Poverty in Vietnam: The Effects of Shocks and Sectoral Growth Patterns

by

Dang Thi Thu Hoai

Submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

Economics
Business School
University of Glasgow

April 2011

Abstract

The thesis aims to examine the effects of adverse shocks and sectoral growth patterns on poverty. The issue of adverse shocks has recently drawn the attention of academics and policymakers alike, but evidence of the persistent impacts of different types of shocks on poverty is limited due to a lack of data; the significance of the impacts compared to other factors has also not been well studied. With the advantage of the unique data set for Vietnam, this thesis deals with the above issues and provides the most comprehensive study of the effects of shocks on poverty. Secondly, it is argued in the current literature that sectoral growth pattern matters for pro-poor growth. Current findings in the literature reveal a mixed picture regarding which industries contribute most to poverty reduction. It is stressed that a labour-intensive feature tends to make an industry more pro-poor. This study provides a wider and more consistent approach to explaining the mixed results in the literature, and compares different growth patterns in terms of poverty reduction. The issues have been examined in the context of Vietnam, a country successful in fighting poverty over the last decades.

The two issues are investigated in three core chapters, in addition to the introduction and conclusion chapters. The first core chapter deals with the issue of adverse shocks by applying an econometric method. It confirms that four types of shocks, namely natural disaster, illness of a household member, crop failure and disease of livestock, generate a negative impact on poverty. The effect of natural disasters and health shocks can be persistent, lasting for more than three years and keeping people in persistent deprivation. The negative effect of shocks on poverty is significant enough to nullify the poverty-reduction achievements of other policies, such as the education policy. Government intervention in relieving the negative impact of shocks is necessary, and has helped Vietnam reduce its poverty headcount rate by up to 10%.

The second and third core chapters study the effects of sectoral growth pattern on poverty and inequality by combining a Social Accounting Matrix multiplier decomposition technique and a Computable General Equilibrium micro-simulation modelling. The first approach is used in the second chapter, where it allows examination of the issue in the short term and identifies the factors that can affect the pro-poorness of the sectoral growth. The results show that some agricultural sectors, food processing and some non-financial services sectors contribute most to poverty reduction in

Vietnam. The magnitude of the poverty reduction from sectoral growth depends on four features of the industry, namely labour-intensiveness, production linkage with the labour-intensive sector, the degree of sector interdependency, and the poverty sensitivity to income of the people who benefit from the growth of the sector. The growth rate of the sector itself also determines its contribution to poverty reduction. Sub-sectors of either agriculture, industry or service sectors can have these features; this explains the mixed findings in the literature. The second approach is applied in the third core chapter, which examines the issue in the medium and long term. The issues of inequality and spatial and ethnic poverty are also discussed in this chapter. The result confirms that more rapid growth of the sectors identified as the most pro-poor in the previous chapter is the most pro-poor long term sectoral growth pattern. Even the most pro-poor growth pattern generates a difference in spatial and ethnic poverty, and increases inequality.

The thesis contributes to the improvement of the research methodology and a better understanding of the relationship between shocks, sectoral growth and poverty. The findings of the thesis provide policy implications for poverty reduction. There is an urgent need to improve the safety net system that helps people cope with adverse shocks. Promoting labour-intensive industry is not the only way to promote pro-poor growth. Industries that have a close production linkage with labour intensive industry have a strong interdependency with the rest of the economy, and the high poverty sensitivity of the people who benefit from the industry growth can also contribute largely to poverty reduction. As a result, the most pro-poor sector can be a sub-sector in the agriculture, industry or service sectors. This introduces more diversified and broader insights into the pro-poor sectoral growth pattern, which can widen policy choices for countries and be tailored to the country's condition rather than narrowly advocating the development of the agricultural sectors.

Table of Contents

List of Tables

List of Figures

Abbreviations

AEP	Average Expenditure Propensity
BL	Backward Linkage
CBN	Cost of Basic Needs
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium
CIEM	Central Institute for Economic Management (Vietnam)
DOE	Department of Economics (University of Copenhagen, Denmark)
FGT	Foster-Greer-Thorbecke
FL	Forward Linkage
GAMS	General Algebraic Modeling System
GDP	Gross Domestic Product
GSO	General Statistics Office (Vietnam)
GTAP	Global Trade Analysis Project
HH	Household
IFPRI	International Food Policy Research Institute
IIA	Independence of Irrelevant Alternatives
ILSSA	Institute for Labour Science and Social Affairs (Vietnam)
IPSARD	Institute of Policy and Strategy for Agriculture and Rural Development (Vietnam)
LES	Linear Expenditure System
MCP	Mixed Complementary Problem
MDG	Millennium Development Goals
MEP	Marginal Expenditure Propensity
NGO	Non-Governmental Organization
NLP	Non Linear Program
OLS	Ordinary Least Square
P0	Poverty headcount
P1	Poverty gap
P2	Poverty distributional sensitivity
RRR	Relative Risk Ratio
SAM	Social Accounting Matrix

SD	Standard Deviation
SOEs	State-Owned Enterprises
USD	United State Dollar
VARHS	Vietnam Access to Resource Household Survey
VASS	Vietnamese Academy of Social Science
VLSS	Vietnam Living Standard Survey
VND	Vietnamese Dong

Acknowledgements

This thesis is a realisation of my dream of improving myself, which could never have come true without the encouragement, support and help of many people who I would like to sincerely thank in this acknowledgement. First of all, I wish to express my deepest gratitude to my supervisors, Dr Luis Angeles and Professor Gregg Huff, who provided me with guidance, encouragement and support throughout the PhD process. I want to thank them for their time and patience in reading all the early drafts of my work. Their constructive and valuable comments and suggestions greatly helped me improve my knowledge and work over time. I also want to thank Dr Norbert Fiess for his supervision during my initial period of study.

I am also grateful to the academic staff and my fellow postgraduate students in the Department of Economics for their helpful comments during the two PhD workshops, which suggested ways for me to improve my work. My sincere thanks also go to the administrative staff in the department, particularly Ms Jane Brittin, Ms Lavina McMillan and Christine Athorne, for their help and support. My sincere thanks also extend to Micaela Maftei for helping me carefully proofread the final version of this thesis in such a short time.

I thank my employer, CIEM, and the Danida-funded project for providing me a scholarship to study in the United Kingdom. I also want to thank the University of Glasgow especially for providing a supportive and friendly environment for international students like me.

Last but not least, this thesis could not have been completed without the boundless support and sacrifices of my beloved family. I am heavily indebted to my husband, Hung, and my daughter, Hoang Lan, for accompanying me during my period of study and brilliantly overcoming many difficulties in getting used to life in a country that is very far away and totally different from home. My beautiful daughter, Hoang Lan, is always a source of motivation, encouragement and comfort in helping me overcome the challenges facing me during the PhD process. No words can describe my gratitude to my Dad, Man, and my Mom, Kim, who always sacrifice and save the best for me, and never hesitate to show how much they love and care for me. I especially thank my Mom

for teaching and taking care of my lovely daughter at home during my last six months of study.

Author's declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature _____

Printed name _____

Chapter 1- General thesis introduction

1.1- Poverty in recent decades: Research motivation

Poverty has long been an issue of the greatest concern in development (Lipton and Ravallion, 1995). The literature on poverty has rapidly mounted, while commitment by world leaders to reduce poverty has grown since the Millennium Development Goals in the year 2000. Despite many successes in fighting poverty, challenges are still ahead, and the need for further research in this field is on the rise. Four defining features of poverty, illustrated in Table 1.1, have inspired economists and shaped the literature on poverty in recent decades. First, although extreme poverty has declined, the number of poor remains substantial. In the literature, two international poverty lines widely used are one dollar a day and two dollars a day, meaning people are extremely poor if they live on less than one dollar a day and poor if less than two dollars. The extreme poverty rate has declined from 51.9% of the world's population, equivalent to 1,900 million people in 1981, to 25.2%, or 1,374 million people, in 2005. The poverty rate fell from 69.4% to 47%, whereas the number of poor did not drop but slightly increased, from 2,542 million people to 2,564 million people. This reflects the fact that achievements have not been significant enough to free us from the issue of poverty; on the contrary, more efforts seem to be needed.

Second, it is observed from Table 1.1 that poverty alleviation in recent decades differs greatly from region to region. The East Asian and Pacific region have made remarkable and consistent progress in poverty reduction; meanwhile, South Asia has experienced very modest results, and almost no progress has been seen in Sub-Saharan Africa; in fact, the situation was getting worse until very little progress was made recently. This observation has motivated much literature trying to explain why there is such a considerable difference, what factors made the East Asian and Pacific region so successful while South Asia and especially Sub-Saharan Africa have been unsuccessful, and what can be learnt from the successful examples.

Table 1.1- Statistics on poverty and growth in the world, 1981-2005

	1981	1987	1990	1999	2002	2005
Share of people living on less than 2005 PPP $2 a day, %						
East Asia and Pacific	92.6	81.6	79.8	61.8	51.9	38.7
Europe and Central Asia	8.3	5.6	6.9	14.3	12	8.9
Latin America & Caribbean	24.6	24.9	21.9	21.8	21.6	17.1
Middle East and North Africa	26.7	22.7	19.7	19	17.6	16.9
South Asia	86.5	83.9	82.7	77.2	77.1	73.9
Sub-Saharan Africa	73.8	74	76.1	77.6	75.6	72.9
Total	**69.4**	**64.3**	**63.4**	**57.1**	**53.3**	**47**
Number of people living on less than 2005 PPP $2 a day, million						
East Asia and Pacific	1,278	1,238	1,274	1,105	954	729
Europe and Central Asia	35	25	32	68	57	42
Latin America & Caribbean	90	103	96	111	114	94
Middle East and North Africa	46	47	44	52	51	51
South Asia	799	881	926	1,031	1,084	1,092
Sub-Saharan Africa	294	351	393	509	536	556
Total	**2,542**	**2,646**	**2,765**	**2,875**	**2,797**	**2,564**

Economic growth	**1980-1989**	**1990-1999**	**2000-2005**
East Asia and Pacific	9.8	11.2	8.4
Europe and Central Asia		-2.4	5.8
Latin America & Caribbean	1.3	3.3	2.8
Middle East and North Africa	2.8	3.6	4.6
South Asia	6.4	6.1	6.2
Sub-Saharan Africa	2.0	2.0	4.2

Sources: World Bank, World Development Indicators (2008a), data on economic growth was taken and calculated from Thomas (2009).
Note: Economic growth was PPP Gross Domestic Product growth rate as an annual average of the respective period.

Third, even for successful countries such as those in East Asia and the Pacific, concern over sustainable poverty reduction remains significant. The experience of countries whose poverty issues were less serious in 1981, like Latin America or the Middle East and North Africa, make improvement on poverty seem complicated. For example, Latin America and the Caribbean managed to reduce their poverty rate by about 7% between 1981-2005, while the rate increased for Europe and Central Asia. As a result, the issue of sustainable poverty reduction has been an interesting subject for research.

Finally, the relationship between economic growth and poverty is not as simple as the idea that growth reduces poverty, although it was apparent that East Asian and Pacific countries, with their outstanding economic performance in recent decades, also experienced the most rapid poverty reduction. One puzzle is that South Asia grew considerably, by an annual average rate of over 6%, but their progress in poverty alleviation was much farther behind East Asia and the Pacific. More concernedly, the poverty problem in Sub-Saharan Africa worsened, regardless of their positive economic growth. The above observation suggests a complex relationship between growth and poverty.

The persistence and extreme complexity of poverty has generated a huge research motivation, resulting in a vast body of literature on poverty. [1] This is also facilitated by the increasing availability of household survey data in developing countries worldwide.[2] First of all, at a micro level, poverty measurement has developed significantly, so that the picture of poverty has been painted more accurately. If the most widely used poverty indicator, poverty headcount ratio for example, which is the percentage of persons below the poverty line, is considered to be sensitive to an abstract poverty line, dominance analysis has been developed to supplement it. Advancement was made not only within the income domain but also in the non-income dimension. A multi-dimensional poverty measure has been recently developed[3], driven by the emerging capacity approach to welfare in development. Furthermore, poverty is not only measured based on the information collected from the surveys, but the researchers also ask the poor about their perception of being poor[4]. In terms of the time dimension, poverty was not only measured at present and but also for the future, under the concept of vulnerability to poverty (Kanbur, 2008). This thesis uses the income approach for poverty measurement because income is still the best proximate for the well-being of individuals, at least in the context where poverty is pervasive. The thesis will mainly use a class of the Foster-Greer-Thorbecke (FGT) poverty measure, which includes

[1] For a review of poverty before 1990 see Lipton and Ravallion (1995); for a review including the recent literature see Kanbur (2008); for a general review on development economics see Thorbecke (2006).
[2] According to the World Bank (2008b), the number of data sets can be used for poverty analysis increased substantially, from 3 in 1978-1979, to 15 in 1980-1982, to 118 in 2001-2003. The World Bank now has 675 household surveys for 115 developing countries from 1979 to 2007.
[3] See Kakwani and Silber (2008) for recent progress in measuring multi-dimensional poverty.
[4] This was done by the World Bank in 2000 and reported in The Voice of the Poor.

poverty headcount, poverty gap and poverty severity. In addition, dominance analysis will also be applied where appropriate.

The literature has well identified the determinants of poverty. It is generally agreed that poverty is typically a rural phenomenon caused by some common factors such as low education level, limited access to capital and economic opportunity, and a high dependency ratio (Fiess and Verner, 2004; World Bank Institute, 2005). One of the most newly discovered factors is that of an adverse shock[5] (Kanbur, 2008), which is an unexpected event that can lead an individual or household to experience a substantial loss of their income, wealth or consumption (World Bank, 2001). It was found that poor people are particularly vulnerable to shocks such as price, market, illness, and natural calamities (Dercon, 2005). Unlike other factors, information on shocks is not included in household surveys, which are usually used to analyse poverty in developing countries. Therefore, although identified long ago in the literature, the important role of shocks in poverty reduction has not been well recognised until recently. For example, literature on risk, such as Townsend (1994, 1995), Morduch (1990, 1995), and Rosenzweig and Binswanger (1993) found that households were not fully insured against shocks, and formal insurance and credit markets were poorly developed, especially for the poor, which indicates that shocks might impoverish people. The role of shocks in poverty reduction has only been taken seriously since the qualitative work "The Voices of the Poor", initiated by the World Bank (2001a), which asked the poor about their life and found that shocks were a pervasive and a part of their life (Dercon, 2005).

As a result, recent literature has made a considerable effort to determine the direct impact, especially the persistent impact, of shocks on poverty. However, due to data constraints, empirical evidence so far is rather limited in some countries, such as Bangladesh, Chile, Ethiopia and India, in studies by Binayak (2003), Neilson et al. (2008), Dercon et al. (2005) and Quisumbing (2007). The findings of this literature will be discussed in more detail later in the main chapter. However, in general, three major issues emerging from contemporary findings are worth pursuing further. First, it is surprising that some studies, such as Dercon et al. (2005), did not find as strong an

[5] It is noted that two more terms related to adverse shocks and poverty in the literature are risk and vulnerability. Risk is understood as a potential adverse shock to the poor, which has not yet happened. More precisely, shock is a realisation of risk (Dercon, 2005). Vulnerability is more or less related to risk in the sense that it measures how households are vulnerable to poverty in the presence of risks.

impact as expected. Second, the persistent impacts of shocks have not been empirically confirmed though they are possible in theory. For instance, Lokshin and Ravallion (2000), and Jalan and Ravallion (2004) revealed in their studies on China that shocks tend to have a short-term impact, and that after about three years, households seem to fully recover from shocks. Third, it is questionable how significant the role of shocks is relative to other factors, such as low levels of education. Motivated by these issues, and taking advantage of the data in hand, part of this thesis examines the impact of shocks on poverty to provide further empirical evidence and insights.

If shocks have only recently attracted the most attention as a cause of poverty, growth has long been considered a crucial remedy for poverty in developing countries. However, the way growth affects poverty has greatly evolved and is constantly altering in the literature. In fact, poverty was not an explicit target in the policy agenda during the 1950s and 1960s because at this time it was understood as a by-product of growth, termed a trickle-down effect. As long as growth was assured, the poor would benefit from it. This view, as noted by Lipton and Ravallion (1995), was mainly driven by the major theories developed during this period, such as the "Big push" theory by Rosenstein-Rodan (1943), Nurske's "Balanced-growth" (1963) and Lewis's "Dualism" (1954). Theories predicted that during the industrialisation process, which emphasised large investments in physical capital and infrastructure, the poor, who initially worked in low productivity sectors such as agriculture, would gradually move to higher productivity sectors such as industries; therefore, their income would finally increase. As a result, during this time growth was the sole target in the policy agenda, with a firm belief that growth would automatically lead to poverty reduction.

Nevertheless, evidence during the 1970s and 1980s, especially since the study "Redistribution with growth" (Chenery, 1975), revealed a different picture. It was found that the demand on unskilled labor did not increase as much as expected during industrialisation, so the poor could not increase their income by moving to industrial sectors. In contrast, the sector where the poor earned their living was negatively affected; thus hurting them more. Limited capital was invested in the industrial sector, leaving agriculture under-invested. This argument called for a combination of redistribution policy with growth in order for the poor to benefit from the industrialisation process. Since then, poverty started appearing explicitly on the policy agenda, and redistribution policies were advocated to be incorporated into the growth-

oriented policy to make sure that growth came with poverty reduction. Redistribution was recommended to assist the poor in improving their human capital and their access to assets and infrastructure. It was believed that these policies would help the poor participate in the growth process and benefit from it. For example, in the world development report in 1980 on poverty and human development, the World Bank emphasised the growth of education and health as important instruments for poverty reduction.

The new situation and findings in the literature further altered understanding of the impact of growth on poverty. First, the redistribution measure becomes very restricted in a low economic growth condition, where the resources for redistribution are so limited that poverty reduction targets cannot be met. This was a real situation after the mid-1970s, when economic growth slowed severely and resources for redistribution became extremely limited, as noted by Lipton and Ravallion (1995). This premise has also been empirically proved in a paper by Ravallion (2009) showing that countries whose consumption per capita was under USD 2,000 per year in 2005 purchasing power parity had little or no capacity to use redistribution for poverty reduction. In this situation, it is necessary to find a solution other than redistribution to reduce poverty. Second, although growth is on average good for the poor (Dollar and Kraay, 2001) it is also recognised that there is a sizable variance between countries in how much the poor benefit from the same growth rate (Ravallion, 2004).

This leads to a new concept emerging in the literature: "pro-poor growth"[6]. Even though there are several differences between concrete definitions of this concept, the underlying idea is that it reflects the extent to which the poor benefit from growth, meaning growth in some countries might be more pro-poor than in others. Compared to previous understanding of the relationship between growth and poverty, the pro-poor growth concept integrates poverty into growth in the sense that not only can redistribution reduce poverty, but growth itself can also be "made" more pro-poor. According to Ravallion (2004), two factors are responsible for making growth more pro-poor: initial inequality and change in inequality. Low initial inequality will make growth more pro-poor than high initial inequality. Fewer increases in inequality will make the poor benefit more from growth.

[6] For the concept of pro-poor growth see Ravallion (2004) and Son (2007); for the methodology on pro-poor growth analysis see Grimm et al. (2007); for experiences and policy implications see Kakwani and Son (2006), Besley and Cord (2007), OECD (2007), Omer and Jafri (2008) and World Bank (2008c).

However, change in inequality can in turn be determined by either geographical or sectoral patterns of growth. Sectoral patterns of growth can affect how growth benefits the poor. The literature has tried to explain what sectoral growth patterns are the most pro-poor but so far results are rather inconclusive. Loayza and Raddatz (2006) suggest that the size of sectoral growth and its labor-intensity feature decide its poverty impact. Some studies show that agriculture contributes to poverty alleviation more than other industries in some developing countries, such as in South Africa (Khan, 1999) and Indonesia (Thorbecke and Jung, 1996), others find that service sector is the most conducive to poverty, such as in the case of India (Ravallion and Datt, 1996) and Thailand, Indonesia, Malaysia and the Philippines (Warr, 2002), and others find that industry growth was most important for poverty alleviation in the case of Taiwan[7] and East Asia (Hansan and Quibria, 2002). It is noted that development is considered as a process where the role of the sector is changeable, depending on the stage of development (Cypher and Dietz, 2009). While the development literature does not disagree on the increasing role of the industry and service sectors during the development process, viewpoints on the role of agriculture do change over time. If the agricultural sector was formerly viewed as a passive and traditional-low-productivity sector which mainly provides food and employment during the growth process in early classical theory, recent literature tends to view it as playing an active role, especially during the early development stage (Diao et al., 2007). With the potential close linkage in the economy in terms of production, consumption and saving, the agriculture industry plays an important role in facilitating the industrialisation process. Due to the different role of the sector during the development process it is therefore necessary to control for the development stage (i.e. the initial income level of the countries) in order for sensible comparison of the role of the sector on poverty reduction across countries. The results of the above mentioned studies are roughly compatible because all studies use data from an early stage of the country's development. For example, the data for East Asia in the studies of Hansan and Quibria (2002) use data for Taiwan during 1964-1979, and data for South Korea from 1965-1985. Khan studied the South African economy in 1978; Thorbeke and Jung studied Indonesia's economy in the 1980s. Ravallion and Datt (1996) studied the Indian economy during 1951-1991 and Warr (2002) studied the four countries from the 1960s to 1999. Motivated by these inclusive results, another part of this thesis investigates the impact of sectoral growth pattern on poverty with the

[7] This is cited in Warr (2002) and Suryahadi et al. (2006), which reviews the study by Warr and Wang (1999).

intention to shed light on the mixed results in the literature and to provide policy implication for pro-poor growth. Given the resurgent role of inequality in the poverty literature, the thesis will also take it into analysis.

In short, this thesis will analyse, discuss and contribute to poverty literature on the two newest issues important for poverty reduction: adverse shocks and sectoral growth pattern. These two issues are examined in the context of Vietnam, as a case study of a successful example of poverty reduction (Cord, 2007; Klump, 2007). In addition, as pointed out by Ravallion (2001), cross-country data hides the heterogeneity of the impact, and Bourguignon (2002) argues that due to data constraints, it is impossible for a cross-country study to capture the heterogeneity of socio-demographic factors across countries, which is very important for assessing the distributional consequences of growth. Thus, in this context the case study will be a good supplement to cross-country study. Furthermore, from a practical point of view, the case study approach in this thesis allows for more detailed data to analyse, especially on the issue of shocks.

1.2- Overview on poverty reduction in Vietnam

Vietnam has been officially transitioning from central plan to a market oriented economy for nearly twenty-four years. The reform, named "*Doi moi*", has created a radical change in the economy, with the gradually established market system replacing the extremely distorted economy under central planning mechanism, creating incentives for people to work hard and enhancing the efficiency in resource allocation accordingly. Individuals have gradually been given rights to make decisions based on market signals. The transformation started in rural areas, with the reform in land-use rights, where farmers were given land with which to make their own production decisions. Reforms in other areas followed, such as almost abolishing the price-control system, allowing the development of private businesses, reforming the state-owned enterprises, carrying out financial sector reforms and gradually opening to the world economy, etc.[8]

As a result, the economy has grown steadily, by an annual average of 7.6% between 1993 and 2008 (Table 2). According to the World Bank's calculation using the Atlas method, Vietnam's Gross National Income (GNI) increased from USD 170 in 1993 to

[8] See Glewwe et al. (2004).

USD 1,010 in 2009, exceeding the threshold of a low-income country and reaching the lower-middle income level set by the World Bank.[9] The country has followed an industrialisation process, transforming from an agriculture-based economy toward an industry- and service-based economy with an explicit target of increasing the share of industry and service sectors in Gross Domestic Product (GDP). The economy has been increasingly open to the world economy, becoming a member of the World Trade Organization in 2007. The government has pursued import-substitution policies in combination with export-orientation. Integrating into the world economy increased the demand, price and capital inflow to take advantage of the abundant labor resources in Vietnam.[10] The high performance and achievement of Vietnam so far is an expectation from the combination of a low starting point, the great advantages of market mechanism and globalisation over central planning and a closed economy.

In parallel with economic growth, Vietnam has made remarkable progress in poverty reduction over the last decades. The headcount poverty rate[11] has decreased significantly, by 43% over fourteen years, from 58% in 1993 to 17% in 2006 (see Table 1.2). The result of poverty dominance analysis shows that this progress has held, regardless of the poverty line[12]. However, the poverty elasticity of growth has been in decline, meaning more growth is needed for a percentage point of poverty reduction over time (VASS, 2007). If the reduction in poverty was broken down into a change in growth and a change in income distribution, according to the Datt-Ravallion method, growth reduced poverty whereas the change in income distribution worsened he situation (Klump and Bonschap, 2004).

[9] Income groups classified by the World Bank based on GNI per capita using the Atlas method: Low income is $995 or less; lower middle income $996 -$3,945; upper middle income $3,946-$12,195; and high income $12,196 or more.

[10] For the discussions on the impact of globalisation on Vietnam see Abbott et al (2008, 2009), Cling et al.(2009), Vanzetti and Huong (2006), Chan and Dung (2006), Toan (2005), and Niimi et al. (2003).

[11] This is the national general poverty line calculated by the General Statistics Office of Vietnam, with the technical support of the World Bank (hereafter called the World Bank poverty line). It is the sum of food and non-food poverty lines, based on a basic needs approach. Food poverty line is the amount of money required to provide a daily intake of 2100 calories per person. Non-food poverty line is the average non-food expenditure of the third group based on the expenditure quintile. Both of these poverty lines were calculated based on the 1993 household living standard survey (World Bank, 1999).

[12] The technique is illustrated in Deaton (1997) and applied for Vietnam during 1993-1998 in Justino and Litchfield (2003).

Table 1.2- Statistics on growth, poverty and inequality in Vietnam

	1993	1995	1998	2000	2002	2004	2006	2008
GDP Growth	8.1	9.5	5.8	6.8	7.1	7.8	8.2	6.2
Agriculture	3.3	4.8	3.5	4.6	4.2	4.4	3.7	4.1
Industry	12.6	13.6	8.3	10.1	9.5	10.2	10.4	6.1
Services	8.6	9.8	5.1	5.3	6.5	7.3	8.3	7.2
Share of GDP								
Agriculture	29.9	27.2	25.8	24.5	23.0	21.8	20.4	22.1
Industry	28.9	28.8	32.5	36.7	38.5	40.2	41.5	39.7
Services	41.2	44.1	41.7	38.7	38.5	38.0	38.1	38.2
Openness								
Export/GDP	28.7	32.8	44.8	55.0	56.8	65.7	73.6	78.2
Import/GDP	37.5	41.9	52.2	57.5	62.0	73.3	78.2	94.7
Income distribution								
Poverty headcount	58		37		29	20	16	
Gini	0.34		0.374		0.375	0.376		

Source: Poverty and inequality indicators are from VASS (2007) and author's calculation for 2006 based on Vietnam Living Standard Survey, 2006. Other indicators are from Asian Development Bank, 2009.

Similar to the general literature on poverty, the literature on poverty in Vietnam has been on the rise, due in part to the availability of the household living standard survey. It has been revealed that the prominent features of poverty in Vietnam are geographical and ethnic[13] (Liu, 2001, Minot et al., 2006, VASS, 2007). Poverty is mainly a rural phenomenon, especially in some regions, and the majority of ethnic minorities are living in deprivation. The gap between regions is significantly sizable; the incidence of poverty in some regions is more than double the national rate. In this sense, Vietnam's poverty picture shares the same concern as world poverty, which is the unbalanced performance of poverty reduction between regions and ethnic groups. The ethnic and spatial dimension of poverty is explained by the difference in endowments such as land quality, human capital and access to assets, infrastructure and market, such as capital, main road and market density (Minot et al., 2006). Other studies (Baulch et al., 2008; Swinkels and Turk, 2006; Takahashi, 2007) find that difference in the returns to endowments may have a bigger role. This thesis will add one more dimension, the sectoral growth pattern, which might explain the spatial and ethnic poverty of Vietnam. In addition, the location divide also contributes to the increasing trend of inequality in Vietnam, which is considered an obstacle to further poverty reduction (Fritzen, 2002;

[13] Vietnam has 56 ethnic groups, of which Kinh is the majority, accounting for about 70% of the population.

Klump and Pruffer, 2006). This thesis, therefore, also examines inequality in combination with poverty in Vietnam to gain more insights in this respect.

In general, similar with findings from other developing countries, household characteristics such as education, household size, occupation and proportion of old persons are among the determinants of poverty in Vietnam. Besides that, poor households in Vietnam are mainly farming households, and have less access to capital, social and physical infrastructure[14]. Again, shocks were also identified as an important factor in descriptive studies in Vietnam, and households are increasingly exposed to shocks, especially due to climate change and openness to international economies.[15] It is very likely that many people would fall back into poverty if shocks are not properly coped with, which challenges the future sustainability of poverty reduction. It was estimated for 1998-2002 that between 5 and 10 percent of the population was still vulnerable to poverty[16]. Therefore, it is advocated that poverty reduction programs from 2000 onward should pay special attention to improving the safety net for the poor. However, there is no quantitative study on the impacts of shocks on poverty and poverty dynamics. This thesis will investigate this issue in a comprehensive manner, from its impacts on poverty to the current shock coping measures.

Rapid reduction in poverty during the past was due to both redistribution and pro-poor growth patterns in the economy (VASS, 2007). In terms of redistribution, many government schemes, such as investment in rural infrastructure, education and health, and credit or transfer programs, have been implemented to assist and support the poor. The first national program on poverty alleviation, namely the Hunger Eradication and Poverty Reduction program, commenced in 1996, which helped the poor in the form of credits, employment, free healthcare insurance, education fee exemption and training. Since then, the government's efforts in reducing poverty have increased over time in terms of coverage, program diversification and comprehensiveness. However, the impact of the programs on poverty reduction was rather ambiguous (Klump and Pruffer, 2006; Fritzen, 2002).

The major concern is the effectiveness of the programs, which is far from perfect. Cuong (2008) finds a positive impact from the government's micro-credit program on

[14] Minot et al. (2006), Justino and Litchfield (2003), and Thang et al. (2006).
[15] World Bank (1999, 2003), VASS (2007).
[16] World Bank (2003).

poverty reduction; however, the non-poor benefited more from the program than the poor. Quynh (2004) claims that Vietnam's current safety net system fails to target the most vulnerable groups, while Van de Wale (2004)[17] concludes that Vietnam's public safety net (including the subsidy on health insurance and natural disaster assistance) was irrelevant to Vietnam's poverty reduction. It helped only a few people to escape poverty and protected even fewer from poverty. Government investment in agricultural research, roads, education and public infrastructure had a significant positive impact on poverty (Fan et al., 2004; World Bank, 2001b). However, government investment in general also increased inequality, since it favored capital-intensive industries more than labor-intensive ones (Huong and Vinh, 2004).

