has no impact on the average wages of male workers. At the 10<sup>th</sup> percentile of the wage distribution, the change in industrial structure and the related industrial returns lower wages of female workers by 0.06 log points (6%) and wages of male workers by 0.04 log points (4%). The impact is highly significant for both sexes.

#### ***Contributions to the gender wage gap in 1993 and 2008***

Tables 3.7 reports the decomposition results of the factors contributing to the gender wage gap in 1993 and 2008.

[Table 3.7 about here]

In 1993, the average gender wage gap is 0.23 log points (26%). Along the distribution, the gap is 0.17 log points (19%) at the 10<sup>th</sup> percentile and 0.25 log points (28%) at the median and the 90<sup>th</sup> percentile. Contributions to the gender wage gap come from both gender differences in average characteristics and their returns. The contribution of gender differences in average characteristics is stable along the distribution, at 0.04 log points (4%).

In 2008, the average gender wage gap is 0.17 log points (18%). Along the distribution, the gap is 0.29 log points (34%) at the 10<sup>th</sup> percentile, 0.19 log points (21%) at the median and 0.03 log points (3%) at the 90<sup>th</sup> percentile. Interestingly, the

gender wage gap is higher at the bottom than the top of the distribution. However, there were significant improvements in average characteristics of women relative to men over the observed period. As a result, while in 1993 the gender difference in observed characteristics contributes positively to the gender wage gap, the gender difference in observed characteristics narrows the gender wage gap in 2008.

Since gender differences in the average years of schooling are close to zero in 1993, different schooling does not contribute to the gender wage gap. In contrast, the better education of average women in 2008 reduces the gender wage gap by 0.03 log points (3%) at the mean and the median, 0.02 log points (2%) at the 10<sup>th</sup> percentile and 0.06 log points (6%) at the 90<sup>th</sup> percentile. The gender difference in returns to education does not contribute significantly to the gender wage gap in 2008.

The gender difference by sectoral concentration does not contribute significantly to the gender wage gap in 1993 but its contribution is highly significant and negative in 2008. In both years, the gender difference in returns across sectors increases the gender wage gap. At the mean, the contribution is 0.06 log points (6%) in 1993 and 0.08 log points (8%) in 2008.

Industrial segregation significantly contributes 0.01 log points (1%) to the gender wage gap in 1993. The contribution reduces to zero and is no longer significant in 2008. Along the distribution, the gender difference in industrial segregation contributes 0.02 log points (2%) to the gender wage gap at the 10<sup>th</sup> percentile in 1993. The contribution reduces to 0.01 log points (1%) in 2008. The contribution is not significant at the median in both years. At the 90<sup>th</sup> percentile of the distribution, the gender difference in industrial segregation is not significant in 1993. However, in 2008, it is significant at the 10% level and lowers the gender wage gap by 0.01 log points

(1%). The gender difference in returns across industries is not significant at the mean in 1993. It becomes highly significant and contributes 0.02 log points (2%) to the gender wage gap in 2008.

### **3.6 Conclusion**

This paper uses the Vietnam Living Standard Surveys to analyze changes in the labour force behavior, wages and the gender wage gap in Vietnam between 1993 and 2008. I find that over this period, the average real wages of Vietnamese workers doubled. Wage inequality declined significantly. By gender, the wage increase was higher for women than for men. As the economy becomes more marketized, women benefit relative to men in the labour market. The average gender wage gap is reduced by more than a half, from 24% in 1993 to 10% in 2008. Along the distribution, the gender wage gap evolves differently, while it increases in the lower part of the distribution, it declines significantly in the upper part. I find no evidence of a glass-ceiling in the Vietnamese gender wage gap. In 2008, the last year of the observed transition period, there is evidence of sticky-floors. The phenomenon of sticky-floors in the Vietnamese gender wage gap is similar to China, as found by Chi et al. (2008).

In 1993, the initial year of the observed transition period, the gender difference in average characteristics of observed variables contributes positively to the gender wage gap. Over the studied period, there have been significant improvements in average characteristics of women relative to men. As a result, the gender difference in average characteristics of observed variables narrows the gender wage gap in 2008. In both years, most of the contribution to the gender wage gap comes from the gender differences in the returns to characteristics and other factors not being captured in the model, also known as ‘discrimination’.



Education contributes significantly to the wage increase and provides an important explanation for the reduction in the gender wage gap. This is consistent with the finding of Liu (2004) and Pham and Reilly (2007). Over the observed period, the wage premium of the public service increased in comparison to the private sector. Specifically, average male workers in the public sector earned 9% more than comparable workers in the private sector in 2008. The public-private wage gap of average women is 54%. This phenomenon has important implications for Vietnam during its transition. On one hand, an increase in official wages of public servants may help to reduce corruption. On the other hand, an incompatible wage increase in the public service in comparison to other sectors will polarize the society, which is harmful for the long run social stability.

In both years 1993 and 2008, while male workers in the private sector earned more than in SOEs, female workers in the private sector earned less than in SOEs. The results suggest that the private sector favors men over women. Moreover, while 100% of public servants and 97% of SOE workers have social insurance, health insurance and trade-union contributions from their employers, the number is only 47% for domestic private firms (General Statistics Office, 2009b). Given that female workers in the private sector do not only receive lower wages than their counterparts in the state sector, many of them also do not receive health and social insurance contributions from their employers. They are the most vulnerable group of wage labourers.

**Table 3.1 Share of Wage Employment, 1993-2008 (%)**

|                       | 1993  | 1998  | 2002  | 2004  | 2006  | 2008  |
|-----------------------|-------|-------|-------|-------|-------|-------|
| <b>All sample</b>     | 16.66 | 20.18 | 27.81 | 27.68 | 28.72 | 29.76 |
| <b>By sex</b>         |       |       |       |       |       |       |
| Male                  | 19.58 | 25.27 | 34.1  | 33.67 | 34.17 | 35.33 |
| Female                | 13.89 | 15.22 | 21.45 | 21.51 | 23.04 | 23.91 |
| <b>By urban-rural</b> |       |       |       |       |       |       |
| Urban                 | 32.52 | 35.13 | 39.92 | 40.17 | 41.23 | 41.35 |
| Rural                 | 11.46 | 15.47 | 23.77 | 22.97 | 23.88 | 25.11 |
| <b>By ethnicity</b>   |       |       |       |       |       |       |
| Majority              | 17.43 | 21.33 | 29.11 | 29.66 | 30.92 | 32.21 |
| Minority              | 12.26 | 13.67 | 18.74 | 14.12 | 15.08 | 14.07 |

\*Notes: (1) Samples are weighted.

(2) Wage employments are those whose main job in the past 12 months was a wage earner

Source: VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008, own calculations.

**Table 3.2 Wages and Gender Wage Gap, 1993 & 2008**

|                           | 1993                    |        |                           | 2008                    |        |                           | % Change  |        |                       |
|---------------------------|-------------------------|--------|---------------------------|-------------------------|--------|---------------------------|-----------|--------|-----------------------|
|                           | Mean wage<br>(1.000VND) |        | Gender<br>wage<br>gap (%) | Mean wage<br>(1.000VND) |        | Gender<br>wage<br>gap (%) | Mean wage |        | Gender<br>wage<br>gap |
|                           | Male                    | Female |                           | Male                    | Female |                           | Male      | Female |                       |
| Mean                      | 5.00                    | 4.02   | 24%                       | 9.62                    | 8.74   | 10%                       | 92%       | 117%   | -58%                  |
| 10th Quantile             | 1.45                    | 1.22   | 19%                       | 4.13                    | 3.06   | 35%                       | 185<br>%  | 151%   | 84%                   |
| 50th Quantile             | 3.52                    | 2.75   | 28%                       | 7.39                    | 6.15   | 20%                       | 110<br>%  | 124%   | -29%                  |
| 90 <sup>th</sup> Quantile | 9.04                    | 7.05   | 28%                       | 16.17                   | 16.09  | 1%                        | 79%       | 128%   | -96%                  |
| Ratio<br>Q10th/Q90th      | 6.23                    | 5.78   |                           | 3.92                    | 5.26   |                           |           |        |                       |

\*Notes: (1) Samples are weighted.

(2) Wage employments are those whose main job in the past 12 months was a wage earner

(3) Money values are adjusted by spatial and temporal price indexes, converted to the real value of Jan 2008.

Source: VLSS1993 and VHLSS2008, own calculations.

**Table 3.3 Variable Descriptions and Summary Statistics**

| Variable                | Variable description                                          | Male        |             | Female     |             |
|-------------------------|---------------------------------------------------------------|-------------|-------------|------------|-------------|
|                         |                                                               | 1993        | 2008        | 1993       | 2008        |
| Lnwage                  | = Natural log of hourly wage                                  | 8.19        | 8.94        | 7.96       | 8.78        |
| Minority                | = 1 if <i>minority ethnic</i> , = 0 if majority <sup>61</sup> | 0.12        | 0.09        | 0.1        | 0.07        |
| Married                 | = 1 if <i>married</i> , = 0 if single                         | 0.62        | 0.65        | 0.54       | 0.63        |
| General experience      | = <i>age-schooling-6</i>                                      | 16.58       | 18.57       | 15.86      | 17.44       |
| Experience square       | = General experience square/100                               | 3.68        | 4.7         | 3.61       | 4.39        |
| School year             | = <i>Years of schooling</i>                                   | 8.21        | 9.42        | 8.24       | 9.94        |
| Public servant          | = 1 if working as <i>public servant</i> <sup>62</sup>         | 0.2         | 0.18        | 0.29       | 0.24        |
| SOE                     | = 1 if working in <i>SOE</i>                                  | 0.15        | 0.09        | 0.18       | 0.11        |
| Private                 | = 1 if working in <i>private enterprises</i> <sup>63</sup>    | 0.65        | 0.73        | 0.53       | 0.65        |
| Manufacturing           | = 1 if working in <i>manufacturing</i>                        | 0.42        | 0.45        | 0.34       | 0.39        |
| Service                 | = 1 if working in <i>service sector</i>                       | 0.32        | 0.39        | 0.4        | 0.47        |
| Agriculture             | = 1 if working in <i>agriculture</i>                          | 0.26        | 0.16        | 0.26       | 0.14        |
| Urban                   | = 1 if living in <i>Urban</i>                                 | 0.46        | 0.35        | 0.5        | 0.42        |
| Northern Upland         | = 1 if living in the <i>Northern Uplands</i>                  | 0.08        | 0.13        | 0.09       | 0.13        |
| Red River Delta         | = 1 if living in the <i>Red River Delta</i>                   | 0.18        | 0.24        | 0.17       | 0.24        |
| North Central Coast     | = 1 if living in the <i>North Central Coast</i>               | 0.07        | 0.08        | 0.08       | 0.06        |
| South Central Coast     | = 1 if living in the <i>South Central Coast</i>               | 0.12        | 0.1         | 0.1        | 0.11        |
| Central Highlands       | = 1 if living in the <i>Central Highlands</i>                 | 0.02        | 0.04        | 0.02       | 0.04        |
| South East              | = 1 if living in the <i>South East</i>                        | 0.27        | 0.19        | 0.27       | 0.2         |
| Mekong River Delta      | = 1 if living in the <i>Mekong River Delta</i>                | 0.27        | 0.22        | 0.27       | 0.23        |
| <b>No. observations</b> |                                                               | <b>1183</b> | <b>4102</b> | <b>915</b> | <b>2704</b> |

\*Notes: (1) These are raw figures without sample weight adjustments.

(2) Money values are adjusted by spatial and temporal price indexes, converted to the value of Jan 2008.

Source: VLSS 1993 and VHLSS2008, own calculations.

<sup>61</sup> Vietnam has 54 ethnic groups; the Kinh group is the majority one.

<sup>62</sup> Public servants are those who work for the government, the communist party or social organizations.

<sup>63</sup> Private sector workers are those who work for private companies, foreign invested firms, collectives or other households and in paid.

Table 3.4 OLS and Unconditional Quantile Estimation by Gender, 1993

| VARIABLES              | Male                                        |                    |                    |                    | Female                                      |                    |                   |                   |
|------------------------|---------------------------------------------|--------------------|--------------------|--------------------|---------------------------------------------|--------------------|-------------------|-------------------|
|                        | Unconditional quantile regression (RIF-OLS) |                    |                    | OLS<br>Mean        | Unconditional quantile regression (RIF-OLS) |                    |                   | OLS<br>Mean       |
|                        | Q10 <sup>th</sup>                           | Q50 <sup>th</sup>  | Q90 <sup>th</sup>  |                    | Q10 <sup>th</sup>                           | Q50 <sup>th</sup>  | Q90 <sup>th</sup> |                   |
| Minority               | 0.19*<br>(0.10)                             | 0.06<br>(0.08)     | -0.29***<br>(0.11) | 0.01<br>(0.06)     | 0.08<br>(0.09)                              | 0.12<br>(0.09)     | 0.04<br>(0.17)    | 0.09<br>(0.09)    |
| Married                | 0.06<br>(0.10)                              | 0.15**<br>(0.07)   | 0.16<br>(0.11)     | 0.13**<br>(0.06)   | 0.07<br>(0.08)                              | 0.11*<br>(0.06)    | 0.16<br>(0.12)    | 0.10*<br>(0.05)   |
| General experience     | 0.02<br>(0.02)                              | 0.03***<br>(0.01)  | -0.01<br>(0.02)    | 0.01<br>(0.01)     | 0.01<br>(0.01)                              | -0.00<br>(0.01)    | -0.02<br>(0.02)   | -0.00<br>(0.01)   |
| Experience square      | -0.07*<br>(0.04)                            | -0.06**<br>(0.02)  | 0.04<br>(0.04)     | -0.03<br>(0.02)    | -0.01<br>(0.03)                             | 0.01<br>(0.02)     | 0.05<br>(0.03)    | 0.01<br>(0.02)    |
| School year            | 0.02*<br>(0.01)                             | 0.04***<br>(0.01)  | 0.02*<br>(0.01)    | 0.03***<br>(0.01)  | 0.01<br>(0.01)                              | 0.02**<br>(0.01)   | 0.05***<br>(0.02) | 0.03***<br>(0.01) |
| Public servant         | -0.30*<br>(0.17)                            | -0.50***<br>(0.09) | -0.40***<br>(0.15) | -0.37***<br>(0.09) | 0.37**<br>(0.14)                            | 0.19**<br>(0.09)   | 0.05<br>(0.18)    | 0.20**<br>(0.09)  |
| State-owned Enterprise | 0.12<br>(0.10)                              | -0.02<br>(0.08)    | -0.03<br>(0.15)    | -0.01<br>(0.07)    | 0.17<br>(0.11)                              | 0.11<br>(0.08)     | -0.10<br>(0.15)   | 0.08<br>(0.07)    |
| Manufacturing          | 0.41***<br>(0.11)                           | 0.14*<br>(0.07)    | -0.05<br>(0.13)    | 0.15**<br>(0.07)   | -0.11<br>(0.10)                             | 0.10<br>(0.09)     | 0.12<br>(0.15)    | 0.07<br>(0.08)    |
| Service                | -0.02<br>(0.15)                             | 0.08<br>(0.09)     | -0.08<br>(0.15)    | -0.01<br>(0.08)    | -0.35**<br>(0.14)                           | 0.16*<br>(0.09)    | -0.00<br>(0.16)   | -0.03<br>(0.09)   |
| Urban                  | 0.11<br>(0.09)                              | -0.08<br>(0.06)    | 0.02<br>(0.10)     | -0.03<br>(0.05)    | -0.04<br>(0.09)                             | -0.20***<br>(0.06) | -0.01<br>(0.11)   | -0.12**<br>(0.06) |
| Regional dummies       | Yes                                         | Yes                | Yes                | Yes                | Yes                                         | Yes                | Yes               | Yes               |
| Constant               | 6.26***<br>(0.27)                           | 7.19***<br>(0.14)  | 9.27***<br>(0.26)  | 7.54***<br>(0.14)  | 6.30***<br>(0.22)                           | 7.32***<br>(0.14)  | 8.18***<br>(0.26) | 7.26***<br>(0.13) |
| R-squared              | 0.08                                        | 0.14               | 0.02               | 0.12               | 0.09                                        | 0.10               | 0.04              | 0.12              |
| No of observations     | 1183                                        |                    |                    |                    | 915                                         |                    |                   |                   |

\*Notes: (1) Private sector is the base group for sectors; agriculture is the base group for industries; Northern Uplands is the base group for regions.

(2) Robust standard errors are in parentheses, P values: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: VLSS 1993, own estimations.

Table 3.5 OLS and Unconditional Quantile Estimation by Gender, 2008

| VARIABLES              | Male                                        |                    |                    |                    | Female                                      |                    |                    |                    |
|------------------------|---------------------------------------------|--------------------|--------------------|--------------------|---------------------------------------------|--------------------|--------------------|--------------------|
|                        | Unconditional quantile regression (RIF-OLS) |                    |                    | OLS                | Unconditional quantile regression (RIF-OLS) |                    |                    | OLS                |
|                        | Q10 <sup>th</sup>                           | Q50 <sup>th</sup>  | Q90 <sup>th</sup>  | Mean               | Q10 <sup>th</sup>                           | Q50 <sup>th</sup>  | Q90 <sup>th</sup>  | Mean               |
| Minority               | -0.00<br>(0.06)                             | -0.03<br>(0.03)    | 0.03<br>(0.07)     | -0.03<br>(0.03)    | -0.03<br>(0.09)                             | 0.01<br>(0.05)     | 0.20**<br>(0.09)   | 0.03<br>(0.04)     |
| Married                | 0.13***<br>(0.04)                           | 0.11***<br>(0.02)  | -0.01<br>(0.05)    | 0.08***<br>(0.02)  | 0.06<br>(0.05)                              | 0.11***<br>(0.03)  | 0.03<br>(0.05)     | 0.09***<br>(0.02)  |
| General experience     | 0.04***<br>(0.01)                           | 0.02***<br>(0.00)  | 0.04***<br>(0.01)  | 0.03***<br>(0.00)  | 0.02***<br>(0.01)                           | 0.01***<br>(0.00)  | 0.03***<br>(0.01)  | 0.02***<br>(0.00)  |
| Experience square      | -0.08***<br>(0.01)                          | -0.04***<br>(0.01) | -0.07***<br>(0.01) | -0.06***<br>(0.01) | -0.07***<br>(0.02)                          | -0.03***<br>(0.01) | -0.03<br>(0.02)    | -0.03***<br>(0.01) |
| School year            | 0.04***<br>(0.01)                           | 0.04***<br>(0.00)  | 0.11***<br>(0.01)  | 0.06***<br>(0.00)  | 0.04***<br>(0.01)                           | 0.05***<br>(0.00)  | 0.11***<br>(0.01)  | 0.06***<br>(0.00)  |
| Public servant         | -0.02<br>(0.05)                             | 0.13***<br>(0.03)  | 0.13<br>(0.08)     | 0.09***<br>(0.03)  | 0.34***<br>(0.06)                           | 0.50***<br>(0.04)  | 0.34***<br>(0.09)  | 0.43***<br>(0.04)  |
| State-owned Enterprise | -0.33***<br>(0.07)                          | 0.03<br>(0.03)     | 0.16*<br>(0.09)    | -0.02<br>(0.04)    | 0.05<br>(0.07)                              | 0.19***<br>(0.05)  | 0.18*<br>(0.09)    | 0.14***<br>(0.04)  |
| Manufacturing          | -0.03<br>(0.05)                             | 0.00<br>(0.03)     | -0.23***<br>(0.05) | -0.09***<br>(0.03) | -0.46***<br>(0.08)                          | -0.11**<br>(0.04)  | -0.24***<br>(0.06) | -0.21***<br>(0.04) |
| Service                | -0.18***<br>(0.06)                          | 0.05*<br>(0.03)    | -0.07<br>(0.06)    | -0.07**<br>(0.03)  | -0.59***<br>(0.09)                          | -0.11**<br>(0.05)  | -0.14*<br>(0.08)   | -0.18***<br>(0.04) |
| Urban                  | -0.12***<br>(0.04)                          | -0.04**<br>(0.02)  | 0.08*<br>(0.04)    | -0.01<br>(0.02)    | 0.03<br>(0.04)                              | -0.06**<br>(0.03)  | -0.16***<br>(0.05) | -0.05**<br>(0.02)  |
| Regional dummies       | Yes                                         | Yes                | Yes                | Yes                | Yes                                         | Yes                | Yes                | Yes                |
| Constant               | 7.62***<br>(0.09)                           | 8.16***<br>(0.05)  | 8.11***<br>(0.11)  | 8.02***<br>(0.05)  | 7.83***<br>(0.13)                           | 7.85***<br>(0.07)  | 7.89***<br>(0.15)  | 7.81***<br>(0.07)  |
| R-squared              | 0.05                                        | 0.16               | 0.17               | 0.23               | 0.08                                        | 0.29               | 0.18               | 0.37               |
| No of observations     | 4106                                        |                    |                    |                    | 2704                                        |                    |                    |                    |

\*Note: See Table 3.4

Source: VHLSS2008, own estimations.