No less than the redistribution policies, the growth pattern also played a significant role in Vietnam's poverty-related achievements. In parallel with the international emergence of the pro-poor growth concept, poverty reduction was well integrated into the national social and economic development plan for the period 2006-2010[18]. However, Vietnam's growth pattern seems to have been pro-poor well before that period. Klump and Bonschab (2004) and VASS (2007) have speculated that economic growth was one of the main drivers of poverty reduction in the past, but why and how is it so have not been thoroughly investigated in these studies. It may be due to the increase in the productivity of agriculture after the land reforms (Ravallion and Van de Walle, 2008), or the development of non-farming activities (Hung et al., 2010) or the creation of employment outside agriculture (Huong et al., 2003; Justino et al., 2008). Present literature on Vietnam provides some insights but not an overall picture of the contribution of growth pattern to poverty alleviation; this thesis will fill this gap.

1.3- Objectives, research questions and methodologies

In general, this thesis aims to contribute to the ongoing debate and open questions of two issues which are considered very important for poverty reduction in developing countries: adverse shocks and sectoral growth pattern. The specific aims in each topic are as follows:

[17] This paper studies the effect of the government's safety net program on the promotion and protection of people in poverty using the panel national data from the Vietnam Living Standard Survey in 1993 and 1998.

[18] See the World Bank (2006) for more details on the process of integrating poverty reduction into the socio-economic development plan. Conventionally, the Vietnamese government manages the economy with annual and five-year socio-economic development plans, and a ten-year socio-economic development strategy.

Shocks and poverty

On this topic, the thesis aims to assess the impacts of different types of shocks on poverty and poverty dynamics in rural Vietnam, and examine current arrangements in shock-coping measures of households. In particular, the following research questions will be addressed:

- Do adverse shocks have a negative impact on poverty and poverty dynamics? What types of shocks?
- Is the impact persistent or transitory?
- Does the measurement of shocks matter?
- What is the size of the effect? How significant is it compared to the effect of the other poverty determinants?
- What are the coping arrangements for each type of shock?

The econometrics method has been applied to address the questions. Two types of models, logit and multinomial logit, have been built to assess the impacts of shocks on poverty and poverty dynamics in rural Vietnam.

Sectoral growth pattern and poverty in the short-term

The aim of this part is to measure the impact of the growth of different sectors in the economy to poverty reduction, and to explore the channels that determine such impacts. This part of the thesis will examine the issue in the short-term context, meaning the fixed-price assumption is applied. Research questions answered in the section are as follows:

- How much does the growth of different sectors in the economy contribute to poverty reduction in the short-term? Through what channels?
- What sector is the most pro-poor?
- What sector is the most potentially pro-growth?

This section relies on the Social Accounting Matrix (SAM) multiplier decomposition technique proposed in Thorbecke and Jung (1996). However, this method is extended in

order to differentiate between two simulations. The first one performs the simulation that all sectors grow by the same rate. The second simulates the actual growth rates of each sector during 2003-2004. This will help provide a more adequate picture and better understanding of the poverty impact of sectoral growth. To connect the SAM with poverty indicators, the poverty elasticity to income is also estimated based on the Kakwani-Lorenz curve. In addition, the thesis also applies the key sector analysis developed by Rasmussen in order to identify the most pro-growth sector and thus discuss the possible trade-off between pro-poor and pro-growth scenarios.

Sectoral growth pattern, poverty and inequality in the medium and long term

This part of the thesis expands on the previous section on sectoral growth pattern and poverty. Instead of short-term analysis, this part investigates the issue in a long-term context, where the fixed-price assumption mentioned above is released and the behaviors of different agents in the economy are taken into account. The issue of inequality is introduced to find the most equitable growth path. In addition, due to the typical situation in Vietnam as mentioned above, spatial and ethnic issues are also considered. The aim of this part is to identify the most pro-poor sectoral growth pattern and inspect the future income distribution of Vietnam under different growth scenarios. Specifically, the following research questions will be discussed:

- What will be the most pro-poor sectoral growth pattern over long-term development?
- How will the sectoral growth pattern contribute to the spatial and ethnic poverty difference in Vietnam?
- What will be the change in inequality under different sectoral growth patterns? What will be the most equitable growth path?

To address the above questions, this section will apply the most recently developed technique in the literature, macro-micro modeling. The dynamic computable general equilibrium (CGE) model and a behavioral micro model for Vietnam are built and linked together. The framework for the dynamic CGE model for Vietnam is based on the model written in GAMS by Thurlow (2004) for South Africa, while the behavorial micro model is based on the income generation model documented in Robilliard et al. (2008). The two models are linked by the “top down” approach developed in Bourguinon et al. (2003).

1.4- The outline of the thesis

The thesis is organised in five chapters, as follows:

Chapter 1- General thesis introduction

This chapter explains the research motivations through a brief literature review on poverty and provides background information for the thesis. Objectives, research questions, methodologies and an outline of the thesis are also presented here.

Chapter 2- Shocks, coping measures and poverty in rural areas

This chapter begins by reviewing the literature on the impact of shocks on poverty, poverty dynamics and coping measures. It then goes on to explain the methodological framework in comparison with the methodologies available in the literature and the data used. The unique combination of two data sets gives this chapter an advantage over previous studies on shocks. The data provides information about the different types of shocks suffered by households and the coping measures over five consecutive years. It also forms a panel data, which allows for tracking household poverty status over time. In particular, the data allows us to measure the severity of shocks, extending the current literature, where shocks are usually measured by a dummy variable due to data constraints. The chapter proceeds by building logit and multinomial logit models to examine the impacts. Before presenting the results of the models, the chapter shows the descriptive statistics on shocks and coping measures. Finally, the chapter ends with concluding remarks.

Chapter 3- Sectoral growth and poverty alleviation: a short-term view

The chapter commences by presenting the analytical and methodological frameworks and their appropriateness in examining the sectoral contribution of growth to poverty reduction. Particularly, adding to the value of current literature in this field, this chapter pinpoints the difference in potential and real impacts of sectoral growth. This point is important to identify a correct understanding of the role of each sector. The chapter then goes on to present the data, including the Vietnam Social Accounting Matrix (SAM) in 2003 and the Vietnam Living Standard Survey (VLSS) in 2002, and brief descriptive

statistics to envisage the possible impacts. The final results are presented together with discussion. To add insights into the possible trade-off between pro-poor and pro-growth sectors, the chapter continues the key sector analysis and the discussion of the results. Concluding remarks appear in the final section.

Chapter 4- Equitable growth scenarios in Vietnam: Beyond the millennium development goals

The chapter starts with a background on sectoral growth and income distribution in Vietnam. The methodology to model the relationship between sectoral growth and income distribution is discussed. Afterwards, the chapter explains in detail the features of the two models for Vietnam, the data used and how the geographical, ethnic and inequality issues are brought into the analysis. The method to link the two models is also presented. The chapter continues with the growth scenarios, which are identified based on a combination of findings from the previous chapter and contemporary findings in the literature on Vietnam's growth strategy and specific conditions. Three scenarios will be investigated, namely manufacturing-led growth, pro-poor growth and accelerated current growth path. Manufacturing-led growth is based on Vietnam's current growth strategy; pro-poor growth is based on previous findings; and the last scenario is designed to see the consequence of income distribution if the sectoral growth pattern in Vietnam is maintained as it was during the past decade. The results are then presented with discussions and the chapter finishes with concluding remarks.

Chapter 5- General conclusions and directions for future research

This chapter summarises the main findings of the thesis, identifies the contributions to the literature, provides policy implications and suggests ideas for further research.

Chapter 2- Shocks, coping measures and poverty in rural Vietnam

2.1- Introduction

An adverse shock, a realisation of risk (Dercon, 2004), is broadly understood as an unexpected event for individuals/households, which can lead to a substantial loss of income, wealth or consumption (World Bank, 2001a). In theory, shocks may have impacts on poverty. On the one hand, as indicated in a permanent income hypothesis, risk divides the inter-temporal income of a household into two parts, permanent and transitory income (Deaton, 1992b). If the credit market is developed and households can save, their consumption will be smooth over time, and proportioned to their permanent income. However, in developing countries credit markets are poorly developed and poor households do not have enough savings to smooth consumption when facing shocks; shocks may matter, and their impact depends on households' ability to cope with them. On the other hand, under the sustainable rural livelihood framework developed by the Institute of Development Studies (University of Sussex), shocks and the ability to cope with shocks are key elements of the sustainability of livelihood (Scoones, 2000). According to the framework, household welfare is affected by three groups of factors: assets, access to assets and contextual group (Lawson et al., 2006). Assets include financial, human, natural, physical and social capital assets, while access to assets is the environment in which assets are mobilised and utilised. Shocks belong to the group of contextual factors. They can affect the assets, returns to assets and also the consumption of households; therefore, they may impact multiple dimensions of poverty, including income poverty. The impact of shocks depends on their nature, including their frequency and severity, and the capability of households to respond to them (Shaffer, 2002).

In practice, the issue of risk and poverty has been of increasing concern in an advisory domain. In several editions of the World Development Report of the World Bank, as far as poverty is concerned, risk is considered a critical issue. For example, the World Bank (2001a) insists on the need to provide "security" to the poor, in addition to opportunities and empowerment. The World Development Report 2008 on Agriculture for Development shows that poor people in rural areas face risks on a regular basis, while the mechanisms for protecting them are poorly developed. The report, therefore,

recommends that protecting rural households against risks be an area of greater policy attention.

From a policy point of view, when resources to fight poverty are limited, the priority is how to use them effectively. With regards to shocks, two central points are raised. First, do shocks have a persistent or transitory impact on poverty? This will have implications on how much we should we focus on shocks when considering poverty reduction. There is an argument that if shocks only have an impact on transitory poverty, which is temporary, households would soon recover; therefore governments in countries with high chronic poverty rates should pay more attention to the factors that make households persistently poor (Dercon, 2005). In theory, Carter and Ikegami (2007) use the economic theory of asset accumulation and poverty traps to show that uninsured shocks can be an important part of chronic poverty. Murdoch (1994) shows that shock may lead to poverty persistence through two channels: (i) under poorly developed credit and insurance markets and with budget constraints, poor people tend to select less profitable but safer production activities – as a result, they cannot realise high profits with which to escape from their deprived state; and (ii) shocks create loss of assets either through using physical assets as a coping measure or depleting health and education, which may reduce future income. However, present empirical evidence has not yet shown a persistent effect of shocks on poverty. For example, studies by Lokshin and Ravallion (2000), and Jalan and Ravallion (2004) have examined long-term impacts of shocks on poverty in Bulgaria and China respectively: the results reveal that shocks tend to have a short-term impact on households. After about three years, households seem to fully recover. Some papers show negative impacts of some types of shocks on poverty but little evidence shows the impacts of different shocks on poverty dynamics (Dercon, 2005).

Second, how should governments intervene effectively? Moral hazard and adverse selection in the insurance market creates a rationale for the government to intervene in social protection. However, households adopt several strategies in response to shocks; these vary from country to country, and can be formal or informal. Therefore, in order to intervene effectively, governments should understand the concurrent shock-coping institutions in order to complement them to help the poor. It is possible that government intervention may have a side effect, canceling out the current shock-coping mechanism and therefore negatively impacting poor households (Dercon, 2002). The present literature focuses on investigating the strategies poor households use to respond to

shocks. There is no consensus on this since the responses of households are diversified among different settings, but rich empirical evidence[19] shows that the poor respond in the two above channels, which may lead to poverty persistence.

This chapter complements the current literature on the issues stated above by using panel data of rural households in 12 provinces of Vietnam and retrospective information on shocks during the last five years. Firstly, the persistent impacts of different types of shocks on poverty are discovered by connecting household poverty status with shocks occurring in the past five years. Taking advantage of the unique data set, the chapter examines the accumulation and severity of shocks, information which is lacking in the majority of literature on shocks, mainly due to data limitations (Bauch and Hodinott, 2000). The chapter will show that fully considering the severity of shocks reveals a relatively different picture, and examining the correlation of shocks on both poverty and poverty dynamics gives more useful insights on transitory and persistent impacts. Secondly, the chapter tries to closely investigate the current architecture of shock-coping measures. This will support the findings on the effect of shocks and provide more evidence on shock-coping measures in developing countries, as well as policy guidance for sound government intervention.

Vietnam is an interesting case for studying shocks and poverty. After transforming from a planned to a market economy, Vietnam experienced rapid growth of 7.5% during 1993-2006[20], and a sharp poverty reduction. However, while high growth in a relatively open and market-oriented economy is considered a main contributor to poverty reduction, it also increases risks for households, especially poor ones. Transformation to higher productivity may increase risks to farmers. Opening the economy to international markets may easily transmit price fluctuations in international markets to the domestic economy. The more industrialisation the country embarks on, the more serious pollution and forest devastation it experiences, increasing health risks and natural disasters such as floods. The latest report on poverty in Vietnam in 2006[21] indicates a challenge of sustaining poverty reduction achievements, mainly due to the presence of shocks. In this context, a detailed picture of the risks and their impact on poverty provides a more complete picture of Vietnam's success in poverty reduction; in other words, whether its successful poverty reduction still holds after shocks have been taken into account.

[19] For example, Rosenzweig and Binswanger (1993), Morduch (1994), Townsend (1995), Dercon (1996), Jacoby and Skoufias (1997), Dercon (2002), and Cruces and Wodon (2003).
[20] General Statistics Office of Vietnam.
[21] VASS (2007).

A recent study by Van de Walle (2004) shows that Vietnam's social safety net has a negligible impact on poverty transition; one of her explanations is the inefficiency and deficiency of the social safety net. This chapter will provide further evidence that the social safety net fails to protect households from natural disaster, illness of household members, crop failure and diseases of livestock. Furthermore, in rural areas, diversifying and changing production are important strategies to improving household welfare. However, this chapter will demonstrate that shock insurance needs to be improved if the government wants to accelerate production diversification. This kind of information will be useful for policy makers to design a sound policy for further poverty reduction in Vietnam. Quynh (2004) examines a test on risk-sharing in Vietnam and shows that the poor tend to be less insured. However, this approach to assessing the impact of shock does not take into account the indirect impact, such as changing behavior of households toward less risky but low-profit production. This chapter will do so, and provide further details on which types of shocks matter in rural areas of Vietnam.

This chapter will try to address the above issues by using panel data with rich retrospective information on shocks and coping measures, which is not available in living standard surveys. The majority of poor people live in rural areas; therefore, looking at rural poverty is justified. As calculated from a national living standard survey in 2006 (VLSS 2006), 75% of the population and 94% of the poor people in Vietnam live in rural areas. Shock in this chapter is defined as income and asset loss and consumption reduction; this chapter also uses money metric measurement for poverty[22]. The data allows for examining the impacts of separate types of shocks, and multivariate and multinomial logit models from the "poverty profile" approach will be used. The rest of the chapter will be structured as follows: section 2 reviews current literature on the impacts of shocks on poverty and poverty mobility, and coping measures. Methodological issues are discussed in section 3. Section 4 presents data and model specifications, followed by descriptive statistics in section 5. Section 6 reports the results and discussion; conclusions appear in section 7.

[22] It is commonly agreed that poverty is a multidimensional concept; therefore, the income approach is only one of many measures of poverty. A case in point is that poverty measured under the human approach includes three aspects: health, education and income.

2.2- Shocks, coping measures and poverty: Evidence from the literature

The issue of shocks and poverty dynamics has been increasingly examined in the literature on vulnerability, poverty and poverty dynamics. The literature can be divided into two branches. The first investigates the direct impacts of shocks on poverty or poverty dynamics through either calculating risk-adjusted poverty or identifying shocks as determinants of poverty or poverty dynamics. Certain impacts of shocks on poverty have been found. For example, the study by Cruces and Wodon (2003) relies on a Constant Relative Risk Aversion utility function to estimate risk-adjusted poverty for Argentina. The results show that poverty incidence increases by 11% when shocks have been taken into account. Dercon (2005) uses the Ethiopian Rural Household Survey 2004 to calculate predicted poverty with and without shocks. The results show that predicted poverty without shocks is fourteen percentage points lower than that with shocks.

Shocks have been examined as a determinant of poverty or poverty dynamics together with other factors such as physical assets, education, demographics, economic activities, location and household life cycle stage. However, few studies on determinants of poverty dynamics investigate the role of shocks, mainly because of a lack of data[23]. For those studies where shocks are taken into account, the sample size is rather small and the types of shock impacts on poverty dynamics are different from country to country. For instances, Neilson et al. (2008) use a logit model to identify determinants of escaping and falling into poverty in Chile: they find that health shocks increase the probability of households falling into poverty. Binayak (2003) analyses a panel data set of 379 rural households from 21 villages in Bangladesh between 1987-88 and 2000, and concludes that descent into poverty was associated with floods and illness of a household member. Panel data on 183 households from five villages in India during 1975-84 is used in Gaiha and Imai (2002) to assess the impact of crop shock. They discovered that a large number of rural households experienced a long spell of poverty (over three years) even without negative crop shocks. Crop shocks led to an increase in the proportion of households experiencing short spells of poverty (one to two years). Small farmers were more vulnerable to long spells of poverty after a large or severe crop shock. Quisumbing (2007) uses a multinomial logit model for Bangladesh and shows that the illness and death of a household member, crop loss and livestock death affected the probability of both being chronically poor and escaping poverty. Hulme and

[23] Dercon (2008).

McKay (2005) indicate that transient poverty was a result of crop failure in Rwanda. Dercon et al. (2005) analyse the impacts of shocks on per capita consumption in rural Ethiopia and find that only experiencing drought reduced per capita consumption; the impact of illness was found not statistically significant at 10%. This finding was surprising; as they put it, "the striking feature of the results of the shocks variables is how *unimportant* many of them seem to be". This seems inconsistent with the fact that shocks were pervasive in rural Ethiopia and with findings from a related study, such as Dercon and Khrisnan (2000). This study found that household consumption was affected by both idiosyncratic and common shocks, such as crop failure or rainfall.

The second branch explores the impact of shocks on poverty through the response to shocks or risks. It is argued that the way people respond to shocks may determine the effect of shocks. Specifically, when facing shocks, the welfare of households will not be negatively impacted if they have adequate response mechanisms. Although this branch does not inspect the direct impact of shock-coping measures on poverty dynamics, it focuses on studying how households respond to shocks or risks and how risks are shared, especially for poor households. It has been found that poor households are vulnerable to shocks and rely mainly on themselves to cope with shocks by applying both ex-ante and ex-post mechanisms.[24] The former implies that measures are applied before the shocks happen, also called income smoothing or risk management. The latter means that poor people smooth consumption when shocks occur; this is also called consumption smoothing or risk coping measure.[25] It is evident from many studies that households are not always fully insured against shocks, and formal insurance and credit markets are often poorly developed, especially for the poor (see, for example, Townsend, 1994; Jalan and Ravallion, 1999). According to Dercon (2002), selling assets is a common shock-coping measure in developing countries, while employment is sometimes a channel to cope with shocks in India (Kochar, 1995). A study by Udry (1994) shows informal credit as a shock-coping measure in rural Nigeria.

There is plentiful evidence in the literature that some households respond to shocks in a way that may lead them to persistent poverty. Rosenzweig and Binswanger (1993), for instance, explore the impact of risk on production using data from three villages in

[24] See Alderman and Paxson (1992), Morduch (1990, 1995), Townsend (1995), and Dercon (2002) for reviews of shock-responses strategies of households in developing countries.
[25] However, according to Shaffer (2002), it is more accurate to use the terms income and consumption smoothing than ex-ante and ex-post strategies, respectively, because some strategies happen either before or after shocks occur; for example, selling assets.

India. They measure the impact of risks on input choice by estimating a production function. The results show that when the environment became riskier, vulnerable households shifted production into more conservative but less profitable patterns. Morduch (1990), using the same data set of Indian households, shows that poor households devoted a larger share of land to a safer traditional production of rice and castor than to a riskier but higher-return one. A study by Rosenzweig and Wolpin (1993) reveals that using bullocks was one mechanism of coping with shocks in rural India. In addition, the poor in India may withdraw their children from school in times of income shortfall (Jacoby and Skoufias, 1997). Dercon (1996) finds that Tanzanian households with limited liquid assets grew proportionately more sweet potatoes, a low-return but low-risk crop. Large shocks resulted in a negative impact on the health of people in Zimbabwe and Ethiopia (Dercon and Hoddinott, 2004).

Very few studies have examined the relationship between shocks, response and poverty in Vietnam. Research recently carried out by Gaiha and his colleagues (2007) uses national panel data from the Vietnam Living Standards Surveys (VLSS) in 2002 and 2004 to construct the ex ante measures of vulnerability, which were mainly derived from adverse shocks. The study finds that, in general, vulnerability in 2002 translated into poverty in 2004 and the vulnerability of the poor tended to perpetuate their poverty. The paper concludes that sustainability of poverty reduction in Vietnam depends on the performance of social safety nets to protect vulnerable households from risks. The level of risk sharing in Vietnam has been examined by Quynh (2004) using national panel VLSS 1993 and 1998. The results show a good level of risk sharing taking place at a district level but not so at a regional level. They also show that less wealthy and low expenditure households were more vulnerable to risks. The safety net was found inefficient and irrelevant for poverty protection and promotion during 1993-1998 in Quynh (2004) and Van de Wale (2004). It helped only a few people escape from poverty and protected even fewer households from falling into poverty.

When it comes to specific types of shocks, some other qualitative studies examine several types, such as flood, price shock or performance of certain types of government-subsidised insurance. For example, Wagstaff and Pradhan (2003) evaluate health insurance and find that the main participants in the schemes were better-off households, while the poor had to use informal insurance but were still unable to cope with health shocks. Thomas et al. (2010) studied the economic impacts of natural disasters in Vietnam and found that people were vulnerable to numerous natural disasters with

increasingly frequent devastating shocks, such as cyclones and riverine floods, which may destroy livelihoods, eliminating the hope of escaping poverty.

2.3- Methodological framework

In the current literature, the correlation of shocks with poverty can be examined using four approaches: shock response, risk-sharing, lifetime pattern of consumption or income and "poverty profile". The first approach investigates household response to shocks to see whether they lead households into poverty through the main two channels mentioned above. The second approach studies how consumption is smoothed when households experience shock, mainly testing the full-insurance model. The third inspects the pattern of household consumption or income over time to see whether it follows a low-level non-convex pattern, which implies the persistent impact of shocks. The last approach directly explores the correlation of shocks with different poverty measurements, such as income poverty, health poverty and transient or transitory poverty. This chapter applies the last approach and uses income headcount poverty because it suits the data in hand and has several advantages over the other approaches. For example, it can capture the indirect impacts of shocks, such as selecting low-risk and low-profit crops rather than risky high-profit ones, which is otherwise not represented in the risk-sharing approach (Skoufias and Quisumbing, 2005).

Under the poverty profile approach, the effects of shocks on poverty and poverty dynamics can be estimated using two main types of model: a model for continuous dependent variable and one for discrete.[26] The continuous model uses changes in consumption or income or its logarithm as a dependent variable, while shocks are explanatory variables together with control variables such as age, education, assets or location. It is also called a micro-level growth model, which estimates the impact of shock on consumption and uses that to simulate the counterfactual consumption without shocks. From that, one can determine the contribution of shocks on poverty changes during a certain period. This method was proposed by Dercon (2002, 2004) in his papers estimating the determinants of growth in villages in Ethiopia.

[26] This is drawn from the review on modelling the poverty transition of Lawson et al. (2006). One more type of model, a duration model, is also used in the literature to identify the determinants of poverty transition. However, this type of model needs several waves of panel data so it is not mentioned here.

In the discrete dependent model, for poverty, the dependent variable is a dummy variable with a value of 1 for poor and 0 for non-poor households, and the logit or probit model is used. Shocks are explanatory variables together with other conventional determinants of poverty, such as education, age, sex and assets. For poverty dynamics, dependent variables are four categories of poverty dynamics, falling into poverty, escaping poverty, chronic poverty and never poor, which are identified using a concrete poverty line and a spell approach[27]. Explanatory variables are more or less the same in the poverty logit or probit model. Several discrete models have been used, including the sequential logit or probit model, the ordered logit model and the multinomial logit model.

First, a sequential logit or a series of logit or probit models, firstly considering the factors influencing whether or not a household is poor in the first year of being studied, and then the factors associated with being poor or not in the second year, given an initial poverty status. An example of applying this model is found in Bhide and Mehta (2003), who modelled poverty transitions in rural India. This type of model captures the dynamic nature of different poverty dynamic states. Specifically, households escaping poverty may be affected by two sets of factors: those making them more likely to be poor in the first place, and those enabling them to escape poverty. The first set of factors may be similar to factors associated with chronic poverty, and the second set associated with the never poor. However, the model does not allow for the non-random nature of the sample at the second stage; an alternative approach to this is to estimate a nested logit model (Lawson et al., 2004).

Second, some studies, such as Baulch and McCulloch (1998), use the ordered logit model with the argument that there is a natural order in poverty status. In other words, it is assumed that each household has a set of factors regarding the status of poverty dynamics. Baulch and McCulloch (1998) argue that the ordered logit approach is good for understanding the relative influence of different household characteristics on poverty

[27] According to Glewwe and Gibson (2006), there are two methods for identifying income poverty dynamics, namely spells and component approaches. With regard to the spells approach, poor households are defined as ones with income or expenditure less than a poverty line at a point in time, while the component approach classifies households with average income or expenditure during periods less than a poverty line as poor. The rate of transient poverty tends to be higher in the spell approach compared to the components approach. Because of the sensitivity to measurement error, the spell method tends to overestimate the proportion of the population that is poor in some periods but not in others. As a result, the spell method is more appropriate in identifying the determinants of poverty dynamics because it separates the factors affecting households falling into and escaping poverty, which are argued to be different (Lawson et al., 2006).

status. However, their findings see no difference between the ordered logit and the multinomial logit model. As pointed out by and Justino and Litchfield (2003), the work of Niniimi, Dutta and Winters (2003), which applies a number of ordered logits, does not bring satisfactory results.

Third, the multinomial logit model is the most widely used approach[28], enabling the identification of factors that are more prevalent within each poverty dynamic category Baulch and McCulloch (1998). However, the estimate from the model is unbiased only if the assumption of "independence of irrelevant alternatives" (IIA) is satisfied. In other words, odds ratios of two probabilities must be independent from remaining probabilities. For poverty dynamics it may be reasonable in the sense that the probability of being in any state of poverty dynamics depends on the factors presented by explanatory variables rather than the characteristics of the alternatives, i.e poverty dynamics status. This chapter uses the multinomial model, with that argument. However, there is an argument that in order to be poor in both periods, one needs to be poor in the first stage. In this case the nested logit model is more appropriate. One may try the nested logit model to compare results from the multinomial models, but this chapter does not do that. The IIA assumption can be tested with three types of tests in Stata software: the Hausman test, the Suest-based Hausman test and the Small-Hsiao test. All tests are based on the idea initiated by Hausman and McFadden that if an alternative is independent, dropping one of the alternatives will not lead to inconsistent estimation (Greene, 2003). However, according to Long and Freese (2005), the Suest-based Hausman test is more stable across the alternatives than the two others; therefore, the Suest-based Hausman test is used in this chapter. If the assumption is not satisfied, the alternative is the multinomial probit model, but it is rarely used because of the intensity of its computation.

The application of the discrete dependent variable model in poverty analysis was criticised by Ravallion (1996) because of the loss of information. This model does not capture the variation of households at different income levels. However, by applying both continuous and discrete dependent variables in a study on Vietnam, Justino and Litchfieldo (2003) find that the results are not very different. It is concluded that as long as the poverty line is set at a meaningful level, modelling poverty transitions across the

[28] Such as Herrera (2001) on Peru, Baulch and McCulloch (1998) on Pakistan, Quisumbing (2007) for application to Bangladesh, and Justino and Litchfield (2003) for application to Vietnam.

poverty line yields valuable insights for poverty reduction policies. In addition, if the study uses income instead of consumption to define poverty, one should pay attention to the measurement error (Ravallion, 1996). For rural areas in developing countries, the measurement error of income may be challenging because it does not let researchers impute sufficiently the value of income from self-production. In this regard, the discrete model eases the impact of the measurement error of income because it does not depend on the total variation of income but only on income level either below or above the poverty line.

This chapter uses logit and multinomial logit models to see the correlation of shock with poverty and poverty dynamics. The panel data satisfies the assumption of "independence of irrelevant alternatives" through a Suest-based Hausman test. To set up the model, each household *i* can fall into j poverty status or poverty dynamics status. j = 2 for poverty status, poor and non-poor, or j = 4 for poverty dynamics status, namely poor in both years, poor in initial year but non-poor in another year, non-poor in initial year and poor in another year, and non-poor in both years. Applying the cumulative logistic distribution function, the probability of households falling into j alternatives, influenced by a vector of factors x, is presented as follows[29]:

$$P(Yi = j) = \frac{e^{\beta_0 + \beta_j x_i}}{\sum_{j=0}^{k} e^{\beta_0 + \beta_j x_i}} \qquad (1)$$

where j = 1 for the logit model and j = 0, 1, 2, 3 for the multinomial logit model For the multinomial logit model, a sum of j probabilities is 1; the above model is thus unidentified. To solve the problem, one coefficient β must be set to 0 and all other sets are estimated in relation to this base case. If β_0 is set to 0, the model becomes:

$$P(Y_i = j) = \frac{e^{\beta_0 + \beta_j x_i}}{1 + \sum_{k=1}^{j} e^{\beta_0 + \beta_k x_i}} \qquad \text{for j= 1, 2, 3} \qquad (2)$$

$$P(Y_i = 0) = \frac{(3)\ 1}{1 + \sum_{k=1}^{j} e^{\beta_0 + \beta_k x_i}} \qquad (3)$$

[29] Greene (2003).

To estimate β, dividing (2) to (3), we get:

$$\frac{P(Y_i = j)}{P(Y_i = 0)} = e^{\beta_0 + \beta_j x_i}$$

Now, taking the natural log of the above equation, we obtain:

$$L_i = \ln\left(\frac{P(Y_i = j)}{P(Y_i = 0)}\right) = \beta_0 + \beta_j x_i$$

Of which, $\frac{P(Y_i = j)}{P(Y_i = 0)}$ is the odds ratio in the logit model and the relative risk ratio (RRR) in the multinomial logit model.

2.4- Data and model specifications

Data

This chapter uses data from two surveys, VLSS 2004[30] (Vietnam Living Standard Survey) and VARHS 2006 (Vietnam Access to Resource Household Survey). VLSS 2004 is a national representative survey conducted by the General Statistics Office of Vietnam during May and November 2004. It originates from a survey under the World Bank's living standard measurement survey program in 1993; thus its format is almost identical to the World Bank's living standard measurement surveys in many other developing countries. It covers information on household living standards, such as income and expenditure, demography, education and assets. Characteristics of localities, i.e. where the household lives, are covered in a questionnaire at commune level. However, this type of survey does not include comprehensive information on shocks experienced by households over time.

VARHS 2006 was implemented in collaboration between the University of Copenhagen (Denmark) and the Institute for Labor Studies and Social Affairs (Vietnam) between July and September 2006. It covers 1,436 rural households in 12 provinces, which were interviewed in the 2004 VLSS mentioned above[31]. The provinces were selected to provide information to monitor the progress of farmers in provinces supported by

[30] There are two modules for this survey with different sample sizes; the data set used in this paper is from the income and expenditure module.

[31] In fact, the survey covered 2,324 households in 12 provinces; however, 888 households were not surveyed in VHLSS 2004, therefore they are not mentioned here. Vietnam has 64 provinces. For detailed information about the survey, see CIEM, DOE, ILSSA and IPSARD (2007).

Danish aid. These provinces are spread all over the country, in seven out of eight regions, including poor and less poor regions.[32] In addition to general information on individual household members, the survey contains detailed information about access to and use of production resources such as land, labour and credit, and especially rich information on shocks and coping measures. Specifically, the survey asks households to provide detailed information on shocks, their consequences, and household responses during 2002-2006. The survey provides information on the total income of households but covers only part of food consumption.

As a result, to serve the objective of the chapter, panel data from VLSS 2004 and VARHS 2006 are used. VLSS 2004 provides information on initial income, household characteristics and localities; VARHS 2006 provides information on shocks during 2002 and 2006, and household income in 2006. It is noted that almost all studies on poverty on Vietnam use household consumption expenditure to define the poverty status of households, because household consumption is argued to be a better measure of household living standard, especially in developing countries, from both theoretical and empirical perspectives.[33] However, there is no comparable information on consumption expenditure for panel households in 2006, so income is used instead.[34] In order to bring it closer to consumption, income of households in the sample includes some items that may be considered as factors of consumption smoothing, such as selling assets and transfers. As mentioned above, a panel of 1,462 households can be formulated; however, due to some missing observations of some relevant variables, the final sample is 1,232.

This panel raises three concerns. Firstly, how does the sample represent poverty in rural areas of Vietnam? To check this, we compare the poverty rate estimated by the sample and that estimated by the national living standard survey in 2006; these are 27.2% and 21.8%, respectively. This is probably due to the fact that the sample excludes the least poor region of Vietnam, the South East region, which had a poverty rate of 10% in rural areas in 2006. In addition, the sample includes more poor provinces in the seven regions. Therefore, the sample accurately presents for the rural areas, where poverty is

[32] The seven regions are: Red River Delta (Ha Tay province), North East (Lao Cai and Phu Tho), North West (Lai Chau and Dien Bien), North Central Coast (Nghe An), South Central Coast (Quang Nam and Khanh Hoa), Central Highland (Dak Lak, Dak Nong, Lam Dong) and Mekong River Delta (Long An).
[33] McKay (2000).
[34] An alternative will be the prediction of household consumption expenditure based on household income and other information to see the difference.

more serious. However, it does express the diversity and variation of geographic and socio-economic conditions of different localities. The chapter uses weight created in VLSS 2004 to increase its representation of the households in the 12 surveyed provinces.

Secondly, the income data from 2004 and 2006 is from two different surveys; therefore, their comparability should be checked. The general statistics office (GSO) of Vietnam implemented a national living standard survey like the VLSS in 2004. Two years later, it implemented a similar survey, called VLSS 2006. This is a rotating survey, so half of the households interviewed in VLSS 2004 were re-interviewed in VLSS 2006. As a result, half of the households in VARHS 2006 were interviewed in VLSS 2006. The income of these households in VLSS 2006 is used to check the comparability of income in the two surveys, VARHS 2006 and VLSS 2004. It is assumed that if means of income of the overlapped households in VLSS 2006 and VARHS 2006 are the same, the income of VARHS 2006 and VLSS 2004 is comparable. The result shows that income means of the two samples of 601 overlapped observations are VND 24.5 million and 26.4 million, which are the same at 5% significant level. In addition, the poverty rate of 12 provinces estimated by VARHS 2006 was 27.2%, while that in VLSS 2006 was 28.4%.

Thirdly, there is increasing concern in the literature on the impact of attrition[35] regarding the quality of the panel data. The rate of dropping out in this panel is 15%, which is considered low compared to many surveys. There are various reasons for households dropping out, so there is less of a possibility of affecting the panel. Additionally, the attrition in this panel concerns 230 observations, which have missing values in some variables. It is necessary to check if these attrited observations carry a bias in the estimation by running a regression on the probability of being attrited. This chapter, however, has not yet done it.

[35] An issue is that households from the previous survey were not interviewed again in the second survey, or that data cannot be used in the panel for reasons such as missing data.

Model specifications

Persistent impacts of shocks on poverty

First of all, logit models will be used to identify the impacts of shocks during 2002-2006 on household poverty status in 2006. The logit model is specified using the same specifications as Dercon (2005) and Scott (2000) for Ethiopia and Chile, respectively, as follows:

$$P(Yi=1)/P(Yi=0) = f(S_i, Y_{06i}, X_i, L_i) \qquad (4)$$

Where Y*i* is household poverty status in 2006, with 1 as poor and 0 as non-poor. A poor household had an annual per capita income in 2006 (regionally and monthly price adjusted) of less than VND 2,637,000. This poverty line is widely used in the literature and known as a general poverty line estimated by General Statistics Office and assisted by the World Bank's experts. It was formulated for the first time in 1993 and inflated for 2006.[36] S*i* is a vector of shock variables, which are incorporated into the equation to measure the correlates of shocks. It is self-reported information; households were asked if they had experienced any type of income loss during 2002-2006 and, if so, how much. As a result, two types of shock variables will be used. First, a dummy shock variable will take value 1 if households experienced each type of shock at least once during 2002-2006 and 0 otherwise. This type of shock variable is also used in many current studies on shocks, such as Dercon (2005) and Scott (2000). Second, instead of a dummy shock variable, we use variables for shock severity. This is measured by a ratio of average income loss incurred by shocks during 2002-2006 to the household per capita income in 2006. These variables can capture the frequency and intensity of shocks. This is different from the majority of studies on shocks.

Y_{06i}, X*i* and L*i* are control variables, where Y_{06i} is controlled for the time when the shock happened. It takes value 1 if shocks occurred in 2006 and 0 otherwise. This is because of the possibility that shocks that happened in 2006 will have more impact on household income in 2006 than other shocks. X*i* and L*i* are the characteristics of

[36] The poverty line for 2006 was inflated based on food and non-food price indexes in 2005 and 2006. The poverty line is based on the cost of basic needs (CBN) method. There are two poverty lines in Vietnam; the other one is mainly used for targeting purposes, which changes over time when the resources for fighting poverty increase.

households and location, which are commonly used in the poverty equation. Of these, age and education levels of the households' head largely explain household earnings. Other socio-demographic variables, such as dependency, gender of household head and household size, help to control for imperfect adult-equivalent scales and for unobserved heterogeneity. The variable of share of the number of farm workers in the household reflects different economic returns to different industries. They are considered as time invariant because they cover such a short period (three years). In the case of Vietnam, ethnicity is included because there is a significant difference in poverty between the ethnic minority and majority.[37] The variables of location characteristics are incorporated to reflect geographical heterogeneity, which has been recognized in many poverty studies on Vietnam, such as Justino and Litchfield (2003), Klump (2007), and Ravallion and Van de Walle (2008). In the studies, dummy variables of eight regions of Vietnam are usually used for this purpose. However, 12 provinces in the data spread over seven out of eight regions of Vietnam but they do not represent for the region they belong to. In addition, this chapter studies shocks; therefore, it is reasonable to use provinces instead of regions because provinces capture the heterogeneous nature of shocks in Vietnam, especially natural disasters, and the institutions available for households to cope with shocks, such as credit or insurance. A variable of the availability of a factory which employs local labour is included to capture the opportunity available for farming households to utilise their labour redundancy. More details on variables are described in Appendix 2.1.

In order to see the persistent correlation of shocks with poverty, both dummy shocks and shock severity are divided into two groups based on date of occurrence: shocks during 2002-2003 and shocks during 2004-2006. This is to see whether shocks during 2002-2003 still had an impact on household poverty status in 2006 and, for the same type of shocks, if the correlates of shocks from 2002-2003 had different correlates with household poverty status in 2006 compared to shocks from 2004-2006. Two logit regressions are run and other control variables are kept the same.

To measure the impacts of shocks on poverty dynamics during 2004-2006, the multinomial logit model is used. We estimate the model for dummy shock variables and

[37] Vietnam has 56 ethnicities, of which Kinh is the majority, accounting for about 70% of the population. Chinese is a minority but a relatively wealthy ethnic group. The poverty rates of Kinh/Chinese and ethnic minorities were 3% and 21% in 2004, and 2% and 17% in 2006. Many studies have pinpointed that ethnicity contributes to poverty differences in Vietnam, for example VASS (2007), Baulch et al. (2008), and Swinkels and Turk (2006).

severity shock variables to see the difference. We define Y*i* as a categorical variable on poverty dynamics of households during 2004 and 2006[38] with a value of 0 if poor in both years, 1 if poor in 2004 but not in 2006, 2 if not poor in 2004 but poor in 2006 and 3 if not poor in both years. When the regression is estimated by Stata software, one out of four poverty dynamics categories will be selected as a base category. As a result, three ratios of probability over that of base category, which are called relative risk ratios, are reported. However, the chapter is concerned with two ratios, the relative probability of falling into poverty over the probability of never being poor, and the probability of escaping from poverty over the probability of remaining poor; therefore, firstly we select the category of never being poor (Y*i* = 3) as a base. The parameters of the following equation will be reported:

$$P(Y_i = 2) / P(Y_i = 3) = f(\mathrm{S}_i, Y_{06i}, \mathrm{X}_i, \mathrm{L}_i) \qquad (5)$$

Secondly, in order to estimate the ratio of the probability of escaping from poverty to the probability of remaining poor, a category of being poor in both years (Y*i* = 0) will be selected as a base and the parameters of the following equation will be reported:

$$P(Y_i = 1) / P(Y_i = 0) = f(\lambda \mathrm{S}_i, Y_{06i}, \mathrm{X}_i, \mathrm{L}_i) \qquad (6)$$

S*i* is, in turn, dummy shock and severity of shock variables, as mentioned above. However, this regression has only five types of shocks: natural disaster, illness of a household member, death of a household member, disease of livestock and crop failure, because the number of observations of other types of shocks is so few that the regressions face a perfect prediction problem when they are incorporated. Other variables are the same as equation (4) above.

Endogeneity problem

In the current literature, shocks are assumed to be exogenous to poverty in all studies; no study discusses the endogeneity problem in assessing the effect of shocks on poverty. This seems a reasonable assumption for some types of shocks, such as natural disasters and crop price, because the presence of natural disasters and crop price is

[38] Although data on shocks are available for 2002-2006, there is no information on the poverty status of households in 2002 or 2003; therefore, only poverty dynamics during 2004-2006 can be analysed. The poverty line for 2004 is VND 2,077,000.

almost exogenous. However, for some types of shocks, such as illness and death of a household member, disease of livestock or crop failure, this may be a strict assumption. Because the endogeneity problems can be created by either the omitted variables or reverse causality. It is likely that poor households tend to have limited coping abilities that may increase their exposure to shocks or may not have the capacity to prevent it from happening. For instance, households may be too poor to make enough nutritious food, so their resistance to illness may be low, or they may be too poor to afford proper treatment cost, so they might die. Or they may not have enough money to buy qualified feed or qualified seeds, or they may not have money to buy medicine when their livestock are ill, thus suffering a loss. In addition, even if there is no endogeneity issue when the dummy variable is used to measure shocks, it might be a problem in case of the shock severity variable. For example, the household may not be good enough at financial management, making them poor and influencing the extent of the losses they suffer from shocks. In this case, If the endogeneity problem exists in the data, the coefficients in equations (4), (5), and (6) could be biased and inconsistent. However, it must be clear that it depends on the specific situation or a specific set of data whether endogeneity might create a problem, because poverty status may or may not affect the probability of experiencing household shocks. To solve the problem of endogeneity, it would be ideal if there are good instrumental variables which correlate with the shock variables but do not correlate with poverty. However, in our data set, we cannot find these instrumental variables.

Therefore, in this chapter, as in other studies, due to data constraints we cannot control the endogenous issues in the model above. However, with data in hand, we will try to roughly investigate how obvious the endogenous problem is in our data set for the four types of shocks mentioned above: death and illness of a household member, disease of livestock and crop failure. To do this, we take two groups of poor and non-poor households in 2004 to see whether more poor households suffered from these types of shocks during 2005 and 2006 than the non-poor. We compare the shock ratio of the two household groups (poor and non-poor in 2004) to see if these two ratios were different. The results are documented in Table 2.1, and show that there is no firm difference in experiencing illness and death between the poor and non-poor households. However, for disease of livestock and crop failure, the difference seems obvious, especially for the disease of livestock. It is notable that non-poor in 2004 suffered more from crop failure than the poor household. This results is opposite with the expectation caused by the endogenous problem. The reasonable explanation is that non-poor may engage more in

the crops, which are more likely subject to failure than the non-poor households. However, the result of this test only tells us about the fact that the endogeneity is quite obvious in the case of disease of livestock and crop failure; it does not exclude the other two shocks from this issue. Therefore, cautious interpretation of the results is needed.

Table 2.1- Results of T tests on two means

	Observations	Illness	Death	Disease of livestock	Crop failure
Dummy shock					
Mean of Non-poor	1006	0.097	0.015	0.083	0.053
Mean of Poor	272	0.099	0.022	0.232	0.025
Diff = mean (Non-poor) - mean (Poor)		-0.002	-0.007	-0.149	0.027
T test results: Pr(|T| > |t|)) (Ha: different from 0)		0.928	0.411	0.000	0.055
Severity of shock					
Mean of Non-poor	1006	0.093	0.024	0.038	0.090
Mean of Poor	272	0.133	0.061	0.243	0.018
Diff = mean (Non-poor) - mean (Poor)		-0.040	-0.037	-0.205	0.072
T test results: Pr(|T| > |t|)) (Ha: different from 0)		0.315	0.114	0.000	0.037

Source: Author's calculation from VLSS 2004 and VARHS 2006.

Shocks and coping measures

To see how households respond to different shocks, the logit models are used with dependent variables as the five types of main coping measures, explanatory variables as the five types of most frequent shocks, and other control variables. Only households who experienced shocks are included in the sample. The equations are estimated as follows:

$$P[Ci=1]/P[Ci=0] = f(S_i, X_i, L_i) \quad (7)$$

C*i* is a vector of dummy variables of six shock-coping measures most regularly used by households in the sample, and has a value of 1 if the household used that coping measure and 0 otherwise. This is self-reported information from households asked what measures they used to cope with shocks. These are: formal credit insurance, which is a loan from a formal financial institution such as a bank; informal credit insurance, meaning borrowing from informal financial institutions such as private lenders or rotating savings and credit associations (ROSCAs); postponement of loan payments; asset insurance i.e. selling land, livestock, stored crops or other durable assets; informal assistance i.e. receiving money from relatives or friends; and employment i.e. getting extra work hours or a new job. The questionnaire asked about other measures, such as getting assistance from the government or insurance companies, but there were too few observations of these measures to incorporate them into the model. S*i* are the five most frequent dummy shock variables, incorporated into the equation at the same time. X*i* are some household characteristics, as mentioned in the equation (4). L*i* are the eight region variables instead of the 12 province ones because some provinces do not have enough observations in some coping measures.

In addition, as reviewed in the literature, there is the possibility that coping with shocks by selling assets can make cause poverty because future income from those assets may be affected. Thus, in this section we will test this hypothesis with this data set by running equations (4), (5) and (6) with the interaction variable between different types of shocks and the coping measure of selling assets.

2.5- Descriptive statistics

Poverty & poverty dynamics of the sample

The poverty rate of the sample was 27.2% in 2006; 12.8% of households remained poor in both years, 8.5% escaped poverty, 14.4% fell into poverty and 64.3% were not poor in either year during 2004-2006. Households in the sample mainly worked in the farming sector. On average, 84% of household members worked in the farming sector, while only 6% of total surveyed households worked exclusively in the non-farming sector. Summary statistics on poverty and poverty dynamics of households according to several indicators are presented in Table 2.2 below. For example, with regard to

ethnicity, 50% of poor people in the sample were ethnic minorities, while only 20% of non-poor people were. 70% of people who remained poor during 2004-06 were ethnic minorities. Definitions of the indicators are referred to Appendix 2.1.

Table 2.2- Poverty and poverty dynamics profile of sample

	In 2006		Between 2004-2006							
	Poor	Non-poor	Remained Poor		Escaped Poverty		Became Poor		Never Poor	
	Mean	Mean	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Ethnic minority	0.5	0.2	0.7	0.5	0.5	0.5	0.2	0.4	0.1	0.3
Head-male	0.86	0.80	0.8	0.3	0.8	0.4	0.8	0.4	0.8	0.4
Head_age	47.5	49.5	45.9	14	46.5	13.2	49.2	14.7	49.8	13.8
Head education	0.8	1.3	0.5	0.8	0.9	1	1.1	0.9	1.3	1
Dependency	49.7	39.4	53	18.8	48.3	20.5	47.3	19.6	38.3	24.1
Household size	5.5	4.5	6.1	2.2	5.3	2	4.9	1.8	4.4	1.7
Value of assets (VND million)	55.6	123	26	41.4	42.2	40.7	81.6	108.5	132.9	195
Share of number of farm workers	93.6	81.3	96.9	14.6	91.3	23.1	90.9	21.3	80.1	32.8
Factory employed local labour	0.4	0.6	0.2	0.4	0.4	0.5	0.6	0.5	0.6	0.5

Source: Author's calculations from VLSS 2004 and VARHS 2006.

Shocks description

Statistics in Table 2.3 show that shocks were relatively frequent in rural areas of Vietnam, with 47% of households in the sample facing at least one type of shock at least once during 2002-2006. According to the table, it is likely that households tended to be more exposed to shocks overtime. In 2002, 8% of households experienced at least one type of shock; this rate increased to 27% in 2005. However, this may be due to a recall error, meaning that people tend to remember what happened recently and forget what happened some years ago. As reported by households, the two most common shocks were illness of a household member and disease of livestock, affecting 16.9% and 15.1% of surveyed households, respectively. Natural disaster and crop failure attacked 10.7% and 7.1% of households. The survey also recorded that livestock that died were mainly pigs, chickens and ducks. In terms of crop failure, it is hard to identify which kind of crops failed, but the majority of household crops were rice, corn, potato and

coffee. Very few households faced crop price shocks, except for some households in Dac lac and Dac nong provinces that were affected by the fluctuation of coffee prices in international markets. Due to limited observations, land loss and job loss will be dropped out in the models.

Table 2.3- - Percentage of households that experienced shocks 2002-2006

	2002	2003	2004	2005	Up to 7/2006	2002-2006
Natural disaster	1.7	3.0	4.5	6.9	1.2	10.7
Illness of HH member	4.1	5.4	4.8	6.5	5.6	16.9
Death of HH member	0.4	0.5	0.9	1.1	0.6	3.1
Disease of livestock	0.6	3.0	3.2	7.7	3.9	15.1
Change in crop price	0.0	0.4	0.6	0.3	0.1	0.9
Crop failure	0.7	0.6	1.7	4.2	1.0	7.1
Land loss	0.1	0.1	0.0	0.0	0.0	0.2
Job loss	0.0	0.1	0.0	0.0	0.1	0.2
Unsuccessful investment	0.2	0.2	0.2	0.3	0.1	0.4
Other shocks	0.2	0.2	0.2	0.3	0.2	0.9
Any shock	8.0	13.5	16.0	27.4	12.7	47.5

Source: Author's calculations from VARHS 2006.

Table 2.4- Severity of shocks

	Total loss (VND 000)				Annual loss/income per capita in 2006			
	2004-2006		2002-2006		2004-2006		2002-2006	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Natural disaster	7526	10179	8522	12501	0.83	1.35	0.52	0.88
Illness of HH member	5012	7001	6891	12502	0.59	0.84	0.41	0.62
Death of HH member	8335	5608	8670	5637	0.76	0.68	0.51	0.55
Disease of livestock	4190	8867	5416	14653	0.59	1.34	0.37	0.89
Change in crop price	4850	3794	7167	8294	0.21	0.21	0.15	0.17
Crop failure	9259	11320	9406	11488	0.93	1.74	0.53	0.92
Land loss			38167	42268			0.24	0.13
Job loss			7195	6585			0.14	0.18
Unsuccessful investment	7526	10179	8522	12501	1.54	1.50	1.07	1.15
Other shocks	5012	7001	6891	12502	0.64	0.84	0.57	0.70

Source: Author's calculations from VARHS 2006.

Table 2.4 shows that the average loss incurred by different shocks changed over time. However, a constant feature is that among the five most frequent shocks, natural disaster, death of a household member and crop failure caused the highest loss on average during 2002-2006, while that of disease of livestock caused the least. This holds for the ratio of average loss to per capita income of household in 2006.

Shock coping measures

Households may use more than one method to cope with shocks. Table 2.5 presents only the most important measures, which households used to cope with the five most frequent shocks. It is noted that coping measures in Table 2.5 are more detailed than the six previously mentioned in the regressions, in order to provide a complete picture of shock coping measures. When it comes to regressions, these measures are aggregated into six groups to enable the estimation. For example, measures on "asset insurance" in the regressions consist of the first four measures in Table 2.5, i.e. "sold land", "sold livestock", "sold stored crops" and "sold other assets". Similar with other developing countries, self-reliant measures such as selling livestock and informal assistance were the most frequently used. Of formal methods, borrowing from the bank was fairly common, while insurance and assistance from the government had a very modest role, and insurance was almost totally unavailable for disease of livestock and crop failure. It is notable that more households tended to reduce consumption when they suffered disease of livestock than when facing other shocks. This is a possible signal that this type of shock is more likely to have an impact on household poverty dynamics. It is also notable that consumption reduction is fairly common, which suggests that shocks are likely to have negative impacts on poverty.

In addition, the survey asked for the self-assessment of households on their recovery from shocks, classified in four levels: "completely recovered", "partly recovered", "still suffering some" and "still suffering badly". Although this type of question is relatively arbitrary because the recovery levels are not well defined, it does provide some information. Table 2.6 shows that 7.49% of households that experienced shocks during 2002-2006 said they were still badly suffering from shocks, and 17.07% reported they were "still suffering some". The recovery level seems not to depend on when the shocks happened but rather on what types of shocks happened. Households where a member died or was sick tended to recover more slowly, following by households that suffered disease of livestock. This may be due to the fact that households tended to repeatedly

suffer from illness and diseased livestock during the five years. The rate of households suffering disease of livestock and illness more than three times during 2002-2006 was 3.4% and 3.1%, while that rate was 2.6% for natural disasters and 0.7% for crop failure. A higher percentage of poor households were still suffering from shocks than non-poor households in 2006.

Table 2.5- Most important shock coping measures
Coping measure adopted after each type of shock, in percentage

Groups of coping measures	Natural disaster	Illness	Death of HH member	Disease of livestock	Crop disease	Total
Assets insurance	16.82	17.85	9.52	9.29	7.84	13.97
Sold land	*0.93*	*1.54*	*0.00*	*0.00*	*0.98*	*0.85*
Sold livestock	*14.02*	*11.69*	*7.14*	*3.10*	*3.92*	*9.17*
Sold stored crops	*1.87*	*4.31*	*2.38*	*6.19*	*2.94*	*3.84*
Sold other assets	*0.00*	*0.31*	*0.00*	*0.00*	*0.00*	*0.11*
Informal assistance	7.48	17.85	23.81	5.31	1.96	10.45
Assistance of Government/NGO	1.87	0.31	0.00	1.33	2.94	1.17
Formal credit	5.14	8.62	9.52	7.08	13.73	8.21
Informal credit	6.08	12	16.66	5.75	9.8	8.85
Borrowing from friends	*5.61*	*7.69*	*9.52*	*3.54*	*4.90*	*5.86*
Borrowing from others	*0.47*	*4.31*	*7.14*	*2.21*	*4.90*	*2.99*
Formal insurance	0.93	5.23	2.38	0.00	0.00	2.45
Postponed investment	2.80	3.69	0.00	3.54	2.94	3.09
Postponed loans	1.40	0.62	0.00	2.65	0.00	1.28
Employment	6.07	1.85	2.38	6.63	2.94	4.16
New job	*3.74*	*0.92*	*0.00*	*6.19*	*2.94*	*3.09*
Migration	*0.93*	*0.31*	*0.00*	*0.00*	*0.00*	*0.32*
Sent children to work	*0.00*	*0.00*	*0.00*	*0.44*	*0.00*	*0.11*
Begging	*1.40*	*0.62*	*2.38*	*0.00*	*0.00*	*0.64*
Reduced consumption	31.78	15.08	19.05	38.05	30.39	25.80
Doing nothing	19.63	16.92	16.67	20.35	27.45	20.58
Total	100	100	100	100	100	100

Source: Author's calculations from VARHS 2006.

Table 2.6- Self-assessment of households on recovery level after shocks, in percentage

	Completely recovered	Partly recovered	Still suffering some	Still suffering badly	Total
Type of shock					
Natural disaster	74.77	9.17	12.84	3.21	100
Illness of HH member	53.47	15.11	20.85	10.57	100
Death of HH member	46.67	31.11	11.11	11.11	100
Disease of livestock	67.72	11.02	13.78	7.48	100
Change in crop price	88.24	5.88	5.88	0	100
Crop failure	51.4	23.36	21.5	3.74	100
Land loss	0	0	50	50	100
Job loss	50	0	0	50	100
Unsuccessful investment	41.67	0	58.33	0	100
Poverty status in 2006					
Non-poor	68.91	11.73	13.93	5.43	100
Poor	44.69	19.69	23.75	11.88	100
Total	**61.18**	**14.27**	**17.07**	**7.49**	**100**

Source: Author's calculations from VARHS 2006.

Shocks, coping measures and poverty dynamics

Table 2.7 presents summary statistics of five shocks and six coping measures for households in four poverty dynamics states during 2004-2006. It shows that for those who were poor in 2006 suffered more from shocks, especially from illness of a household member and disease of livestock for dummy shock variable. When shock severity is taken into account, they also suffered more from natural disaster. The poor tended to sell more assets to cope with shocks than non-poor households. Those who fell into poverty during 2004-2006 tended to suffer more from natural disaster, illness of a household member, disease of livestock and crop failure for shock severity. Meanwhile, natural disaster and illness of a household member affected more households that remained poor during 2004-2006. Selling assets to cope with shocks was used more often in households that remained poor during the above period.

Table 2.7– Shocks, coping measures and poverty dynamics

	In 2006		Between 2004-2006							
	Poor	Non-poor	Remained poor		Escaped poverty		Became poor		Never poor	
	Mean	Mean	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dummy shocks										
Natural disaster	0.12	0.10	0.13	0.26	0.12	0.33	0.11	0.31	0.09	0.29
Illness of HH member	0.20	0.16	0.15	0.36	0.12	0.33	0.15	0.35	0.12	0.32
Death of HH member	0.03	0.03	0.03	0.16	0.04	0.18	0.02	0.13	0.02	0.15
Disease of livestock	0.23	0.12	0.25	0.43	0.24	0.43	0.13	0.34	0.09	0.28
Crop failure	0.07	0.07	0.05	0.21	0.07	0.26	0.06	0.23	0.07	0.25
Shock severity										
Natural disaster	0.11	0.04	0.18	0.38	0.06	0.2	0.13	0.67	0.03	0.18
Illness of HH member	0.12	0.05	0.20	0.29	0.08	0.24	0.14	0.57	0.05	0.2
Death of HH member	0.03	0.01	0.03	0.27	0.02	0.1	0.02	0.17	0.01	0.07
Disease of livestock	0.13	0.03	0.13	0.36	0.05	0.13	0.13	0.73	0.03	0.25
Crop failure	0.07	0.02	0.03	0.15	0.01	0.06	0.12	0.65	0.03	0.14
Coping measures										
Postponed investment	0.01	0.01	0.01	0.08	0.01	0.09	0.01	0.11	0.01	0.09
Formal credit	0.03	0.04	0.02	0.14	0.07	0.26	0.05	0.21	0.03	0.18
Informal credit	0.06	0.04	0.06	0.25	0.07	0.26	0.06	0.25	0.04	0.20
Asset insurance	0.13	0.07	0.17	0.37	0.10	0.30	0.10	0.30	0.07	0.26
Informal assistance	0.07	0.07	0.08	0.27	0.10	0.31	0.05	0.22	0.07	0.26
Employment	0.03	0.04	0.04	0.19	0.06	0.24	0.01	0.11	0.04	0.19

Source: Author's calculations from VARHS 2006.

2.6- Empirical results and discussion

This section will present and discuss the results in four parts. The first part shows the results from the logit model (equation (4)) on the impact of shocks during 2002-2006 on the poverty status of households in 2006. The second part is the results from the multinomial logit model (equations (5) and (6)) on the effect of shocks on the poverty dynamics of households during 2004-2006. The third part examines the size of the effect to see how important the effect of shocks on poverty was, compared to other factors. The final part investigates the correlation of coping measures with each type of shocks (equation (7)) and the effect of using asset insurance on household poverty status.

2.6.1- Impacts of shocks and their persistence

Summary results of logit models on the impacts of shocks on poverty during 2002-2006 are presented in Table 2.8; complete results are in Appendix 2.2. Odds ratios are reported because they are more interpretable than log-odds ratios. Odds ratios greater than one mean that shocks increased the probability of being poor, i.e. had a negative impact on poverty, and vice versa. Several points are noted from the table. First of all, shocks increased the probability of being poor. Second, taking intensity and frequency of shocks into account yields quite different results, and the impacts of shocks on poverty were more obvious. Intuitively, taking severity into account better reflects the effects of shocks on poverty because less severe shocks will certainly have less of an impact on poverty. For example, natural disaster and death of a household member did have a negative impact on poverty when severity of shocks was taken into account, but the impact was not statistically significant when the shocks were measured by dummy variables. This seems reasonable because many households experienced a natural disaster and the death of a household member, but if their loss relative to their income was not significant, their poverty status may not have been affected. In addition, the impact of shocks may be different between households that suffered from many shocks during five years and households that suffered only one. The shock severity variable can also capture this aspect. Third, in general, the results show that four types of shocks, namely natural disaster, illness of a household member, death of a household member and crop failure, increased the probability of households being poor regardless. This finding confirms current findings in the literature that the negative effects of health shock on poverty were found in Chile and Bangladesh, of natural disasters were found in Bangladesh and Ethiopia, of death of household member were found in Bangladesh, and of crop shocks were found in India and Rwanda.

Table 2.9 provides evidence of the persistent impacts of natural disaster and illness of a household member on poverty; these shocks increased households' probability of being poor in both 2002-2003 and 2004-2006. This is different from the death of a household member, disease of livestock and crop failure, where only those occurring during 2004-2006 had a negative impact on poverty, while the impacts from such events occurring before had already died out. It is noted that illness appears to have more effect than death of household member. This can be explained by the fact that the death person may

be already weak or too old to affect the household income, while the ill member may be the household's bread-winner and the family may also incur expenses from his illness.