**Table 3.6 Contributions to Wage Increase from 1993 to 2008 at Mean & selected Quantiles by Gender**

| VARIABLES      | Female           |                  |                  |          | Male             |                  |                  |          |
|----------------|------------------|------------------|------------------|----------|------------------|------------------|------------------|----------|
|                | 10 <sup>th</sup> | 50 <sup>th</sup> | 90 <sup>th</sup> | Mean     | 10 <sup>th</sup> | 50 <sup>th</sup> | 90 <sup>th</sup> | Mean     |
| Total increase | 0.88***          | 0.78***          | 0.78***          | 0.81***  | 1.01***          | 0.73***          | 0.56***          | 0.73***  |
| Explained      |                  |                  |                  |          |                  |                  |                  |          |
| Ethnicity      | 0.00             | 0.00             | -0.01**          | 0.00*    | -0.01**          | 0.00             | 0.00             | 0.00     |
| Marital Status | 0.01             | 0.01***          | 0.00             | 0.01***  | 0.00             | 0.00             | 0.00             | 0.00     |
| Experience     | -0.01            | 0.00             | 0.03***          | 0.01*    | -0.01            | 0.00             | 0.01             | 0.00     |
| School year    | 0.04***          | 0.08***          | 0.19***          | 0.10***  | 0.05***          | 0.05***          | 0.11***          | 0.05***  |
| Sector         | -0.01            | -0.03***         | -0.03***         | -0.03*** | 0.02***          | 0.00             | 0.00             | 0.00     |
| Industry       | -0.02**          | -0.02***         | -0.03***         | -0.02*** | -0.01            | 0.00             | -0.02***         | 0.00     |
| Urban          | 0.01             | 0.00*            | 0.00             | 0.00*    | 0.01**           | 0.00*            | -0.02***         | 0.00*    |
| Region         | -0.04***         | -0.02***         | -0.02***         | -0.02*** | -0.06***         | -0.02***         | -0.03***         | -0.02*** |
| Total          | -0.03            | 0.03*            | 0.13***          | 0.04***  | 0.01             | 0.03***          | 0.06***          | 0.03***  |
| Unexplained    |                  |                  |                  |          |                  |                  |                  |          |
| Ethnicity      | 0.04             | 0.04             | -0.06            | 0.03     | 0.08             | 0.04             | -0.12***         | 0.04     |
| Marital Status | 0.00             | 0.00             | -0.01            | 0.00     | 0.01             | 0.00             | -0.02            | 0.00     |
| Experience     | 0.02             | 0.15*            | 0.56***          | 0.21***  | 0.21             | -0.09            | 0.51***          | -0.09    |
| School year    | 0.26**           | 0.29***          | 0.46***          | 0.29***  | 0.14             | 0.01             | 0.76***          | 0.01     |
| Sector         | 0.01             | -0.04**          | -0.05            | -0.03    | 0.05             | -0.10***         | -0.11**          | -0.10*** |
| Industry       | -0.06***         | -0.01            | 0.00             | -0.01    | -0.04***         | -0.01            | -0.01            | -0.01    |
| Urban          | -0.01            | 0.00             | 0.01**           | 0.00     | 0.01             | 0.00             | 0.01             | 0.00     |
| Region         | -0.04            | -0.10***         | -0.10***         | -0.11*** | 0.02             | -0.07***         | 0.05             | -0.07*** |
| Constant       | 0.68***          | 0.41***          | -0.15            | 0.38***  | 0.52**           | 0.91***          | -0.56**          | 0.91***  |
| Total          | 0.91***          | 0.75***          | 0.65***          | 0.77***  | 1.00***          | 0.69***          | 0.51***          | 0.69***  |

\*Notes: (1). Decompositions are carried out with 500 bootstrap replications.

(2) Result is rounded to two digits after decimal; P values for two-sides test: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Source: VLSS 1993 & VHLSS 2008, own estimations



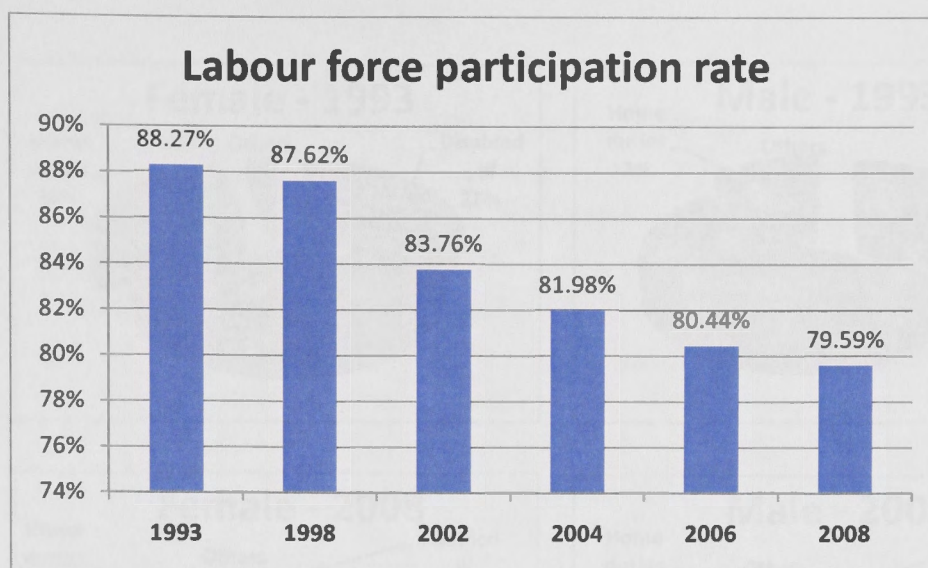
**Table 3.7 Contributions to the Gender Wage Gap at Mean & selected Quantiles in 1993 and 2008**

| VARIABLES      | 1993             |                  |                  |         | 2008             |                  |                  |          |
|----------------|------------------|------------------|------------------|---------|------------------|------------------|------------------|----------|
|                | 10 <sup>th</sup> | 50 <sup>th</sup> | 90 <sup>th</sup> | Mean    | 10 <sup>th</sup> | 50 <sup>th</sup> | 90 <sup>th</sup> | Mean     |
| Total increase | 0.17***          | 0.25***          | 0.25***          | 0.23*** | 0.29***          | 0.19***          | 0.03***          | 0.17***  |
| Explained      |                  |                  |                  |         |                  |                  |                  |          |
| Ethnicity      | 0.00             | 0.00             | 0.00             | 0.00    | 0.00             | 0.00             | 0.00             | 0.00     |
| Marital Status | 0.01             | 0.01*            | 0.01             | 0.01**  | 0.00             | 0.00             | 0.00             | 0.00     |
| Experience     | 0.01             | 0.01*            | -0.01            | 0.00    | 0.01***          | 0.01***          | 0.02***          | 0.02***  |
| School year    | 0.00             | 0.00             | 0.00             | 0.00    | -0.02***         | -0.03***         | -0.06***         | -0.03*** |
| Sector         | -0.01            | 0.01*            | 0.02             | 0.01    | -0.01**          | -0.02***         | -0.02***         | -0.02*** |
| Industry       | 0.02***          | 0.01             | 0.01             | 0.01**  | 0.01***          | 0.00             | -0.01*           | 0.00     |
| Urban          | 0.00             | 0.00             | 0.00             | 0.00    | 0.00**           | 0.00***          | 0.00             | 0.00*    |
| Region         | 0.01             | 0.00             | 0.00             | 0.00    | 0.00*            | 0.00**           | -0.01***         | -0.01**  |
| Total          | 0.04*            | 0.04***          | 0.04**           | 0.04*** | 0.00             | -0.03***         | -0.06***         | -0.03*** |
| Unexplained    |                  |                  |                  |         |                  |                  |                  |          |
| Ethnicity      | -0.05            | 0.02             | 0.13             | 0.03    | -0.01            | 0.02             | 0.08             | 0.03     |
| Marital Status | 0.00             | 0.01             | 0.00             | 0.00    | 0.01             | 0.00             | 0.00             | 0.00     |
| Experience     | 0.06             | 0.27**           | 0.11             | 0.11    | 0.24***          | 0.02             | 0.01             | 0.07     |
| School year    | 0.08             | 0.16             | -0.26            | 0.01    | 0.00             | -0.13**          | 0.02             | -0.05    |
| Sector         | 0.06             | 0.08***          | 0.02             | 0.06*** | 0.13***          | 0.08***          | 0.03             | 0.08***  |
| Industry       | 0.04***          | -0.01            | -0.02            | 0.00    | 0.08***          | 0.03***          | 0.01             | 0.02***  |
| Urban          | 0.00             | 0.00             | 0.00             | 0.00    | 0.02***          | 0.00             | -0.03***         | 0.00     |
| Region         | -0.04            | -0.04            | -0.12**          | -0.05   | 0.01             | -0.01            | 0.04             | 0.01     |
| Constant       | -0.02            | -0.28            | 0.35             | 0.02    | -0.18            | 0.22**           | -0.05            | 0.05     |
| Total          | 0.13**           | 0.21***          | 0.21***          | 0.19*** | 0.29***          | 0.22***          | 0.09***          | 0.20***  |

\*Notes: See Table 3.6

Source: VLSS 1993 &amp; VHLSS 2008, own estimations

**Figure 3.1 Labour Force Participation Rate, 1993-2008**

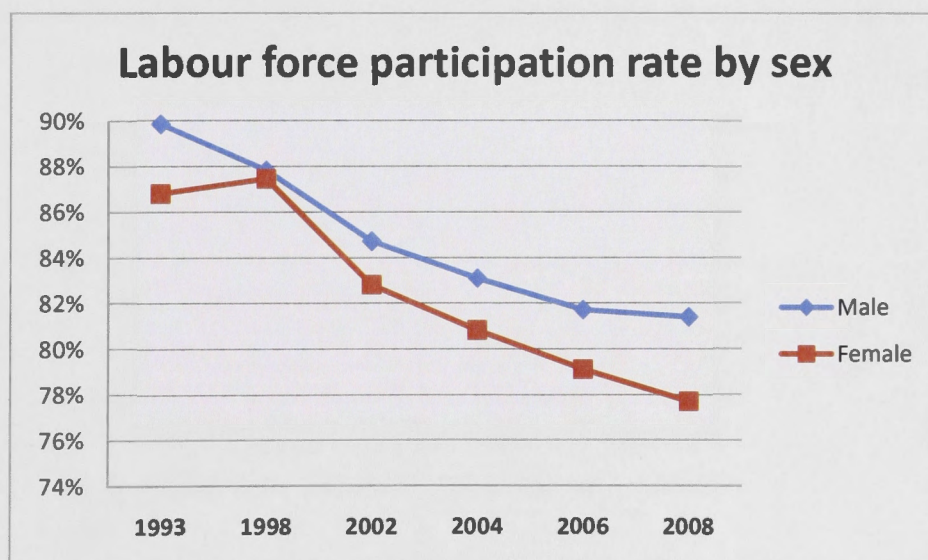


\*Notes: (1) Samples are weighted by sample weights.

(2) LFP rate is the ratio between the labour force and the size of the population in the labour age. Thus the participation excludes those who are in the labour force age group but not working because they are studying, being ill or disabled, doing home duties, and others.

Source: VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008, own calculations.

**Figure 3.2 Labour Force Participation Rate by Sex, 1993-2008**

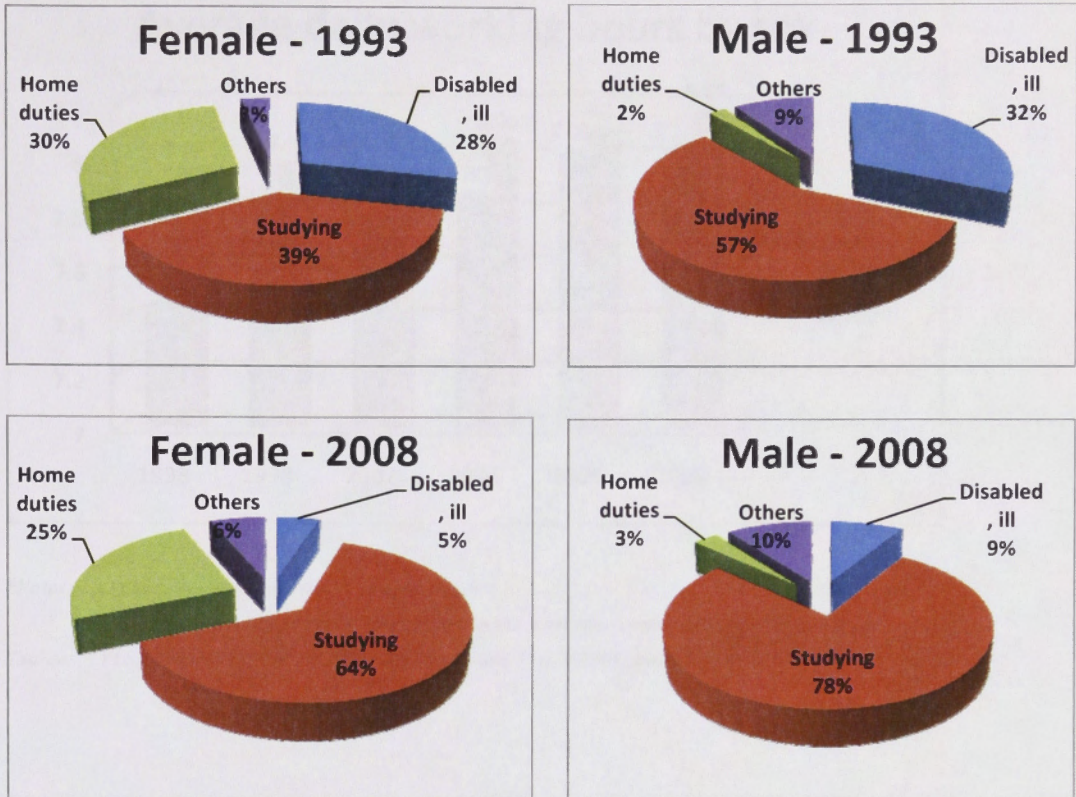


\*Note: See Figure 3.1.

Source: VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008, own calculations.



**Figure 3.3 Reasons for Non Participant by Sex, 1993 & 2008**

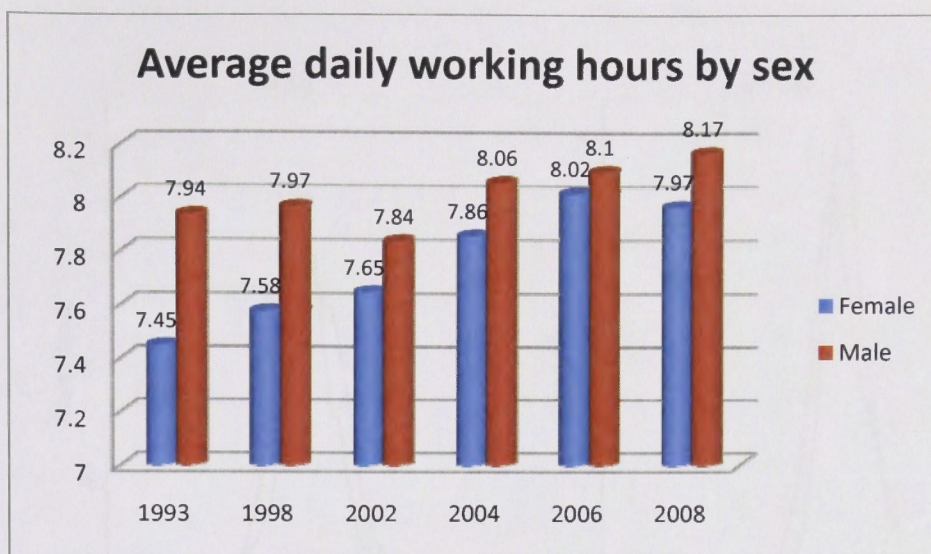


*\*Note:* Samples are weighted by sample weights.

*Source:* VLSS 1993 & VHLSS 2008, own calculations.



**Figure 3.4 Average Daily Working Hours by Sex, 1993-2008**

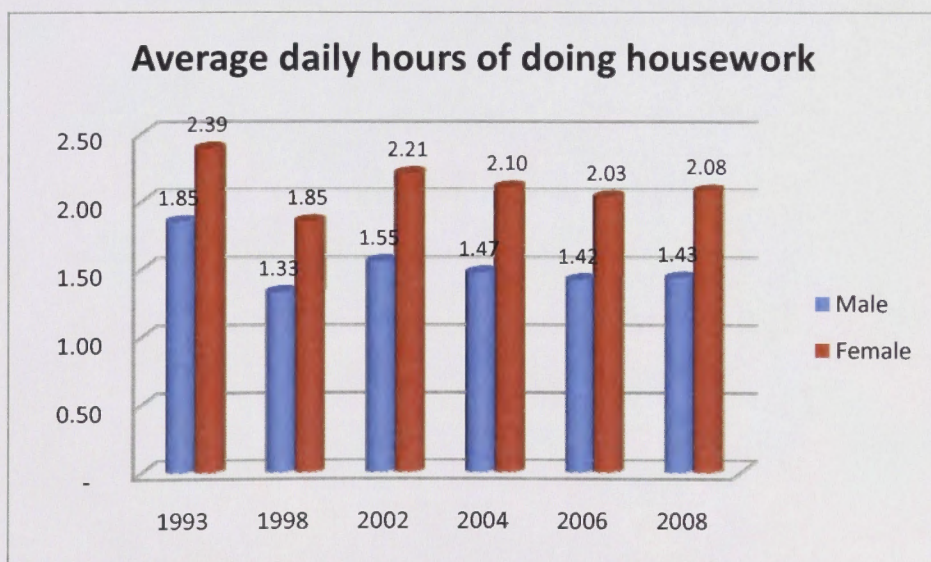


\*Notes: (1) Samples are weighted by sample weights.

(2) These are daily working hours spent on the most time consuming job over the last 12 months.

Source: VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008, own calculations.

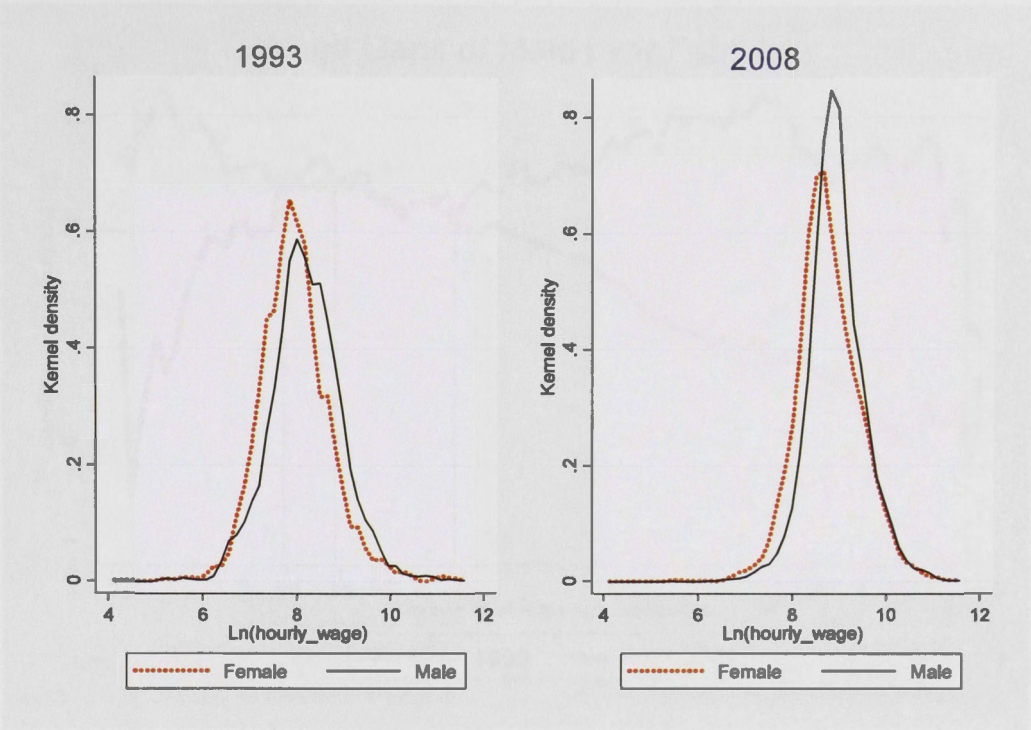
**Figure 3.5 Daily Hours of Doing Housework by Sex, 1993-2008**



\*Note: Samples are weighted by sample weights.

Source: VLSS 1993/1998, VHLSS 2002/2004/2006 and VHLSS2008, own calculations.

Figure 3.6 Wage Distributions by Sex, 1993 & 2008

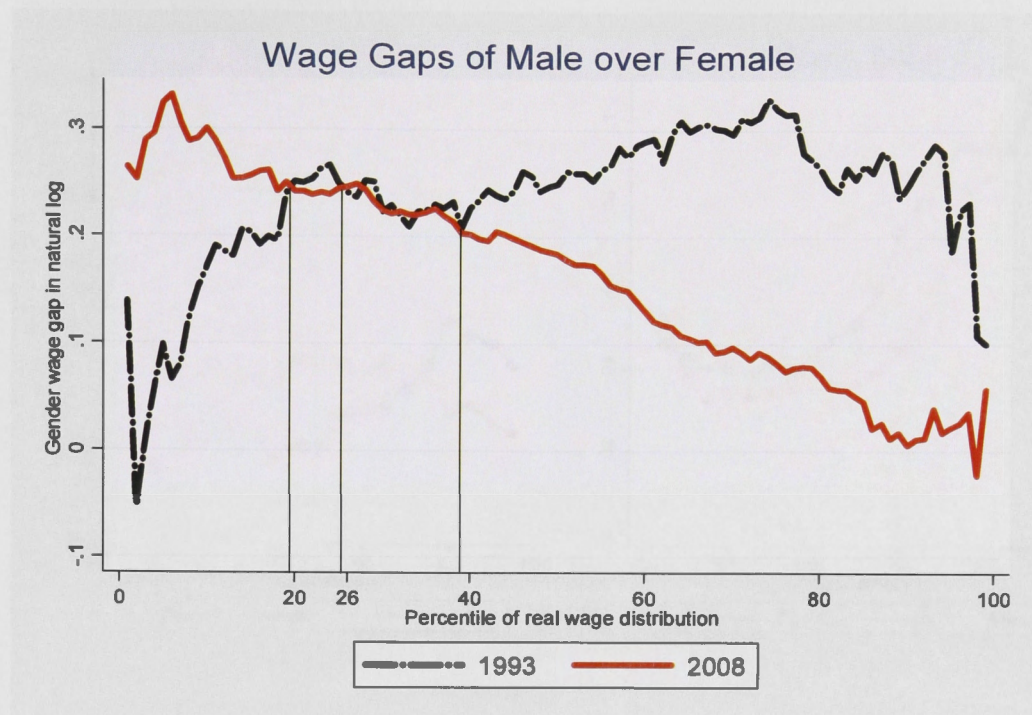


\*Notes: (1) Samples are weighted by sample weights  
(2) Gaussian kernel is estimated with a common bandwidth=0.1

Source: VLSS 1993 and VHLSS2008, own estimations.



**Figure 3.7 Raw Gender Wage Gaps across Percentiles**

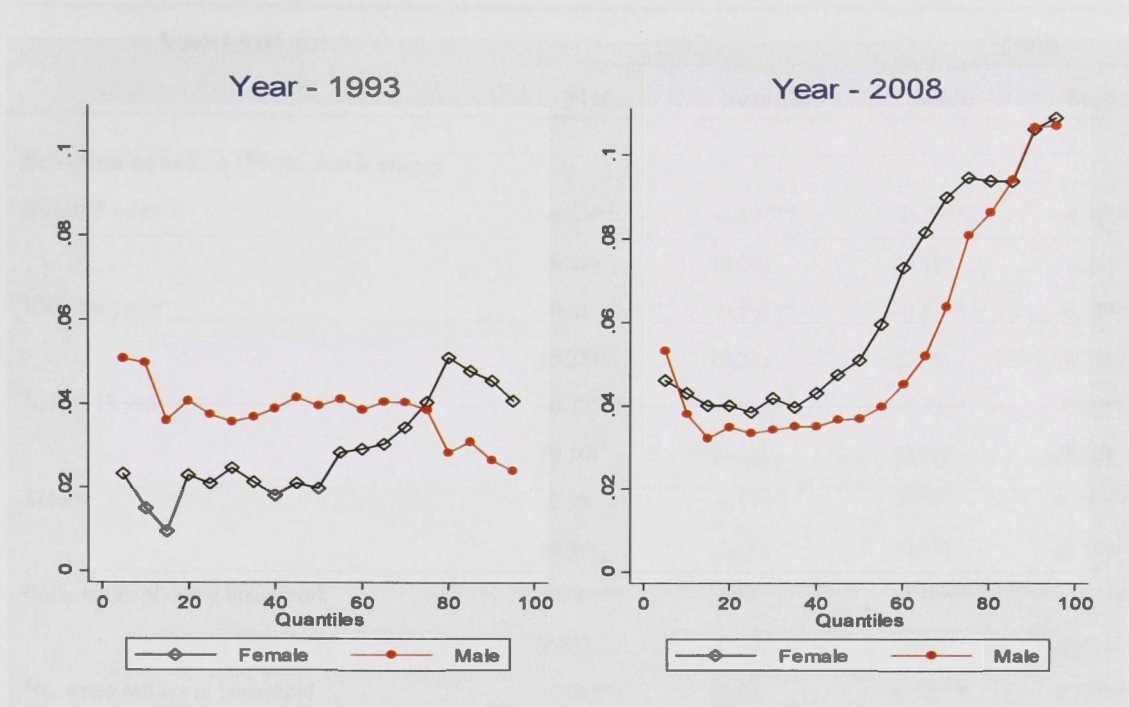


\*Note: Samples are weighted by sample weights

Source: VLSS 1993 and VHLSS2008, own calculations.



Figure 3.8 Estimated Return to Education by Sex, 1993 & 2008



Source: VLSS 1993 and VHLSS2008, own estimations.

## Appendix 3.1 Heckman Sample Selection Estimations 1993 &amp; 2008

| VARIABLES                                              | 1993               |                    | 2008               |                    |
|--------------------------------------------------------|--------------------|--------------------|--------------------|--------------------|
|                                                        | Male               | Female             | Male               | Female             |
| <b>Selection equation (Prob. work wage)</b>            |                    |                    |                    |                    |
| Kids 0-3 years                                         | -0.59**<br>(0.28)  | -1.19***<br>(0.30) | -0.39**<br>(0.20)  | -0.77***<br>(0.21) |
| Kids 3-6 years                                         | -0.41<br>(0.25)    | -0.86***<br>(0.28) | -0.48**<br>(0.19)  | -0.57***<br>(0.21) |
| Kids 6-18 years                                        | -0.78***<br>(0.16) | -0.93***<br>(0.16) | -0.25**<br>(0.10)  | -0.27***<br>(0.10) |
| Elderly                                                | -0.19<br>(0.20)    | -0.52**<br>(0.21)  | 0.19*<br>(0.11)    | 0.33***<br>(0.11)  |
| Daily hours of doing housework                         | -0.06***<br>(0.02) | -0.01<br>(0.02)    | -0.10***<br>(0.02) | -0.06***<br>(0.01) |
| No. wage earners in household                          | -0.04**<br>(0.02)  | -0.02<br>(0.02)    | 0.32***<br>(0.02)  | 0.28***<br>(0.02)  |
| Other people's years of schooling                      | -0.04***<br>(0.01) | -0.07***<br>(0.01) | -0.04***<br>(0.01) | -0.05***<br>(0.01) |
| Non-labour income                                      | -0.00**<br>(0.00)  | -0.00***<br>(0.00) | 0.00<br>(0.00)     | 0.00<br>(0.00)     |
| Cultivated land area                                   | -0.00<br>(0.00)    | 0.00<br>(0.00)     | -0.00**<br>(0.00)  | -0.00<br>(0.00)    |
| Variables in wage equation                             | Yes                | Yes                | Yes                | Yes                |
| <b>Wage offer equation</b>                             |                    |                    |                    |                    |
| Lamda (mills)                                          | -.043<br>(.07)     | .11<br>(.08)       | -.06<br>(.04)      | -.07<br>(.04)      |
| Variables in wage equation                             | Yes                | Yes                | Yes                | Yes                |
| No. of observations                                    | 11610              | 12457              | 18810              | 19443              |
| Uncensored observations                                | 1183               | 915                | 4012               | 2704               |
| <b>LR test of indep. eqns. (rho = 0) :<br/>chi2(1)</b> | <b>0.33</b>        | <b>1.70</b>        | <b>1.82</b>        | <b>2.48</b>        |
| <b>Prob &gt; chi2</b>                                  | <b>0.56</b>        | <b>0.19</b>        | <b>0.18</b>        | <b>0.12</b>        |

\*Notes: See Table 3.4

Source: VLSS 1993 & VHLSS 2008, own estimations

**Appendix 3.2 Price Inflator Conversion**

| <i>Series</i> | <i>CPI conversion</i><br><i>(Jan 200=1)</i> |
|---------------|---------------------------------------------|
| Jan 1993      | 2.75372                                     |
| Jan 1998      | 1.89149                                     |
| Jan 2002      | 1.72693                                     |
| Jan 2004      | 1.61133                                     |
| Jan 2006      | 1.35153                                     |
| Jan 2008      | 1.00000                                     |

*Source: Author's calculation from the monthly CPI indexes released by GSO Vietnam.*

## **4 Child Labour and Children's Educational Performance in Rural Vietnam**

**Abstract:** This paper uses the 1998 Vietnam Living Standard Survey to investigate the determinants and impact of child labour on children's educational performance in rural Vietnam. The unusually rich information of the data set allows me to model the determinants of child labour and children's educational performance as functions of variables observed at individual, household, school, commune and regional levels. I use annual provincial temperature variations as an instrument for child labour. The joint equation estimates suggest that child labour has a significant impact on children's academic performance. Household economic conditions are one of the most important determinants of child labour and children's educational performance. There exists gender discrimination against girls with regard to the burden of child labour. Children from ethnic minorities have to work more. For school infrastructure, the presence of electricity, a library and a good blackboard play important roles in determining student's study results.

**JEL classification:** J82; I21; C30

**Keywords:** Child labour; educational performance; joint Tobit-ordered probit model

## **4.1 Introduction**

Child labour has long been a critical issue in history. Over the last decades, child labour in developing countries has been of particular concern.<sup>64</sup> Vietnam is an interesting country to study child labour for several reasons. First, Vietnam is a developing country in Asia, a region harboring the largest number of child workers.<sup>65</sup> In 1998, 28% of Vietnamese children aged 6 to 15 years (more than 5 million) were engaged in non-housework labour supply. Second, Vietnam was devastated by more than 30 years of war (1945-1975) and underwent a long period as a centrally planned economy with stagnant economic performance. By the end of the period – in 1985 – Vietnam was one of the poorest countries in the world. The country's renovation, which started in 1986, has made significant progress in poverty reduction. However, in 1998 around 45% of households in rural Vietnam still lived under the poverty line (World Bank, 1999), poverty often compels parents to send their children to work for the family to survive. Third, until the 1990s about 80% of the country's population still lived in rural areas and two-thirds of labourers worked in agriculture, mostly as self-employed on household farms (Dollar and Glewwe, 1998). This characteristic provides various opportunities for children to engage in child labour within the household.

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<sup>64</sup> Edmonds (2007) provided a competent review of the historical ideas about child labour and discussions of its potential consequences.

<sup>65</sup> According to the International Labour Organization (2002), there are 211 million children aged 5 to 14 at work in economic activity in the world in 2000. This accounts for nearly 20% of all children in this age group. The Asian-Pacific region has the largest number of child workers (127.3 million), followed by Sub-Saharan Africa (48 million) then Latin America and the Caribbean (17.4 million). In relative terms, Sub-Saharan Africa has the highest proportion of working children (29%) followed by Asia and the Pacific (19%) then Latin America and the Caribbean (16%).



Vietnam has made significant progress in promoting education over the last decades. Primary education became almost universal in 2000, which is a remarkable achievement among other developing countries with the same level of per capita income. Between 1991 and 1999, the number of lower secondary enrollments more than doubled, from 2.7 million to 5.8 million, the number of upper secondary enrolments tripled, from 0.7 million to 2 million. The enrollment rates in lower secondary education and upper secondary education are 74% and 49% in 2000, respectively (Vietnam's Ministry of Education and Training, 2001; Asian Development Bank, 2003). Traditionally, Vietnam is a society in which education is highly valued and respected. Despite its low income level, Vietnam had a relatively well educated population (Glewwe and Jacoby, 1998). Demand for education is also found to have increased substantially in the 1990s as the Vietnamese become richer (Glewwe and Jacoby, 2004). Nowadays, education is placed as a top priority in the development strategy of the Vietnamese government in the course of the country's industrialization and modernization.<sup>66</sup> The share of education expenditure increased from 2.2% of GDP and 10% of the government budget in 1992 to 3.5% of GDP and 17% of the government budget in 1998 (World Bank, 2000).

Given that an important determinant for children's success in their later life is formed in their early childhood (Becker and Tomes, 1986), understanding the impact of child labour on children's outcomes is particularly important. To date, most studies on child labour in Vietnam focus on investigating the evolution of child labour during the path of the country's transition or the impact of child labour on children's health. Influential papers are Edmonds and Turk (2002), Edmonds (2005), Edmonds and

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<sup>66</sup> See Chapter 3 – Article 35 of the National Constitution issued in 1992, the Education and Training Development Strategy to year 2010 issued in 2001 and the Education Law issued in 2005.

Pavcnik (2005) and O'Donnell et al. (2005). However, little is known about the consequences of child labour in Vietnam on children's educational outcome. To my knowledge, only two studies investigate the problem. These are of studies of Beegle et al. (2004) and Rosati and Tzannatos (2006). Both use data from the 1993 and 1998 Vietnam Living Standard Surveys and find that child labour has a negative impact on children's school enrolment and grade attainment. The negative consequences of child labour on children's educational performance measured by school enrolment and grade attainment in Vietnam is consistent with the results found in many other developing countries, as shown in studies of Psacharopoulos (1997) for Bolivia and Venezuela; Heady (2003) for Ghana; Ersado (2005) for Nepal, Peru and Zimbabwe; Rosati and Rossi (2006) for Pakistan and Nicaragua. In Tanzania and nine Latin America countries, child labour is found to lower children's test scores (Hideo and George, 1999; Gunnarsson et al., 2006). Even for a developed country such as Portugal, child labour is also found to increase the student's probability of repeating a grade (Goulart and Bedi, 2008).

Using unusually rich data from the 1998-Vietnam Living Standard Survey (VLSS), this study makes several important contributions to the knowledge of child labour in Vietnam and the impact of child labour on children's educational success worldwide. First, different from most previous studies on child labour in Vietnam, which use a dummy variable as an indicator for child labour, I investigate child labour by total hours of work. This includes hours doing housework and non-housework labour supply. By doing so, I measure the true workload that a child has to bear.

Second, this paper uses a direct evaluation of student's study results in class as an indicator for children's educational success, which is classified into one of four

levels ranking from poor, average, good to excellent.<sup>67</sup> In Vietnam, if a student gets a poor academic score, he or she will have to repeat the grade. Therefore the measure using the ranking of student's academic performance is broader than grade repetition alone, which is often used to study the impact of child labour on children's educational outcome in Vietnam.

Third, to evaluate the impact of child labour on children's educational success, I estimate a system of simultaneous tobit (determinants of child labour) and ordered probit (determinants of children's educational success) equations. This estimation is different from previous studies which either estimate the two equations separately or use a bi-probit or multinomial probit model to estimate the simultaneous equations of child labour and children's educational success, treating child labour and educational success measured by school attendance as binary outcomes.

I model the determinants of child labour and children's educational performance as functions of variables observed at individual, household, school, commune and regional levels. Because there are unobserved factors that simultaneously affect child labour and a student's academic achievement, these unobserved factors, if not controlled for, could lead to biased and inconsistent estimates of the impact of child labour on children's educational success due to the endogeneity of child labour. To solve this problem, I use annual provincial temperature variations as an instrument for

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<sup>67</sup> Children's educational scores are ranked according to their mark. In each subject, the 10 point scale marking is applied with 10 being the highest and 0 being the lowest. A mark under 5 is classified as poor; a mark from 5 to under 6.5 is classified as average; a mark from 6.5 to under 8 is good and a mark from 8 to 10 is excellent.

child labour.<sup>68</sup> This instrumental variable is highly correlated with child labour but does not directly influence children's academic achievement.

The joint equations estimates suggest that child labour has a significant impact on children's academic performance. Children with longer hours of child work have a lower probability of accomplishing good or excellent academic results and a higher probability of reporting poor academic results. Child labour has a bigger impact on children's educational performance for girls than for boys.

Among other explanatory variables, household economic conditions are one of the most important determinants of child labour and children's educational performance. Consistent with the literature, I find that both mother's and father's education have a strong impact on children's academic performance. There exists gender bias against girls in child work incidence in rural Vietnam. Children from minority ethnic groups also have to work more. There is a strong and positive impact of the share of educated people within the commune on the predicted probability that students accomplish good or excellent academic results. Among school characteristics, some school infrastructures, such as the presence of electricity, a library and a good blackboard are significant in determining student's study results.

The remainder of the paper is structured as follows. Section 2 describes the data. Section 3 provides the econometric framework. Section 4 discusses variables used and presents summary statistics. Section 5 explains the estimation results. The conclusions are given in the final section.