Table 2.8- Logit models of the effect of shocks 2002-2006 on poverty

	Dummy shocks		**Shock severity**	
	Odds ratio	*P value*	*Odds ratio*	*P value*
	(1)	*(2)*	*(3)*	*(4)*
Natural disaster	1.29	0.40	2.19***	0.00
Illness of HH member	1.97***	0.00	2.96***	0.00
Death of HH member	0.93	0.87	2.71**	0.05
Disease of livestock	1.62*	0.07	2.03	0.15
Crop failure	1.93**	0.03	3.72***	0.00
Crop price	0.54	0.64	7.07	0.53
Unsuccessful investment	0.96	0.97	1.98	0.13
Other shocks	1.20	0.80	5.81**	0.02
Number of observations	1232		1232	
Wald chi2(31)	213		232	
Prob > chi2	0		0	
Pseudo R2	0.19		0.22	

Note: ***, **, and * correspond to significance levels of less than 0.01, 0.05, and 0.1, respectively. Dependent variable is household poverty status in 2006. Columns 1 and 2 report the odds ratios and corresponding P value of the logit model when shocks are measured by dummy variables. Columns 3 and 4 report the results when severity of shocks is taken into account. The other control variables included in the model but not present here are ethnicity of head, sex of head, age of head, education of head, dependency rate of household, household size, value of durable assets, houses and land owned by household, proportion of household members working in the farming sector, any factory that employs local labour, and province.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

Thus, the results indicate that the impact of illness of a household member and natural disaster seem to be more persistent than the findings of Lokshin and Ravallion (2000), and Jalan and Ravallion (2004), which state that the effect no longer persists after three years. Together with evidence from Dercon et al. (2005), who found that drought created an impact on poverty for more than three years, findings from this study further support the persistent impact of shocks, particularly that of natural disaster and illness of household members, on poverty.

Table 2.9- Logit model of the effects of shocks during two periods, 2002-203 and 2004-2006 on poverty in 2006

	Dummy shocks		Shock severity	
	Odds ratio	*P value*	*Odds ratio*	*P value*
Shocks 2004-2006				
Natural disaster	1.13	0.70	1.48***	0.00
Illness of HH member	1.65*	0.06	1.71**	0.03
Death of HH member	0.71	0.48	1.50*	0.04
Disease of livestock	1.82**	0.05	2.25***	0.00
Crop failure	1.76*	0.09	2.11***	0.00
Crop price	0.28	0.20	0.00	0.18
Unsuccessful investment	0.96	0.97	1.07	0.88
Other shocks	2.32	0.30	1.53	0.66
Shocks 2002-2003				
Natural disaster	1.60	0.29	1.50*	0.06
Illness of HH member	1.81**	0.05	1.71***	0.00
Death of HH member	2.29	0.28	2.21	0.19
Disease of livestock	1.12	0.77	0.82	0.14
Crop failure	2.04	0.21	1.65	0.16
Crop price	8.63*	0.08		
Unsuccessful investment	3.17	0.43	2.17	0.27
Other shocks	0.79	0.84	3.04***	0.00
Number of observations	1232		1232	
Wald chi2(39)	219.72		242.08	
Prob > chi2	0		0	
Pseudo R2	0.1902		0.2322	

Note: ***, **, and * correspond to significance levels of less than 0.01, 0.05, and 0.1, respectively. Other control variables included in the model but not present here are ethnicity of head, sex of head, age of head, education of head, dependency rate of household, household size, value of durable assets, houses and land owned by household, proportion of household members working in farm sector, any factory that employs local labour,, and province.

Source: Author's calculations from VARHS 2006 & VLSS 2004.

2.6.2- Transitory impacts of shocks

Table 2.10 presents the results from equations (5) and (6) with dummy and severity shock variables. The table shows the relative risk ratio (RRR) of shock variables, which is a coefficient of regressors with the relative probability between two poverty dynamic statuses. For the multinomial logit model, one can easily calculate the marginal effect of

the variables on the probability of poverty dynamic status. However, this effect is not constant but changing according to the level of probability; thus the relative risk ratio is presented instead. When the relative risk ratio is greater than unity, it means shocks increase the probability over the base category; less than unity means otherwise. The relative risk ratios of other control variables are reported in Appendix 2.2. All results of the coefficients of control variables are the same as the findings from other studies, such as Justino and Litchfied (2003, 2004).

The results show that when severity of shocks is taken into account, natural disaster, illness of a household member, crop failure and disease of livestock increased the probability of households falling into poverty over the probability of never being poor. This is an expected result because, on the one hand, these are quite regular shocks faced by households, as shown in the descriptive statistics in section 2.4. On the other hand, social safety nets and insurance do not play a proper role in poverty protection, as shown in some studies, such as Van de Wale (2004).

Table 2.10- Multinomial logit models of the correlation of shocks with poverty dynamics 2004-2006

	Dummy shocks				**Severity of shocks**			
	Fell into poverty		**Escaped poverty**		**Fell into poverty**		**Escaped poverty**	
	RRR	*P*	*RRR*	*P*	*RRR*	*P*	*RRR*	*P*
Natural disaster	1.14	0.71	0.75	0.57	1.61***	0.01	0.72*	0.09
Illness of HH member	1.63	0.11	0.68	0.48	1.71**	0.04	0.57*	0.08
Death of HH member	0.71	0.62	1.20	0.83	1.62	0.27	0.66	0.49
Disease of livestock	1.95**	0.06	1.00	1.00	2.55***	0.01	0.72	0.14
Crop failure	1.93*	0.09	0.79	0.75	2.11***	0.00	0.22	0.14
Number of obs.	1232				1232			
Pseudo R2	0.224				0.242			

Note: ***, **, and * correspond to significance levels of less than 0.01, 0.05, and 0.1, respectively. Other control variables included in the model but not present here are ethnicity of head, sex of head, age of head, education of head, dependency rate of household, household size, value of durable assets, houses and land owned by household, proportion of household members working in farm sector, any factory that employs local labour, and region.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

The impact of disease of livestock and crop failure on falling into poverty poses a challenge to poverty reduction of Vietnam. It is noted that the results also show that the higher the proportion of household members working in agriculture, the higher the probability of the household falling into poverty (see Appendix 2.2). In this context, the impact of diseased livestock and crop failure makes farmers much more vulnerable. The increase in risks of agricultural production is attributed to changes in the weather and changes in agricultural production; when households try to change to more profitable production methods, their risk of failure increases accordingly. Among many reasons, it is likely that farmers do not have enough necessary knowledge of production, and the extension services system is also poorly performed. Households, therefore, frequently suffer from diseased livestock and crop failure, while almost no formal insurance is available to them.

Natural disaster and illness of a household member reduced the probability of escaping from poverty. This further supports the findings above, that these two types of shocks had a persistent impact on poverty. In other words, natural disaster and illness of a household member can make people chronically poor. It is notable that the Vietnamese government has policies to support households that suffer losses from natural disaster or illness/death of a household member. In addition, Table 4 shows those who suffered the illness of a household member were highly assisted by relatives and friends. However, all these actions do not seem powerful enough to ease the impacts of natural disaster and illness: more must be done.

2.6.3- Size of the effects

To measure the size of the effects, we examine three numbers. The first is the odds ratio in column 2 of Table 2.11: the higher the odds ratio, the larger the impact on poverty. However, the size of the impact can be compared among the shock variables but not among the other variables because of the difference in measurement units. As shown in Table 2.11, when the severity of shocks is taken into account, crop failure has the largest impact on poverty. One percentage of loss over the household's per capita income created by crop failure increased the ratio of the probability of being poor to the probability if being non-poor by a factor of 3.72. The impact of the illness of a household member was smaller, by a factor of 2.96, and that of natural disaster was the smallest, by a factor of 2.19. Second, to compare the size of shock impact with that of other variables, standardised odds ratios for explanatory variables must be calculated.

This is the change in the odds ratios per standard deviation change in the independent variable; it is presented in Table 2.11. It illustrates that the impacts are so significant that crop failure or illness of a household member almost abolish completely the gain from improving the education of the household head. The impact of natural disaster was higher than the impact of household size and the share of number of farm worker.

Table 2.11- Odds ratios and standardised odds ratios of logit models

	Severity shocks		Severity shocks	
	Odds ratio	P value	Standardised odds ratio	SD
Natural disaster	2.19***	0.00	1.39	0.42
Illness of HH member	2.96***	0.00	1.41	0.32
Disease of livestock	2.03	0.15	-	-
Death of HH member	2.71**	0.05	1.17	0.15
Crop failure	3.72***	0.00	1.43	0.27
Ethnic minority	2.39***	0.00	1.37	0.40
Head with secondary education*	0.64*	0.09	1.30	0.47
Head with above high-school education*	0.37***	0.01	1.45	0.33
Dependency	1.03***	0.00	1.77	21.56
Household size	1.15***	0.01	1.27	1.90
Value of assets & land*	1.00**	0.02	1.61	178.43
Share of number of farm workers	1.01***	0.01	1.31	29.45

Note: The figures are calculated basically based on the logit models whose results are presented in Table 2.8. However, only variables which have statistical impacts at less than 10% are included. * is reverse standardised odds ratios, meaning the probability of being non-poor compared to that of being poor. This is because the impacts of these variables have an opposite sign compared to that of others; therefore, the reverse standardised odds ratios are calculated for ease of comparison.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

The above results of standardised odds ratios are still very abstract; therefore, in Table 2.12 we present the third way to see the size effect of shocks in a comparison with the effects of other variables. The table documents the predicted poverty rate if policy simulations had been made. Policy simulations are hypothesised policy actions. For example, policy simulation 1 is the government putting forward a policy to increase the average length of schooling by one year. Policy simulation 6 is the policy to increase

non-farm employment to the extent that the ratio of household members working as a self-employer in the farm sector would be reduced by 10%. The second column in the table presents base line poverty, which is a predicted poverty rate when the value of all variables is set at the average value of that variable in the sample. In fact, this baseline poverty rate more or less equals the poverty rate in the sample. The third column presents the predicted poverty rate if the corresponding policy simulation was realised while the values of other variables were kept at their average value in the sample. The last column is the comparison between the predicted poverty rate and the baseline poverty rate, to see the effect of the policy simulation on poverty. For example, for the first row in the table, increasing length of schooling by one year would reduce the poverty rate by 9.2%.

Table 2.12- Predicted poverty rate of policy simulations

	Policy simulations	Baseline poverty rate	Predicted poverty rate	Poverty reduction rate
1	Average schooling increased by one year	27.6	18.4	-9.2
2	Average schooling increased by two years	27.6	15.8	-11.8
3	Average schooling increased by three years	27.6	13.5	-14.1
4	Average household size reduced by one	27.6	19.1	-8.5
5	Average household size reduced by two	27.6	17.5	-10.1
6	Ratio of household members working as a self-employer in farm sector reduced by 10%	27.6	19.7	-7.9
7	Ratio of household members working as a self-employer in farm sector reduced by 20%	27.6	18.4	-9.2
8	Equal chance of being non-poor for ethnic minorities	27.6	19.2	-8.4
9	Loss of natural disaster fully insured	27.6	20.4	-7.2
10	Loss of illness fully insured	27.6	19.9	-7.7
11	Loss of household member to death fully insured	27.6	20.8	-6.8
12	Loss of livestock to disease fully insured	27.6	20.5	-7.1
13	Loss of crop failure fully insured	27.6	20.3	-7.3
14	Loss of natural disaster and illness fully insured	27.6	19.2	-8.4
15	Loss of natural disaster, illness and death fully insured	27.6	19.0	-8.6
16	Loss of natural disaster, illness, death & livestock disease fully insured	27.6	18.4	-9.2
17	All shocks insured	27.6	17.6	-10.0

Note: The figures are calculated basically based on the logit models whose results are presented in Table 7. The average schooling of household members in the data set was 6.7 years; average household size was 4.7; average ratio of household members working as a self-employer in farm sector was 84.6%; ethnic minorities' poverty rate was 50% and that of the majority was 19.5%.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

The results of Table 2.12 show that the effects of shocks on poverty were very significant compared to the effects of other factors. Indeed, if all shocks were insured, as in policy simulation 17, the poverty rate in rural areas could decrease by 10%. This effect is even stronger than the effect of policy simulation 1, which increases length of schooling by one year, much stronger than policy simulation 4, which reduces household size by one, and even stronger than policy simulation 8, which solves the problems of the ethnic minority, which is considered a critical issue in poverty reduction in Vietnam. Even if any type of shock was fully insured, the effect on poverty was not at all negligible. If the government has a good policy to help ill people, as in policy simulation 10, the effect on poverty would be nearly as strong as the policy to reduce the ratio of household members working as a self-employer in farm sector by 10%, as in simulation 6. In summary, the above indicates that it is worthwhile for the government to pay more attention to policies that help households cope with shocks in Vietnam. Otherwise, the effect of shocks can be big enough to possibly destroy the achievement made by the application of other policies, such as education.

2.6.4- Shocks, coping measures and poverty

Table 2.13 presents the results from estimating equation (7) for five types of coping measures. It indicates that borrowing from banks to cope with shocks is associated more with illness and death of household members and diseases of livestock; this is probably a result of a recent large expansion of rural credit through the Vietnam Bank for Social Policies in 2003 to poor households.[39] However, these types of shocks still had negative impacts on the poor, which may suggest the possibility that the credit value may not be large enough to insure against the shocks. In addition, credit policies may not work well for shocks with persistent impacts, such as illness of a household member. Also, Table 2.13 shows that changes in employment, either by getting new jobs, sending children to work or begging, were statistically significant only for natural disasters. This supports the findings from other developing countries, such as India, in Korchar's study (1995), which shows that employment is one channel for households coping with shocks.

[39] World Bank (2003). Before 2002, it was named Bank for Poor.

Table 2.13- Logit models of the correlation of shocks and coping measures

	Formal credit insurance		Assets insurance		Employment insurance	
	Odds Ratio	**P value**	**Odds Ratio**	**P value**	**Odds Ratio**	**P value**
Natural disaster	2.35	0.22	1.21	0.67	3.80**	0.03
Illness of HH member	5.10***	0.01	1.78	0.14	0.30	0.10
Death of HH member	7.45***	0.00	0.70	0.57	1.16	0.87
Disease of livestock	3.17*	0.09	0.64	0.32	1.73	0.45
Crop failure	1.75	0.35	1.25	0.63	2.21	0.30
Number of observations		520		520		520
Pseudo R2		0.15		0.12		0.18

	Informal insurance		Informal credit insurance	
	Odds Ratio	**P value**	**Odds Ratio**	**P value**
Natural disaster	0.73	0.48	0.13***	0.00
Illness of HH member	1.34	0.46	0.78	0.58
Death of HH member	3.41**	0.03	2.90*	0.07
Disease of livestock	0.53	0.17	0.15***	0.00
Crop failure	0.21**	0.02	0.29***	0.01
Number of observations		520		520
Pseudo R2		0.17		0.21

Note: ***, **, and * correspond to significance levels of less than 0.01, 0.05, and 0.1, respectively. Other control variables included in the model but not present here are ethnicity of head, sex of head, age of head, education of head, dependency rate of household, household size, value of durable assets, houses and land owned by household, and region.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

Table 2.13 shows that coping with shocks by selling assets tends not to correlate with particular shocks. However, descriptive statistics show that this type of coping measure was quite common; it was a coping measure for all types of shock. This may also explain the persistent impacts of shocks, because selling assets may reduce the capital base of households, which leads to a reduction in future income. In addition, it is argued that selling assets may be a worse-off coping measure for households: when many households sell the same assets at the same time to cope with shocks, the asset price may be reduced (Dercon, 2002). This was true for Vietnam when households sold rice to cope with shocks. Table 2.14 presents a result that tests the above theoretical effect of assets selling on poverty. It is done by adding the interaction variable between the shock-coping measure and different types of shocks in equations (4) and (5). Indeed, the

result reveals that the above effect was realised in cases of natural disaster and livestock disease. Selling assets to cope with natural disasters and livestock disease increased the probability of being poor and the probability of falling into poverty.

Table 2.14- Interaction between shocks and shock-coping measure (selling assets)

Shocks	Logit (equation)		Mlogit (equation) Falling into poverty	
	Odds ratio	P value	RRR	P value
Natural disaster	1.90***	0.00	1.55**	0.02
Natural disaster & asset selling	9.00*	0.07	8.07**	0.02
Illness of HH member	2.60***	0.00	1.56	0.13
Illness and asset selling	1.50	0.61	1.52	0.54
Death of HH member	3.43**	0.02	1.76	0.17
Death and asset selling	0.01	0.14	1.00***	0.00
Disease of livestock	1.66	0.27	2.09***	0.00
Livestock disease and asset selling	3.30***	0.01	912***	0.00
Crop failure	3.35***	0.01	1.87***	0.01
Crop failure and asset selling	1.43	0.63	1.81	0.22
Number of observations	1232		1232	
Pseudo R2	0.23		0.25	

Note: ***, **, and * correspond to significance levels of less than 0.01, 0.05, and 0.1, respectively.

Source: Author's calculations from VARHS 2006 and VLSS 2004.

2.7- Conclusions

This chapter provides empirical evidence on the effects of shocks and shock-coping measures on poverty and poverty dynamics of households in rural areas. Retrospective data on rural households in 12 provinces of Vietnam surveyed in mid-2006 provides detailed information on different types of shocks and shock-coping measures over five years. The combination of this data with the Vietnam Living Standard Survey 2004 forms a unique data set, enabling us to follow the changes in poverty status of households during 2004-2006. The impact of various types of shocks on poverty and poverty dynamics are examined when the households and location characteristics can be controlled for.

Shocks tend to be increasingly frequent in rural areas of Vietnam, with 47% of households experiencing at least one type of shock during 2002-2006. The rate

increased from 8% in 2002 to 27% in 2005. Natural disaster, illness of a household member, disease of livestock and crop failures were the most common shocks. An increasing percentage of households facing natural disaster showed a depletion of the environment in Vietnam. While people in rural areas are trying to diversify and change their production methods to improve their lives, associated risks are also increasing accordingly, specifically from diseases of livestock and crop failures.

It is found that shocks do matter for poverty reduction in Vietnam. Providing stronger support to the current literature on the persistent impacts of shocks, the chapter shows that natural disaster and illness of a household member generate a persistent impact on poverty, lasting over three years and keeping people chronically poor. In addition, disease of livestock has a negative impact on poverty transition, increasing the probability of households falling into poverty. This result provides further explanation and evidence for Van de Walle's (2004) findings that the safety net does not have a positive impact on poverty promotion and protection, as mentioned in the introduction. This is because too little is spent on preventing disease of livestock and crop failure, or households falling into poverty for these reasons. The current safety net mainly covers losses from natural disasters, but the results show that the system fails to protect the poor. In addition, the poor are provided with free health insurance in Vietnam; however, the persistent impact of illness on the poor and the effects of illness of a household member on the probability of falling into poverty show the poor performance of this system, which does not have a real effect on poverty reduction.

The chapter has shown that the effect of shocks is indeed significant enough to warrant attention of the government to shocks in poverty reduction strategies. If all shocks were well insured, the poverty rate might fall by as much as 10% in Vietnam. This effect is equivalent to the government's effort to increase the average length of schooling in the country by one year, or the effort to reduce the ratio of household members working as a self-employer in farm sector by 20%, and much stronger than the effect of the policy to solve the ethnic minority problem in Vietnam.

The chapter confirms the findings in the literature that households use a variety of measures to cope with shocks, including asset insurance, informal assistance, credit, employment, government assistance and insurance. Similar to findings from other studies, formal institutions such as insurance and the social safety net play a very insignificant role in coping with shocks. In general, a micro-credit policy seems to be

working for poverty reduction, as found in another study (Cuong, 2008), but with regard to shocks, it did not prevent the negative impact of shocks on poverty. It is also shown that households had to insure themselves by selling assets, but this in turn made them worse off. This coping measure both impeded the opportunity to escape from poverty and made them fall into poverty due to natural disaster and livestock disease.

This chapter also shows that taking the severity of shocks into account changes the result of the impact of shocks on poverty. By taking advantage of the unique data set, this chapter shows that in the case of a natural disaster, its effect on poverty was not found until the severity of the natural disaster was taken into account. This sounds intuitively reasonable because natural disasters can affect many households but the severity can vary from household to household. This may explain the fact that some papers do not find the impacts as expected, for example Dercon et al. (2005).

Findings from the chapter show that taking shocks into account calls into question Vietnam's successful poverty reduction over the last decades. At the same, Vietnam still has a high poverty rate and plans to reduce it further, to approximately 4-5% in 2020[40]; shocks need to be seriously considered in future poverty reduction policies. Firstly, more effort should be made to help households with sick members. This can be done through the improvement of health insurance or other poverty programs such as cash transfer. Secondly, a policy to reduce disease of livestock and crop failure and help households cope better with this should be considered. This not only reduces the probability of households falling into poverty but also, more importantly, encourages rural households to diversify and change production to improve their lives. Thirdly, formal insurance and safety nets should be reformed and developed further to help households cope with shocks more efficiently. By doing so, households will not need to sell their assets to cope with shocks, thus increasing their opportunity to escape from poverty. Finally, further developing the labour market will be a good channel for households to cope with shocks. In fact, this is also found to be a main channel for people to escape from poverty.

In short, shocks and coping measures in Vietnam are similar to other developing countries. Shocks are frequent for rural households, and formal institutions to cope with them are poorly developed. Households tend to rely on themselves and their network to

[40] According to Vietnam's strategy on poverty reduction 2010-2020.

cope with shocks. However, selling assets impedes the probability of households escaping poverty and increases their probability of falling into poverty. This chapter provides a strong justification for paying more attention to shocks in poverty reduction strategies. There should be a more efficient way for households to cope with shocks. Poor development of formal institutions to cope with shocks makes farmers more vulnerable to poverty in Vietnam. Uninsured frequent disease of livestock raises serious concerns about its behavioral impact, which may have a profound impact, trapping farmers in persistent poverty. This behavioral impact is not examined in the chapter but has been found in many studies of other developing countries.

Appendix 2.1- List of variables

Name of variables	Definition	Source
Dependent variable		
Poor in 2006	Dummy variable, equals 1 if income per capita of household in 2006 < VND 2,637,000, and 0 otherwise	
Poverty transit	Categorical variable, equals 0 if household were poor in both 2004 and 2006, 1 if households were poor in 2004 and non-poor in 2006, 2 if households were non- poor in 2004 and poor in 2006 and 3 if households were non-poor in both 2004 and 2006.	
Independent variables		
Dummy shock		
Natural disaster	Dummy variable, equals to 1 if households suffered loss from natural disaster during 2004-2006 and 0 otherwise	VARHS 2006
Illness of HH member	Dummy variable equals to 1 if households suffered loss due to illness of their member during 2004-2006 and 0 otherwise	VARHS 2006
Death of HH member	Dummy variable equals to 1 if households suffered loss due to death of their member during 2004-2006 and 0 otherwise	VARHS 2006
Diseases of livestock	Dummy variable equals to 1 if households suffered loss due to disease of their livestock during 2004-2006 and 0 otherwise	VARHS 2006
Crop failure	Dummy variable equals to 1 if households suffered loss due to failure of their crop during 2004-2006 and 0 otherwise	VARHS 2006
Crop price	Dummy variable equals to 1 if households suffered loss due to change in crop price during 2004-2006 and 0 otherwise	VARHS 2006
Failed investment	Dummy variable equals to 1 if households suffered loss due to unsuccessful investment during 2004-2006 and 0 otherwise	VARHS 2006
Other shocks	Dummy variable equals to 1 if households suffered loss due to other shocks during 2004-2006 and 0 otherwise	VARHS 2006
Shock severity		
Natural disaster	Proportion of annual average income loss incurred by natural disaster to income per capita of households in 2006	VARHS 2006
Expenses of illness of HH member	Proportion of annual average income loss incurred by illness of household member to income per capita of households in 2006	VARHS 2006
Expenses of HH member death	Proportion of annual average income loss incurred by death of HH member to income per capita of households in 2006	VARHS 2006
Diseases of livestock	Proportion of annual average income loss incurred by diseases of livestock to income per capita of households in 2006	VARHS 2006

Continue

Name of variables	Definition	Source
Independent variables		
Crop failure	Proportion of annual average income loss incurred by crop failure to income per capita of households in 2006	VARHS 2006
Crop price	Proportion of annual average income loss incurred by change in crop price to income per capita of households in 2006	VARHS 2006
Failed investment	Proportion of annual average income loss incurred by unsuccessful investment to income per capita of households in 2006	VARHS 2006
Other shocks	Proportion of annual average income loss incurred by other shocks to income per capita of households in 2006	VARHS 2006
Shock-coping measures		
Postponed Investment	Dummy variable equals to 1 if household postponed investment to cope with shocks and 0 otherwise	VARHS 2006
Formal credit	Dummy variable equals to 1 if household borrowed money from bank to cope with shocks and 0 otherwise	VARHS 2006
Informal credit	Dummy variable equals to 1 if household borrowed money from others to cope with shocks and 0 otherwise	VARHS 2006
Asset insurance	Dummy variable equals to 1 if households sold land or livestock or stored crops or other assets to cope with shocks and 0 otherwise	VARHS 2006
Informal assistance	Dummy variable equals to 1 if households got assistance from relatives or friends to cope with shocks and 0 otherwise	VARHS 2006
Employment	Dummy variable equals to 1 if households got a new job, send children to work and went begging to cope with shocks and 0 otherwise	VARHS 2006
Characteristics of households and their locations in 2004		
Ethnicity		
Minority	0 is Kinh & Chinese and 1 is other minority	VLSS 2004
Head-male	0 if head of household is male and 1 if it is female	
Head-age	Age of household head	
Head Education		
(Head with no education)	*Reference group*	VLSS 2004
Head with primary edu.	Dummy variable equals to 1 if highest education of household's head is primary school and 0 otherwise	VLSS 2004
Head with secondary edu.	Dummy variable equals to 1 if highest education of household's head is secondary school and 0 otherwise	VLSS 2004

Continue

Name of variables	Definition	Source
Independent variables		
Characteristics of households and their locations in 2004		
Head with above high-school	Dummy variable equals to 1 if highest education of household's head is above high school and 0 otherwise	VLSS 2004
Dependency	Ratio of the number of persons less than 15 and over 65 year-olds to the total number of household's members	VLSS 2004
Household size	Total number of household's members	VLSS 2004
Value of assets	Value of durable assets, houses and land owned by households in 2004's January price with adjustment for regional price difference	VLSS 2004
Share of number of farming worker	Ratio of the number of household's member self working in agriculture, forestry and aquaculture over the total number of working members of households	VLSS 2004
Locations		
Province dummy	Dienbien, Laocai, Phutho, Laichau, Hatay, Nghean, Quangnam, Khanhhoa, Daclac, DacNong, LamDong, Longan	VLSS 2004
Factory employed local labor	Dummy variable equals to 1 if there is a factory/enterprise/manufactory within 10km from households' commune center, which employs local labors, and 0 otherwise.	VLSS 2004

Appendix 2.2- Full results of econometric models

Logit model on the effects of shock 2002-2006 on poverty in 2006

	Dummy shocks		Shock severity	
	Odds ratio	**P value**	**Odds ratio**	**P value**
Natural disaster	1.29	0.40	2.19	0.00
Illness of HH member	1.97	0.00	2.96	0.00
Death of HH member	0.93	0.87	2.71	0.05
Disease of livestock	1.62	0.07	2.03	0.15
Crop failure	1.93	0.03	3.72	0.00
Crop price	0.54	0.64	7.07	0.53
Unsuccessful investment	0.96	0.97	1.98	0.13
Other shocks	1.20	0.80	5.81	0.02
Year 2006	1.03	0.72	1.00	0.95
Ethnic is minority	2.39	0.00	2.22	0.00
Head_male	0.97	0.92	0.93	0.79
Head_age	0.99	0.17	0.99	0.11
(Head with no education)				
Head with primary edu.	0.78	0.29	0.79	0.32
Head with secondary edu.	0.64	0.09	0.58	0.03
Head with above high-school	0.37	0.01	0.32	0.00
Dependency	1.03	0.00	1.03	0.00
Hhsize	1.15	0.01	1.13	0.01
Value of asset_land	1.00	0.02	1.00	0.03
Share of farm worker	1.01	0.01	1.01	0.01
Factory employed local labor	0.89	0.53	0.84	0.35
(Dienbien province, poorest)				
Laocai	0.11	0.00	0.12	0.00
Phutho	0.51	0.10	0.57	0.17
Laichau	0.34	0.01	0.44	0.03
Hatay	1.01	0.98	1.01	0.97
Nghean	0.55	0.13	0.62	0.21
Quangnam	0.72	0.45	0.72	0.46
Khanhhoa	0.46	0.11	0.33	0.03
Daclac	0.22	0.00	0.17	0.00
DacNong	0.25	0.01	0.21	0.00
LamDong	0.14	0.00	0.17	0.00
Longan	0.27	0.01	0.20	0.00
Number of obs	1232		1232	
Prob > chi2	0		0	
Pseudo R2	0.1883		0.2216	
Log pseudolikelihood	-584.4266		-560.4628	

Logit model of the effects of two-period shocks 2002-2003 and 2003-2006 on poverty in 2006

	Dummy shocks		Shock severity	
	Odds ratio	**P value**	**Odds ratio**	**P value**
Shocks 2002-2003				
Natural disaster	1.13	0.70	1.48	0.00
Illness of HH member	1.65	0.06	1.71	0.03
Death of HH member	0.71	0.48	1.50	0.24
Disease of livestock	1.82	0.05	2.25	0.00
Crop failure	1.76	0.09	2.11	0.00
Crop price	0.28	0.20	0.00	0.08
Unsuccessful investment	0.96	0.97	1.07	0.88
Other shocks	2.32	0.30	1.53	0.66
Shocks 2004-2006				
Natural disaster	1.60	0.29	1.50	0.06
Illness of HH member	1.81	0.05	1.71	0.00
Death of HH member	2.29	0.28	2.21	0.19
Disease of livestock	1.12	0.77	0.82	0.14
Crop failure	2.04	0.21	1.65	0.16
Crop price	8.63	0.08		
Unsuccessful investment	3.17	0.43	2.17	0.27
Other shocks	0.79	0.84	3.04	0.00
Year 2006	0.96	0.87	1.09	0.73
Households and location characteristics in 2004				
(Ethnic is Kinh/Chinese)				
Ethnic is minority	2.47	0.00	2.14	0.01
Head_male	0.91	0.72	0.91	0.73
Head_age	0.99	0.20	0.99	0.10
(Head with no education)				
Head with primary edu.	0.79	0.31	0.77	0.28
Head with secondary edu.	0.66	0.11	0.57	0.03
Head with above high-school	0.39	0.01	0.33	0.00
Dependency	1.03	0.00	1.03	0.00
HH size	1.14	0.01	1.13	0.01
Value of asset_land	1.00	0.02	1.00	0.03
Share of farm worker	1.01	0.01	1.01	0.01
Factory employed local labor	0.87	0.46	0.82	0.31

Logit model of the effects of two-period shocks 2002-2003 and 2003-2006 on poverty in 2006 (continue)

	Dummy shocks		Shock severity	
	Odds ratio	**P value**	**Odds ratio**	**P value**
(Dienbien province, poorest)				
Laocai	0.11	0.00	0.12	0.00
Phutho	0.51	0.11	0.55	0.08
Laichau	0.36	0.01	0.44	0.06
Hatay	1.02	0.97	1.02	0.96
Nghean	0.58	0.17	0.62	0.10
Quangnam	0.77	0.55	0.76	0.42
Khanhhoa	0.45	0.11	0.32	0.01
Daclac	0.24	0.00	0.18	0.00
DacNong	0.28	0.01	0.21	0.00
LamDong	0.14	0.00	0.18	0.00
Longan	0.28	0.01	0.19	0.00
Number of obs	1232		1232	
Wald chi2(39)	219.72		242.08	
Prob > chi2	0		0	
Pseudo R2	0.1902		0.2322	
Log pseudolikelihood	-583.0592		-552.8163	

Multinomial logit model on the effects of shocks on poverty dynamics during 2004-2006

	Dummy shocks				Severity of shocks			
	Fall into poverty		Escape from poverty		Fall into poverty		Escape from poverty	
	RRR	*P value*	*RRR*	*P value*	*RRR*	*P value*	*RRR*	*P value*
Shocks during 2004-2006								
Natural disaster	1.14	0.71	0.75	0.57	1.61	0.01	0.72	0.11
Illness of HH member	1.63	0.11	0.68	0.48	1.71	0.04	0.61	0.14
Death of HH member	0.71	0.62	1.20	0.83	1.62	0.27	0.66	0.49
Disease of livestock	1.95	0.06	1.00	1.00	2.55	0.01	0.72	0.14
Crop failure	1.93	0.09	0.79	0.75	2.11	0.00	0.22	0.14
Year 2006	0.98	0.95	0.75	0.61	1.04	0.90	0.84	0.69
Households and location characteristics in 2004								
(Ethnic is Kinh/Chinese)								
Ethnic is minority	2.44	0.01	0.88	0.81	2.15	0.02	0.98	0.98
Head_male	0.94	0.83	1.01	0.54	0.91	0.75	1.27	0.62
Head_age	1.00	0.64	1.30	0.59	0.99	0.42	1.01	0.52
(Head with no education)								
Head with primary edu.	0.88	0.65	1.20	0.66	0.82	0.49	1.25	0.60
Head with secondary edu.	0.88	0.69	3.45	0.02	0.78	0.41	3.67	0.01
Head with above high-school	0.34	0.02	1.08	0.92	0.28	0.01	1.22	0.80
Dependency	1.02	0.00	0.97	0.00	1.02	0.00	0.97	0.00
Hhsize	1.14	0.04	0.93	0.42	1.12	0.08	0.93	0.40
Value of asset_land	1.00	0.02	1.01	0.44	1.00	0.03	1.01	0.44
Share of farm worker	1.01	0.00	0.99	0.44	1.01	0.01	0.99	0.50
Factory employed local labor	1.03	0.89	1.43	0.32	1.04	0.87	1.40	0.35
(Red River Delta)								
Laocai	0.18	0.03	8.43	0.02	0.19	0.04	9.17	0.02
Phutho	0.97	0.96	3.36	0.13	0.94	0.91	3.48	0.12
Laichau	0.13	0.03	3.76	0.03	0.15	0.04	3.96	0.02
Hatay	2.39	0.12	4.39	0.09	2.13	0.18	5.15	0.06
Nghean	1.17	0.77	2.91	0.14	1.10	0.86	3.17	0.11
Quangnam	1.65	0.38	3.32	0.19	1.40	0.56	3.96	0.13
Khanhhoa	1.19	0.77	4.60	0.19	0.82	0.75	5.82	0.13
Daclac	0.56	0.29	11.45	0.00	0.38	0.09	14.06	0.00
DacNong	0.70	0.58	10.04	0.00	0.44	0.23	12.08	0.00
LamDong	0.41	0.15	22.38	0.00	0.46	0.20	20.20	0.00
Longan	0.56	0.36	6.70	0.06	0.40	0.16	8.47	0.04
Number of obs	1232				1232			
Pseudo R2	0.224				0.242			

**** suest-based Hausman tests of IIA assumption (N=1232)

Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives.