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<sup>68</sup> Annual provincial temperature variation is calculated as the difference between a province's highest and lowest recorded temperatures within a year.

## **4.2 Data and descriptive statistics**

### **4.2.1 Data**

I use data from the Vietnam Living Standard Survey (VLSS) undertaken in 1997/1998 by the Vietnamese General Statistics Office with technical assistance from the World Bank, called the 1998-VLSS. The survey includes five sets of questionnaires. These are the households, communities, schools, prices and clinics. The household questionnaire includes 1,561 questions collecting information about individual and household demographics, education, health, labour activities, income, expenditure, credit and savings. Its sample covers 6,002 households in 194 communes of 61 provinces of Vietnam and is chosen to be nationally representative with sample weights attached. The community, school, price and clinic questionnaires include 737 questions and collect information about general community, school, clinic's characteristics and price levels of basic commodities within the commune. These questionnaires cover 156 communes of all rural and semi-urban areas.

The 1998-VLSS is the most comprehensive wave of the VLSSs.<sup>69</sup> The survey provides information on both students' academic performance in their previous grade and their labour activity.<sup>70</sup> Specifically, the academic outcome takes one of four values:

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<sup>69</sup> There have been five other waves of the VLSS carried out in 1993, 2002, 2004, 2006 and 2008. Unfortunately, none of these waves provides information as suitable for our study purpose as the 1998 wave. For example, the wave in 1993 provides relatively detailed information on education and child work participation but does not have information on student's academic achievement. The wave in 2006 provides information on academic scores of students but does not have sufficient information on child labour in self-employed agricultural activities. Other waves do not have information on either academic records or self-employed agricultural activities.

<sup>70</sup> VLSS information was collected by asking retrospective questions. There is a possibility that the collected information may be biased due to inaccurate recall. For example, when being asked about



excellent, good, average or poor. Children's labour activity provides detail information about total hours of housework and non-housework labour supply over the past 12 months. This characteristic makes the study possible.<sup>71</sup>

I restrict the sample to rural Vietnam. There are several reasons for me to do so. First, as shown in Figure 4.1, while 35% of children aged 6-15 years in rural areas engage in non-housework labour supply, the rate is only 6% in urban areas. About 95% of working children in Vietnam reside in rural areas. Second, while the information on community and school characteristics in the 1998-VLSS are nationally representative for rural areas, this information is only collected for semi urban areas (small towns). Third, the sample of VLSS only includes the registered residence. So children of unregistered migrants and street children are omitted from the sample. While this omitted sample problem is significant in urban areas, it is not significant in rural areas

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academic performance in the previous grade, there is a possibility that children will report the academic results of the nearest semester which results in a timing mismatch between the reported child labour period and children's academic results. Specifically, a school year in Vietnam consists of two semesters. The first semester starts in September and ends in January; the second semester starts in January and ends in May. By the end of May, children will have the academic results of the whole year, which is an average of the first and second semester's results. The 1998-VLSS was surveyed in one year, between December 1997 and December 1998. For those children who were surveyed between January and May – the time when the academic results of the first semester were available – there is a possibility that they reported the academic result of the nearest semester. Of all children in the sample, 38% were surveyed during this period. However, this inexact recall is beyond our control. As a result, our results have to be interpreted with caution.

<sup>71</sup> It is argued that children's abilities accumulate over time. If a child worked a lot and studied little in the past, the child is likely not only to get poor past mark but also poor marks in the current academic year. Consequently, the current academic score reflects the study and work patterns of several previous years (Strauss et al., 1995). Since I only have information about children's working hours over the previous 12 months, I assume that current work patterns are indicative of the past as well.

because most children in rural Vietnam work with their family in household agricultural production.<sup>72</sup>

I further restrict the sample to school children aged 6 to 15 years old.<sup>73</sup> There are 4,626 children in this group. Children aged 6 with missing information on academic achievement are dropped from the sample. This results in the loss of 110 observations.

#### **4.2.2 Descriptive Statistics**

Table 4.1 breaks down the incidence of child work in Vietnam in 1998. Of all children aged 6-15, 67% of them study only, 19% combine both work and study, 9% work only and 4% report neither work nor study. For those who are studying, Figure 4.1 segregates the incidence of child work by urban and rural areas. The figure shows that child labour is a common phenomenon in rural Vietnam with more than one-third, or 35%, of children who are studying also participating in non-housework labour supply. The corresponding rate is only 6% in urban areas. Of all children working in Vietnam, 95% are in rural areas. In contrast to the incidence of child labour found in Western countries in the late 18<sup>th</sup> century during industrialization, where children had to work long hours in machine operation, most children in rural Vietnam work with their family in the household agricultural production (Edmonds and Turk, 2002; Edmonds, 2007). In this respect, child labour in Vietnam is similar to the incidence of child labour observed in other developing countries in the 20<sup>th</sup> century.

[Table 4.1 & Figure 4.1 about here]

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<sup>72</sup> See O'Donnell et al. (2005) for further discussions.

<sup>73</sup> Six is the age when children start school in Vietnam. Child labour for children age under 15 years old is of special concern of the International Labour Organization. In addition, the Vietnamese labour code prohibits the employment of children under the age of 15 years.

Among working children in rural areas, the average daily hours of non-housework labour supply is 2.76 hours. Together with more than one hour spent doing housework, those children have to work up to four hours a day. Figures 4.2 and 4.3 further illustrate children's labour force participation and average hours of non-housework labour supply by children's ages in rural Vietnam. These figures show that both children's labour force participation and average hours of non-housework labour supply increase as children get older.

[Figure 4.2 & 4.3 about here]

Given that children in Vietnam spend 4–5 hours per day on weekdays (from Monday to Friday) studying in class (common program by Ministry of Education and Training), working may substantially constrain the time left for self-studying. Long working hours may tire children and reduce their concentration ability when studying. Thus working is expected to have a negative impact on children's academic performance.

Table 4.2 breaks down children's academic attainment by their working status in rural areas. It can be seen that, while about 11% of children who only study obtain excellent results, the rate is only 5% among children who have to combine both work and study. While about 49% of children who only study get average results, the rate is 56% among children who work and study. Overall, the percentages of children who receive good and poor results are about the same for children in the two groups.

[Table 4.2 about here]

However, because there are many factors which simultaneously determine the incidence of child labour and children's educational success, simple descriptive statistics only inform us about a two way correlation between the two factors but do not

allow inferences about the impact of child labour on children's academic performance. The next section will provide an econometric framework to estimate the impact of child labour on children's educational performance.

### **4.3 Econometric framework**

In estimating the impact of child labour on students' academic achievement, there are some econometric problems. First, it is likely that there are unobserved factors that simultaneously affect child labour and student's academic achievement. For example, a child with high innate ability can be a successful student despite work. Another example is that parent's preference for education also affects their decision on whether to send their children to work or to school. Parents with high expectations for their children's education will do more to help their children succeed at school, such as spending more time or money on their children's private tutoring, helping them do their homework, buying more books or reading more stories for them to develop their literacy skills (Dang, 2007). These unobserved factors, if not controlled for, could lead to biased and inconsistent estimates of the impact of child labour on children's educational success due to the endogeneity of child labour.

Consistent estimation requires instruments that are highly correlated with child labour but do not directly influence children's academic score. As discussed in Edmonds (2007) child labour and children's academic performance both depend on children's time allocation across activities. So a perfect instrument in this case is the shadow value of child time, which is unobservable in practice. Theoretically, the shadow value of child time to a household depends on the value of money that a unit of child work brings to the family and the marginal utility of an additional money unit to the family. As a result, children are more likely to participate in child work than in

study if their household is living under the subsistence level or there are various opportunities for a child to work and the return from an hour of child work is high (Basu and Van, 1998; Edmonds, 2007; Basu, Das and Dutta, 2010). With this in mind, some variables are thought of as instruments such as: the annual provincial temperature variation within province, the per capita cultivated land area of the household, the presence of local factories within 10km of the commune, the average wage of unskilled young workers within the commune. The relevance of these instruments is checked through their significance in the first stage estimation of child labour determinants (See Appendix-Table 4.1). Among them, only the annual provincial temperature variation is significant in the first stage. As a result, this variable is used as instrument.

The reason behind using annual provincial temperature variation as an instrument for child labour lies in the characteristics of the Vietnamese weather in relation to its agricultural production. Vietnam is located in South East Asia, in the region of both Eastern and Northern hemispheres with three-quarters of the territory consisting of mountains and hills. The country's weather varies across regions. Annual temperature variations are generally higher in the north than in the south. They are also higher in the mountains and plateaus than in the plains. Agricultural production in regions with higher temperature variation is harder; peasants in these regions are poorer, so children are more likely to work to help their parents for the existence of the family.<sup>74</sup> It is argued that temperature variation can affect students' academic

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<sup>74</sup> I also see a significantly positive correlation between regional temperature variations and poverty. In this study, annual provincial temperature variations are obtained from the statistical year books of each province in 2004. I would have liked to obtain provincial temperature variations in 1998 or the average of some previous years around that time but I did not have statistical year books for each province prior to 1999. Because I observe that the annual provincial temperature variation in 2004 is nearly the same as the annual provincial temperature variation in the years 2005 to 2009. This suggests that the annual



achievement through school attendance. However, in the data the correlation between temperature variations and student's school attendance rate is very low, at only 0.017 and not significant even at the 25% level. An explanation may lie in the characteristics of temperature variations in Vietnam. Vietnam's annual temperature variations occur across seasons. Within each season, daily temperatures are rather stable. Students are prepared for hot or cold days in each season. Temperature variations do not prevent children from going to school and thus do not affect children's school attendance or academic achievement.

In the sample, the variable children's average daily working hours is censored: about 40% of children report zero hours of work, while the variable student's academic score is discrete and ordered-ranking. Consequently a system of two simultaneous equations consisting of a tobit equation for child labour and an ordered-probit equation for children's educational success is estimated.<sup>75</sup>

$$y_{1i}^* = \theta \cdot y_{2i} + \beta_1 \cdot x_{1i} + u_{1i} \quad (4.1a)$$

$$y_{2i}^* = \beta_2 \cdot x_{2i} + u_{2i} \quad (4.1b)$$

Where:

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provincial temperature variation in Vietnam is rather stable. I expect the annual provincial temperature variation in 2004 to be similar to that of 1998. In the future, I would like to update the analysis when I have the information about the annual provincial temperature variation in 1998.

<sup>75</sup> It is argued that a parent's decision on whether to send a child to work or to school also depends on the child's educational ability. For this reason, previous academic performance should be also included in the current child labour equation. However, it is challenging to find a variable that affects children's academic achievement without affecting child labour in order to get an unbiased and consistent estimate of the impact of previous academic performance on current child labour in Equation 4.1b. Moreover, our major interest here is the impact of child labour on children's educational performance. With an instrumental variable for child labour, I can obtain an unbiased and consistent estimate of the impact of child labour on children's educational performance in Equation 4.1a. I leave the question of how children's previous academic performance affects their labour force participation for further studies.

$y_{1i}^*$  is a latent variable for student ( $i$ )'s academic score and ( $y_{1i}$ ) is the observed counterpart:

$$y_{1i} = 0 \quad \text{if} \quad y_{1i}^* \leq \alpha_1 \quad (\text{a child has poor study result})$$

$$y_{1i} = 1 \quad \text{if} \quad \alpha_1 < y_{1i}^* \leq \alpha_2 \quad (\text{a child has average study result})$$

$$y_{1i} = 2 \quad \text{if} \quad \alpha_2 < y_{1i}^* \leq \alpha_3 \quad (\text{a child has good study result})$$

$$y_{1i} = 3 \quad \text{if} \quad y_{1i}^* \geq \alpha_3 \quad (\text{a child has excellent study result})$$

$\alpha_1, \alpha_2, \alpha_3$  : are three cut points of the ordered-probit model.

$y_{2i}^*$  is a latent variable for hours of child work and ( $y_{2i}$ ) is the observed counterpart:

$$y_{2i} = y_{2i}^* \quad \text{if} \quad y_{2i}^* > 0 \quad (\text{a child does work})$$

$$y_{2i} = 0 \quad \text{if} \quad y_{2i}^* \leq 0 \quad (\text{a child does not work})$$

And  $x_{1i}$  is a vector of observed characteristics;  $x_{2i}$  is a vector consisting of the constant term, the vector of observed characteristics  $x_{1i}$  and the instrument for child labour;  $\theta, \beta_1, \beta_2$ , are parameters to be estimated;  $u_{1i}$  and  $u_{2i}$  are error terms assumed to follow a bivariate normal distribution with  $Var(u_2) = \sigma^2$ ,  $Var(u_1)$  normalized to 1,  $\rho$  is the correlation coefficient between the error terms of the two equations, and the variance-covariance matrix is given by :  $\begin{bmatrix} 1 & \rho \cdot \sigma \\ \rho \cdot \sigma & \sigma^2 \end{bmatrix}$

When  $\rho = 0$ : the system can be estimated by single equations.

When  $\rho \neq 0$ : the error terms of the two equations are correlated, a single equation estimation will be biased and the two equations should be estimated jointly.<sup>76</sup>

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<sup>76</sup> Systems of simultaneous equations for tobit models were first introduced by Amemiya (1974). Other developers and appliers of simultaneous equations, for example are Nelson and Olson (1978), Heckman

## **4.4 Variable descriptions**

### **4.4.1 The dependent variables**

The dependent variable ( $y_{1i}$ ) in model (4.1a) is children's academic score achieved in the past year, which is ordinal and observed in one of four ranking values: poor, average, good or excellent.<sup>77</sup> The dependent variable ( $y_{2i}$ ) in model (1b) is children's average daily working hours over the past year, excluding schoolwork at home. This includes hours of housework and non-housework labour supply.<sup>78</sup> I use total hours of work instead of hours of economic work or housework separately because I want to measure the true work load that a child has to do.

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(1978), Lee (1978), Amemiya (1978, 1979), Vella (1983), Hanemann (1984), Dang (2007) and Cameron and Cobb-Clark (2008). The system estimation is programmed in the aML software, a statistical package for multi-level and multi-process modeling developed by Lillard and Panis (2003).

<sup>77</sup> Children's educational scores were collected from the self-reported information. This self-reported information may be biased because a child tends not to report the true academic score if the score is bad. For the case of Vietnam, as also discussed in Dang (2007), there are two reasons that this bias due will not happen. First, in contrast to many countries, in Vietnam students' test scores are public. Teachers let all students in the class know the scores of their friends and name who scores the highest to encourage students to emulate. Second, children are asked about their academic results in the presence of adult family members so it is hard to imagine that they will misreport their results.

<sup>78</sup> The 1998-VLSS provides information about work in the last seven days and work in the last 12 months. In this study, I use information about work in the last 12 months. By doing so, I avoid the problem of variations in working hour in a year due to seasonal factors in agricultural production. The survey asked in detail about the number of peak weeks and non-peak weeks in a year in the agricultural production and their corresponding daily working hours. Since weather characteristics vary across regions and thus there are also variations in agricultural produce. Even some regions with the same produce have different harvest time. I also wished to check whether the peak time in agricultural production coincides with the semester time or summer holiday of children's academic year. Unfortunately, I could not do so because the survey did not ask when the peak time occurred.

#### **4.4.2 The explanatory variables**

I model the determinants of child labour and children's academic performance as functions of explanatory variables observed at individual, household, school, commune and regional levels. First, at the individual level, I include variables reflecting student's age, age squared, sex and ethnicity. In Vietnam, children have to take the national exam in their last grade at each school level. During the years of their last grades, children tend to put more effort into studying and parents tend to create more favourable study conditions for their child, thus reducing the children's workload. To capture these effects, I include a dummy variable indicating whether a child is in his or her last grade. I also include the standardized height-for-age z-scores to partly evaluate the impact of children's nutritional status on their academic performance.<sup>79</sup>

The data design of the VLSS allows me to match a child with their parents and thus include mother's and father's years of schooling as additional explanatory variables. These variables are important in many ways. First, children from a family with better educated parents may inherit a better genetic ability. Second, better educated parents usually have higher preferences for their child's education. Third, better educated parents can assist their children better in their school work thus help them success at school. Accordingly, this variable will capture a part of the unobserved heterogeneity of a child's ability and the parent's preference for their child's education all of which are highly important in determining child labour and children's educational

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<sup>79</sup> Children's height-for-age z-score is calculated using version 3.1 of the ANTHRO program released by the World Health Organization in June 2010. Following the World Health Organization (1995) suggestion, scores with a height-for-age-z-score above 3 or below -6 are unreasonable. These unreasonable scores may come from measurement errors. Thus observations with unreasonable height-for-age-z-score are dropped from the sample.

success. In addition to parent's education, Booth and Tamura (2009) pointed out that temporary paternal absence in Vietnam has direct influences on children's educational outcome, so a dummy variable indicating whether both parents are present in the household is included.

Second, at the household level, I include variables that reflect the household economic conditions and the demographic structure of children within the household. I would like to use household per capita income to measure household economic status. However, due to measurement errors in measuring income in rural Vietnam (see Deaton, 1997), I use household per capita expenditure instead. Other variables reflecting the demographic structure of children within the household are the number of siblings by age groups and the average birth space between siblings.

Third, to control for the heterogeneity of schools and identify which school characteristics are significant in determining child labour as well as student's academic achievement, several school characteristics are used. These are variables indicating whether the school has electricity, a library, enough chairs and tables, and the share of rooms with a good blackboard. Variables reflecting teacher characteristics are the share of experienced teachers having more than five years of teaching and the share of qualified teachers according to the Vietnamese Ministry of Education and Training (MOET) standard.<sup>80</sup>

Fourth, at commune level, variables indicating the average distance to the school and the percentage of educated people within the commune are included. If children live

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<sup>80</sup> According to the MOET teacher's standard, qualified teachers in primary and lower secondary education are expected to have graduated from a college-level training institution with a 3-year training period and upper-secondary school teachers are expected to have graduated from a university-level training institution with 4-year training period.



far from school, going to school takes time and effort; children may choose to stay at home and work. As a result, the further the distance from school, the higher the probability of missing classes. Following Card (1993), I expect a negative correlation between the distance to school and children's academic score. In contrast, I expect a positive association between the percentage of educated people within the commune and children's educational performance. Finally, six regional dummies are added to control for heterogeneity of seven regions.

Table 4.3 gives detailed summary statistics of variables of both the total samples, and of separate samples, by gender. I restrict my discussion here to variables that I wish to highlight in analysis. In our observed rural sample, on average, mothers have 6.5 years of education, which is 1.4 years less than fathers. Segregating parent's education by ethnicity, I see that average parents from a minority ethnic group have 2 years of education less than average parents from the majority group. Looking at the demographic structure of children within households, I see that on average a child in the rural sector has 3 to 4 siblings and the average birth space between siblings of rural children is about 2 years. Mean height-for-age of rural Vietnamese children is 1.89 standard deviations below the median height-for-age of children in the same sex in a well-nourished reference group (children in the United States). By ethnicity, while children from the majority group have 1.86 standard deviations of their mean height below the median height-for-age of children in the same sex of the reference group, the number is 2.1 for children in the minority one. This figure suggests that stunting is

particularly significant for rural children of minority groups in Vietnam.<sup>81</sup> By children's gender, I see that stunting is more significant for boys than for girls.

Among school characteristics, I see that in 1998 about 25% of schools in rural Vietnam do not have electricity, 59% do not have a library, 12% of schools do not have enough chairs and tables and about 25% of classrooms do not have a good black board. School infrastructure and teacher quality also vary significantly. Schools in the inland delta and in coastal regions have a better infrastructure than schools in mountainous regions. For example, while more than 82% of classrooms in the inland delta and the coastal regions have a good backboard, the rate is only 69% in the mountainous regions. Another example is that while 94% of classrooms in the inland delta have enough chairs and tables, the rate is 87% in coastal regions and only 83% in the mountainous areas. While 85% of schools in the inland delta have electricity, the rate is only 69% in coastal and mountainous regions. In terms of teachers' characteristics, the observed sample shows that 78% of teachers have the formal MOET teacher's standard. The share of teachers with more than 5 years of teaching experience in the observed rural sample is 74%.

The average distance to school for children in rural Vietnam is 3 kilometres, while it is 2.5km for children in the inland delta and coastal regions and 3.7 for children in the mountainous regions. Of particular note is that the average distance to school for children in the minority ethnic is up to 4.5 kilometres.

[Table 4.3 about here]

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<sup>81</sup> The World Health Organization's standard on child growth and malnutrition suggests that children with height-for-age z-score below -2 are stunted.

I have seen high variations in factor endowments among children observed at individual, household, school, community and regional levels. Which factors are important in determining child labour and children's academic performance? How does child labour affect children's educational performance? Using the econometric framework presented in Section 3, the next section will answer the questions.

#### **4.5 Estimation results and interpretations**

Table 4.4 reports the determinants and the impacts of child labour on children's educational performance for children in rural Vietnam. The estimated sample includes children of both sexes. While Panel A presents the result of the joint equation estimate, Panel B presents the result of the single equation estimate.

The coefficient on provincial temperature variation is positive and highly significant, suggesting that, other things equal, children in provinces with a higher annual temperature variation have to work more. The joint equation estimate shows that the estimated correlation coefficient between the error terms of the two equations –  $\rho$  ( $\rho$ ) – is positive and highly significant. This positive correlation confirms previous prediction that a child with high innate ability can both study well and participate more in labour activities. While in the joint equations estimation the estimated coefficient of children's working hours in the academic performance equation is negative and significant at 10% level, it is positive and not significant in the single equation estimation. This shows that there is an upward bias in the estimated impact of child labour on children's educational performance when the correlation between unobserved factors is not controlled for.

Figure 4.5 plots the predicted probability of falling into one of four academic rankings in response to hours of child work, keeping all other observed characteristics at

their mean. The horizontal axis indicates children's working hours ranging from 0 to 12. With 12 as the maximum hours of child work then 1, 2, 3.2, 4.1 and 6.1 hours correspond to the 50th, 75th, 90th, 95th and 99th percentiles, respectively. The Figure suggests that more hours of child work relate to a lower probability that a child accomplishes good or excellent study results and a higher probability that a child falls into a poor or average academic category.

[Table 4.4 and Figure 4.5 about here]

It can also be seen from Table 4.4 that the gender dummy is highly significant in both equations. The negative estimated coefficient of gender dummy in child labour equation suggests that – other things equal – girls have to work more. There is also a significant difference in academic achievement between boys and girls. My calculation of the change in the predicted probability of falling into each academic category – keeping other variables at their mean – in response to a change in children's gender from girl to boy suggests that – controlling for all other characteristics – girls have a higher probability of falling into the good or excellent academic category and lower probability of falling in to poor academic category. Note that, while girls have to work more, they are more successful at school. This could be consistent with many other studies showing that girls tend to develop earlier than boys and thus perform better than boys at early ages (Epstein et al., 1998). However, another possible explanation for the result is sample selection. Because the sample only includes those who are attending school with their academic score available. Those who drop out of school are not observed. For children of primary school ages (from 6 to 10 years), this sample selection is not a problem because primary education is compulsory in Vietnam and the enrolment rates for children at these ages are high (over 96%) for both sexes. However, as children get older, the school drop-out rate is higher for girls than for boys, reflecting

the gender bias against girls in rural households' investment decisions. At lower secondary education level, the enrolment rates for girls and boys in rural Vietnam in 1998 are 74% and 84%, respectively. Therefore, those girls who remain at school might be a group of higher educational ability. Due to this sample selection problem, the result must be explained with caution.<sup>82</sup>

I then estimate the impact of child labour on children's educational performance separately for children in each sex. The estimation results are reported in Table 4.5. The estimated coefficient of hours of child work variable in the academic achievement equations show that while the impact of child labour on children's academic performance is negative in the joint equation estimate, it is positive in the single equation estimate. This is true for both boys and girls and consistent with the results of the pooled sample estimate. In the joint equation estimate, the impact of child labour on children's academic performance is significant at the 10% level for girls, but not significant for boys.

[Table 4.5 about here]

Figure 4.6 further plots the predicted probability of achieving one of four academic rankings in response to the child work burden, keeping all other observed characteristics at their mean, for boys and girls separately. In the sample, daily working hours of girls range from 0 to 10. With 10 as the maximum hours of child work then 1, 2, 3.3, 4.3 and 6.6 represent the 50th, 75th, 90th, 95th and 99th percentiles, respectively. Daily working hours of boys range from 0 to 12. With 12 as the maximum hours of

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<sup>82</sup> I would like to solve this sample selection problem. However, at this stage I could not find a variable which affects children's school drop-out without affecting children's academic performance. So I leave this for further study.



child work then 1, 2, 3.2, 4 and 6 represent the 50th, 75th, 90th, 95th and 99th percentiles, respectively. To make a comparable comparison for children in the two sexes, I set the range of horizontal axes in common from 0 to 12. The Figure suggests that for both boys and girls, an increase in the hours of child work relates to a lower probability of accomplishing good or excellent results and a higher probability of falling into poor academic category. For boys, an increase in the hours of child work relates to a higher probability of falling into average academic category. This is true along the whole range of predictions. For girls, the relationship between daily hours of child work and the probability of falling into an average academic category is positive when a child works less than 8 hours a day, and it becomes negative beyond that point. Because the sum of probabilities of falling into one of four academic rankings at each value on the horizontal axis is equal to 1, I can easily see that the fall in the probability of getting an average academic result in response to hours of child work as a child works more than 8 hours a day is compensated by the quicker increase in the probability of getting poor academic result. Moreover, the absolute slope of the graph – the change in the probability of getting a poor, good or excellent academic result in response to hours of child work – is always higher for girls than for boys. The results suggest that child labour has a bigger negative impact on children's academic performance for girls than for boys.

[Figure 4.6 about here]

Turning to the impact of other explanatory variables, household economic conditions, measured as household per capita expenditure, play an important role in determining both child labour and children's academic success. Other things being equal, children from poor households have to work significantly longer hours. The probability of achieving a good or excellent academic result increases with higher

household per capita expenditure. *Ceteris paribus*, children from the minority ethnic group have to work more.

Children have to work more as they get older, however the rate of increase declines with children's age. In contrast to prediction, I find no evidence of a reduction in work hours during the children's final grade of each educational level. However, the dummy variable for the last grades is highly significant in determining children's academic achievement. Specifically, the predicted probability of falling in each academic ranking in response to a change in a child's last grade shows that there is a significant improvement in a student's academic performance in the final grade. This is probably because once children are sent to work because of household poverty, the economic value of child labour contributes to the survival of the family. So even while recognizing the importance of children's academic performance in their last grades, for an existence, there is no way that households can do to reduce their child's work burden. But students themselves recognize the importance of academic performance in their last grades and thus make their own effort to succeed in these years.

Consistent with previous studies, I find a highly significant and positive effect of father's and mother's education on children's academic achievement. Additionally, the presence of both parents in the house has a significant impact on children's educational performance. The predicted probability suggests that the presence of both parents in the house increases the probability of getting good academic scores and decreases the probability of getting poor ones. Perhaps when both parents are in the house, they have more time to observe, support and supervise their children in studying and thus help them have better academic achievements.

Turning to the demographic structure of children within the household, I see that while children in households with more young siblings (0-5 years) have to work more, children in households with more old siblings (12 & over years) have to work less. Children in households with larger birth spaces between siblings have to work less.

It is remarkable that children's height is highly significant in determining children's academic performance. Taller children have a higher probability of accomplishing either good or excellent and a lower probability of falling into a poor academic category. Because children's height reflects their nutritional status (O'Donnell et al., 2009; Gørgens et al., forthcoming), the result suggests that children's nutritional status plays an important role in improving children's academic performance in rural Vietnam.

Does better school quality reduce child labour and enhance students' learning? Several school characteristics, such as the presence of electricity, a library and the share of rooms with a good blackboard are found to have significant impacts on the students' academic achievement. Children in schools with these better facilities are found to have a higher probability of getting a good or excellent study result. However, the school's sufficiency of chairs and tables is not significant in determining the students' academic performance. In terms of teacher characteristics, while the share of experienced teachers reduces child labour, more interesting is that the share of qualified teachers increases the probability of accomplishing good or excellent results. As expected, the probability of falling into a poor academic category increases with the children's distance from school.

Children who live in mountainous areas have to work more than comparable children who live in the inland delta. However, geographical characteristics do not have a significant effect on their educational outcome. Notably, the share of educated people

within the commune has a significant impact on student's academic success. The probability of achieving good or excellent academic results increases in communes with a higher share of educated people. Perhaps, education in these communities with a higher share of educated people is valued more highly. Parents there have a higher preference for their child's schooling; children are more ambitious to succeed at school. It may also be that children in communities with a higher share of educated people can easily find people who have the ability to help them with difficult study problems.

#### **4.6 Robustness check**

The estimation includes a rich set of variables observed at the individual, household, school and community characteristics as well as regional dummies. Due to missing values of some observable characteristics, a number of observations were dropped from our estimated sample. I suspect that the omission of these variables may bias the results. So I estimate other models under different sets of control variables. Model 1 only controls for the most basic characteristics and regional dummies. Model 2 adds to Model 1 the number of siblings by age groups, the average birth space between siblings and the standard height-for-age z scores. Finally, Model 3 adds school and community characteristics to model 1.

The estimation results of Models 1 to 3 with different sample sizes due to missing information on additional observable characteristics are reported in Appendix Table 4.2. The estimation results of Models 1 to 3 with common sample size – the sample size of the model which controls for all observed variables – are reported in Appendix Table 4.3. These results suggest that child labour consistently has a significant impact on children's academic performance and the estimated coefficient of the hours of child labour variable is negative in the academic performance equation.

For the estimations with a common sample size, I then carry out a likelihood ratio test for preference of the nested models (reported in Appendix Table 4.3) over the nesting model (presented in Table 4.4) which controls for all variables. The test results suggest the model which controls for all observable characteristics is preferred.<sup>83</sup>

## **4.7. Conclusions**

This paper examines the determinants and impact of child labour on children's academic performance in rural Vietnam using the 1998 Vietnam Living Standard Survey. The unusually rich information of the data allows me to model child labour and children's educational performance as functions of variables observed at individual, household, school, commune and regional levels. I use annual temperature variations within provinces as an instrument for child labour. The joint equation results suggest that child labour has a significant impact on the students' academic performance. More hours of child work relates to a lower probability of accomplishing excellent or good study results and a higher probability of reporting a poor academic result. The impact of child labour on children's educational success is greater for girls than for boys.

Among other observed characteristics, household economic condition is the most important determinant of child labour and children's academic achievement. Children from poor households have to work significantly harder and have a lower probability of being successful at school. Together with the increase in the return to education observed during the country's transition (Moock et al., 1998; Nguyen, 2002), child labour could be a channel for inter-generational transmission of poverty and deeper social stratification.

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<sup>83</sup> The test results are not presented here for brevity but are available upon request. It can also be easily computed from the results reported in Table 4 and Appendix Table 3.



I find that there exists gender discrimination against girls with regard to the child work burden in rural Vietnam. Children from ethnic minority groups work longer hours. Children in mountainous areas work more than comparable children who live in the inland delta. Consistent with findings in the literature, both mother's and father's education have significant impacts on children's educational success. With regard to household demographic structure, the greater the number of young siblings the more working hours a child has to bear. In contrast, the greater the number of older siblings the fewer the hours a child has to work.

Some school characteristics, such as the presence of electricity, a library and a good blackboard are found to be significant in determining children's study results. In terms of teacher's characteristics, while the share of experienced teachers reduces child labour, the share of qualified teachers increases the probability that a student achieves good or excellent academic result. Finally, the academic environment within a commune has a strong effect on students' educational performance.

**Table 4.1 Children's Activities across Different Characteristics**

| Activity       | All sample  | By Rural-Urban |             |
|----------------|-------------|----------------|-------------|
|                |             | Rural          | Urban       |
| Work only      | 9%          | 11%            | 3%          |
| Study only     | 67%         | 63%            | 87%         |
| Work and study | 19%         | 22%            | 5%          |
| No activity    | 4%          | 4%             | 5%          |
| <b>Total</b>   | <b>100%</b> | <b>100%</b>    | <b>100%</b> |

\*Notes: (1) Samples are weighted.

(2) A child is considered as working if he or she has a positive number of hours of non-housework labour supply

Source: VLSS 1998, own calculations.

**Table 4.2 Rural Children's Academic Score by Activities**

| Academic ranking | All sample  |                | By Gender   |                |             |                |
|------------------|-------------|----------------|-------------|----------------|-------------|----------------|
|                  | Study only  | Work and study | Girls       |                | Boys        |                |
|                  |             |                | Study only  | Work and study | Study only  | Work and study |
| Poor             | 4%          | 3%             | 3%          | 3%             | 4%          | 4%             |
| Average          | 49%         | 56%            | 43%         | 52%            | 55%         | 59%            |
| Good             | 36%         | 36%            | 41%         | 39%            | 32%         | 33%            |
| Excellent        | 11%         | 5%             | 13%         | 7%             | 9%          | 4%             |
| <b>Total</b>     | <b>100%</b> | <b>100%</b>    | <b>100%</b> | <b>100%</b>    | <b>100%</b> | <b>100%</b>    |

\*Notes: See Table 4.1

Source: VLSS 1998, own calculations.

**Table 4.3 Summary Statistics of Variables**

| VARIABLES                               | All sample | By Gender |         |
|-----------------------------------------|------------|-----------|---------|
|                                         |            | Girls     | Boys    |
| Dependent Variables:                    |            |           |         |
| Hours worked                            | 1.332      | 1.407     | 1.265   |
| Academic score                          | 1.432      | 1.502     | 1.370   |
| Instrumental variable                   |            |           |         |
| Annual provincial temperature variation | 8.672      | 8.651     | 8.690   |
| Explanatory Variables:                  |            |           |         |
| Individual & household characteristics  |            |           |         |
| Ln of household expenditure per capita  | 7.600      | 7.593     | 7.607   |
| Age                                     | 10.303     | 10.137    | 10.448  |
| Age squared                             | 113.108    | 109.524   | 116.252 |
| Last grade                              | 0.187      | 0.185     | 0.189   |
| Minority                                | 0.201      | 0.197     | 0.203   |
| Father's years of schooling             | 7.844      | 7.857     | 7.832   |
| Mother's years of schooling             | 6.461      | 6.576     | 6.359   |
| Parents living in the house             | 0.929      | 0.925     | 0.932   |
| No siblings age 0-5                     | 0.488      | 0.539     | 0.442   |
| No siblings age 6-11                    | 1.485      | 1.547     | 1.431   |
| No siblings age 12-15                   | 1.029      | 1.006     | 1.050   |
| No siblings age 16-18                   | 0.342      | 0.339     | 0.344   |
| No siblings age 19 & over               | 0.251      | 0.242     | 0.259   |
| Birth space                             | 2.044      | 2.047     | 2.041   |
| Height for age z score                  | -1.890     | -1.823    | -1.948  |
| School & community characteristics      |            |           |         |
| Share of rooms with good blackboard     | 0.752      | 0.762     | 0.742   |
| Have enough chairs & tables             | 0.877      | 0.885     | 0.870   |
| Have electricity                        | 0.749      | 0.739     | 0.757   |
| Have library                            | 0.413      | 0.407     | 0.419   |
| Share of qualified teachers             | 0.784      | 0.791     | 0.779   |
| Share of experience teachers            | 0.745      | 0.748     | 0.742   |
| Distance to school                      | 3.036      | 3.029     | 3.042   |
| Inland Delta                            | 0.470      | 0.465     | 0.474   |
| Coastal                                 | 0.071      | 0.079     | 0.064   |
| Hills & mountain                        | 0.459      | 0.456     | 0.462   |
| Have road that car can travel on        | 0.818      | 0.825     | 0.812   |
| Share of educated people within commune | 0.742      | 0.741     | 0.742   |
| Regional dummies                        |            |           |         |
| Northern Upland                         | 0.242      | 0.240     | 0.245   |
| Red River Delta                         | 0.174      | 0.177     | 0.172   |
| North Central Coast                     | 0.199      | 0.207     | 0.192   |
| South Central Coast                     | 0.080      | 0.074     | 0.085   |
| Central Highlands                       | 0.049      | 0.049     | 0.048   |
| South East                              | 0.078      | 0.079     | 0.078   |
| Mekong River Delta                      | 0.177      | 0.175     | 0.180   |
| No of observations                      | 3,836      | 1,785     | 2,051   |

\*Notes: (1) Samples include rural children and are weighted.

(2) The number of hours of child work is the average daily working hours over the past 12 months, including housework and non-housework labour supply.

Source: VLSS 1998, own calculations.