	Dummy shocks			Severity of shocks			
Omitted	*chi2*	*df*	*P>chi2*	*chi2*	*df*	*P>chi2*	*evidence*
RemainP	34.168	58	0.995	30.995	58	0.999	for Ho
EscapeP	34.2	58	0.995	29.871	58	0.999	for Ho
FallP	42.457	58	0.937	38.364	58	0.978	for Ho

Note: rrr and p value are reported, ***, **, and * corresponds to significant level less than 0.01, 0.05, and 0.1, respectively.

Logit and mlogit models on the effects of shocks coping measures on poverty dynamics during 2004-2006

	Logit model				Mlogit model			
	Poor 1		Poor 2		Fall into poverty		Escape from poverty	
	Coef.	*P value*	*Coef.*	*P value*	*RRR*	*P value*	*RRR*	*P value*
Formal credit	0.18	0.68	0.41	0.35	2.04	0.13	3.74	0.08
Asset insurance	0.84	0.00	0.61	0.03	1.78	0.09	0.31	0.02
Employment	-0.25	0.56	-0.37	0.40	0.84	0.76	1.34	0.71
Informal assistance	-0.22	0.53	-0.36	0.30	0.73	0.47	0.93	0.91
Informal credit	0.25	0.45	0.09	0.79	1.19	0.68	0.87	0.82
Postponed investment	0.47	0.67	1.31	0.32	2.32	0.49	2.03	0.55
Year 2006	0.27	0.27	0.16	0.56	1.31	0.37	0.65	0.34
Households and location characteristics in 2004								
(Ethnic is Kinh/Chinese)								
Ethnic is minority	0.84	0.00	1.15	0.00	2.52	0.01	0.96	0.93
Head_male	-0.01	0.96	-0.02	0.93	0.99	0.97	1.20	0.71
Head_age	-0.01	0.26	-0.01	0.29	1.00	0.65	1.01	0.53
(Head with no education)								
Head with primary edu.	-0.22	0.34	-0.20	0.42	0.93	0.80	1.33	0.47
Head with secondary edu.	-0.48	0.07	-0.90	0.00	0.88	0.67	3.90	0.01
Head with above high-school	-1.00	0.01	-1.05	0.02	0.36	0.03	1.56	0.58
Dependency	0.03	0.00	0.03	0.00	1.02	0.00	0.97	0.00
HH size	0.14	0.01	0.24	0.00	1.14	0.04	0.90	0.24
Value of asset_land	0.00	0.02	-0.01	0.04	1.00	0.02	1.01	0.48
Share of farm worker	0.01	0.01	0.01	0.02	1.01	0.00	1.00	0.60
Factory employed local labor	-0.15	0.42	-0.08	0.70	1.04	0.87	1.59	0.21
(Dienbien province, poorest)								
Laocai	-1.97	0.00	-2.29	0.00	0.20	0.04	6.66	0.03
Phutho	-0.57	0.17	-0.21	0.62	0.99	0.99	2.74	0.21
Laichau	-0.82	0.03	-0.14	0.74	0.16	0.04	4.23	0.01
Hatay	0.10	0.81	0.23	0.62	2.44	0.11	4.20	0.09
Nghean	-0.34	0.37	0.17	0.68	1.27	0.66	2.88	0.14
Quangnam	-0.15	0.72	-0.36	0.43	1.76	0.32	3.06	0.22
Khanhhoa	-0.58	0.21	-0.66	0.18	1.29	0.66	3.92	0.23
Daclac	-1.35	0.00	-1.13	0.01	0.61	0.37	9.99	0.00
DacNong	-0.95	0.04	-0.86	0.09	0.82	0.76	7.51	0.01
LamDong	-1.71	0.00	-1.67	0.00	0.46	0.20	18.54	0.00
Longan	-1.34	0.01	-0.76	0.15	0.55	0.35	8.03	0.05
Constant	-2.55	0.00	-3.36	0.00				
Number of obs	1232		1232		1232			
Wald chi2(13)	201.0		220.2		325.37			
Prob > chi2	0		0		0			
Pseudo R2	0.185		0.284		0.2293			
Log pseudolikelihood	-586.969		-489.495		-966.1631			

Suest-based Hausman tests of IIA assumption (N=1232)

Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives.

Omitted	*chi2*	*df*	*P>chi2*	*evidence*
RemainP	30.826	60	0.999	for Ho
EscapeP	34.013	60	0.997	for Ho
FallP	41.75	60	0.965	for Ho

Note: ***, **, and * corresponds to significant level less than 0.01, 0.05, and 0.1, respectively.

Chapter 3- Sectoral growth and poverty alleviation in Vietnam

3.1- Introduction

The impact of economic growth on poverty alleviation has been explored intensively in the literature, especially after world leaders committed to reducing poverty as one out of the eight Millennium Development Goals in 2000. Although a theoretical framework on the relationship between growth and absolute poverty has not been fully developed, increasing empirical evidence shows that growth reduces poverty.[41] The study by Dollar and Kraay (2001) shows that average incomes of the poor grow proportionately with average incomes of society. However, evidence also shows that growth does not automatically "trickle-down" to the poor. An extreme case of this was Romania during 1996-2002, where the economy grew by 0.2% while the poverty rate increased by 6.1% annually. Moreover, the impact of growth on poverty reduction is very different among countries. For example, a percentage change in the head-count poverty ratio with respect to a percent increase (or decrease) in average income ranges from -0.6% to -2.4%.[42] This motivates increasing interest in finding policies that promote a growth pattern which most benefits the poor.[43] One of the dimensions of this literature is to investigate the sectoral growth pattern with respect to poverty reduction (Sahay et al., 2006).

Evidence from current literature does not reach a common conclusion as to which sectors are most poverty responsive. On the one hand, agriculture has been found to contribute to poverty alleviation more than other industries in some developing countries, such as in South Africa (Khan, 1999), Indonesia (Thorbecke and Jung, 1996) and China (Montalvo and Ravallion, 2010). Some other studies, such as Ravallion and Datt (1996) and Warr (2002), find that service is the most conducive to combating poverty in India, Thailand, Indonesia, Malaysia and the Philippines. Yet other studies, such as those on Taiwan[44] and East Asia (Hansan and Quibria, 2002), reveal evidence

[41] For reviewing the evidence, see Sahay et al. (2006), Kanbur (2008), and Shorrocks and Van de Hoeven (2004).
[42] Calculated from Table 1.1 in Grimm et al., 2007.
[43] This is equivalent to the absolute concept of pro-poor growth, which means that growth comes with higher absolute poverty reduction. There is another concept of pro-poor growth, meaning growth comes with a decrease in inequality. For more information on this see Kakwani and Son (2006) or Son (2007).
[44] This is cited in Warr (2002) and Suryahadi et al. (2006), which reviews the study by Warr and Wang (1999).

that only industry growth is strongly associated with poverty reduction. As a result, it is hard to draw any policy implications without explaining why different sectors contribute differently to poverty reduction in different countries.

The current literature provides some explanations. Loayza and Raddatz (2006) suggest that the size of sectoral growth and its labour-intensity feature determine its poverty impact. Growth in industries, which employ significantly an unskilled labour force would lead to significant poverty reduction. This argument has been proven both theoretically and empirically. However, the explanation seems to overlook the case where development of sectors having a strong link with their labour-intensive counterparts can also lead to poverty reduction. For instance, the growth of the agro-industry tends to reduce poverty because of its close link to the agricultural sector (Benfica et al., 2002). Therefore, the decomposition of sectoral growth into three characteristics of the industry and a characteristic of the population, as done by Thorbecke and Jung (1996), seems more inclusive. Besides the labour-intensive feature mentioned above, Thorbecke and Jung show that production linkage and interdependency of the sector and poverty sensitivity of the population also have impact on the poverty responsiveness of the sector. The interdependency results from combining all the above features of the industry with the feature implying how much income increase from the growth of the sector has been spent domestically, so that it will push the growth of other sectors. For instance, the growth of the agricultural sector increases farmers' incomes; if farmers then spend their additional income on domestic manufacturing goods, the manufacturing sector will grow due to the increase in demand. This is called a second-round effect of the growth of agriculture. In addition, the growth of the sector will be more poverty-sensitive if the households working in the sectors are poverty-sensitive, meaning their poverty elasticity of income is high. A reason for the difference in the poverty sensitivity of the household groups related to different industries is probably the lack of labour mobility between locations and/or sectors. However, the application of Thorbecke and Jung's decomposition to Indonesia does not take the size of sectoral growth into account.

This chapter follows Thorbecke and Jung's method, namely the Social Accounting Matrix (SAM) multiplier decomposition technique, to estimate and decompose the sectoral growth impact on poverty. To develop it further, the chapter includes a simulation in order to measure the effect of the size of the sectoral growth, as mentioned by Loayza and Raddatz. The methodology will be applied to Vietnam in order to

explain Vietnam's success in fighting poverty (Grimm et al., 2007) and thus provide some insights for policy implication. Several studies on Vietnam, such as Klump and Bonschab (2004) and VASS (2007), have shown that economic growth was one of the main drivers of poverty reduction, but the connection between sectoral growth and poverty has not been examined. In addition, regardless of its success, Vietnam still has significant poverty, with a headcount rate of 16% in 2007. This study aims to provide policy options for further reducing poverty. Vietnam is halfway through an industrialisation process, moving from an agriculture-based to an industrialised economy. The share of agriculture in the GDP has declined significantly, from 38% to 20% during 1990-2007, while that of industry increased from 22% to 41% (Asian Development Bank, 2009). In that context, this study elucidates the question of how the poor have benefited from the current industrialisation, and how they can benefit more in the future.

To achieve the objectives, the chapter will address four issues. First, the chapter will estimate the poverty elasticity of sectoral growth when each sector grows by 1% compared to the base year (2003). Sectors will be disaggregated into 20 industries, and Vietnam's Social Accounting Matrix (SAM) in 2003 and data from the 2002 Vietnam Living Standard Survey (VLSS) will be used for calculation. Second, the chapter will explain the difference in the poverty elasticity of different sectors by decomposing the poverty elasticity into four components, implying the four features of the industry, namely labour-intensity, production linkage, interdependency and poverty sensitivity of the household groups who benefit from the industry growth. Third, the chapter will estimate the impact of sectoral growth on poverty when each sector grows by the actual growth rate during 2003-2004. This aims to examine the impact of the size of sectoral growth on poverty, as mentioned above. The findings at this stage will allow identification of which sectors should be developed in order to have a greater impact on poverty reduction, or which characteristics of the sectors should possibly be changed. However, in order to decide which sectors should be developed and how, one needs to know whether the poverty-responsive sectors play a key role in the economy. In other words, from a growth perspective, whether the development of poverty-responsive sectors will have an optimal impact on the growth of the economy. This leads to the fourth issue examined in the chapter: to see whether poverty-responsive sectors are key sectors in the economy. The rest of the chapter will be organised as follows: section 2 briefly presents the SAM multiplier decomposition technique. Section 3 provides information on the data used in the chapter and an overview of poverty reduction and

sectoral growth in Vietnam, giving an overall context for the study. Section 4 shows the results and discussions of the poverty impact of sectoral growth. Section 5 presents the key sector analysis and is followed by concluding remarks in section 6.

3.2- Methodology

In the literature, there are four approaches (Boccanfuso and Kabore, 2004) to connecting sectoral growth with poverty alleviation. The first uses the decomposition technique and different household surveys (at least two surveys from two points in time) to analyse the income growth of households by different sectors, for example in Huppi and Ravallion (1991). The second approach applies an econometric method for time series data to measure the relationship between poverty rate and sectoral growth, for example in Warr (2002), Hansan and Quibria (2002), and Loayza and Raddatz (2006). The third approach is an economy-wide analysis developed by Thorbecke and Jung (1996), which uses the Social Accounting Matrix (SAM) multipliers decomposition technique. Finally, the fourth approach uses the Computable General Equilibrium (CGE) model to investigate the issue.

The first and second approaches are limited in that they do not identify which mechanism makes a sector more pro-poor[45], which is one of the objectives of the chapter. Meanwhile, the third method can meet the requirement by decomposing the impact in such a way that one can clearly see the influence of the four industry features mentioned above on the impact. However, this method has limitations as well. It depends on the two assumptions of fixed-price and intra-group neutral distribution of sectoral growth. The fixed-price assumption means unconstrained production capacity, which is a strict assumption for some economies but less so for Vietnam because of its labour redundancy and large flow of foreign capital. However, the results can only apply to the issue in the short-term. The fixed-price assumption can be overcome by applying the fourth approach, the Computable General Equilibrium model (CGE model), although this approach is less transparent in identifying the influential factors than the third approach. There are still different views on using either the SAM multipliers technique or the CGE model in this context (Pyatt and Round, 2006). The effect of the assumption on intra-group neutral distribution will be reduced in this

[45] To be more exact, the study by Loayza and Raddatz uses cross-country data to examine only one feature influencing the pro-poorness of the sectoral growth, the labor-intensity feature.

chapter by the small group division in the Vietnam 2003 SAM. Therefore, this chapter will apply the third approach, and the next chapter will follow up the fourth approach to examine the issue in a longer time frame.

The basic idea of the SAM multipliers decomposition technique is that, based on the prevailing structure of the economy in one year, in terms of function and size distribution as well as production linkage and interdependency, multipliers will be calculated to measure the impacts of increasing the industry outputs on household income and its decomposition. Then, the poverty elasticity with respect to household income is used to link the increase in household income with the overall poverty indicator. Details on this methodology are presented below.

SAM multipliers and decompositions

The SAM is a squared matrix which records all transactions in the economy during a given year. Columns and rows of the SAM are called accounts; they usually include production accounts, factors of production accounts, institution accounts, capital accounts and rest of the world accounts. Payments are made from column accounts to row accounts, and the column total of any account (total expenditure) must equal the row total of that account (income). With that structure, the SAM is a comprehensive snapshot of an economy because it portrays all relevant activities, including production, consumption, accumulation and distribution. A simple stylized SAM is shown in Appendix 3.1.[46]

The above SAM can be used to measure the impacts of industries' output change on household income. To do that, two assumptions need to be made: (i) there exists the capacity in the economy for prices to remain constant; and (ii) technology and resource endowments are given. The SAM then is partitioned into endogenous and exogenous accounts, and with the above two assumptions, one can estimate the impacts on the endogenous accounts of changes in the exogenous accounts. The government, capital and rest of the world accounts are considered exogenous, while production, factor of production and household accounts are considered endogenous. The simplified SAM now becomes the one in Table 1 where all cells T belong to the transactions of endogenous accounts, of which T_{13} is the payment to factors of production, T_{21} is the

[46] For more details about SAM and its uses in modelling, see Thorbecke (2000) and Round (2003, 2007).

allocation of income from use of factor of production to the household, who owned the production factors, T_{22} is the transfer among households and companies, T_{32} is the payments of households for commodities they consumed, and T_{33} is the payment of production for intermediate input consumption, while x are exogenous injections.

Table 3.1- Simplified SAM

		Expenditures				
		Endogenous accounts			Exogenous accounts	Totals
		Factors	Households	Production	Sums of other accounts	
Receipts		1	2	3	4	5
Factors	1	0	0	T_{13}	x_1	y_1
Households	2	T_{21}	T_{22}	0	x_2	y_2
Production	3	0	T_{32}	T_{33}	x_3	y_3
Sums of other accounts	4	l_1	l'_2	l'_3	T	y_x
Totals	5	y'_1	y'_2	y'_3	y'_x	

Source: Thorbecke and Jung (1996)

Now we convert all endogenous parts of the above matrix (T) into the matrix of average expenditure propensity (A below) by dividing each cell of the endogenous accounts by the sum of the column where the cell belongs ($A = T / y' = T / y$).

$$A_n = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix}$$

We have:

$$y_n = A_n y_n + x \qquad (1)$$

Solving for Yn yields:

$$y_n = (I - A_n)^{-1} x \qquad (2)$$

Or

$$y_n = M_a x \qquad (3)$$

where Ma refers to an accounting multiplier matrix. Equation (3) implies that the income of the endogenous accounts equals the multiplication of accounting multiplier and exogenous change, which is also called an injection. The accounting multiplier implies that any incremental injection leads to a marginal expenditure propensity, which equals the average expenditure. In other words, the expenditure elasticity equals unity ($\varepsilon_y = MEP / AEP = 1$; therefore, MEP = AEP, where ε_y is expenditure elasticity, MEP is marginal expenditure propensity, and AEP is average expenditure propensity). This assumption may be reasonable for all other elements of A but not realistic for the expenditure pattern of the household groups (A32). To ease this unrealistic assumption, one can replace the average household expenditure propensity with the matrix of marginal expenditure propensities corresponding to the observed income and expenditure elasticity of households, under the assumption that prices remain fixed (replace A32 with C32, below). In this case, matrix A will be replaced by matrix C, where all the elements of matrix C are the same as that of matrix A, except for $C_{32} \neq A_{32}$, as follows:

$$C_n = \begin{bmatrix} 0 & 0 & C_{13} \\ C_{21} & C_{22} & 0 \\ 0 & C_{32} & C_{33} \end{bmatrix} \qquad C_{ij} = A_{ij} \text{ for all except } C_{32}$$

Similar with equations (2) and (3), we have

$$dy_n = (I-C_n)^{-1}dx$$
$$= M_c dx \qquad (4)$$

Mc is termed a fixed-price multiplier matrix, used to calculate the change in income of the endogenous account n (dy_n) due to the change in the exogenous account x (dx). We are interested in the change in income of the households' account (dy_2) when the output of the production account changes due to the change in the final demand (dx_3). Therefore, we will use the fixed-price multiplier matrix M_{23}: its rows are household accounts and its columns are production accounts. We have:

$$dy_2 = M_{23} dx_3 \qquad (5)$$

Now we decompose the above fixed-price multiplier matrix M_{23} into four components in order to explain the impacts of change in sector growth on household income. First, we write the equation (1) for three endogenous accounts as follows:

$$dy_1 = C_{13}dy_3 + dx_1$$
$$dy_2 = C_{21}dy_1 + C_{22}dy_2 + dx_2$$
$$dy_3 = C_{32}dy_2 + C_{33}dy_3 + dx_3$$

Or:

$$dy_1 = C_{13}dy_3 + dx_1 \quad (6)$$
$$dy_2 = (I - C_{22})^{-1}C_{21}dy_1 + (I - C_{22})^{-1}dx_2 \quad (7)$$
$$dy_3 = (I - C_{33})^{-1} C_{32}dy_2 + (I - C_{33})^{-1}dx_3 \quad (8)$$

We are interested in the effects of an increase in the output of production activities due to a change in the final demand on household income. In other words, we want to know the impacts of dx_3 in equation (8) on dy_2 in equation (7) above. Therefore, we need to separate the impact of dx_3 on dy_2 from the impacts of other exogenous factors such as dx_1 (i.e. the exogenous factors impacting on the factor account, for example exporting labour overseas) and dx_2 (i.e. the exogenous factors impacting on the household income such as remittance from overseas or government transfer). To do that, we set dx_1 and dx_2 equal 0 and the exogenous demand for production such as the value of export or government spending changes by dx_3. Replacing equation (8) with equation (6) yields:

$$dy_1 = C_{13}(I - C_{33})^{-1} C_{32}dy_2 + C_{13}(I - C_{33})^{-1}dx_3 \quad (9)$$

Then, replacing equation (9) with equation (7) yields:

$$dy_2 = (I - C_{22})^{-1}C_{21}C_{13}(I - C_{33})^{-1} C_{32}dy_2 + (I - C_{22})^{-1}C_{21}C_{13}(I - C_{33})^{-1}dx_3$$

or

$$dy_2 = (I - C_{22})^{-1}C_{21}C_{13}(I - C_{33})^{-1} [I - (I - C_{22})^{-1}C_{21}C_{13}(I - C_{33})^{-1} C_{32}]^{-1} dx_3 \quad (10)$$

From equations (5) and (10), we see that the overall impact on household income from change in production due to change in the exogenous demand M_{23} is decomposed into different components in the right hand side of equation (10), which can be grouped into four components, as follows:

- $D_3 = (I - C_{22})^{-1}$: This is called transfer effect, caused by the transfer among households because C_{22} implies the transfer among household accounts in Table 3.1.
- $D_2 = C_{21}C_{13}$: This is the direct effect (or the employment effect) because C_{21} implies the incomes of households from production factors and C_{13} shows the payment that production pays to the factor accounts in Table 3.1.
- $D_1 = (I - C_{33})^{-1}$: This is the effect due to the production linkage among sectors since C_{33} implies the payment among the production accounts in Table 3.1.
- $R = [I - (I - C_{22})^{-1}C_{21}C_{13}(I - C_{33})^{-1} C_{32}]^{-1} = (I - D_3.D_2.D_1.C_{32})^{-1}$ is called the interdependence effect. As seen in Table 3.1, C_{32} implies the payment of the consumers (household accounts) to the commodity (production) accounts. R depends on all three components mentioned above, D_3, D_2, D_1 and also C_{32}, which is called the second-round effect of the sector growth. This effect is different from the production linkage above because C32 represents the consumption linkage of the sector. It tells us how the households spend their additional income earned from the growth of the sector.

As a result, M_{23}, the impact of increase in output of production activity driven by an increase of the exogenous demand (dx_3) on household income (dy_2), can be decomposed into four components: transfer effect, employment/labour-intensity effect, production linkage effect and interdependency effect, as follows:

$$M_{23} = D_3 D_2 D_1 R \qquad (11)$$

In this chapter, the transfer effect will be assumed to be unity, due to the lack of data. However, the results from the two previous applications of the methodology show that transfer effect does not differ among sectors.

Poverty impacts of sectoral growth

The above section presents how to estimate the impact of the change in production output due to the change in the exogenous demand on household income. This section will connect that change of household income with the change of national poverty indicators. Firstly, according to Kakwani (1993), a change in poverty can be decomposed into two parts: change in the mean per capita income and change in income distribution:

$$dP_{\alpha ij} = \frac{\partial P_{\alpha ij}}{\partial \overline{y}_i} d\overline{y}_i + \sum \frac{\partial P_{\alpha ij}}{\partial \theta_{ijk}} d\theta_{ijk}$$

Where $P_{\alpha ij}$ is the FGT poverty measures linking sector j to household group i, $\overline{y}$ is the mean per capita income of household group i, and θ_{ij} is the income distribution parameters. It is assumed that the change in the output of production activity j is distributionally neutral, so that:

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \frac{\partial P_{\alpha ij}}{\partial \overline{y}_i} \frac{\overline{y}_i}{P_{\alpha ij}} \frac{d\overline{y}_i}{\overline{y}_i} = \eta_{\alpha i} \left(\frac{d\overline{y}_i}{\overline{y}_i} \right) \qquad (12)$$

Where $\eta_{\alpha i}$ is the elasticity of poverty ($P_{\alpha ij}$) with respect to the mean per capita income of each household group i ($\overline{y}_i$), resulting from an increase in the output of sector j. The method for estimating $\eta_{\alpha i}$ in this chapter is developed by Kakwani (1993) and estimated in the following formulas[47]:

$$\eta_{P0j} = -\frac{zf(z)_j}{P_{0j}} \qquad (13)$$

$$\eta_{P\alpha j} = -\frac{\alpha[P_{\alpha j-1} - P_{\alpha j}]}{P_{\alpha j}} \qquad (14)$$

Where, η_{P0j} and $\eta_{P\alpha j}$ are the poverty elasticity of household group j for three FGT poverty classes with $\alpha = 0$ and $\alpha = 1$ or 2, respectively. Z is the poverty line, P_{0j} and $P_{\alpha j}$

[47] Refer to Appendix 3.2 for detailed derivation of the formulas.

are the FGT poverty classes of household group j. $f(z)_j$ is the poverty density of household group j.

From equation (5):

$$d\bar{y}_i = m_{ij} dx_j \qquad (15)$$

Where dx_j is the change in the output of sector j, driven by the change in the exogenous injection, measured on a per capita basis for group i, $d\bar{y}_i$ is change in the mean income of household group i, and m_{ij} is an element of multipliers matrix M_{ij}, whose rows are household accounts and columns are production accounts. Replacing equation (15) with equation (12) yields:

$$\frac{dP_{\alpha ij}}{P_{\alpha ij}} = \eta_{\alpha i} m_{ij} \left(\frac{dx_j}{\bar{y}_i} \right) \qquad (16)$$

According to the additive decomposability feature of P_α, the aggregate poverty measure $P_{\alpha j}$ across m household groups is:

$$P_{\alpha j} = \sum_{i=1}^{m} P_{\alpha ij} \left(\frac{n_i}{n} \right) \qquad (17)$$

Where n_i is the population of group i and $n = \sum_{i=1}^{m} n_i$

The diferential form of equation (17) is

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} \left(\frac{dP_{\alpha ij}}{P_{\alpha ij}} \right) \left(\frac{n_i}{n} \right) = \sum_{i=1}^{m} \left(\frac{dP_{\alpha ij}}{P_{\alpha ij}} \right) \left(\frac{P_{\alpha ij} n_i}{P_{\alpha j} n} \right) \qquad (18)$$

The general formula of FGT poverty measures is:

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{m} P_{\alpha ij} \left(\frac{z - y_i}{z} \right)^\alpha, \ \alpha = 0, 1, 2 \qquad (19)$$

From equations (17) and (18):

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m}\left(\frac{dP_{\alpha ij}}{P_{\alpha ij}}\right)\left(\frac{\sum_{k=1}^{q_i}((z-y_k)/z)^{\alpha}}{\sum_{l=1}^{q_i}((z-y_l)/z)^{\alpha}}\right) \qquad (20)$$

where q_i is the number of poor in group i, and $q = \sum_{i=1}^{m} qi$. Let $s_{\alpha i}$ denote the poverty share of household group i out of total poverty and $\sum_{i=1}^{m} s_{\alpha i} = 1$, then:

$$s_{\alpha i} = \left(\frac{\sum_{k=1}^{q_i}((z-y_k)/z)^{\alpha}}{\sum_{l=1}^{q_i}((z-y_l)/z)^{\alpha}}\right) \qquad (21)$$

Then:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m}\left(\frac{dP_{\alpha ij}}{P_{\alpha ij}}\right)s_{\alpha i} \qquad (22)$$

Combining equations (16) and (22) yields:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} s_{\alpha i}\eta_{\alpha i} m_{ij}\left(\frac{dx_j}{\bar{y}_i}\right) \qquad (23)$$

Defining $m'_{\alpha ij} = s_{\alpha i} m_{ij}$, called the modified multiplier, and $q_{\alpha ij} = \eta_{\alpha i}\left(\frac{dx_j}{\bar{y}_i}\right)$, called the poverty sensitivity effect, so that the poverty effect of increase in output is divided into modified multiplier effects and poverty sensitivity effects. Since $m_{ij} = r_{ij} d_{ij}$, defining $d'_{\alpha ij} = s_{\alpha i} d_{ij}$, we get:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} m'_{ij} q_{\alpha ii} = \sum_{i=1}^{m} r_{\alpha ij} d'_{\alpha ij} q_{\alpha ij} = \sum_{i=1}^{m} (r_{\alpha ij})(s_{\alpha ij} d_{ij})(q_{\alpha ij}) \qquad (24)$$

Defining $d'_{2\alpha ij} = s_{\alpha i} d_{2ij}$, then $d'_{\alpha ij} = s_{\alpha i} d_{ij} = d_{3\alpha ij}(s_{\alpha i} d_{2ij}) d_{1\alpha ij} = d_{3\alpha ij} d'_{2\alpha ij} d_{1\alpha ij}$, where d_{ij} is an element of the matrix D_{ij}. Then equation (24) becomes:

$$\frac{dP_{\alpha j}}{P_{\alpha j}} = \sum_{i=1}^{m} r_{\alpha ij} d_{3\alpha ij} d'_{2\alpha ij} d_{1\alpha ij} q_{\alpha ij} \qquad (25)$$

In summary, total poverty effects ($\frac{dP_{\alpha j}}{P_{\alpha j}}$) of the increase in the output of sector j, driven by the increase in exogenous demand dx_j (measured on a per capita household income basis) is calculated by equation (23). It is then decomposed into modified multiplier effects ($m'_{\alpha j} = \sum_{i=1}^{m} m'_{\alpha ij} = \sum_{i=1}^{m} s_{\alpha i} m_{ij}$) and poverty sensitivity effects ($q_{\alpha j} = \frac{dP_{\alpha j}}{P_{\alpha j}} / m'_{\alpha j}$), according to equation (24). The modified multiplier effects are further divided into modified

distributional effects ($d'_{\alpha j} = \sum_{i=1}^{m} s_{\alpha i} d_{\alpha ij}$) and interdependency effects ($r_{\alpha j} = m_{\alpha j} / d_{\alpha j}$). Then the modified distributional effects are divided into three parts: transfer effects ($d_{3\alpha j} = d_{\alpha j} / d_{2'\alpha j} d_{1\alpha j}$), direct distributional effects ($d'_{2\alpha j} = \sum_{i=1}^{m} s_{\alpha i} d_{2ij}$) and distributional effects due to production linkages ($d_{1\alpha j} = d_{\alpha 2j} d_{\alpha 1j} / d_{2\alpha j}$).