**Table 4.4 Determinants and Impact of Child Labour on Children's Educational Success**

| VARIABLES                                         | Joint Equations Estimate |                     | Single Equations Estimate |                     |
|---------------------------------------------------|--------------------------|---------------------|---------------------------|---------------------|
|                                                   | <i>Academic score</i>    | <i>Hours worked</i> | <i>Academic score</i>     | <i>Hours worked</i> |
| Hours worked                                      | -0.102 *                 |                     | 0.017                     |                     |
|                                                   | (0.057)                  |                     | (0.016)                   |                     |
| Annual provincial temperature variation           |                          | 0.068 ***           |                           | 0.064***            |
|                                                   |                          | (0.014)             |                           | (0.015)             |
| <i>Individual &amp; household characteristics</i> |                          |                     |                           |                     |
| Ln of household per capita expenditure            | 0.216 ***                | -0.144 *            | 0.231***                  | -0.146*             |
|                                                   | (0.053)                  | (0.078)             | (0.051)                   | (0.080)             |
| Age                                               | -0.037                   | 1.077 ***           | -0.074                    | 1.078***            |
|                                                   | (0.064)                  | (0.107)             | (0.060)                   | (0.100)             |
| Age squared                                       | 0.001                    | -0.029 ***          | 0.001                     | -0.029***           |
|                                                   | (0.003)                  | (0.005)             | (0.003)                   | (0.005)             |
| Last grade                                        | 0.149 ***                | 0.080               | 0.145***                  | 0.077               |
|                                                   | (0.048)                  | (0.077)             | (0.050)                   | (0.075)             |
| Male                                              | -0.255 ***               | -0.350 ***          | -0.234***                 | -0.352***           |
|                                                   | (0.039)                  | (0.058)             | (0.038)                   | (0.058)             |
| Minority                                          | -0.243 ***               | 0.227 **            | -0.261***                 | 0.221**             |
|                                                   | (0.064)                  | (0.096)             | (0.065)                   | (0.100)             |
| Father's years of schooling                       | 0.050 ***                | -0.005              | 0.051***                  | -0.005              |
|                                                   | (0.007)                  | (0.011)             | (0.007)                   | (0.010)             |
| Mother's years of schooling                       | 0.025 ***                | 0.005               | 0.025***                  | 0.005               |
|                                                   | (0.007)                  | (0.011)             | (0.007)                   | (0.011)             |
| Parents living in the house                       | 0.133 *                  | -0.093              | 0.144**                   | -0.092              |
|                                                   | (0.072)                  | (0.107)             | (0.072)                   | (0.110)             |
| Number siblings age 0-5                           | -0.016                   | 0.113 **            | -0.023                    | 0.114**             |
|                                                   | (0.030)                  | (0.049)             | (0.030)                   | (0.047)             |
| Number siblings age 6-11                          | -0.072 ***               | 0.029               | -0.078***                 | 0.032               |
|                                                   | (0.025)                  | (0.038)             | (0.025)                   | (0.039)             |
| Number siblings age 12-15                         | -0.078 ***               | -0.148 ***          | -0.074***                 | -0.151***           |
|                                                   | (0.027)                  | (0.042)             | (0.027)                   | (0.043)             |
| Number siblings age 16-18                         | -0.032                   | -0.341 ***          | -0.008                    | -0.340***           |
|                                                   | (0.038)                  | (0.057)             | (0.037)                   | (0.057)             |
| Number siblings age 19 & over                     | -0.020                   | -0.122 **           | -0.011                    | -0.128**            |
|                                                   | (0.035)                  | (0.058)             | (0.034)                   | (0.054)             |
| Birth space                                       | -0.027                   | -0.047              | -0.027                    | -0.047              |
|                                                   | (0.024)                  | (0.038)             | (0.022)                   | (0.035)             |
| Height for age z scores                           | 0.079 ***                | 0.038               | 0.077***                  | 0.035               |
|                                                   | (0.020)                  | (0.031)             | (0.020)                   | (0.031)             |
| <i>School &amp; community characteristics</i>     |                          |                     |                           |                     |
| % rooms good blackboard                           | 0.140 **                 | 0.242 **            | 0.124*                    | 0.243**             |
|                                                   | (0.068)                  | (0.103)             | (0.068)                   | (0.107)             |
| Have enough chairs & tables                       | -0.036                   | -0.239 **           | -0.006                    | -0.237**            |
|                                                   | (0.065)                  | (0.095)             | (0.063)                   | (0.097)             |
| Have electricity                                  | 0.171 ***                | 0.410 ***           | 0.150***                  | 0.414***            |
|                                                   | (0.050)                  | (0.083)             | (0.050)                   | (0.080)             |

**Table 4.4 Determinants and Impact of Child Labour on Children's Educational Success (cont)**

| VARIABLES                                                   | Joint Equations Estimate |                       | Single Equations Estimate |                      |
|-------------------------------------------------------------|--------------------------|-----------------------|---------------------------|----------------------|
|                                                             | <i>Academic score</i>    | <i>Hours worked</i>   | <i>Academic score</i>     | <i>Hours worked</i>  |
| <b><i>School &amp; community characteristics (cont)</i></b> |                          |                       |                           |                      |
| Have library                                                | 0.135 ***<br>(0.045)     | -0.058<br>(0.067)     | 0.144***<br>(0.044)       | -0.054<br>(0.069)    |
| Share of qualified teachers                                 | 0.116<br>(0.086)         | -0.072<br>(0.129)     | 0.115<br>(0.086)          | -0.077<br>(0.137)    |
| Share of experienced teachers                               | -0.065<br>(0.105)        | -0.506 ***<br>(0.154) | -0.044<br>(0.102)         | -0.506***<br>(0.163) |
| Distance to school                                          | -0.013<br>(0.009)        | 0.001<br>(0.014)      | -0.014<br>(0.009)         | 0.002<br>(0.014)     |
| Coastal                                                     | 0.054<br>(0.080)         | -0.056<br>(0.131)     | 0.059<br>(0.076)          | -0.047<br>(0.124)    |
| Hills & mountain                                            | -0.002<br>(0.056)        | 0.235 ***<br>(0.088)  | -0.019<br>(0.055)         | 0.247***<br>(0.087)  |
| Have road that car can travel on                            | 0.022<br>(0.056)         | 0.035<br>(0.087)      | 0.027<br>(0.055)          | 0.032<br>(0.088)     |
| % educated people within commune                            | 1.424 ***<br>(0.425)     | 1.007<br>(0.242 **)   | 1.345***<br>(0.427)       | 1.047<br>(0.663)     |
| <b><i>Regional dummies</i></b>                              | YES                      | YES                   | YES                       | YES                  |
| Constant                                                    |                          | -6.669 ***<br>(1.033) |                           | -6.655***<br>(1.024) |
| Cut1 (Alpha1)                                               | 0.809<br>(0.647)         |                       | 0.688<br>(0.635)          |                      |
| Cut2 (Alpha2)                                               | 2.967 ***<br>(0.647)     |                       | 2.866***<br>(0.636)       |                      |
| Cut3 (Alpha3)                                               | 4.375 ***<br>(0.649)     |                       | 4.289***<br>(0.637)       |                      |
| Sigma                                                       |                          | 1.621 ***<br>(0.037)  |                           | 1.621***<br>(0.025)  |
| Rho                                                         | 0.165 **<br>(0.077)      |                       |                           |                      |
| Log Likelihood                                              | -8962.994                |                       | -3547.239                 | -5418.903            |
| Pseudo R-squared                                            |                          |                       | 0.0760                    | 0.155                |
| Observations                                                | 3,836                    | 3,836                 | 3,836                     | 3,836                |
| Observations left-censored at 0                             |                          | 1,443                 |                           | 1,443                |

\*Notes: (1) Sample includes all rural children

(2) Huber-White robust standard errors accounting for clustered sample at commune levels are in parentheses, P values: significance \* = 10%; \*\* = 5%; \*\*\* = 1%.

(3) Inland delta is the base group for geographical characteristics; Red River Delta is the base group for regions

Source: VLSS 1998, own estimations.



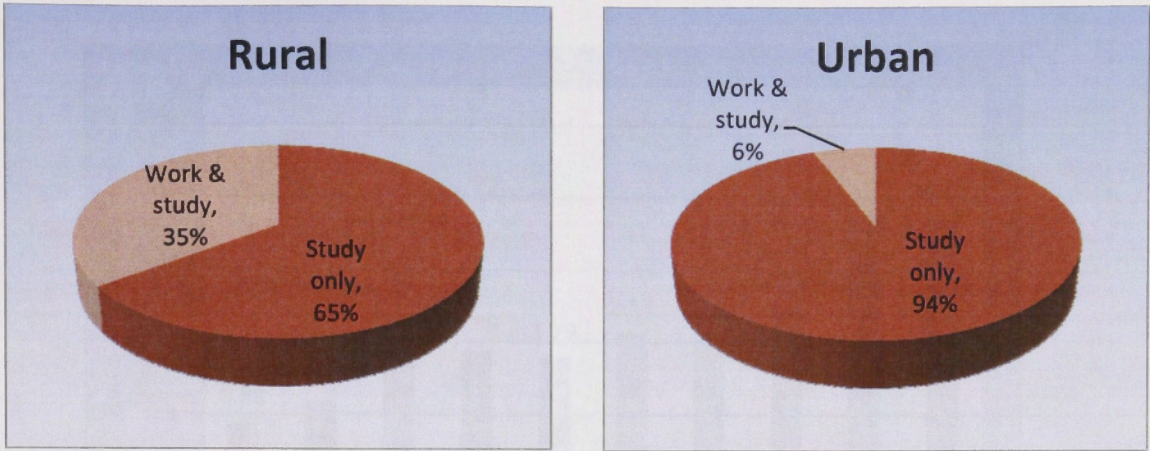
**Table 4.5 Determinants and Impact of Child Labour on Children's Educational Success (Separately by Gender)**

| VARIABLES                               | GIRLS                    |                     |                           |                     | BOYS                     |                     |                           |                     |
|-----------------------------------------|--------------------------|---------------------|---------------------------|---------------------|--------------------------|---------------------|---------------------------|---------------------|
|                                         | Joint Equations Estimate |                     | Single Equations Estimate |                     | Joint Equations Estimate |                     | Single Equations Estimate |                     |
|                                         | <i>Academic score</i>    | <i>Hours worked</i> | <i>Academic score</i>     | <i>Hours worked</i> | <i>Academic score</i>    | <i>Hours worked</i> | <i>Academic score</i>     | <i>Hours worked</i> |
| Hours worked                            | -0.144 *                 |                     | 0.010                     |                     | -0.062                   |                     | 0.016                     |                     |
|                                         | (0.085)                  |                     | (0.023)                   |                     | (0.087)                  |                     | (0.022)                   |                     |
| Annual provincial temperature variation |                          | 0.083 ***           |                           | 0.082***            |                          | 0.054 **            |                           | 0.049**             |
|                                         |                          | (0.020)             |                           | (0.021)             |                          | (0.022)             |                           | (0.021)             |
| Other explanatory variables             | YES                      | YES                 | YES                       | YES                 | YES                      | YES                 | YES                       | YES                 |
| Constant                                |                          | -8.559 ***          |                           | -8.532***           |                          | -4.883 ***          |                           | -4.877***           |
|                                         |                          | (1.477)             |                           | (1.446)             |                          | (1.458)             |                           | (1.437)             |
| Cut1 (Alpha1)                           | 1.589                    |                     | 1.249                     |                     | 0.260                    |                     | 0.269                     |                     |
|                                         | (0.972)                  |                     | (0.929)                   |                     | (0.895)                  |                     | (0.878)                   |                     |
| Cut2 (Alpha2)                           | 3.667 ***                |                     | 3.360***                  |                     | 2.508 ***                |                     | 2.527***                  |                     |
|                                         | (0.966)                  |                     | (0.931)                   |                     | (0.891)                  |                     | (0.879)                   |                     |
| Cut3 (Alpha3)                           | 5.154 ***                |                     | 4.874***                  |                     | 3.860 ***                |                     | 3.884***                  |                     |
|                                         | (0.967)                  |                     | (0.934)                   |                     | (0.890)                  |                     | (0.881)                   |                     |
| Sigma                                   |                          | 1.568 ***           |                           | 1.568***            |                          | 1.644 ***           |                           | 1.643***            |
|                                         |                          | (0.050)             |                           | (0.034)             |                          | (0.052)             |                           | (0.035)             |
| Rho                                     | 0.211 *                  |                     |                           |                     | 0.109                    |                     |                           |                     |
|                                         | (0.114)                  |                     |                           |                     | (0.116)                  |                     |                           |                     |
| Log Likelihood                          | -4237.235                |                     | -1675.662                 | -2564.018           | -4665.759                |                     | -1840.706                 | -2825.794           |
| Pseudo R-squared                        |                          |                     | 0.0847                    | 0.159               |                          |                     | 0.072                     | 0.158               |
| Observations                            | 1,785                    | 1,785               | 1,785                     | 1,785               | 2,051                    | 2,051               | 2,051                     | 2,051               |
| Observations left-censored at 0         |                          | 617                 |                           | 617                 |                          | 826                 |                           | 826                 |

\*Notes: See Table 4.4

Source: VLSS 1998, own estimations.

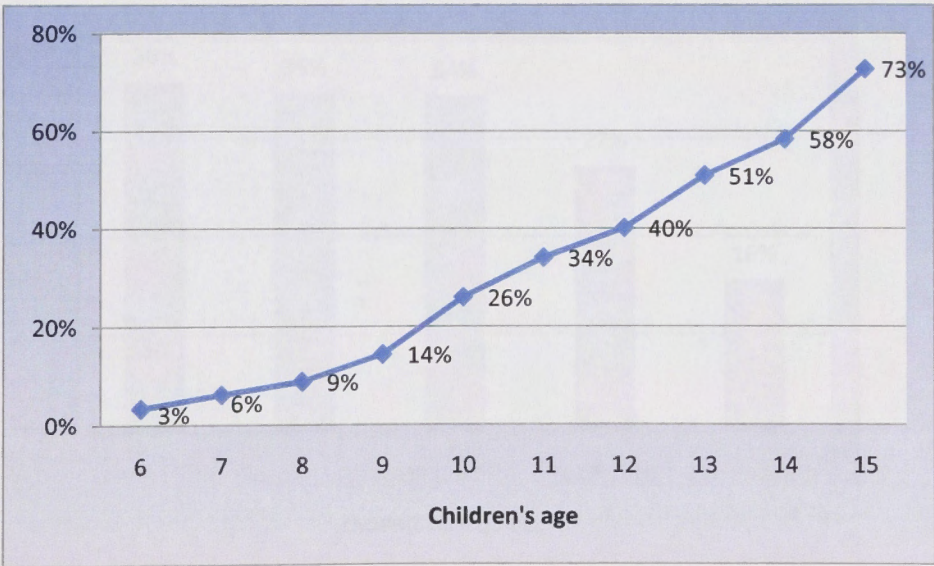
Figure 4.1 Proportion of Children Studying by Working Status



\*Notes: (1) Samples are weighted  
(2) A child is considered as working if he or she has a positive number of hours of non-housework labour supply

Source: VLSS 1998, own calculations.

Figure 4.2 Rural Children's Labour Force Participation by Age

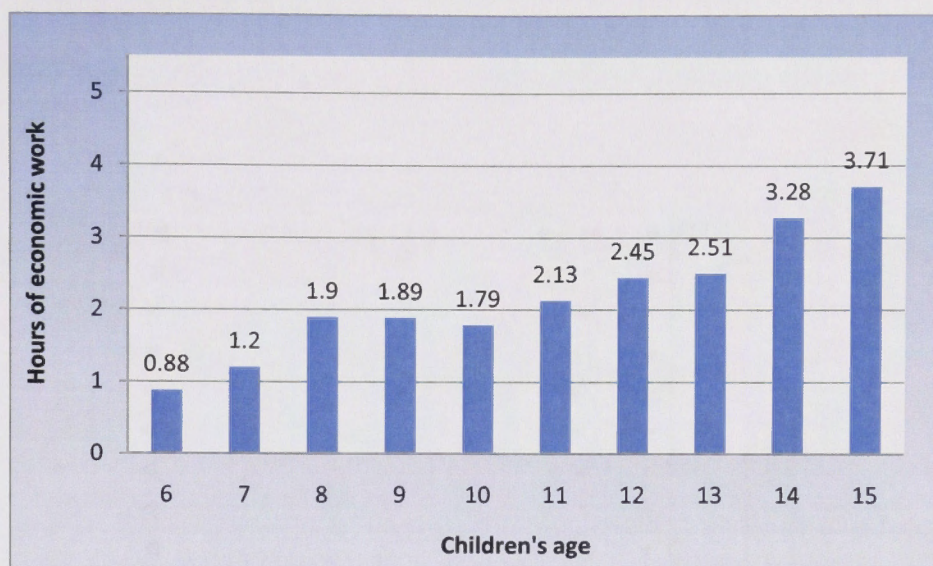


\*Notes: See Figure 4.1

Source: VLSS 1998, own calculations.



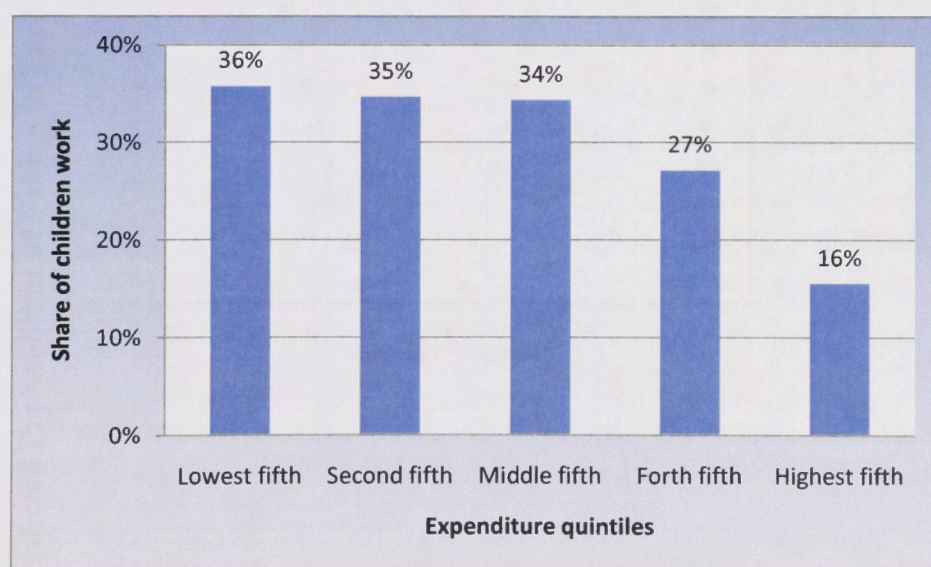
**Figure 4.3 Hours of Non-housework Labour Supply by Children's Age in Rural**



\*Notes: Samples are weighted by sample weights

Source: VLSS 1998, own calculations.

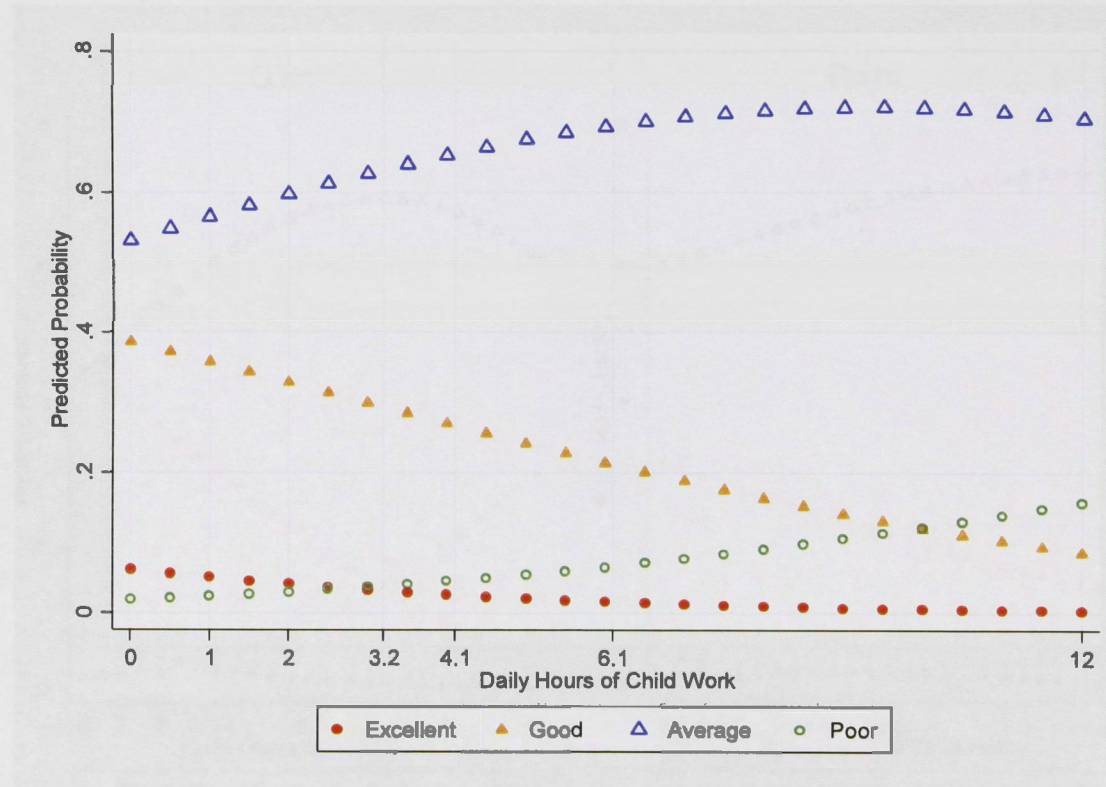
**Figure 4.4 Child Labour by Household Expenditure Quintiles in Rural**



\*Notes: See Figure 4.3

Source: VLSS 1998, own calculations.

**Figure 4.5 Predicted Probabilities of Falling in Each Academic Category in Response to Hours of Child Work**

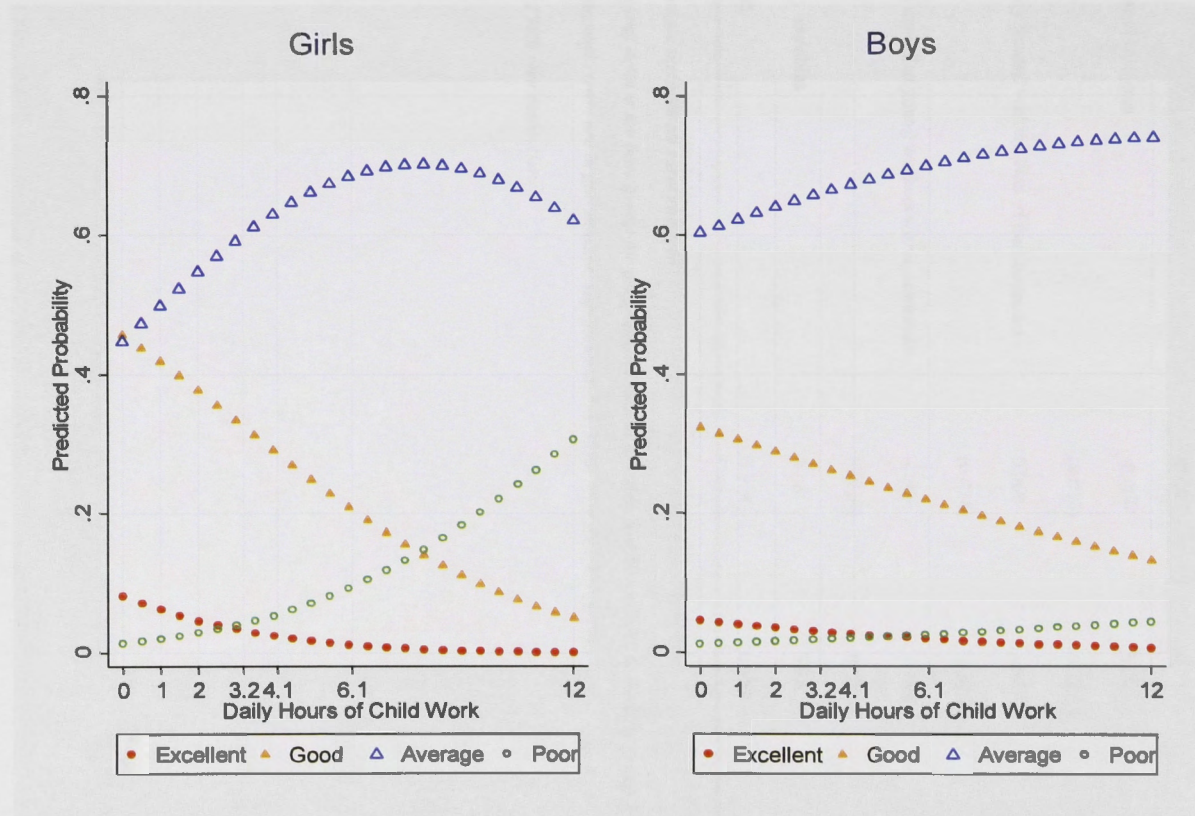


\*Note: Sample includes all rural children

Source: VLSS 1998, own calculations from the joint equations estimate, pooled sample of children in both sexes



**Figure 4.6 Predicted Probabilities of Falling in Each Academic Category in Response to Hours of Child Work (Separately by Gender)**



\*Note: Sample includes all rural children

Source: VLSS 1998, own calculations from the joint equations estimate for girls and boys separately.



**Appendix Table 4.1 First Stage Estimation with Various Instruments**

| <b>VARIABLES</b>                                       | <b>Female</b>       | <b>Male</b>         |
|--------------------------------------------------------|---------------------|---------------------|
| <i>Instrumental variables</i>                          |                     |                     |
| Annual provincial temperature variation                | 0.043***<br>(0.007) | 0.021***<br>(0.007) |
| Per capital cultivated land area                       | -0.000<br>(0.000)   | 0.000<br>(0.000)    |
| Presence of factory located within 10km of the commune | 0.060<br>(0.028)    | -0.005<br>(0.029)   |
| Average wage of unskilled young workers within commune | -0.006<br>(0.010)   | -0.008<br>(0.010)   |
| Other explanatory variables                            | YES                 | YES                 |
| Pseudo R-squared                                       | 0.164               | 0.162               |

\*Notes: (1) Sample includes all rural children

(2) Inland delta is the base group for geographical characteristics; Red River Delta is the base group for regions

(3) Standard errors are in parentheses, significance: \* = 10%; \*\* = 5%; \*\*\* = 1%

Source: VLSS 1998, own estimations.

Appendix Table 4.2 Determinants and Impact of Child Labour on Children's Educational Success

| VARIABLES                                         | Joint Equations Estimates – Models with Different Control Variables and Different Sample Sizes |                       |                       |                       |                       |                       |
|---------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                                   | Model 1                                                                                        |                       | Model 2               |                       | Model 3               |                       |
|                                                   | <i>Academic score</i>                                                                          | <i>Hours worked</i>   | <i>Academic score</i> | <i>Hours worked</i>   | <i>Academic score</i> | <i>Hours worked</i>   |
| Hours worked                                      | -0.145 ***<br>(0.051)                                                                          |                       | -0.134 **<br>(0.058)  |                       | -0.132 **<br>(0.054)  |                       |
| Annual provincial temperature variation           |                                                                                                | 0.049 ***<br>(0.014)  |                       | 0.051 ***<br>(0.013)  |                       | 0.069 ***<br>(0.014)  |
| <i>Individual &amp; household characteristics</i> |                                                                                                |                       |                       |                       |                       |                       |
| Log of household per capita expenditure           | 0.313 ***<br>(0.046)                                                                           | -0.210 ***<br>(0.072) | 0.231 ***<br>(0.049)  | -0.177 **<br>(0.074)  | 0.281 ***<br>(0.048)  | -0.200 ***<br>(0.076) |
| Age                                               | 0.007<br>(0.059)                                                                               | 1.143 ***<br>(0.100)  | 0.003<br>(0.063)      | 1.154 ***<br>(0.101)  | -0.023<br>(0.062)     | 1.089 ***<br>(0.105)  |
| Age squared                                       | 0.000<br>(0.003)                                                                               | -0.034 ***<br>(0.005) | 0.000<br>(0.003)      | -0.033 ***<br>(0.005) | 0.001<br>(0.003)      | -0.032 ***<br>(0.005) |
| Last grade                                        | 0.141 ***<br>(0.045)                                                                           | 0.093<br>(0.074)      | 0.123 ***<br>(0.046)  | 0.097<br>(0.074)      | 0.172 ***<br>(0.047)  | 0.085<br>(0.076)      |
| Male                                              | -0.245 ***<br>(0.036)                                                                          | -0.338 ***<br>(0.056) | -0.255 ***<br>(0.037) | -0.343 ***<br>(0.056) | -0.247 ***<br>(0.038) | -0.346 ***<br>(0.058) |
| Minority                                          | -0.265 ***<br>(0.058)                                                                          | 0.337 ***<br>(0.093)  | -0.290 ***<br>(0.058) | 0.259 ***<br>(0.091)  | -0.212 ***<br>(0.064) | 0.321 ***<br>(0.099)  |
| Father's years of schooling                       | 0.046 ***<br>(0.006)                                                                           | -0.002<br>(0.010)     | 0.048 ***<br>(0.006)  | -0.006<br>(0.010)     | 0.049 ***<br>(0.007)  | -0.002<br>(0.011)     |
| Mother's years of schooling                       | 0.034 ***<br>(0.006)                                                                           | 0.022 **<br>(0.010)   | 0.030 ***<br>(0.007)  | 0.007<br>(0.011)      | 0.029 ***<br>(0.007)  | 0.026 **<br>(0.011)   |
| Parents living in the house                       | 0.058<br>(0.060)                                                                               | -0.077<br>(0.095)     | 0.083<br>(0.069)      | -0.064<br>(0.102)     | 0.107 *<br>(0.062)    | -0.064<br>(0.096)     |
| Number of siblings age 0-5                        |                                                                                                |                       | -0.035<br>(0.028)     | 0.099 **<br>(0.047)   |                       |                       |
| Number of siblings age 6-11                       |                                                                                                |                       | -0.086 ***<br>(0.024) | 0.025<br>(0.036)      |                       |                       |

Appendix Table 4.2 Determinants and Impact of Child Labour on Children's Educational Success (cont.)

| VARIABLES                                                | Joint Equations Estimates – Models with Different Control Variables and Different Sample Sizes |                     |                       |                       |                       |                       |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                                          | Model 1                                                                                        |                     | Model 2               |                       | Model 3               |                       |
|                                                          | <i>Academic score</i>                                                                          | <i>Hours worked</i> | <i>Academic score</i> | <i>Hours worked</i>   | <i>Academic score</i> | <i>Hours worked</i>   |
| <i>Individual &amp; household characteristics (cont)</i> |                                                                                                |                     |                       |                       |                       |                       |
| Number of siblings age 12-15                             |                                                                                                |                     | -0.090 ***<br>(0.025) | -0.164 ***<br>(0.041) |                       |                       |
| Number of siblings age 16-18                             |                                                                                                |                     | -0.036<br>(0.035)     | -0.292 ***<br>(0.056) |                       |                       |
| Number of siblings age 19 & over                         |                                                                                                |                     | -0.017<br>(0.031)     | -0.080<br>(0.057)     |                       |                       |
| Birth space                                              |                                                                                                |                     | -0.020<br>(0.021)     | -0.063 *<br>(0.036)   |                       |                       |
| Height for age z scores                                  |                                                                                                |                     | 0.085 ***<br>(0.018)  | 0.024<br>(0.030)      |                       |                       |
| <i>School &amp; community characteristics</i>            |                                                                                                |                     |                       |                       |                       |                       |
| % rooms good black board                                 |                                                                                                |                     |                       |                       | 0.164 **<br>(0.066)   | 0.220 **<br>(0.104)   |
| Have enough chairs & tables                              |                                                                                                |                     |                       |                       | -0.053<br>(0.062)     | -0.223 **<br>(0.097)  |
| Have electricity                                         |                                                                                                |                     |                       |                       | 0.160 ***<br>(0.049)  | 0.412 ***<br>(0.083)  |
| Have library                                             |                                                                                                |                     |                       |                       | 0.125 ***<br>(0.044)  | -0.046<br>(0.067)     |
| Share of qualified teachers                              |                                                                                                |                     |                       |                       | 0.138<br>(0.085)      | -0.040<br>(0.129)     |
| Share of experienced teachers                            |                                                                                                |                     |                       |                       | -0.042<br>(0.104)     | -0.554 ***<br>(0.154) |

Appendix Table 4.2 Determinants and Impact of Child Labour on Children's Educational Success (cont.)

| VARIABLES                                            | Joint Equations Estimates – Models with Different Control Variables and Different Sample Sizes |              |                |              |                |              |
|------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------|----------------|--------------|----------------|--------------|
|                                                      | Model 1                                                                                        |              | Model 2        |              | Model 3        |              |
|                                                      | Academic score                                                                                 | Hours worked | Academic score | Hours worked | Academic score | Hours worked |
| <i>School &amp; community characteristics (cont)</i> |                                                                                                |              |                |              |                |              |
| Distance to school                                   |                                                                                                |              |                |              | -0.015 *       | -0.001       |
|                                                      |                                                                                                |              |                |              | (0.008)        | (0.015)      |
| Coastal                                              |                                                                                                |              |                |              | 0.063          | -0.058       |
|                                                      |                                                                                                |              |                |              | (0.078)        | (0.131)      |
| Hills & mountain                                     |                                                                                                |              |                |              | 0.018          | 0.206 **     |
|                                                      |                                                                                                |              |                |              | (0.054)        | (0.087)      |
| Have road that car can travel on                     |                                                                                                |              |                |              | 0.029          | 0.045        |
|                                                      |                                                                                                |              |                |              | (0.055)        | (0.088)      |
| % educated people in the commune                     |                                                                                                |              |                |              | 1.754 ***      | 0.985        |
|                                                      |                                                                                                |              |                |              | (0.411)        | (0.648)      |
| <i>Regional dummies</i>                              |                                                                                                |              |                |              |                |              |
| Constant                                             | YES                                                                                            | YES          | YES            | YES          | YES            | YES          |
|                                                      |                                                                                                | -5.866 ***   |                | -5.997 ***   |                | -6.546 ***   |
|                                                      |                                                                                                | (0.764)      |                | (0.801)      |                | (0.979)      |
| Cut1 (Alpha1)                                        | 0.789 *                                                                                        |              | -0.248         |              | 2.006 ***      |              |
|                                                      | (0.433)                                                                                        |              | (0.480)        |              | (0.582)        |              |
| Cut2 (Alpha2)                                        | 2.888 ***                                                                                      |              | 1.870 ***      |              | 4.139 ***      |              |
|                                                      | (0.434)                                                                                        |              | (0.477)        |              | (0.583)        |              |
| Cut3 (Alpha3)                                        | 4.277 ***                                                                                      |              | 3.268 ***      |              | 5.536 ***      |              |
|                                                      | (0.436)                                                                                        |              | (0.478)        |              | (0.586)        |              |
| Sigma                                                |                                                                                                | 1.693 ***    |                | 1.661 ***    |                | 1.650 ***    |
|                                                      |                                                                                                | (0.035)      |                | (0.035)      |                | (0.037)      |
| Rho                                                  | 0.221 ***                                                                                      |              | 0.205 ***      |              | 0.207 ***      |              |
|                                                      | (0.071)                                                                                        |              | (0.079)        |              | (0.073)        |              |
| Log Likelihood                                       | -10422.064                                                                                     |              | -10097.122     |              | -9229.139      |              |
| Observations                                         |                                                                                                | 4377         |                | 4262         |                | 3929         |
| Observations left-censored at 0                      |                                                                                                | 1666         |                | 1600         |                | 1493         |

\*Note: See Table 4.4

Source: VLSS 1998, own estimations.

Appendix Table 4.3 Determinants and Impact of Child Labour on Children's Educational Success

| VARIABLES                                         | Joint Equations Estimates – Models with Different Control Variables and Common Sample Size |                       |                       |                       |                       |                       |
|---------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                                                   | Model 1                                                                                    |                       | Model 2               |                       | Model 3               |                       |
|                                                   | <i>Academic score</i>                                                                      | <i>Hours worked</i>   | <i>Academic score</i> | <i>Hours worked</i>   | <i>Academic score</i> | <i>Hours worked</i>   |
| Hours worked                                      | -0.161 ***<br>(0.057)                                                                      |                       | -0.129 **<br>(0.055)  |                       | -0.134 **<br>(0.057)  |                       |
| Annual provincial temperature variation           |                                                                                            | 0.053 ***<br>(0.014)  |                       | 0.049 ***<br>(0.014)  |                       | 0.073 ***<br>(0.014)  |
| <i>Individual &amp; household characteristics</i> |                                                                                            |                       |                       |                       |                       |                       |
| Log of household per capita expenditure           | 0.279 ***<br>(0.048)                                                                       | -0.201 ***<br>(0.075) | 0.219 ***<br>(0.051)  | -0.137 *<br>(0.077)   | 0.274 ***<br>(0.049)  | -0.207 ***<br>(0.077) |
| Age                                               | -0.021<br>(0.066)                                                                          | 1.088 ***<br>(0.105)  | -0.020<br>(0.063)     | 1.109 ***<br>(0.107)  | -0.034<br>(0.065)     | 1.062 ***<br>(0.105)  |
| Age squared                                       | 0.001<br>(0.003)                                                                           | -0.032 ***<br>(0.005) | 0.001<br>(0.003)      | -0.030 ***<br>(0.005) | 0.001<br>(0.003)      | -0.031 ***<br>(0.005) |
| Last grade                                        | 0.161 ***<br>(0.048)                                                                       | 0.107<br>(0.077)      | 0.146 ***<br>(0.048)  | 0.093<br>(0.077)      | 0.163 ***<br>(0.048)  | 0.090<br>(0.077)      |
| Male                                              | -0.261 ***<br>(0.038)                                                                      | -0.336 ***<br>(0.059) | -0.260 ***<br>(0.039) | -0.337 ***<br>(0.058) | -0.257 ***<br>(0.039) | -0.348 ***<br>(0.058) |
| Minority                                          | -0.252 ***<br>(0.061)                                                                      | 0.335 ***<br>(0.095)  | -0.284 ***<br>(0.061) | 0.253 ***<br>(0.092)  | -0.214 ***<br>(0.065) | 0.317 ***<br>(0.099)  |
| Father's years of schooling                       | 0.048 ***<br>(0.007)                                                                       | -0.005<br>(0.011)     | 0.048 ***<br>(0.007)  | -0.007<br>(0.011)     | 0.050 ***<br>(0.007)  | -0.003<br>(0.011)     |
| Mother's years of schooling                       | 0.030 ***<br>(0.007)                                                                       | 0.027 **<br>(0.011)   | 0.024 ***<br>(0.007)  | 0.004<br>(0.011)      | 0.030 ***<br>(0.007)  | 0.029 ***<br>(0.011)  |
| Parents living in the house                       | 0.040<br>(0.069)                                                                           | -0.144<br>(0.104)     | 0.106<br>(0.072)      | -0.108<br>(0.107)     | 0.076<br>(0.070)      | -0.126<br>(0.103)     |
| Number of siblings age 0-5                        |                                                                                            |                       | -0.013<br>(0.029)     | 0.118 **<br>(0.049)   |                       |                       |
| Number of siblings age 6-11                       |                                                                                            |                       | -0.085 ***<br>(0.025) | 0.025<br>(0.038)      |                       |                       |



Appendix Table 4.3 Determinants and Impact of Child Labour on Children's Educational Success (cont.)

| VARIABLES                                                | Joint Equations Estimates – Models with Different Control Variables and Common Sample Size |              |                       |                       |                      |                       |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------|-----------------------|-----------------------|----------------------|-----------------------|
|                                                          | Model 1                                                                                    |              | Model 2               |                       | Model 3              |                       |
|                                                          | Academic score                                                                             | Hours worked | Academic score        | Hours worked          | Academic score       | Hours worked          |
| <i>Individual &amp; household characteristics (cont)</i> |                                                                                            |              |                       |                       |                      |                       |
| Number of siblings age 12-15                             |                                                                                            |              | -0.088 ***<br>(0.026) | -0.148 ***<br>(0.042) |                      |                       |
| Number of siblings age 16-18                             |                                                                                            |              | -0.046<br>(0.038)     | -0.350 ***<br>(0.058) |                      |                       |
| Number of siblings age 19 & over                         |                                                                                            |              | -0.020<br>(0.035)     | -0.099 *<br>(0.058)   |                      |                       |
| Birth space                                              |                                                                                            |              | -0.025<br>(0.023)     | -0.053<br>(0.037)     |                      |                       |
| Height for age z scores                                  |                                                                                            |              | 0.087 ***<br>(0.020)  | 0.038<br>(0.032)      |                      |                       |
| <i>School &amp; community characteristics</i>            |                                                                                            |              |                       |                       |                      |                       |
| % rooms good black board                                 |                                                                                            |              |                       |                       | 0.160 **<br>(0.067)  | 0.240 **<br>(0.105)   |
| Have enough chairs & tables                              |                                                                                            |              |                       |                       | -0.047<br>(0.063)    | -0.254 ***<br>(0.097) |
| Have electricity                                         |                                                                                            |              |                       |                       | 0.171 ***<br>(0.050) | 0.404 ***<br>(0.084)  |
| Have library                                             |                                                                                            |              |                       |                       | 0.131 ***<br>(0.045) | -0.047<br>(0.068)     |
| Share of qualified teachers                              |                                                                                            |              |                       |                       | 0.128<br>(0.086)     | -0.049<br>(0.129)     |
| Share of experienced teachers                            |                                                                                            |              |                       |                       | -0.052<br>(0.103)    | -0.558 ***<br>(0.155) |