3.3- Data and overall picture of industrialisation and poverty reduction in Vietnam

3.3.1- Data

The chapter will use two sources of data, the 2003 Vietnam SAM developed by a collaboration between Copenhagen University (Denmark) and the Central Institute of Economic Management (Vietnam)[48], and the 2002 Vietnam Living Standard Survey (VLSS 2002) conducted by the General Statistics Office of Vietnam. Firstly, the 2003 Vietnam SAM will be used to calculate the accounting multipliers and their decomposition. This is the most recent SAM in Vietnam; it is disaggregated into 112 industries and 16 household groups (disaggregated across location (rural/urban) as well as characteristics of the head of household (sex (male/female) and type of employment (farmer, self-employed, wage-earner, non-employed). This study aggregates 112 industries into 20 industries, slightly modifying the 31-industry classification designed by Jensen et al. (2004). Details on the 2003 Vietnam SAM and its industry classification and aggregations are in Appendices 3.3 and 3.4. It has been used by several studies using a SAM multiplier technique and a computable general equilibrium model for Vietnam, mainly on the impact of trade on income distribution, such as Jensen and Tarp (2005), Toan (2005), Chan and Dung (2006) and Abbott et al. (2008). It is notable that this SAM does not treat land separately but considers it as a capital. This treatment might underestimate the income effect of agricultural growth because land affects income earned on agricultural growth.

Secondly, the VLSS 2002 will be used to estimate the income elasticity of demand, poverty share and poverty elasticity. The income elasticity of demand is estimated separately for 16 household groups and 20 goods and services from 20 industries. It is a ratio of the percentage change in the expenditure on goods of each industry of each household group to the percentage change in their respective income. It is then used to

[48] Jensen and Tarp, 2007a.

calculate the fixed-price multipliers Mc, as mentioned in the methodology. Fixed-price assumption justifies the use of a cross-sectional data, VLSS 2002, to estimate income elasticity. This is similar to the parametric method applied by Nicol (1993). Three forms of Engel curves, linear, trans-log and third-order of trans-log, are examined as follows:

$$\ln x_{ij} = \alpha_{ij} + \beta_{1ij} \ln y_i$$

$$w_{ij} = \alpha_{ij} + \beta_{2ij} \ln y_i + u_{ij}$$

$$w_{ij} = \alpha_{ij} + \beta_{3ij} \ln y_i + \delta_{ij} (\ln y_i)^2 + u_{ij}$$

Where x_{ij} is expenditure on goods of industry j by household group i, and y_j is total income of household group i. In this chapter, total consumption is used as proxy for total income because income fluctuates; w_{ij} is a share of expenditure on goods of industry j of the total consumption of household group i.

Based on the parameters estimated from the above regressions, the income elasticity is calculated as follows: for the linear form, $\eta_{ij} = \hat{\beta}_{1ij}$, for the trans-log form, $\eta_{ij} = (\hat{\beta}_{2ij} / \overline{w}_{ij}) + 1$, and for the third-order trans-log form, $\eta_{ij} = (\hat{\beta}_{2ij} / \overline{w}_{ij}) + 2\hat{\delta}_{ij}(\ln \overline{y}_j) / \overline{w}_{ij} + 1$. Where, $\hat{\beta}_{1ij}, \hat{\beta}_{2ij}, \hat{\delta}_{ij}$ are estimated parameters from the above Engel curves and $\overline{w}_{ij}, \ln \overline{y}_j$ is an average value of expenditure share of goods of industry j of household group i, and an average of the logarithm of the income of household group i. The final selection of the form depends on the explanatory power of the regression (R^2). As a result, the elasticity estimated from the trans-log Engel curve form is used for mining and food processing industries, and the one estimated from the linear form is used for the remaining industries. The final results of income elasticity for the whole population are presented in Table 3.2, together with the elasticity estimated for Vietnam by Seale et al. (2003) based on two-stage demand system models and 1996 data for comparison.[49] This study estimates only the elasticity for the whole population, not for the 16 separate household groups; therefore, it cannot be used in this chapter. The full results, including those classified by the 16 household groups, are documented in Appendix 3.5.

As shown in Table 3.2, the elasticity estimated by Seale et al. tends to be higher for agricultural and industrial products and lower for services than the estimate from this chapter. This seems reasonable because the income level in Vietnam increased during

[49] Although their industrial classification is not exactly the same as in this chapter, this is used as a reference for the results since no other estimates are available.

1996-2002, so the elasticity of necessary goods, such as agricultural and manufacturing goods, should be lower, while the development of the service sector, including luxury goods, should increase their elasticity. In general, the estimated elasticity is reasonable with the necessary or luxury characteristics of different goods and services. The only difference is the estimation for beverages and tobacco products. However, this change is suitable when these products become necessary goods rather than luxury goods due to an increase in income. Therefore, the estimation in this chapter is generally reasonable. And, more importantly, this set of elasticity is much more realistic than assuming all elasticity equals unity (accounting multipliers).

Table 3.2- Income elasticity of household demands in 2002

	Whole population	
	Author's estimation	**Seale et al.'s estimation**
Crops	0.60	0.64
Livestock	0.67	0.78
Fishery	0.64	0.90
Mining	0.26	
Food processing	0.58	0.51
Beverages and Tobacco	0.74	1.10
Chemicals	0.80	
Garment and Footwear	0.56	0.92
Other Manufacturing	0.97	
Utility	1.85	
Transport, Communication and Tourism	1.44	1.27
Financial Services	1.27	
Other Services	1.65	1.54

Source: Author's calculations based on VLSS 2002 and Seale et al. (2003).

The poverty share (s) and poverty elasticity (η) with respect to the mean income of the 16 household groups are used to calculate the poverty impact of sectoral growth according to equation (23). The poverty line used here is known as a general poverty line, estimated by the Vietnam General Statistics Office under the technical assistance of the World Bank's experts and widely used in the literature, equivalent to VND 1,920 million for the year 2002. The poverty elasticity is calculated based on equations (13)

and (14). To do that, $f(z)_j$ is estimated based the estimated parameters of the Kakwani-Lorenz curve, $L(p) = p - ap^{\alpha}(1-p)^{\beta}$. Further details of the methodology to estimate $f(z)_j$ and the derivation of all formulas are referred to in Appendix 3.2. Table 3.3 below presents the results of poverty share and poverty elasticity of income for the 16 household groups. It is notable that households whose head works in the non-farming sector tend to have higher poverty elasticity. This may be because the average income of households in these groups are higher and closer to the poverty line than the other groups, so a one percent increase in their average income may have a greater effect on their poverty status. Very high elasticity of urban households whose heads work in a non-farming sector indicates that the poverty rates of these households are very sensitive to a one percent increase in income.

Table 3.3- Poverty share and poverty elasticity of income of 16 household groups

	Poverty share			**Poverty elasticity**		
	α=0	**α=1**	**α=2**	**α=0**	**α=1**	**α=2**
Rural-male-farm	0.375	0.408	0.428	-2.38	-2.81	-3.45
Rural-male-non-farm	0.086	0.070	0.063	-4.36	-4.13	-4.30
Rural-male-wage	0.304	0.304	0.299	-3.09	-3.14	-3.81
Rural-male-unemployed	0.054	0.055	0.055	-2.08	-3.08	-3.69
Rural-female-farm	0.051	0.047	0.047	-1.95	-3.44	-3.80
Rural female-non-farm	0.016	0.013	0.012	-2.87	-4.04	-4.31
Rural-female-wage	0.027	0.026	0.026	-1.93	-3.25	-3.62
Rural-female-unemployed	0.034	0.033	0.031	-1.84	-3.27	-4.21
Urban-male-farm	0.011	0.009	0.008	-3.55	-3.99	-4.11
Urban-male-non-farm	0.005	0.003	0.002	-7.54	-5.65	-7.10
Urban-male-wage	0.018	0.016	0.014	-5.42	-3.87	-4.41
Urban-male-unemployed	0.006	0.005	0.005	-6.99	-3.27	-3.70
Urban-female-farm	0.002	0.001	0.001	-4.96	-5.62	-3.87
Urban-female-non-farm	0.003	0.002	0.001	-4.29	-5.50	-5.75
Urban-female-wage	0.004	0.004	0.004	-6.27	-3.31	-3.71
Urban-female-unemployed	0.006	0.004	0.003	-5.09	-4.66	-5.02

Note: α=0, 1, 2 means poverty headcount, poverty gap and poverty distributional sensitivity in the FGT poverty measure, respectively.

Source: Author's calculations from VLSS 2002.

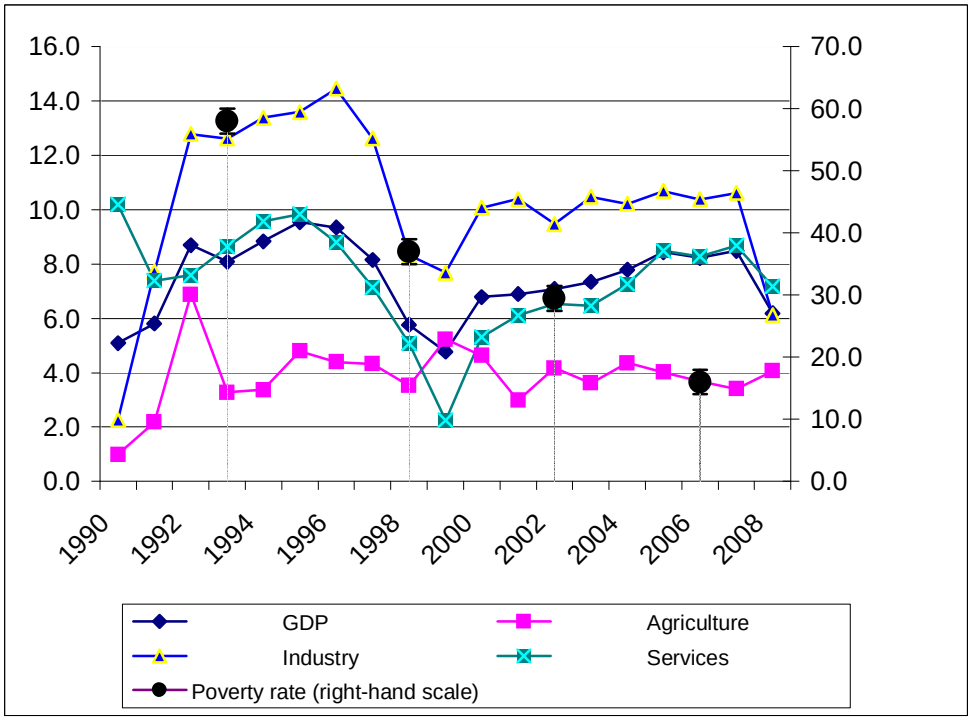
3.3.2- Overview of poverty reduction and sectoral growth in Vietnam

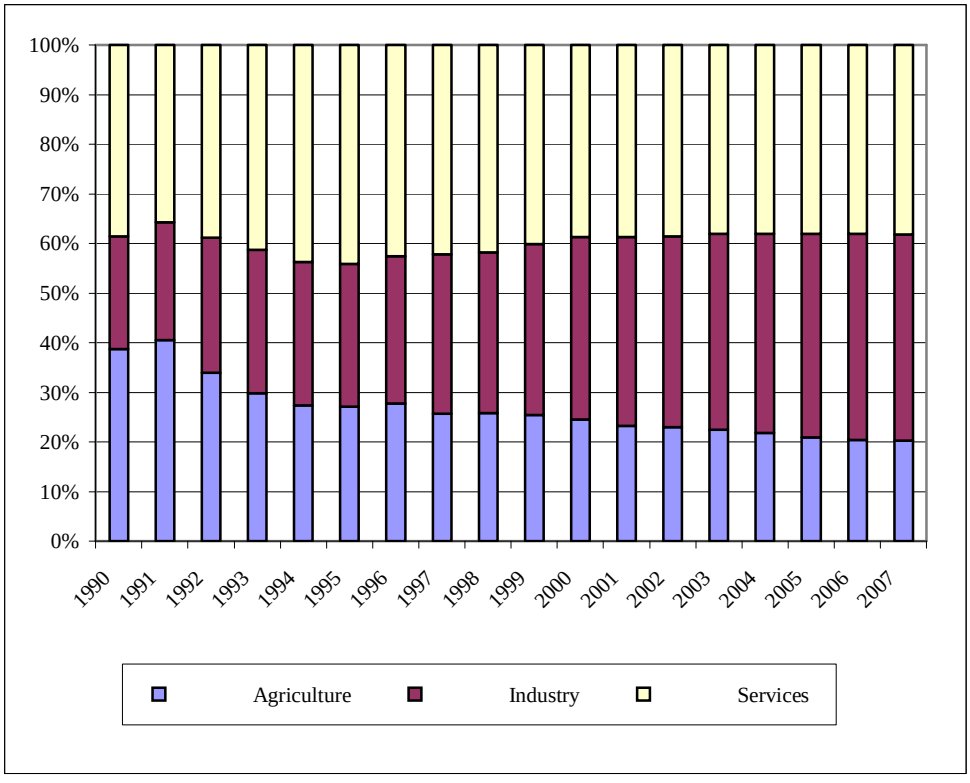
This section aims to provide the context in which the poverty impact of industrial growth has been assessed in this study. Figure 3.1 shows Vietnam's performance in poverty alleviation and economic growth during 1990-2008. It was underlined by a significant reduction of the headcount poverty rate, from as high as 58% in 1993 to 16% in 2006, and high economic growth of 7% on average during 1990-2008. The economic growth picture was marked by outstanding growth in the industrial sector of 10% on average; therefore, its share in the GDP increased from 22% to 42%. The service sector grew by 7% on average and maintained its contribution to the GDP of around 38%. The agriculture sector grew by 4% on average and reduced its role in the economy to 20% in 2008. It is expected from Figure 1 that good performance of the industrial sector may have a large impact on poverty reduction. Poverty elasticity of growth was -1.3 during 1993-2002 and -2.6 during 2002-2004.[50] So, the year of study, 2003, falls into a stable growth period of the economy, with relative high poverty elasticity of growth and an increasing trend in the share of the industrial sector.

During the industrialisation process, sectors grew through both expanding their output and improving their technology. Up to 2003, technology was at a stage where it could take advantage of the labour redundancy in Vietnam and the availability of capital due to the openness of the economy. Table 3.4 demonstrates that agriculture, as usual, employed a majority of the unskilled labour force (71.2%). This is also a sector whose labour input accounts for a large share of the sector value added. Land and capital have been employed more in the industrial and service sectors but they also employ a reasonable percentage of the labour force, in particular medium- and high-skilled labour. It is noted that the other service sectors employ a relatively larger amount of unskilled labour compared to other sub-sectors in the industrial and service sectors.

[50] Elasticity is a percentage change in poverty per a percentage change in growth. The elasticity for 1993-2002 was calculated based on data from Table 1.1 in Grimm et al. (2007), and the one for 2002-2004 is from VASS (2007). These studies use the World Bank general poverty line for Vietnam.

Figure 3.1– Poverty reduction and sectoral growth, 1990-2008





Source: Asian Development Bank (2009), CIEM (2009).

Table 3.4- Use of production factors by industry and within industry in 2003

Industries	Total of columns = 100%				Total of rows = 100%			
	Unskilled labor	Medium & high-skilled labor	Factor land	Factor capital	Unskilled labor	Medium & high-skilled labor	Factor land	Factor capital
Agriculture	**71.2%**	**27.1%**	**2.3%**	**11.7%**				
1 Paddy	35.7%	7.4%	0.6%	1.1%	39.5%	54.6%	0.1%	5.7%
2 Other Crops	23.9%	7.3%	0.6%	4.7%	25.2%	51.5%	0.1%	23.2%
3 Livestock	9.4%	4.0%	0.3%	1.3%	22.6%	63.0%	0.1%	14.2%
4 Agricultural Services	0.1%	0.9%	0.1%	0.3%	1.3%	79.5%	0.2%	19.1%
5 Forestry	1.4%	1.2%	0.1%	0.9%	10.2%	59.5%	0.1%	30.2%
6 Fishery	0.7%	6.3%	0.5%	3.5%	1.1%	71.1%	0.1%	27.6%
Industry	**13.4%**	**37.6%**	**44.2%**	**57.3%**				
7 Mining	2.9%	8.3%	9.6%	17.8%	2.0%	38.5%	1.1%	58.4%
8 Food processing	1.3%	3.6%	4.1%	4.9%	2.5%	49.2%	1.3%	46.9%
9 Beverages & Tobacco	0.6%	1.8%	2.0%	1.4%	3.2%	61.4%	1.7%	33.8%
10 Building Materials	0.6%	1.8%	2.1%	2.9%	2.4%	45.3%	1.3%	51.0%
11 Chemicals	0.6%	1.8%	1.9%	1.8%	2.7%	56.8%	1.4%	39.1%
12 Fertilizer & Pesticides	0.1%	0.5%	0.5%	0.8%	2.0%	42.9%	1.1%	54.0%
13 Garment & footwear	1.4%	3.3%	5.0%	5.3%	2.9%	44.4%	1.7%	51.1%
14 Other Manufacturing	2.7%	7.7%	9.0%	10.0%	2.7%	50.0%	1.4%	46.0%
15 Utility	1.5%	3.3%	5.4%	5.4%	3.1%	44.0%	1.8%	51.2%
16 Construction	1.6%	5.4%	4.7%	7.1%	2.2%	50.4%	1.1%	46.4%
Services	**15.4%**	**35.3%**	**53.5%**	**31.0%**				
17 Trade	2.8%	6.5%	9.6%	8.0%	3.2%	50.8%	1.8%	44.1%
18 Transport, Comm. & Tourism	1.9%	3.8%	6.7%	5.9%	3.3%	44.7%	2.0%	50.0%
19 Financial Services	0.8%	1.6%	2.9%	2.0%	3.8%	49.0%	2.2%	45.0%
20 Other Services	9.9%	23.4%	34.3%	15.0%	4.1%	64.3%	2.3%	29.3%

Source: Author's calculations from 2003 Vietnam SAM.

Table 3.5 shows the main sources of income for the 16 household groups and their respective poverty rate. The households are classified according to the location, gender and working features of the head of the household. For example, the first household group is households whose head lives in a rural area, is male and a self-employer in the farming sector. It is clear that households with a head working in the farming sector in rural areas were the poorest group, and their main income was largely from labour, of which income from unskilled labour accounted for the largest share compared to the

other households. Non-farming households depended more on income from capital. Unemployed and farming households received a larger share of income from the government than the other groups.

Table 3.5- Total income of 16 household groups by source in 2003

	Headcount poverty	Sources of income						
		Unskilled labor	Medium & high-skilled labor	Factor land	Factor capital	Government transfer	Net foreign transfer	Total
Rural-male-farm	0.42	12.3%	64.4%	0.0%	7.3%	12.7%	3.2%	100%
Rural-male-nonfarm	0.23	2.5%	58.4%	0.0%	34.0%	3.7%	1.5%	100%
Rural-male-wage	0.39	8.1%	78.5%	0.0%	4.2%	7.8%	1.4%	100%
Rural-male-unemployed	0.31	0.0%	0.0%	0.0%	0.0%	41.3%	58.7%	100%
Rural-female-farm	0.33	11.5%	58.9%	0.0%	8.5%	16.8%	4.3%	100%
Rural female-nonfarm	0.19	2.3%	61.6%	0.0%	18.8%	3.0%	14.3%	100%
Rural-female-wage	0.34	6.2%	72.6%	0.0%	5.2%	13.2%	2.8%	100%
Rural-female-unemployed	0.31	0.0%	0.0%	0.0%	0.0%	9.9%	90.1%	100%
Urban-male-farm	0.17	3.0%	67.3%	0.6%	9.5%	16.3%	3.3%	100%
Urban-male-nonfarm	0.03	2.9%	33.8%	0.9%	50.7%	4.8%	7.0%	100%
Urban-male-wage	0.08	10.6%	57.1%	4.3%	12.5%	8.2%	7.4%	100%
Urban-male-unemployed	0.06	0.0%	0.0%	0.0%	0.0%	55.3%	44.7%	100%
Urban-female-farm	0.11	4.1%	43.9%	0.0%	12.4%	38.2%	1.4%	100%
Urban-female-nonfarm	0.03	1.4%	45.7%	1.1%	30.3%	7.8%	13.7%	100%
Urban-female-wage	0.05	7.0%	49.8%	10.3%	13.0%	8.7%	11.1%	100%
Urban-female-unemployed	0.05	0.0%	0.0%	0.0%	0.0%	15.9%	84.1%	100%

Note: For details on the household group, see Appendix 3.5. The poverty line used is known as a general poverty line estimated by GSO, assisted by the World Bank's expert based on the cost of basic needs method. It was formulated for the first time in 1993 and inflated for 2002.

Sources: Author's calculations based on data from 2003 Vietnam SAM and VLSS 2002.

3.4- Results and discussions on poverty impacts of sectoral growth

This section will present and discuss the results in three parts. The first part investigates the poverty elasticity of each sector when it grew by 1% annually compared to the base year (2003). The second part examines the channels which determine the poverty elasticity of the sectoral growth presented above. The last part compares the poverty elasticity of the sectoral growth above with the real contribution of sectoral growth, when each sector grew by its actual growth rate during 2003-2004.

3.4.1- Poverty elasticity of sectoral growth

The multiplier matrix Mc_{23} denotes the increase in household income when the output of industries increases by one unit. Since we would like to know the effect on the mean household income, the simulation in this section will be based on the change in the output per capita of the industry. Table 3.6 presents the percentage change in the poverty rate compared to that of the year 2003 due to two types of simulations. The first simulation is the increase of output per capita of each sector by 1% in 2003. This simulation tells us how much each industry can possibly reduce poverty if all industries grow by the same rate. The results are presented in columns 1 to 3. However, this can be influenced by the initial size of the sector; it does not represent the effect caused by the pure structural growth linkage of the sector in the economy. In order to separate the effect of the initial size of the sector, the second simulation is implemented. The second simulation is the increase of output per capita of each sector by eight units. It is noted that the relative contribution of the sector to poverty reduction will be the same regardless of the amount of increase in output. However, in this simulation we choose eight units because it is an average increase of the output across 20 sectors in 2003, and it also makes the poverty elasticity of sectoral growth big enough to ease the presentation. The results of the second simulation are presented in columns 4 to 6.

Based on equation (23), the change in the poverty rate compared to that of 2003 was calculated. The impacts are calculated for all three poverty measures of the FGT poverty class (P0, P1 and P2). The robustness of this estimation framework can be checked, but this is only possible in section 3.4.3, when the real growth rate of the sector has been used to examine the effect of growth. As presented later, the estimation framework is quite robust. In addition, the chapter pays more attention to the relative importance of the growth of 20 sectors to poverty reduction, so that the result of this framework is acceptable, because it takes into account all the transactions relating to the production, income generation and consumption relating to all 20 sectors.

First of all, the results show that based on the structural linkage in the economy, the growth of the agricultural sector has the largest impact on poverty reduction. This is clearly demonstrated in the results of simulation 2 (columns 4 to 6). However, when the size of the sector is taken into account, the industrial sector replaces the agricultural sector in contributing the most to poverty reduction (columns 1 to 3). This shows that

Vietnam would have been more successful in reducing poverty if more effort had been put into promoting the agricultural sector.

Table 3.6- Poverty elasticity of sectoral growth

	Poverty elasticity of sectoral growth (1% growth)			**Poverty elasticity of sectoral growth (unit of growth)**		
	P0	**P1**	**P2**	**P0**	**P1**	**P2**
	(1)	**(2)**	**(3)**	(4)	**(5)**	**(6)**
Agricultural sector	**-0.27%**	**-0.30%**	**-0.37%**	**-0.50%**	**-0.56%**	**-0.69%**
Paddy	-0.10%	-0.11%	-0.14%	-0.11%	-0.12%	-0.15%
Other Crops	-0.06%	-0.07%	-0.09%	-0.08%	-0.09%	-0.11%
Livestock	-0.04%	-0.05%	-0.06%	-0.09%	-0.10%	-0.12%
Agricultural Services	-0.01%	-0.01%	-0.01%	-0.08%	-0.09%	-0.11%
Forestry	-0.01%	-0.01%	-0.01%	-0.06%	-0.07%	-0.08%
Fishery	-0.05%	-0.06%	-0.07%	-0.08%	-0.09%	-0.11%
Industrial sector	**-0.38%**	**-0.42%**	**-0.51%**	**-0.26%**	**-0.29%**	**-0.35%**
Mining	-0.06%	-0.07%	-0.08%	-0.04%	-0.05%	-0.06%
Food processing	-0.14%	-0.15%	-0.19%	-0.07%	-0.08%	-0.09%
Beverages & Tobacco	-0.01%	-0.01%	-0.02%	-0.03%	-0.04%	-0.05%
Building Materials	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%	-0.04%
Chemicals	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%
Fertilizer & Pesticides	-0.002%	-0.002%	-0.003%	-0.02%	-0.02%	-0.02%
Garment & foot-ware	-0.03%	-0.03%	-0.04%	-0.02%	-0.02%	-0.02%
Other manufacturing	-0.04%	-0.04%	-0.05%	-0.01%	-0.02%	-0.02%
Utility	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.02%
Construction	-0.06%	-0.07%	-0.08%	-0.03%	-0.04%	-0.05%
Service sector	**-0.18%**	**-0.20%**	**-0.24%**	**-0.13%**	**-0.14%**	**-0.18%**
Trade	-0.05%	-0.05%	-0.06%	-0.04%	-0.04%	-0.05%
Transport, Communication & Tourism	-0.02%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%
Financial Services	-0.01%	-0.01%	-0.01%	-0.02%	-0.02%	-0.03%
Other Services	-0.12%	-0.13%	-0.15%	-0.04%	-0.05%	-0.06%

Source: Author's calculations.

The table shows that all three sectors, agriculture, manufacturing and services, have some sub-industries, which have fairly high poverty elasticity, meaning the increase in the output per capita of these sectors significantly reduced poverty rates, especially in the case of the first simulation. Paddy, food processing and other services have the largest elasticity, with -0.10%, -0.14%, and -0.12%, respectively. Other sub-industries,

such as other crops, fishery, mining, construction and trade, have an elasticity of about -0.05 to -0.06%. These industries also have a significant impact in other countries, such as Indonesia (Thorbecke and Jung, 1996) and South Africa (Khan, 1999). This implies that examining the contribution of sectoral growth to poverty reduction in broad categories such as agriculture, industry and service may not reveal the true picture. It is necessary to look at a more disaggregated level.

Broad classification of three sectors shown in Table 3.6 demonstrates that growth of the industrial sector can have the largest impact on poverty reduction, followed by agriculture and then services. This is similar to countries such as Taiwan (Warr and Wang, 1999) and East Asia (Hasan and Quibria, 2002), and different from countries such as Indonesia (Huppi and Ravallion, 1991; Thorbecke and Jung, 1996), Thailand, Malaysia and the Philippines (Warr, 2002), India (Ravallion and Datt, 1996), South Asia, Sub-Saharan Africa and Latin America (Hasan and Quibria, 2002). The table shows that poverty reduction in Vietnam may be explained by the close linkage of the agricultural sector to the economy and the rapid expansion of the industrial sector during the industrialisation process. The next section will look more closely at whether this is the realisation of the phenomenon explained by Lewis as the absorption of the rapidly growing industrial sector of redundant labour from the agricultural sector, or the other paradigm of development, by decomposing the impacts.

The table also shows that growth of all industries tends to benefit extremely poor people. This is reflected in the slight increase of poverty elasticity from P0 to P2 for all industries. This is slightly different from Indonesia during 1984-1987, where only growth of the agriculture sector had this feature (Huppi and Ravallion, 1991).

3.4.2- Explaining poverty elasticity

To understand how the different sectors have different poverty elasticity, this section will decompose the above elasticity into four features, as mentioned in the methodology. The overall poverty elasticity is a multiple of four effects, employment effect, production linkage effect, interdependency effect and poverty sensitivity effect. It is noted that there is no transfer effect as mentioned in the methodology because no information about intra-transfer among households is available in the 2003 Vietnam SAM. Therefore, the transfer effect is assumed to be a unity in this chapter and supposed not to distort the assessment because this is transfer among households; it is

small and not sensitive to sectoral growth, as seen from the results of two other studies that apply the same method, by Thorbecke and Jung (1996) and Khan (1999) for Indonesia and South Africa, respectively. The decomposition is based on the simulation 1 as mentioned in section 3.4.1, i.e. output per capita of all industries in 2003 grows by 1%. It is noted that this simulation takes into account the size of the sector and reflect the real contribution of the sector to poverty reduction given its size. It can be decomposed for three poverty measures of the FGT poverty class, but the results are similar; therefore, to ease the exposition, Table 3.7 presents only results of the headcount poverty. The first column of the table repeats the poverty elasticity shown in Table 3.6 for easier comparison.

Table 3.7- Decomposition of the poverty impact of sectoral growth

	Poverty impact (Headcount ratio)	**Employment effects (d2')**	**Production linkage effects (d1)**	**Interdependency effects (r)**	**Poverty sensitivity effects(q)**
	(1)	(2)	(3)	(4)	(5)
Paddy	-0.10%	0.160	1.151	1.298	-0.004
Other Crops	-0.06%	0.125	1.069	1.363	-0.003
Livestock	-0.04%	0.112	1.252	1.348	-0.002
Agricultural Services	-0.01%	0.103	1.227	1.370	-0.001
Forestry	-0.01%	0.081	1.089	1.463	-0.001
Fishery	-0.05%	0.104	1.153	1.413	-0.003
Mining	-0.06%	0.037	1.243	2.059	-0.006
Food processing	-0.14%	0.010	10.202	1.414	-0.009
Beverages & Tobacco	-0.01%	0.023	2.005	1.628	-0.002
Building Materials	-0.02%	0.015	2.135	2.109	-0.003
Chemicals	-0.01%	0.014	1.569	1.810	-0.002
Fertilizer & Pesticides	-0.002%	0.010	1.505	2.227	-0.001
Garment & Footwear	-0.03%	0.006	2.797	2.187	-0.009
Other Manufacturing	-0.04%	0.008	2.014	1.899	-0.013
Utility	-0.01%	0.013	1.178	2.249	-0.002
Construction	-0.06%	0.024	1.672	1.813	-0.008
Trade	-0.05%	0.032	1.420	1.937	-0.005
Transport, Communication & Tourism	-0.02%	0.016	1.444	2.269	-0.003
Financial Services	-0.01%	0.017	1.251	2.333	-0.001
Other Services	-0.12%	0.041	1.284	1.772	-0.012

Source: Author's calculations.

Table 3.7 shows that agricultural sectors have the highest employment effect (column 2), much higher than that of the other industries, ranging from 0.081 to 0.16. This implies that the poverty impact through employment is the highest for agriculture. This impact is very low in other sectors, particularly the industrial sector. The highest employment effect among them, such as from mining, trade and other services, equals only a third or a forth of that of agricultural sectors; other services are more or less a tenth. This means that poverty impact through employment creation of non-agricultural sectors is still very limited.

Although the poverty impact through employment in the food processing industry is as low as most other non-agricultural industries, the food processing industry still has a high poverty impact, mainly due to its very strong link with the agriculture industry (column 3). This number is exceptionally high compared to other industries, up to a factor of about 10. This shows that the pro-poor growth of the industrial sector is mainly driven by the development of the agro-industry sector (food processing industry). Some other manufacturing industries may potentially have a close link with agriculture, for instance beverages and tobacco, garments, wood and rubber products. However, Table 3.7 shows that the production linkages of these industries are higher than others but not high enough to increase their contribution to poverty as remarkably as food processing.

Interdependency effects (column 4) capture the combined effect of the above channels and the indirect impact of consumption. These effects of some industries are higher than those of others, but not high enough to make them more responsive to poverty. This type of impact can be low due to the consumption behaviour. The more people consume domestic goods, the higher the probability that this type of effect will be higher.

Finally, the poverty impact of sectoral growth is also influenced by the poverty sensitivity of the household groups (column 5). This effect depends on the characteristics of households, for example how close their income is to the poverty line. Table 6 shows that this type of impact in fact makes the other service sectors more important for poverty reduction. The poverty sensitive effects were very high for other manufacturing and other service sectors.

3.4.3- Actual contribution of sectoral growth

The above has explained poverty elasticity through four channels. The rest of this section will examine the impact of the size of growth. In order to see the impact of the size of sectoral growth on poverty, the chapter does the following. As mentioned above, the poverty elasticity in Table 3.6 shows the poverty impact when all sectors have the same growth rate. Based on the poverty elasticity, one can calculate the relative contribution of sectoral growth to poverty reduction. The second simulation will be conducted using the actual growth rate of the output per capita of each industry during 2003-2004. This reflects the actual contribution of the industries to poverty reduction, giving their actual growth. It is notable that the sectoral growth rates during 2003-2004 were typical for the sectoral growth rate of the whole period 1993-2008.[51] For example, the 2003-2004 growth rates of agriculture, industry and service were 4.0%, 10.3% and 6.9%, respectively; the average rate for 1993-2008 were 4.0%, 10.7% and 7.2%. So the calculation of the poverty impacts of sectoral growth can be inferred for the whole period 1993-2008. It is noted that this calculation may suffer from a double accounting error due to the duplication in calculating the production linkage. In order to avoid this, we do not use the actual increase of the output directly but use the inverse production linkage (i.e $(I - C_{33})^{-1}$ in equation 8) and the actual increase of the output per capita to calculate the injection ($dx_{3)}$. Then, this injection is used to calculate the poverty elasticity of sectoral growth based on equation 23.

The comparison between two simulations will show how the size of growth changes the poverty contribution of each sector. The additional data on the growth rate of the output per capita of 20 industries are from the GSO (General Statistics Office of Vietnam, 2009). The result of the second simulation was the real impact of industrial growth on poverty during 2003-2004. Since we know that poverty reduction during 2003-2004 was about 4.5%[52], we can do a robustness check of the estimation. The result of the estimation shows that industrial growth reduced the poverty rate by 11% in 2003, equivalent to a 2.7% reduction of the headcount rate during 2003-2004. This is acceptable, because a 4.5% reduction in poverty is the result of not only industrial growth but also other factors, such as government transfer or the transfer from overseas

[51] The reason for not using the real growth rate of 1993-2008 is that it is not possible to obtain the data on the industrial output, which has the same industrial classification in this study.
[52] This was estimated from the information that the headcount poverty rate in 2002 was 29% and in 2004 it was 20%.

remittance. Table 3.8 presents the relative contribution of each sector to poverty reduction in the two simulations.

Table 3.8- Size of sectoral growth to poverty reduction

	Simulation 1 *(1% increase in 2003 industrial output per capita)*			**Simulation 2** *(Actual increase of industrial output per capita 2003-2004)*		
	P0	**P1**	**P2**	**P0**	**P1**	**P2**
Agricultural sector	**32.44%**	**32.99%**	**33.14%**	**24.90%**	**25.40%**	**25.53%**
Paddy	11.59%	11.89%	11.97%	6.85%	7.06%	7.12%
Other Crops	7.37%	7.51%	7.55%	5.48%	5.61%	5.64%
Livestock	5.16%	5.25%	5.27%	4.02%	4.10%	4.13%
Agricultural Services	1.10%	1.11%	1.11%	0.38%	0.38%	0.38%
Forestry	0.80%	0.81%	0.81%	1.28%	1.30%	1.30%
Fishery	6.41%	6.44%	6.44%	6.89%	6.95%	6.96%
Industrial sector	**45.56%**	**45.37%**	**45.31%**	**49.02%**	**48.85%**	**48.80%**
Mining	7.37%	7.24%	7.20%	10.99%	10.84%	10.79%
Food processing	16.28%	16.50%	16.57%	11.35%	11.56%	11.62%
Beverages & Tobacco	1.57%	1.57%	1.57%	2.25%	2.25%	2.25%
Building Materials	2.44%	2.40%	2.39%	2.74%	2.70%	2.69%
Chemicals	0.84%	0.83%	0.83%	1.07%	1.07%	1.06%
Fertilizer & Pesticides	0.26%	0.26%	0.26%	0.29%	0.29%	0.29%
Garment & Footwear	3.78%	3.71%	3.70%	5.59%	5.52%	5.50%
Other manufacturing	4.85%	4.80%	4.79%	5.76%	5.73%	5.72%
Utility	0.94%	0.92%	0.91%	1.12%	1.10%	1.09%
Construction	7.21%	7.13%	7.10%	7.86%	7.81%	7.79%
Service sector	**22.00%**	**21.64%**	**21.55%**	**26.08%**	**25.75%**	**25.68%**
Trade	5.52%	5.42%	5.39%	7.49%	7.39%	7.37%
Transport, Communication & Tourism	1.89%	1.84%	1.83%	2.81%	2.75%	2.74%
Financial Services	0.69%	0.67%	0.67%	0.60%	0.58%	0.58%
Other Services	13.90%	13.71%	13.66%	15.17%	15.02%	14.99%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Author's calculations.

Table 3.8 shows that the picture of the contribution of each industry to poverty reduction is considerably different between the two simulations. The different results between the two simulations are mainly attributed to the actual growth rate of each sector or the size of growth. The actual growth rate of some industries, such as mining, trades and other services, increases their contribution to poverty alleviation in

simulation 2 compared to simulation 1. In general, the modest growth rate of the agricultural sector reduces its contribution to poverty reduction in simulation 1, except for a minor increase from forestry and fishery. This means one should be cautious when comparing findings from different methods because some may measure the impact of simulation 1 while some may refer to the actual impact, as in simulation 2; the two results can even oppose each other. For instance, in Table 3.8, the agricultural sector generates the second largest contribution to poverty reduction after the industrial sector in simulation 1. However, in simulation 2, its contribution is the lowest of the three sectors because in reality both industrial and service sectors experienced much higher growth rates than agriculture. Some may explain the modest growth of agriculture by its inherent constraints in terms of limited available land as input factor. In a Vietnamese context, the modest growth of agriculture can be attributed to under-investment in this sector and low productivity progress (Minh and Long, 2008; Linh, 2009). These studies show that technical efficiency of the agriculture sector is still low and needs to be improved to gain a better growth rate in this sector.

3.5 – Key sector analysis

From the findings above, there are two directions for future pro-poor growth options: (i) increase the poverty elasticity of high potential growth industries, such as manufacturing sectors and service sectors, through either employment effect, production linkage or interdependency; and (ii) develop the industries that have high poverty elasticity, such as agriculture, food processing and other services, so that their impact on poverty will be stronger, or further increase their poverty elasticity through one of the three channels above. However, the above options are driven purely from a poverty impact point of view. Further information from growth perspectives is needed to be able to see a possible trade-off. In other words, it will be interesting to find out which of the 20 sectors' growth has a higher than average influence on the growth rate of the whole economy. This section will carry out the key sector analysis in order to provide that information.

Key sector analysis is widely used in an input-output analysis, which belongs to the analysis strand based on the multipliers. If the SAM multiplier analysis applied in the previous sections is based on all the transactions among three endogenous accounts presented in Table 3.1, the key sector analysis is based only on the transactions between

production accounts[53], T_{33} in Table 3.1, which capture the production linkage among industries. Based on this production linkage, Rasmussen proposes a method to estimate the backward and forward linkage of the sector, which is used to identify the key sectors in the economy, as follows (Nazara et al., 2003). Let $B = (I-A_{ij})^{-1} = [b_{ij}]$, where A_{ij} is the average expenditure propensity of the matrix of n production sectors with sector i at the row and sector j at the column. It is defined as the value of the transaction between sectors i and j per total output of sector j, similar with the matrix A_{33} as mentioned in section 2, after Table 3.1. B is coined a Leontief inverse matrix, which has a column B_j and a row B_i. The backward linkage (BL_j) and forward linkage (FL_i) of sector j are defined as follows:

$$BLj = \frac{\frac{1}{n}\sum_{i=1}^{n} b_{ij}}{\frac{1}{n^2}\sum_{i,j=1}^{n} b_{ij}} = \frac{\frac{1}{n}B_j}{\frac{1}{n^2}V} = \frac{B_j}{\frac{1}{n}V} \qquad \text{and} \qquad FL_i = \frac{\frac{1}{n}\sum_{j=1}^{n} b_{ij}}{\frac{1}{n^2}\sum_{i,j=1}^{n} b_{ij}} = \frac{\frac{1}{n}B_i}{\frac{1}{n^2}V} = \frac{B_i}{\frac{1}{n}V}$$

where $B_j = \sum_{i=1}^{n} b_{ij}$, $B_i = \sum_{j=1}^{n} b_{ij}$ and $V = \sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}$

When BL_j is greater than unity it is understood that a unit change in the final demand in sector j will generate an above average increase in activity in the economy. Similarly, FL_i greater than 1 means a unit change in all sectors' final demand would create an above average increase in sector i. Thus, a key sector is identified as the one having both indices greater than 1. The higher BL_j and FL_i the greater the effect the sector will have on the economy.

The results of applying the above method to 20 sectors are presented in Table 3.9 below. The values of BL_j and FL_i are ranked in descending order in the table. Table 3.9 shows that three highly poverty elastic sectors, paddy, food processing and other services, are not key sectors in the economy; therefore, the policy option to develop these sectors in order to improve poverty reduction may need more thought about the trade-off between poverty reduction and growth. Other options to further increase their poverty responsiveness can be considered, for example through increasing the effect through employment channels for food processing or other service sectors. All sub-

[53] In fact, Cardenete et al. (2009) recently propose to use the transactions of all three endogenous accounts to identify the key sectors because they argue that doing so takes into account the interdependency effect of the sector growth; therefore, the results will be more accurate. However, this chapter still applies the traditional key sector analysis as mentioned above.

sectors of agriculture do not have high value of either BL_j or FL_i; therefore, improvement of their productivity should be given more attention in order to increase their contribution to poverty.

Table 3.9- Key sector analysis results

Backward Linkage		Forward Linkage	
Sectors	**BL_j**	**Sectors**	**FL_i**
Construction	6.1097	Other Manufacturing	5.5412
Garment & Footwear	2.1232	Construction	2.7188
Building Materials	1.1614	Utility	1.6346
Other Manufacturing	0.9426	Building Materials	1.3349
Chemicals	0.8297	Chemicals	1.3326
Fertilizer & Pesticides	0.7931	Garment & Footwear	0.8920
Beverages & Tobacco	0.7642	Transport, Communication & Tourism	0.6803
Food processing	0.7568	Forestry	0.6335
Mining	0.7413	Mining	0.6290
Trade	0.7096	Other Services	0.6233
Livestock	0.5841	Fertilizer & Pesticides	0.5531
Other Services	0.5719	Trade	0.5098
Agricultural Services	0.5671	Paddy	0.4526
Transport, Communication & Tourism	0.5447	Food processing	0.4408
Fishery	0.5199	Other Crops	0.4254
Forestry	0.4842	Agricultural Services	0.3432
Utility	0.4746	Fishery	0.3382
Financial Services	0.4596	Financial Services	0.3319
Paddy	0.4539	Beverages & Tobacco	0.3009
Other Crops	0.4083	Livestock	0.2839

Source: Author's calculations.

Construction, other manufacturing, building materials, garment & footwear, and chemicals are key sectors in the economy, as shown in Table 3.9. Section 3.4.1 also reveals that they have moderate poverty elasticity. This information suggests that developing these sectors may be good in terms of both poverty reduction and growth. If their production linkage and employment effect on poverty can be improved, these are the best and most feasible options for Vietnam. However, it is noted that the above framework does not take into account the interdependency effect, as mentioned in section 3.4. As a result, the consumption linkage is not included in the calculation. As argued in the literature (Diao et al., 2007), the agricultural sector may have a stronger

consumption linkage in the economy compared to the other sectors; the role of the agricultural sector may be underestimated in this calculation.

3.6- Concluding remarks

The chapter has examined the poverty impacts of sectoral growth by taking into account all five possible factors: size of sectoral growth, labour-intensive feature, production linkage, interdependency and poverty sensitivity of the households. By using Vietnamese data, the chapter has also uncovered Vietnam's success in poverty reduction from a sectoral growth point of view. The SAM multipliers decomposition technique has been applied for that purpose. In addition to the available 2003 Vietnam SAM, the chapter directly estimates the income poverty elasticity and income elasticity of demand from the 2002 Vietnam Living Standard Survey. The income elasticity of demand of goods and services is then used to calculate the fixed-price multiplier, which is considered to be more realistic than the accounting one, and the poverty elasticity is used to link the fixed multiplier with the overall poverty rate. The chapter also applies key sector analysis in order to see if the poverty responsive sectors are those having the largest impact on economic growth.

Vietnam's success in poverty reduction is mostly attributed to the close linkage of the agricultural sector in the economy and the growth of crops, livestock and fishery, food processing, mining, construction, trade and some service sectors. The contribution of agricultural sectors is due to the employment channel; meanwhile, the close production linkage of food processing with the agricultural sector makes their contribution significant. The high contribution of some service sectors results from the poverty sensitivity of people in this sector. Good performance of the industrial and service sectors, largely due to export during the industrialisation process, also make their contribution to poverty reduction significant.

In general, the chapter shows that labour intensity is not the only factor explaining the poverty effect of sectoral growth. Three other features of the sector are also accounted for, including the production linkage with the labour-intensive sector, the degree of sector interdependency, which is the second-round effect, including the impacts due to increase in the demand of the domestic market, and the poverty sensitivity to income of the people who benefit from the growth of the sector. For example, for the agricultural

sector, the contribution to poverty reduction was significant due to the employment channel; meanwhile, for food processing, it was due to its close production linkage with the agricultural sector. The high contribution of trade, construction and some services sectors resulted from a combination of all four factors.

The study has shown that good performance of industry and services sectors increase their contribution to poverty reduction. This is illustrated by comparing the difference between the poverty effect of the sectors when all sectors grow by 1% (simulation 1) and the poverty effect when each sector grows by its actual growth rate during 2003-2004 (simulation 2). For example, sectors such as crops, livestock and food processing had a higher impact in simulation 1 than in simulation 2 because the growth rates of these sectors were lower than the average. On the other hand, some other sectors, such as fishery, mining, construction, trade and some other services, showed a higher real impact. This demonstrates that Vietnam could have been more successful in poverty reduction if all highly potentially pro-poor sectors were developed more quickly.

The study also shows that there is probably a "trade-off", at least in the short-term, between growth and poverty reduction, because some of the most potentially pro-poor growth sectors could not generate the strongest growth effects. This may be part of the reason why some of the most potentially pro-poor sectors in Vietnam did not develop quickly enough to exploit their ultimate poverty impact. This conclusion is based on the analysis framework, which does not take into account the consumption linkage (interdependency effect) and so may underestimate the role of agriculture.

This finding contributes to explaining the mixed findings in the empirical literature on the contributions of the agriculture, industry and service sectors on poverty reduction. It is argued that none of the three sectors can possibly significantly impact poverty reduction because the magnitude of the effect depends on more factors than just labour intensity, including close production linkage with labour intensive sectors, high interdependency with the rest of the economy and higher poverty sensitivity to the incomes of people employed by the sector. In addition, the high real growth rate of the sector may also make the sectors which are not most poverty elastic become sectors which actually contribute the most to poverty reduction. This may partly explain the cases of India, where the service sector had the strongest impact on poverty, and Taiwan and East Asia, where the industry sector played the most important role.

In short, all five factors could be equally important in determining the poverty impact of sectoral growth; therefore, taking into account all five factors will better explain the impact, on the one hand, and can be useful when designing pro-poor growth policies on the other hand. In addition, more disaggregated industrial classification rather than agriculture, industry and service should be used when examining poverty impact.

Similar to findings in the current literature, the study shows that, with their contribution through employment and production linkage with some industrial sectors, the higher the growth of the agricultural sector, the more poverty will be reduced in Vietnam. However, there are inherent constraints in agricultural development, since its main input, land, is limited. In this context, this study reveals that some sub-sectors in the industrial and service sectors, which do not face input constraints, can also contribute to poverty reduction. The contribution of these sectors may be further improved if the skills of the poor improve, so that they can be employed in these sectors. This should be a long-term direction for sustainable poverty reduction.

This chapter uses the representative households approach to calculate the poverty elasticity of growth. This may overestimate the overall poverty elasticity because it does not take into account the inequality within the representative households. This limitation will be eased in the next chapter by applying the micro-simulation model, which uses information on individual households rather than representative ones.

Appendix 3

3.1-Structure of a standard Social Accounting Matrix

Receipts		Expenditures								
		Production			*Institutions (Current accounts)*			*7. Combined capital accounts*	*8. Rest of the World*	*Totals*
		1. Activities	*2. Commodities*	*3. Factors*	*4. Private Households*	*5. Enterprises*	*6. Government*			
Production	*1. Activities*				Home Consumption					
	2. Commodities	Intermediate Consumption			Private Marketed Consumption		State Consumption	Investment	Exports	Total Commodity Demand
3. Factors		Value Added								Value Added
Institutions (Current accounts)	*4. Private Households*			Wages, Salaries and Household Enterprise Profits		Distributed Profits and Social Security	Social Security and Other Current Transfers to Households		Net Foreign Transfers to Households	Private Household Income
	5. Enterprises			Gross Profits			Enterprise subsidies		Net Foreign Transfers to Enterprises	Enterprise Income
	6. Government	Value Added and Other Production Taxes	Commodity Taxes	Factor Taxes	Income Taxes	Enterprise Taxes			Net Foreign Transfers to State	State Revenue
7. Combined capital accounts					Household Savings	Retained Earnings	State Savings			Total Savings
8. Rest of World			Imports			Enterprise Remittances				Imports and Remittances
Totals		Total Domestic Payments	Total Commodity Supply	Total Factor Payments	Allocation of Private Household Income	Total Enterprise Payments	Allocation of State Revenue	Total Investment	Total Foreign Exchange	

Source: Adapted from Round (2007) and Jensen et al. (2004)

3.2- Poverty elasticity to income[54] ($\eta_{\alpha i}$)

Lorenz function can be defined as:

$$L(p) = \frac{\int_0^p Q(p)dp}{\int_0^1 Q(p)dp} = \frac{1}{\mu}\int_0^p Q(p)d(p) \qquad (26)$$

Where L(p) is the cumulative percentage of total income held by a cumulative proportion p of the population, $Q(p)$ is the quantile function, defined as $F(Q(p)) = p$, where (F(Q(p)) is a distribution function of Q(p); μ is the mean income.

We have the first derivative of the Lorenz function with respect to p is:

$$L'(p) = \frac{dL(p)}{dp} = \frac{Q(p)}{\mu} \qquad (27)$$

Differentiate (27) second time with respect to p, we have:

$$L''(p) = \frac{d^2L(p)}{dp^2} = \frac{1}{\mu}\frac{dQ(p)}{dp} \geq 0 \qquad (28)$$

We have $F(Q(p)$=p. Differentiating this with respect to p, we have $f(Q(p))d(Q(p))/dp$ =1, where f(z) is the probability density function of income Q(p), Thus,

$$\frac{dQ(p)}{dp} = \frac{1}{f(Q(p))} \qquad (29)$$

Therefore, we have

$$L''(p) = \frac{1}{\mu f(Q(p))} \qquad (30)$$

Now, we look at the FGT poverty measure. Firstly, when $\alpha = 0$: Po is head-count ratio, which is proportion of people, who has a income less than poverty line (z). Replace Po into (27) and (28), we have:

$$L'(Po) = \frac{z}{\mu} \qquad (31)$$

[54] For more details, see Kakwani (1980, 1993), and Duclos and Araar (2006).

and $L''(Po) = \frac{1}{\mu f(z)}$ (32)

Assuming the Lorenz curve does not shift, (32) can be differentiated with respects to μ as follows:

$$\frac{\partial P_0}{\partial \mu} = -\frac{z}{\mu^2 L''(P_0)} \qquad (33)$$

From (28) and (29), we have the elasticity of head-count ratio with respect to the mean income as follows:

$$\eta_{P0} = \frac{\partial P_0}{\partial \mu}\frac{\mu}{P_0} = -\frac{zf(z)}{P_0} < 0 \qquad (34)$$

Secondly, when $\alpha \neq 0$, we have formula:

$$\eta_{P\alpha} = \frac{\partial P_\alpha}{\partial \mu}\frac{\mu}{P_\alpha} = -\frac{\alpha[P_{\alpha-1} - P_\alpha]}{P_\alpha} \qquad (35)$$

3.3- 2003 Vietnam SAM

Receipts (VND Billions)	**Expenditures (VND Billions)**									
	1. Activities	*2. Commodities*	*3. Marketing margin*	*4. Factors*	*5. Private Households*	*6. Enterprises*	*7. States/tax*	*8. Investment/ Savings*	*9. Rest of World*	*10. Total*
SAM dimension	***112***	***112***	***6***	***14***	***16***	***1***	***7***	***5***	***1***	
1. Activities		1,177,636			62,286					1,239,923
2. Commodities	714,654		36,272		343,937		36,601	217,786	366,586	1,715,836
3. Marketing margin		36,272								36,272
4. Factors	522,402								- 10,052	512,350
5. Private Households				321,172		96,449	48,980		31,430	498,031
6. Enterprises				178,337			15,815			194,152
7. State/Tax	2,868	88,140		12,841	8,125	18,661	126,619		1,956	259,210
8. Investment/ Savings					83,683	79,231	27,780	40,238	27,093	258,025
9. Rest of World		413,786				-189	3,415			417,013
10. Total	1,239,923	1,715,836	36,272	512,350	498,031	194,152	259,210	258,025	417,013	

Source: Adapted from Jensen and Tarp (2007a).

3.4- Industry classifications in original SAM and 20 aggregated industries this study

Original 112 industry SAM		20 industry SAM in this study	
Code	**Industry**	**Code**	**Industry**
A001	Paddy (all kinds)	1	Paddy
A002	Raw rubber	2	Other Crops
A003	Coffee beans		
A004	Sugarcane		
A005	Tea		
A006	Other crops		
A007	Pig (All kinds)	3	Livestock
A008	Cow (All kinds)		
A009	Poultry		
A010	Other Livestock		
A011	Irrigation service	4	Agricultural Services
A012	Other Agricultural services		
A013	Forestry	5	Forestry
A014	Fishery	6	Fishery
A015	Fish - Farming		
A016	Coal	7	Mining
A017	Metallic ore		
A018	Stone		
A019	Sand, Gravel		
A020	Other none-metallic minerals		
A021	Crude oil, natural gas (except exploration)		
A022	Processed, preserved meat and by-products)	8	Food processing
A023	Processed vegetable, and animals oils and fats		
A024	Milk, butter and other dairy products		
A025	Cakes, jams, candy, coca, chocolate products		
A026	Processed and preserved fruits and vegetables		
A030	Sugar, refined		
A031	Coffee, processed		
A032	Tea, processed		
A034	Processed seafood and by products		
A035	Rice, processed		
A036	Other food manufactures		
A027	Alcohol, beer and liquors	9	Beverages & Tobacco
A028	Beer and liquors		
A029	Non-alcohol water and soft drinks		
A033	Cigarettes and other tobacco products		

3.4- Continue

Original 112 industry SAM		20 industry SAM in this study	
Code	**Industry**	**Code**	**Industry**
A037	Glass and glass products	10	Building Materials
A038	Ceramics and by products		
A039	Bricks, tiles		
A040	Cement		
A041	Concrete, mortar and other cement products		
A042	Other building materials		
A045	Basic organic chemicals	11	Chemicals
A046	Basic inorganic chemicals		
A050	Veterinary		
A051	Health medicine		
A052	Processed rubber and by products		
A053	Soap, detergents		
A054	Perfumes and other toilet preparation		
A057	Paint		
A058	Inl, varnish and other painting materials		
A059	Other chemical products		
A047	Chemical fertilizer	12	Fertilizer & Pesticides
A048	Fertilizer		
A049	Pesticides		
A075	Weaving of cloths (all kinds)	13	Garment & footwear
A076	Fibers, thread (all kinds)		
A077	Ready -made cloth, sheets (all kinds)		
A078	Carpets		
A079	Weaving and embroidery of textile -based goods (except carpets)		
A080	Products of leather tanneries		
A081	Leather goods		
A043	Chapter pulp and chapter products and by products	14	Other Manufacturing
A044	Processed wood and wood products		
A055	Plastic (including semi-plastic products)		
A056	Other plastic products		
A060	Health instrument and apparatus		
A061	Precise and optics equipment, meter (all kinds)		
A062	Home appliances and its spare parts		
A063	Motor vehicles, motor bile and spare parts		
A064	Bicycles and spare parts		
A065	General -purpose machinery		
A066	Other general -purpose machinery		

3.4- Continue

Original 112 industry SAM		20 industry SAM in this study	
Code	**Industry**	**Code**	**Industry**
A067	Other special -purpose machinery		
A068	Automobiles		
A069	Other transport mean		
A070	Electrical machinery		
A071	Other electrical machinery and equipment		
A072	Machinery used for broadcasting, television and information activities		
A073	Non-ferrous metals and products (except machinery equipment)		
A074	Ferrous metals and products (except machinery equipment)		
A082	Animal feeds		
A083	Products of printing activities		
A084	Products of publishing house		
A085	Other physical goods		
A086	Gasoline, lubricants (already refined)	15	Utility
A087	Electricity, gas		
A088	Water		
A089	Civil construction	16	Construction
A090	Other construction		
A091	Trade	17	Trade
A092	Repair of small transport means, motorbikes and personal household appliances	18	Transport, Communication & Tourism
A095	Transportation		
A096	Railway transport services		
A097	Water transport services		
A098	Air transport services		
A099	Communication services		
A100	Tourism		
A101	Banking, credit, treasury	19	Financial Services
A102	Lottery		
A103	Insurance		
A093	Hotels	20	Other Services
A094	Restaurants		
A104	Science and technology		
A105	Real estate		
A106	Real estate business and consultancy services		
A107	State management, defence and social security		
A108	Education and training		

3.4- Continue

Original 112 industry SAM		20 industry SAM in this study	
Code	**Industry**	**Code**	**Industry**
A109	Health care, social relief	20	Other Services
A110	Culture and sport		
A111	Association		
A112	Other services		

3.5- Household groups classified by household heads' characteristics

Code	**16 Household groups**	**Contents**
HH1	Rural_male_farm	Household is located in rural areas, whose head is male and self-employer in farm sector.
HH2	Rural-male_nonfarm	Household is located in rural areas, whose head is male and self-employer in non-farm sector.
HH3	Rural-male-wage	Household is located in rural areas, whose head is male and working for wage.
HH4	Rural-male-unemployed	HH is located in rural areas, whose head is male and unemployed.
HH5	Rural-female_farm	Household is located in rural areas, whose head is female and self-employer in farm sector.
HH6	Rural female-nonfarm	Household is located in rural areas, whose head is female and self-employer in non-farm sector.
HH7	Rural-female-wage	Household is located in rural areas, whose head is female and working for wage.
HH8	Rural-female-unemployed	Household is located in rural areas, whose head is female and unemployed.
HH9	Urban-male-farm	Household is located in urban areas, whose head is male and self-employer in farm sector.
HH10	Urban-male-nonfarm	Household is located in urban areas, whose head is male and self-employer in non-farm sector.
HH11	Urban-male-wage	Household is located in urban areas, whose head is male and working for wage.
HH12	Urban-male-unemployed	Household is located in urban areas, whose head is male and unemployed.
HH13	Urban-female-farm	Household is located in urban areas, whose head is female and self-employer in farm sector.
HH14	Urban-female-nonfarm	Household is located in urban areas, whose head is female and self-employer in non-farm sector.
HH15	Urban-female-wage	Household is located in urban areas, whose head is female and working for wage.
HH16	Urban-female-unemployed	Household is located in urban areas, whose head is female and unemployed.