Appendix Table 4.3 Determinants and Impact of Child Labour on Children's Educational Success (cont.)

| VARIABLES                                                | Joint Equations Estimates – Models with Different Control Variables and Common Sample Size |              |                |              |                |              |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------|----------------|--------------|----------------|--------------|
|                                                          | Model 1                                                                                    |              | Model 2        |              | Model 3        |              |
|                                                          | Academic score                                                                             | Hours worked | Academic score | Hours worked | Academic score | Hours worked |
| <i>Individual &amp; household characteristics (cont)</i> |                                                                                            |              |                |              |                |              |
| Distance to school                                       |                                                                                            |              |                |              | -0.016 *       | -0.003       |
|                                                          |                                                                                            |              |                |              | (0.009)        | (0.015)      |
| Coastal                                                  |                                                                                            |              |                |              | 0.074          | -0.047       |
|                                                          |                                                                                            |              |                |              | (0.079)        | (0.134)      |
| Hills & mountain                                         |                                                                                            |              |                |              | 0.013          | 0.200 **     |
|                                                          |                                                                                            |              |                |              | (0.056)        | (0.087)      |
| Have road that car can travel on                         |                                                                                            |              |                |              | 0.021          | 0.042        |
|                                                          |                                                                                            |              |                |              | (0.056)        | (0.088)      |
| % educated people in the commune                         |                                                                                            |              |                |              | 1.771 ***      | 1.020        |
|                                                          |                                                                                            |              |                |              | (0.417)        | (0.650)      |
| <i>Regional dummies</i>                                  |                                                                                            |              |                |              |                |              |
| Constant                                                 | YES                                                                                        | YES          | YES            | YES          | YES            | YES          |
|                                                          |                                                                                            | -5.617 ***   |                | -5.951 ***   |                | -6.351 ***   |
|                                                          |                                                                                            | (0.796)      |                | (0.832)      |                | (0.985)      |
| Cut1 (Alpha1)                                            | 0.361                                                                                      |              | -0.486         |              | 1.900 ***      |              |
|                                                          | (0.468)                                                                                    |              | (0.503)        |              | (0.594)        |              |
| Cut2 (Alpha2)                                            | 2.457 ***                                                                                  |              | 1.643 ***      |              | 4.032 ***      |              |
|                                                          | (0.464)                                                                                    |              | (0.504)        |              | (0.593)        |              |
| Cut3 (Alpha3)                                            | 3.820 ***                                                                                  |              | 3.029 ***      |              | 5.422 ***      |              |
|                                                          | (0.464)                                                                                    |              | (0.506)        |              | (0.595)        |              |
| Sigma                                                    |                                                                                            | 1.656 ***    |                | 1.639 ***    |                | 1.639 ***    |
|                                                          |                                                                                            | (0.037)      |                | (0.037)      |                | (0.037)      |
| Rho                                                      | 0.255 ***                                                                                  |              | 0.208 ***      |              | 0.212 ***      |              |
|                                                          | (0.077)                                                                                    |              | (0.074)        |              | (0.077)        |              |
| Log Likelihood                                           | -9084.70                                                                                   |              | -9018.33       |              | -9025.61       |              |
| Observations                                             |                                                                                            | 3836         |                | 3836         |                | 3836         |
| Observations left-censored at 0                          |                                                                                            | 1443         |                | 1443         |                | 1443         |

\*Note: See Table 4.4.

Source: VLSS 1998, own estimations.

## **5 Conclusions**

### **5.1 Summary of main findings and policy implications**

Vietnam has been one of the countries with the highest economic growth and the greatest poverty reduction over the last few decades as Figure 1.1 shows. However, this spectacular performance should not lead to complacency. Vietnam has encountered many development problems during its transitional period of continuously high economic growth. In particular, the economic restructuring inside the economy resulted in dramatic changes in the country's institutional frameworks and social norms. The rapid development of the private sector and the unbalanced distribution of newly established private enterprises between urban and rural areas resulted in unbalanced growth and thus uneven distribution of economic benefits between the two areas. Moreover, the accelerated opening and integration into the world economy created different opportunities and challenges for different groups in the Vietnamese society.

Three chapters of this thesis addressed the important question of how the benefits of economic growth during the Vietnamese's transition were distributed among different groups in Vietnamese society. To what extent did 'vulnerable groups' benefit from the country's transition compared to other groups? This thesis analyzed and answered this important question using the nationally representative Vietnam living standard surveys between 1993 and 2008. The thesis has also made a contribution to the literature by applying new econometric techniques to investigate economic development problems in Vietnam. The main findings and a discussion of policy implications are summarized below.

### **5.1.1 Inequality in Vietnamese urban-rural living standards, 1993-2006**

As Vietnam became more marketised and liberalised, the living standard of Vietnamese people improved remarkably. Overall inequality increased in the initial period of reform and then declined. Inequality in urban areas is consistently higher than in rural areas. Inequality between urban and rural areas makes the largest contribution to the overall inequality compared to the inequality across other household characteristics. This is true for the entire sample period. Between-group urban-rural inequalities increased significantly from 1993 to 1998, peaked in 2002, fell slightly in 2004, and then fell quickly in 2006. The evolution of overall inequality as well as urban-rural inequality in Vietnam in recent years is different from China, a country previously comparable to Vietnam in many respects.<sup>84</sup> Recent trends in Vietnamese inequality suggest that the country's economic growth is broad-based, which is consistent with an assessment by the World Bank (2007) as well as many other international observers.

We find that the major contributions to urban-rural living standard inequality in Vietnam are inter-group differences in education, the demographic structure, labour market activity, geographic location and the like. This suggests that policies which support rural education, promote rural industrialisation, foster urban-rural linkages and rural population control will lower the urban-rural gap. We also find that education is an important determinant of household expenditure and is an effective channel for inequality reduction.

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<sup>84</sup> Both countries had a strong urban-bias policy in the centrally planned period. Up until now, they are both single-party states led by Communist parties. Since the start of the transition in 1978, China experienced a continuous increase in inequality as well as urban-rural inequality (ADB, 2007).

Another important finding is that as the country became more marketised and liberalised, households with a head working in the agricultural sector did not only have the lowest levels of expenditure but also experienced the least improvements in their returns. This is consistent with the fact that, while the service and industrial sector have had annual growth rates of more than 10% over the period, the growth rates of the agricultural sector were only 2% to 4% (GSO Vietnam, 2010). Geographically, Vietnam is in a region with favorable weather conditions for agricultural production. The country's agricultural productivity increased quickly in the initial period of reform, during the late 1980s and early 1990s, when Vietnam removed its collectivisation in agricultural production and allocated land rights to households.<sup>85</sup> Between 1985 and 1995, rice production grew by 57% and per capita food consumption increased by 21% over the same period (Minot, 1998). However, in recent years there has been little improvement in agricultural productivity (World Bank, 2009). Crops diversification has been slow and insufficiently market-responsive (World Bank, 2005).<sup>86</sup>

The fact is that, despite continuously high economic growth, Vietnam is still a developing country. Agriculture plays a significant role in the Vietnamese economy. This sector accounts for 22% of the country's GDP, 30% of exports and 60% of employment (GSO Vietnam, 2010). Most importantly, 90% of the Vietnamese poor live in rural areas and work in the agricultural sector (World Bank, 2009). The development

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<sup>85</sup> Right after the dismantlement of collectivization in agricultural production, Vietnam's rice production not only satisfied the demand of the whole population but could also be exported. In 1990, Vietnam became the third largest rice exporter in the world and has continuously been being the second largest rice exporter since then.

<sup>86</sup> Among agricultural produce, rice production dominates, and accounts for 45% of the agricultural production and 60% of the cultivated land (World Bank, 2005).



of a strong agricultural sector is important to ensure food security for the whole population and to protect the rural poor from being vulnerable to economic shocks.

Currently, while agricultural production in developed countries is carried out on large farms applying advanced production and harvest technology and following a common production process, agricultural production in Vietnam is small scale, mostly at the household level, and follows the traditional production methods, lacking application of modern science and technology.<sup>87</sup> Take Vietnam's rice production as an example. Even though Vietnam continuously ranks as the second or the third largest rice exporter in the world, after Thailand and the USA, the price of Vietnamese rice in the world market is low due to its uneven quality. While Thailand's peasants have their approved chosen seeds, Vietnamese peasants often use their own harvested rice as the next season seed. The uneven quality leads to a low price for the Vietnamese agricultural output in the world market and thus low profits and incomes for Vietnamese farmers. Because of the low selling prices, Vietnamese farmers also face dumping suits by international producers. Without good knowledge of international laws and a common approved production procedure, it is difficult for Vietnam to win these suits (Lam, 2008). A restriction by buyers on imports of Vietnamese agricultural produce will result in a significant reduction in Vietnamese farmer's income.<sup>88</sup>

Increasing incomes for Vietnamese farmers requires synchronised efforts by producers, distributors and especially the government. Governmental support measures may include more technical assistance to rural households in production orientation,

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<sup>87</sup> The image of the Vietnamese peasant with buffalo in small rice fields lasted for centuries and now is still widely seen (Lam, 2008).

<sup>88</sup> See (Brambilla et al., forthcoming) for a detailed analysis of the reduction in Vietnamese farmer's income due to the imposition of the US Antidumping Duties on Vietnamese Catfish export in 2003.

crop diversification, research on choosing seeds and input, storage technology and the connection to markets. Once producers follow common quality controls in the production process, Vietnam can register for a trademark for its agricultural produce in the world market and thus obtain stable export markets and higher prices. To participate in the world market, Vietnam needs specialists with a good knowledge of international trade laws and a good understanding of its export markets and thus be able to advise agricultural producers on their production process and how to meet the market requirements.

Along with rural agricultural development, in the initial period of urban development, rural-urban migration will be a channel for promoting national economic growth through a productivity increases for those who migrate. Vietnam has had massive rural-urban migration in recent years.<sup>89</sup> This rural-urban migration will help to lower the urban-rural gap, as pointed out theoretically (Lipton, 1977) and also empirically (as observed in our study). However, to a certain point, too much concentration in urban areas will have negative impact on economic growth. Urban areas in Vietnam now encounter the problems of insufficient development of infrastructure (ADB, 2010). Big cities in Vietnam, such as Hanoi and Ho Chi Minh City, are facing urban congestion and environmental degradation, which directly affect current urban economic growth and the quality of urban life.<sup>90</sup>

Rural industrialization, and the resultant of creation of jobs in rural areas, is a solution for sustainable development. Currently, nearly all newly established investment

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<sup>89</sup> It is estimated that in Vietnam almost one million people migrate from rural areas to cities every year (World Bank, 2003).

<sup>90</sup> See Tran (2010) for a comprehensive discussion.

projects in Vietnam are concentrated in few provinces and mostly in urban areas.<sup>91</sup> This uneven distribution of investment projects resulted in uneven job opportunities and income generation and thus a high urban-rural gap. To industrialize rural areas, there must be two combined measures. First, further development of infrastructure nationwide is needed. This reduces the transportation cost for final products from production places in rural areas to market destinations in urban areas. Second, there should be policies which give priority to investors who establish their projects in rural areas.

### 5.1.2 The gender wage gap in the Vietnamese transition, 1993-1998

Regarding wages and the gender wage gap, I find that Vietnamese women have benefited greatly from the country's transition. Between 1993 and 2008, average real wages of Vietnamese workers doubled and the gender wage gap declined by more than a half. Women's productivity related characteristics improved remarkably. However, even with similar observed productivity related characteristics as men, women are paid lower because of discrimination.

I also find that, as the economy becomes more market-oriented, the private sector is an advantaged working environment for male workers but it is a disadvantaged working environment for female workers. Moreover, while 100% of public servants and

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<sup>91</sup> According to an estimation of Mekong Economics (2002) from the data of Ministry of Investment and Planning, during the period from 1988 to 2001, foreign direct investment (FDI) in Vietnam was focused in certain key industrial areas such as Ho Chi Minh City, Dong Nai, Ba Ria Vung Tau, Binh Duong in the South, and Ha Noi, Hai Duong, Hai Phong, Quang Ninh in the North. These key areas in the North and the South accounted for around 80% of licensed projects and registered capital. The amount of (FDI) to the two biggest cities, Ha Noi and Ho Chi Minh City, alone accounted for 49% of the total FDI in Vietnam. According to General Statistics Office of Vietnam (2008) during the period from 2000 to 2006, FDI continued to concentrate in some advantage business regions in the Southeast and Red River Delta. The numbers as well as amount of FDI capital in other regions were low.

97% of SOE workers have social insurance, health insurance and trade-union contributions from their employers, the number is only 47% for domestic private firms (General Statistics Office, 2009b). Female workers in the private sector not only receive lower wages than their counterparts in the state sector, many of them also do not receive health and social insurance contributions from their employers. They are the most vulnerable group in paid employment.

To protect women in their labour participation, the Vietnamese labour code has a separate chapter on provisions concerning female workers (Chapter X). According to regulation, female workers are entitled to four to six months of maternity leave (article 114). During the period of maternity leave, female workers who have paid social insurance contributions are entitled to social security benefits equivalent to 100% of their wage and to an additional allowance of one month's wage for the first and second maternity period (article 144). Employers are not allowed to dismiss or terminate the employment contract of female workers unilaterally because of marriage, pregnancy, maternity leave or breast-feeding a child under 12 months of age (article 111). However, with these regulations, the employment of female workers produces extra costs; employers would prefer to employ male workers or employ female workers only under short-term contracts to avoid paying extra costs. Therefore, these regulations unintentionally have created barriers for female workers' labour force participation. I believe that in order for these government regulations protecting women to be realized, the fund paying for female maternity leave and other female worker's supports should be a government one, and should not be an enterprise fund. This will reduce the direct cost to enterprises when employing female workers which in turn will reduce employer's discrimination against female employees.

Vietnam has tax deduction priorities for enterprises employing a higher proportion of female workers. However, as reported by enterprises, procedures for applying are so complicated that the cost is higher than the final benefit they get, so most enterprises did not apply (Minh-Anh, 2011).<sup>92</sup> Simplifying this procedure to make the government policies come into actual life is necessary. This proposal is consistent with the aim of the Vietnamese Government in its administrative reform in the coming years.

Another important finding is that, in recent years, I have observed a higher wage premium for the public service in comparison to the private sector. This phenomenon has important implications for Vietnam during its transition. On the one hand, an increase in official wages of public servants may reduce corruption. On the other hand, an incompatible wage increase in the public service in comparison to other sectors will polarize the society, which in turn is harmful to the long run social stability. Since the start of transition, the private sector has been shown to be the most efficient sector and has played an increasingly important role in the Vietnamese economy, both in terms of job creation and GDP contribution.<sup>93</sup> However, most domestic private firms in Vietnam are small scale, with a low capital-labour ratio, thus their worker's wage are low. Further encouragement for the private sector's development and capital accumulation will increase the capital-labour ratio for private sector workers and thus increase their wages.

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<sup>92</sup> See Decree 23/CP issued on 18/04/1996 for further details.

<sup>93</sup> The private sector contribute a half of the country's GDP. Formal private sector, including workers who work for registered private firms, accounted for 4.8 million jobs, more than the entire public sector (GSO Vietnam, 2010).



### **5.1.3 Child labour and children's educational success in rural Vietnam**

This chapter investigates the determinants and impact of child labour on children's educational performance in rural Vietnam, this chapter provides important policy implications that merit serious consideration for Vietnam's human capital formation through children's development.

The results suggest that child labour has a significant impact on children's educational performance. Thus current exploitation of child labour will reduce the country's future human capital stock, a decisive factor for growth and development in our current world. Additionally, because of the specific characteristics of an increase in the returns to education observed during the Vietnamese's transition (Moock et al., 1998 and Nguyen, 2002), child labour will be a channel for the inter-generational transmission of poverty and deeper social stratification. We also find that household economic conditions are the most important determinant of child labour and children's academic achievement. Children from poor households have to work significantly harder and have a lower probability of being successful at school.

These findings have important policy implications for Vietnam from at least two aspects. First, any measures which promote national economic growth, making Vietnamese households become richer, will reduce child labour and improve children's academic performance. Second, social programs targeted at supporting disadvantaged children from poor families to reduce their work burden and subsequently raising their education, will create a more equal society in the future by balancing the human capital endowment of children from different family backgrounds when they grow up. Programs of this kind, for example are the school lunch program and cash transfers to

poor families conditional on their children's school attendance and educational performance.<sup>94</sup>

There is a strong and positive impact of parent's education on children's educational success. Therefore investment in the education of the current generation will have a positive impact on improving the education standards of the next generation. I find that there exists gender discrimination against girls with regard to the child work burden in rural Vietnam. Therefore education policies that change the gender bias with respect to schooling investment decisions are needed in rural areas. Since children from ethnic minority groups usually have to work more, child support policies should particularly focus on children in this group. In terms of household demographic characteristics, on average each child in rural Vietnam has 3 to 4 siblings. The negative association between the number of children in the household and children's educational performance suggests that the population policy which limits each couple has two children is important to enhance children's educational outcome.

Among teacher's characteristics, the share of qualified teachers increases the probability that students achieve good or excellent academic results. So creating opportunities for current teachers to upgrade their qualifications will improve the student's educational performance. We also find that the academic environment within a commune is highly significant in determining a student's educational performance. This finding confirms the characteristic of externality in education (Iranzo et al., 2009) and thus suggests that government programs targeted at improving the education of a group will have a positive externality on improving education of other groups and thus

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<sup>94</sup> See Jumpatong (2007) for a detail description of school lunch program in Thailand and a discussion of the program's impact on children's nutritional status and school attendance.

education of the whole population. Among schools' infrastructural characteristics, the presence of electricity, library and good blackboards are found to have a significant effect on children's study results. These findings have important implications for school's infrastructural investments that enhance students' performance.

## 5.2 Direction for further studies

Although this thesis has examined important development problems in Vietnam and found many interesting results, there are many potential directions for further studies.

First, besides a comprehensive inequality analysis, Chapter 2 could be extended with an investigation of polarization trends during the Vietnamese transition.<sup>95</sup> The specific characteristics of the Vietnamese economy during its transition such as marketisation, trade liberalisation and probably corruption result in *a shift of the middle income class to the upper end* of the income distribution. This phenomenon leads to *two better-defined groups* of the income (wealth) distribution: *the poor and the rich*, and thus results in a different evolution of polarization compared with inequality.

Second, in Chapter 3, the use of cross sectional data allows me to observe the whole sample of nationally representative wage workers and to examine the overall trends of the Vietnamese labour market, wage and the gender wage gap for a 15-year period. Future study might use panel data to analyze the distributional change in the Vietnamese gender wage gap from 2002 to 2010, as data become available.

Third, Chapter 4 uses cross sectional data from the 1998-VLSS. Further research would benefit from the collection of high quality longitudinal data and investigation of

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<sup>95</sup> While *inequality* measures the *inter-personal alienation*, *polarization* measures the *alienation* that *individuals and groups feel from one another* (Duclos, Esteban and Ray, 2004).

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