3.6- Poverty profile of 16 household groups

	Mean income per-capita per year* (VND 000)	**Population share**	**Poverty Headcount** (P0)	**Poverty gap** (P1)	**Distributional sensitivity poverty** (P2)
Rural-male-farm	7,060	0.26	0.42	0.11	0.04
Rural-male-nonfarm	5,890	0.11	0.23	0.04	0.01
Rural-male-wage	1,562	0.23	0.39	0.09	0.03
Rural-male-unemployed	168	0.05	0.31	0.08	0.03
Rural-female-farm	8,382	0.04	0.33	0.07	0.03
Rural female-nonfarm	5,834	0.02	0.19	0.04	0.01
Rural-female-wage	2,671	0.02	0.34	0.08	0.03
Rural-female-unemployed	149	0.03	0.31	0.07	0.02
Urban-male-farm	9,389	0.02	0.17	0.03	0.01
Urban-male-nonfarm	21,369	0.04	0.03	0.01	0.00
Urban-male-wage	11,428	0.06	0.08	0.02	0.01
Urban-male-unemployed	684	0.03	0.06	0.01	0.00
Urban-female-farm	14,835	0.01	0.11	0.02	0.01
Urban-female-nonfarm	20,994	0.03	0.03	0.00	0.00
Urban-female-wage	18,694	0.02	0.05	0.01	0.00
Urban-female-unemployed	1,052	0.03	0.05	0.01	0.00

Note: Rural_male_farm means household in rural areas and its' head is a male and self-employer in farm sectors; The poverty line used is known as a general poverty line estimated by World Bank office in Vietnam based on the cost of basic needs method. It was formulated for the first time in 1993 and inflated for 2002; * the mean income of group was calculated based on the total income of the group from 2003 Vietnam SAM and the population of the group, which in turn based on the total population from Asian Development Bank (2009) and the group population share from VLSS 2002.
Sources: Own calculations based on data from three sources: Total group income from 2003 Vietnam SAM, population in 2002 from Asian Development Bank (2009) and the rest from VLSS 2002.

3.7- Consumption income elasticity by 20 goods and services and 16 household groups

	Whole population		Chapter estimation for 16 household groups						
	Chapter estimation	Seale et al.'s estimation	HH1	HH2	HH3	HH4	HH5	HH6	HH7
Other Crops	0.60	0.64	0.58	0.51	0.51	0.54	0.55	0.72	0.46
Livestock	0.67	0.78	0.56	0.62	0.74	0.68	0.59	0.81	0.75
Fishery	0.64	0.90	0.94	0.62	0.54	0.66	0.69	0.49	0.20
Mining	0.26		0.26	0.17	0.30	0.33	0.33	0.26	0.32
Food processing	0.58	0.51	0.54	0.53	0.56	0.55	0.52	0.55	0.59
Beverages & Tobacco	0.74	1.10	0.62	0.71	0.70	0.68	0.79	1.20	0.66
Chemicals	0.80		0.76	0.73	0.71	0.73	0.62	0.79	0.70
Garment & foot-ware	0.56	0.92	0.54	0.52	0.53	0.42	0.44	0.71	0.59
Other Manufacturing	0.97		1.02	0.86	0.93	0.86	0.86	1.03	0.94
Utility	1.85		1.52	2.00	1.83	1.70	1.41	2.00	1.59
Transport, Communication & Tourism	1.44	1.27	1.07	1.63	1.12	1.22	1.07	1.54	1.02
Financial Services	1.27		1.19	1.46	1.03	1.10	1.22	1.00	1.15
Other Services	1.65	1.54	1.60	1.55	1.48	1.33	1.53	1.47	1.32
	HH8		**HH9**	**HH10**	**HH11**	**HH12**	**HH13**	**HH14**	**HH15**	**HH16**
Other Crops	0.66		0.65	0.68	0.59	0.65	0.51	0.83	0.60	0.46
Livestock	0.69		0.67	0.92	0.78	0.87	0.59	0.88	0.71	0.69
Fishery	0.47		0.78	0.59	0.45	0.52	0.86	0.56	0.37	0.28
Mining	0.43		0.02	-0.06	-0.08	0.12	0.39	-0.05	0.07	0.19
Food processing	0.60		0.55	0.55	0.56	0.59	0.48	0.57	0.59	0.64
Beverages & Tobacco	0.77		0.72	1.04	0.92	0.93	0.42	1.24	0.99	0.85
Chemicals	0.75		0.55	0.75	0.74	0.75	0.50	0.86	0.77	0.59
Garment & foot-ware	0.64		0.47	0.67	0.67	0.68	0.44	0.73	0.78	0.69
Other Manufacturing	0.93		0.95	1.06	0.99	0.98	0.66	1.02	1.06	0.90
Utility	1.87		1.73	1.53	1.52	1.56	1.97	1.46	1.30	1.09
Transport, Communication & Tourism	1.29		1.48	1.34	1.58	1.65	1.26	1.78	1.60	1.40
Financial Services	0.57		0.44	1.04	1.14	1.45	0.37	1.42	0.97	0.71
Other Services	1.36		1.37	1.57	1.38	1.31	1.40	1.39	1.39	1.18

Note: See appendix 3.5 above for the meaning of household group (HH).

3.8- Parameters of Lorenz curves 2002 and f(z) of 16 household groups

HH groups	Ln a	α	se of α	β	se of β	F(z)
Rural_male_farm	-0.4544	0.9449	*0.0004*	0.6494	*0.0004*	0.0005
Rural-male_nonfarm	-0.5498	0.9340	*0.0008*	0.6217	*0.0008*	0.0005
Rural-male-wage	-0.6083	0.9317	*0.0004*	0.6294	*0.0004*	0.0006
Rural-male-unemployed	-0.2676	0.9738	*0.0014*	0.6978	*0.0014*	0.0003
Rural-female_farm	-0.2059	0.9826	*0.0005*	0.6683	*0.0005*	0.0003
Rural female-nonfarm	-0.2322	0.9854	*0.0015*	0.6764	*0.0015*	0.0003
Rural-female-wage	-0.2792	0.9849	*0.0022*	0.6570	*0.0022*	0.0003
Rural-female-unemployed	-0.1908	0.9724	*0.0010*	0.6415	*0.0010*	0.0003
Urban-male-farm	-0.3786	0.9676	*0.0023*	0.6976	*0.0023*	0.0003
Urban-male-nonfarm	-0.3536	0.9793	*0.0015*	0.6388	*0.0015*	0.0003
Urban-male-wage	-0.3678	0.9709	*0.0010*	0.6093	*0.0010*	0.0002
Urban-male-unemployed	-0.2434	0.9781	*0.0019*	0.6232	*0.0019*	0.0002
Urban-female-farm	-0.3034	0.9515	*0.0030*	0.6758	*0.0030*	0.0003
Urban-female-nonfarm	-0.2736	0.9678	*0.0015*	0.6612	*0.0015*	0.0007
Urban-female-wage	-0.2272	0.9827	*0.0016*	0.5796	*0.0016*	0.0002
Urban-female-unemployed	-0.1350	0.9929	*0.0014*	0.6571	*0.0014*	0.0001

Note: La, α β are estimated by running 16 separate regressions log(p-L(p)) = a + log(p) + log(1-p) for 16 household groups; se means standard error. This regression is log version of Kakwani Lorenz curve: $L(p) = p - ap^{\alpha}(1-p)^{\beta}$. F(z) are calculated based on the equation (28).

Source: Author's calculations from VLSS 2002.

Chapter 4- Equitable Sectoral Growth Patterns of Vietnam: Beyond the Millennium Development Goals

4.1- Introduction

This chapter continues the discussion of the previous chapter on sectoral growth and poverty. In Chapter 3, the SAM multiplier decomposition technique with the assumption of fixed price allows us to analyse the issue in the past and in the short term. This chapter releases the fixed-price assumption by applying the computable general equilibrium (CGE) micro-simulation model. In the model, price is flexible, and agents in the economy behave and interact accordingly. This allows the issues to be investigated in the medium and long term, therefore predicting the future of income distribution under different sectoral growth patterns for Vietnam. In addition, this chapter will continue to examine which sector of those identified as the most pro-poor in Chapter 3 will have the largest impact on poverty reduction.

Recently, attention has not only been increasingly paid to the nexus growth-poverty; the issue of inequality is also considered since traditional views on growth and income distribution have been challenged. One can no longer count upon the Kuznet hypothesis, in which inequality is predicted to decrease after the country has reached a threshold of development (Deininger and Squire, 1998; Angeles, 2010). Meanwhile, as far as poverty is concerned, inequality may be bad for the poor since it reduces the effect of growth on poverty reduction (Ravallion, 2007) and impedes growth (Easterly, 2007), which is considered a sustained driver of poverty reduction. A change in poverty, as a result, is a function of growth, initial distribution and change in the distribution (Bourguignon 2004). This chapter, therefore, examines issues of inequality as well as poverty. Inequality is not included in Chapter 3 because it uses the representative household approach to examine poverty. This approach is probably relevant to studying poverty, but it might be incomplete when considering inequality because the representative approach does not take into account the inequality within representative groups. The alternative method, micro-simulation, which is applied in this chapter, allows a better treatment of household heterogeneity and is therefore able to connect the sectoral growth pattern not only with poverty but also with inequality.

In a dynamic sense, the growth of sectoral patterns is usually studied in relation to the development ladder of the economy over time.[55] The literature in this tradition has been well studied both theoretically and empirically, although the view seems to change over time. Firstly, a leading role of the industrial sector in early stages of development has been well supported by many development theories, such as the theory of big push by Rosentein Rodan, the theory of balanced growth by Ragnar Nurkse, or the dual-economy model by Arthur Lewis, as well as the successful experiences of developed and newly industrialised countries based on industrialisation. Growth is accelerated and sustained through the industrialisation process, in which the industries with high productivity and increasing return to scale, especially in the context of trade liberalisation, will expand and absorb the surplus labour from the low productivity and diminishing terms of trade agriculture. In this line of thinking, agriculture tends to have a passive role in development, and service has an increasingly important role during the development process.

Secondly, more and more arguments have been made to claim an active role of agriculture on development, especially after the successful green revolution in Asian countries (Diao et al., 2007). Advances in mechanical and biological technology have pushed the growth of this sector and facilitated industrialisation through its production and consumption linkage with nonagricultural sectors. It is claimed that agriculture keeps wages in the industrial sector low due to low food prices, increases the domestic demand of industrial products and provides foreign exchange for industrial imports.

Recently, Sheehan (2008) proposes a primary idea of a service-based development scenario. Several arguments have been put forth to support this proposal: (i) in theory, many service industries meet all the conditions to potentially drive sustained growth, including increasing returns, labour shift to higher productivity uses and pecuniary externalities; (ii) evidence of this growth pattern is found in India, whose growth has been led by service sectors, not the industrial sector, and who has actually absorbed a majority of labour shift from agriculture in India during the past decades; (iii)

[55] Alternatively, growth scenarios have been intensively approached from an international trade perspective in two main scenarios, namely import substitution and export-oriented growth. In terms of policy implication in studying sectoral growth, there is debate on the role of the government in industrial policy. Some believe economic structural transformation should be left to market forces, while some argue that there are some market failures, especially in a dynamic sense, that call for the planning and coordinating role of the government (see Lin and Chang, 2009; Schmitz, 2007; Rodrik, 2004 for discussions). In practice, industrial policies are quite pervasive in Asian development history and Vietnam is no exception.

industrialisation can lead to some problems, such as environmental problems or inequality, and this could be avoided or at least lessened by service based growth. This is a reason why China has been presently shifting to more service and agriculture based growth, given the intensity of the inequality and environmental problems.

Recently, as the issues of poverty and inequality have attracted great research interest, sectoral growth pattern is further linked with poverty. It is generally formulated in the "pattern of growth" hypothesis by Montalvo and Ravallion (2010). The hypothesis states that "The sectoral and/or geographic composition of economic activity affects the aggregate rate of poverty reduction independently of the aggregate rate of growth". It is argued that the hyphothesis may hold because sectoral growth patterns may have different effects on groups of people with enough inequality between them to influence the poverty results. Furthermore, the initial inequality also determines how much individuals can gain from a certain sectoral growth pattern, and therefore its effect on poverty. The methodology used in this chapter allows us to test the hypothesis in Vietnam's case, contributing the evidence to the literature.

To the author's best knowledge, only the study by Thurlow and Wobst (2006) uses this approach to analyse the issue for Zambia, a country with very poor performance in both growth and poverty reduction during the study period, with a rise in poverty headcount rate from 68.9% in 1991 to 75.4% in 1998, and an average annual growth rate of 0.2% during the same period. This paper offers analysis using this approach but applies it to Vietnam, one of the successful cases in fighting poverty reduction, with a fall of poverty headcount rate from 29% in 2002 to 17% in 2006, and an average annual growth rate during the study period of 7.09%. Thurlow and Wobst design the sectoral growth scenarios in a way that is more relevant to a Zambian context, while the growth scenarios in this paper are formulated in a way that takes into account both a Vietnamese context and the findings of the roles of sectoral growth on the development ladder and on poverty reduction in the current literature, as mentioned above. In terms of the methodology, this paper also differs from Thurlow and Wobst's study in the micro-simulation part. Thurlow and Wobst use an accounting micro-simulation model, while this paper uses a behavioural micro-simulation model, which takes into account household behaviour.

In the past, Vietnam has followed an industrialisation process, in parallel with the development of the agricultural sector. Up to now, the economy has been transforming,

with the share of the industrial sector in the GDP rising from 22% in 1990 to 41% in 2008. Vietnam also set a target to be an industrialised country by 2020, which probably means a higher share of industrial contribution to the GDP. Over the past decades, growth has been led by the industrial sector, facilitated by the active and important role of the agriculture. Under the current development path, as shown in my previous chapter, all three sectors have contributed significantly to poverty reduction, although there was a trade-off between growth and poverty reduction.

As far as the future of income distribution of Vietnam is concerned, Vietnam is facing a challenge which is beyond the poverty target set up by the Millennium Development Goals (MDG). Vietnam is one of the few countries to achieve the first out of eight MDG of halving the poverty rate during 1990-2015 quite early. The poverty rate was reduced from 58% in 1993 to 20% in 2004. However, the poverty rates are still very high for some groups of people, and some locations and regions. Some have benefited very little from the growth compared to others; for example, the ethnic minority compared to the ethnic majority, rural people compared to urban dwellers, and some regions compared to other regions. As a result, inequality is increasing. This may make it difficult to sustain the success in poverty reduction of Vietnam, lower the growth elasticity on poverty and even hinder Vietnam from experiencing sustainable and fast growth. This paper examines how this challenge will evolve in different growth scenarios.

Given the above context, the objectives of the chapter are twofold: (i) examine the link between sectoral growth patterns and poverty and inequality in the context of Vietnam for the medium and long term, in order to identify the most pro-poor sectoral growth pattern; and (ii) inspect the future income distribution of Vietnam under different growth scenarios, with a special focus on the issue beyond MDG, as mentioned above. By doing so, the paper tries to contribute to the empirical evidence on sectoral growth and poverty and inequality, and provides insights on designing policies oriented towards sustainable poverty reduction and equitable development, especially for Vietnam. The sectoral growth scenarios are identified based on the combination of findings in Chapter 3 and the condition of Vietnam. Three scenarios will be investigated, namely manufacturing-led growth, pro-poor growth and accelerated current growth path. The manufacturing-led growth is based on the government's priorities in the growth scenarios of Vietnam. The pro-poor growth is based on the findings of my second paper, and other current literature on the field, as mentioned above. The last scenario is

designed to see the consequence of income distribution if the sectoral growth pattern of Vietnam is maintained as it has been during the past decade.

The paper uses the computable general equilibrium (CGE) micro-simulation model to achieve the above objectives. This method[56] is justified by the fact that CGE is a multisectoral general equilibrium model which is able to capture the general equilibrium impacts of different sectoral growth scenarios; meanwhile, the micro-simulation allows for the heterogeneity of the households, which is critical in studying poverty and inequality. In Vietnam, only Cling et al. (2009) apply this method to study the impact of WTO accession on income distribution, although their micro-simulation model is the accounting model rather than the behavioural model. No study has used the CGE micro-simulation model to examine different growth scenarios, which is the objective of this study. The rest of the paper will be organised as follows: section 1 reviews the past development of Vietnam to provide background information for the selection of the model specification as well as identify the appropriate growth scenarios for the simulations; section 2 presents the methodology in detail; section 3 introduces the simulations and show the results and discussions; and finally, some conclusions are provided in section 4.

4.2- Sectoral growth and income distribution in Vietnam

Sectoral growth and government policies

As presented in Chapters 1 and 3, Vietnam is a transitional country moving from a central plan to a market-oriented economy. The country is also actively adopting an industrialisation and modernisation approach to development, transforming the economy from agriculture based to industry based. During the past twenty-four years, the economy has grown as much as 7%, during 1990-2008, and the economic structure has shifted in a direction where the industrial sector accounts for an increasing share in the economy, while that of the agriculture is decreasing. In general, the market system has gradually developed and played an increasing role during this process; however, government influence, especially in resource allocation to sectoral growth, is still very strong, both from the legacy of the old economy and from the development model Vietnam is trying to embark on.

[56] For a review of the methodology, see Davies (2009), and Vaqar and Cathal (2007).

Firstly, the most vivid legacy is the pervasive role of state-owned enterprises (SOEs), especially in industrial and services sectors. This situation will not end soon, despite strong criticism and pressure from the international donor community, for both hidden and formally stated reasons. The former relates to the close relation and vest-interest between the bureaucracy (government officers) and the SOEs. The latter implies a present perceived ideology of socialism, which Vietnam is trying to achieve, that the state sector should play a leading role in a socialist market-oriented economy. State enterprises in Vietnam presently account for about 40% of the total investment in the economy. The criticism many economists level at maintaining the large state sector is its apparent low efficiency and the unhealthy competitive environment it creates. More worryingly, the close links between SOEs in banking and non-banking sectors, both by historical connection and by administrative force from the government, facilitate the flow of a major share of total capital in the banking sector to the inefficient SOEs.

Secondly, under the industrialisation and modernisation approach, more attention has been paid to the development of the industrial sector. This is partly from the expectation of having a leapfrogging in the development. As a result, big investment thus has been made or encouraged in industrial sectors, especially the heavy industry sectors. With limited capital in a developing country, the agricultural sector in this context has been largely neglected. A situation where agriculture attracts less attention than other sectors is not, in fact, only happening in Vietnam but is common in other developing countries as well (Timmer, 2000). This development approach has influenced the Vietnamese government in issuing policies such as investments and trade policies which prioritise industrial sectors. For example, some manufacturing and services sectors are given priority in terms of land allocation, trade promotion, and research and development funds.[57] In addition, due to the nature of agriculture, low state investment, such as investment in irrigation, infrastructure, and research and development, prevents investment from the non-state sector. This makes the situation worse.

As a result, during the development process, while the industrial sector attracted the most investment, and grew as fast as 10% annually, agriculture received low interest and was considered to be under-invested in compared to other sectors (Fritzen and Brassard, 2005). This is not only true for state investment but also investment from the

[57] This is according to the Decision of Vietnam's Prime Minister, number 55/2007/QD-TTg, dated 23/4/2007, on the list of prioritised and key industries and assistance policies during 2007-2020.

private sector. The share of investment in agriculture as a percentage of total investment in 2009, 2008, 2005 and 2000 was 6.26%, 6.45%, 7.50% and 13.85%, respectively. In 2008, agriculture attracted only 0.32% of total foreign investment in Vietnam. This amount in 2009 was 0.58%, and for the whole period 1988-2009 was 2.3%.

In short, many studies[58] have pointed out several constraints of growth in Vietnam. First, the state-owned enterprise sector, which accounts for a major share of the investment in the economy, is still operating inefficiently (Dam, 2010). It is argued that better management or a reduction in the size of the state sector will improve economic growth. Second, growth during the past decade has mainly been driven by capital accumulation. The contribution of technological improvement to growth is very limited. As a result, the Vietnamese government currently gives incentives and subsidies to firms making a technological improvement. Third, it is found that there is potential for improvement in the production efficiency of Vietnam's agricultural sector if more investment flows to the sector.

In the draft socio-economic development plan for 2011-2015, the Vietnamese government put forward the target that the average growth rate during this period will be 7-8% annually. The economic structure is expected to transform in the direction of increasing the share of the industrial and service sectors, while the agricultural share of the GDP is expected to be around 15-16% in 2015.

Income distribution

Table 4.1 shows the change in income distribution in Vietnam in the past. When the World Bank's general poverty line is used, the poverty rate has been cut significantly, by 43 percentage points over fourteen years, from 58% in 1993 to 17% in 2006. Moreover, people who are still below the poverty line are becoming less poor, since the poverty gap has been reduced accordingly. The indicators are calculated for sub-groups, which define the main feature of poverty and inequality in Vietnam, i.e. rural, urban, ethnic minority and majority, and eight regions.

[58] Such as Minh and Long (2008).

Table 4.1- Poverty and inequality in Vietnam, %

	1993	1998	2002	2004	2006
Poverty headcount	58	37	29	20	17
By location					
Urban	25	9	7	4	4
Rural	66	46	36	25	22
*By ethnic group**					
Majority (Kinh/Chinese)			26	14	11
Minority			74	61	54
By eight regions					
North East Mountains	86	62	38	29	27
North West Mountains	81	73	68	59	51
Red River Delta	63	29	22	12	10
North Central Coast	75	48	44	32	30
South Central Coast	47	35	25	19	14
Central Highlands	70	52	52	33	30
South East	37	12	11	5	6
Mekong Delta	47	37	23	16	11
Inequality					
Gini index**	0.34	0.35	0.37	0.37	0.37
Gini decomposition (percentage of total inequality explained by:)					
By location					
Urban				0.10	
Rural				0.38	
Between groups				0.39	
By ethnic group					
Majority (Kinh/Chinese)				0.79	
Minority				0.01	
Between groups				0.16	
By region					
Within regions				0.15	
Between regions				0.39	

Note: * Vietnam has 54 ethnic groups, where the majority group, Kinh, accounts for 84% of the population (2006). Chinese is one out of 53 ethnic minority groups, accounting for 0.6% of population. However, because the Chinese group is quite a wealthy group, even compared to the Kinh, it is included in the majority group in the above table.

** Gini index in this table is calculated by household expenditure, which is argued to underestimate the inequality in Vietnam. The index estimated by household income is indeed higher than that by expenditure (Cuong et al., 2010).

Source: VASS (2007) and author's calculation for 2006 based on VLSS 2006.

Table 4.1 also clearly shows the challenge beyond Vietnam's MDG. At the moment, poverty is mainly a rural and ethnic phenomenon, concentrated in some main regions, such as mountainous areas and north coastal and central highland regions. It is also revealed that the current difference in poverty between regions results largely from the unbalanced poverty reduction in the past. However, inequality tends to increase; the most important source is the inequality in rural areas, the inequality between rural and urban areas, the inequality between the majority ethnic groups and the inequality between regions. Within a regional dimension, inequality is less severe. Therefore, the most pro-poor and equitable growth scenario might be one that benefits people in rural areas.

Table 4.2- Human resources and household income sources

	Poor	**Non-poor**	**Total**
Percentage of households' labour by skill level*	100	100	100
Skilled	4	21	19
Semi-skilled	52	57	56
Unskilled	43	22	24
Percentage of household income source	100	100	100
Wages	20	28	27
Self-employers in farm sector (agriculture)	61	34	37
Self-employers in nonfarm sector (non-agriculture)	5	18	16
Others	14	20	19

Note: *: Skilled labourers mean those who have a high school degree or above; semi-skilled labourers have a primary or secondary degree; and unskilled labourers have no degree.

Source: Author's calculations from VLSS 2004.

Table 4.2 presents the human resources as well as income sources of poor versus non-poor groups of households in order to sketch the main directions of some possible distributional impacts of growth scenarios. This is because these features carry some of the distributional impact of different growth scenarios, as shown in the methodology section below. A poor household has, on average, a higher share of unskilled labour, while the difference in the share of semi-skilled labour between two groups is less obvious. Consequently, the change in the wage for unskilled labour should have a more

significant impact on poverty rate than the change in the ware for semi-skilled labour. The increase in the wage for skilled labour may have less of an impact on the poor because only 4% of labour in this group of households was skilled. Table 4.2 also shows that agricultural growth will certainly have a more significant impact on poverty than non-agriculture. The income increase from wages, though, is less important than that from self-employment in agriculture enables households to escape poverty.

Table 4.3 demonstrates the above indicators across eight regions, which is also a concern of Vietnam in terms of the gap on income distribution among regions. It is clearly illustrated that poverty matters in some regions more than in others. Human resources could possibly be one factor contributing to this regional dimension of poverty, but there might be many other factors as well. For example, the North West region had the highest headcount rate (0.42) and also had the highest average household share of unskilled labour (43%). Meanwhile, the Mekong River Delta had as high a share of unskilled labour as the North West, but their headcount rate was much lower (0.16). Things seem to be different with the structure of household income source. There is a clear trend that the poorest regions tend to be those having the highest share of household income from agriculture.

Table 4.3- Indicators by eight regions

Region	Percentage of household labour by skill level			Percentage of household income sources		
	Skilled	Semi-skilled	Unskilled	Wage	Farm	Non-farm
Red River Delta	26	62	11	29	30	17
North East	21	59	21	24	47	12
North West	11	46	43	20	62	6
North Central Coast	20	63	17	21	42	14
South Central Coast	18	57	25	32	30	21
Central Highlands	13	55	32	22	52	14
North East South	24	52	24	38	16	23
Mekong River Delta	10	50	40	28	36	18
Overall	19	56	24	28	35	17

Source: Author's calculations from VLSS 2004.

4.3- Methodology

4.3.1- Modelling sectoral growth and income distribution

The paper aims to investigate the income distribution consequences of different sectoral growth scenarios. In theory, different sectoral growth scenarios can have different impacts on poverty and inequality through two main channels. The first is the price channel. Different changes in the supply structure lead to different sets of relative prices through the interaction with demand. These different relative price sets will have different impacts on the welfare of households through their expenditure patterns. The second is the income channel. Sectoral growth leads to a change in the demand and returns of the different production factors, which in turn have an impact on the income of the households that own the production factors. As a result, in order to measure the effect, a model must capture the above channels. In this regard, a link between a CGE model and a micro-simulation model is an appropriate framework.

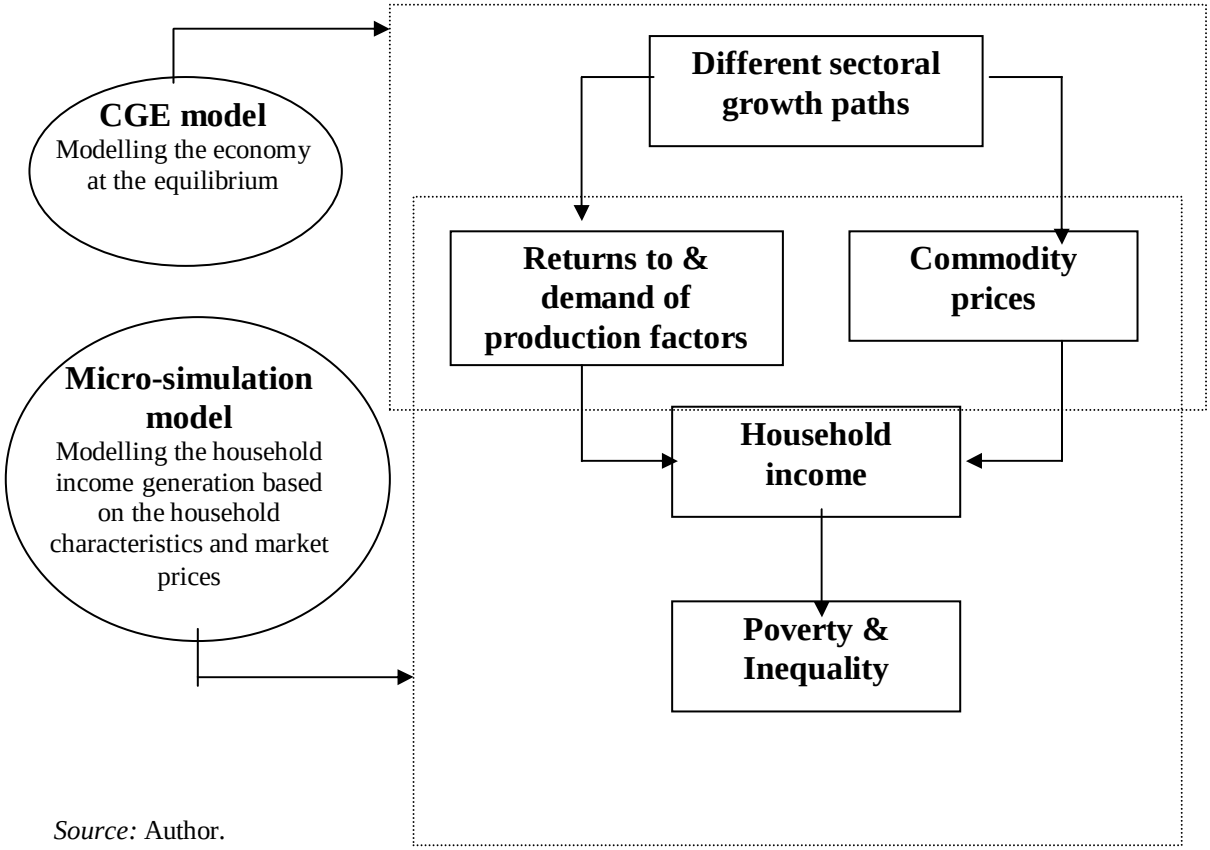
Figure 4.1 below visualizes this link. First of all, the CGE model mentioned here is an empirical dynamic multi-sector general equilibrium model which captures interactions among industries and the behaviour of different agents under certain environments in the economy, during a period of time.[59] The model is solved numerically and the outcomes are the series of sets of prices and quantities of commodities and services when the economy reaches a series of equilibriums, meaning all excess demands are zero. As a result, the model is able to produce different growth paths of the economy under different growth scenarios. In the model, household is one of the agents in the economy; therefore, it is possible to trace the income distribution consequences of sectoral growth. However, in the CGE model, households are representative; therefore, their heterogeneity is not well presented, which may result in an incorrect assessment of income distribution, especially in terms of inequality. For example, the model does not capture inequality within a representative household. In a recent development of methodology[60], instead of using a representative household, the CGE model has been linked with a micro-simulation model to fully capture the heterogeneity of households.

[59] The CGE model was first introduced in the 1960s and increasingly developed during the last decades. There are many types of CGE models in terms of specifications as well as model computation, but the common feature is their explicit consideration of the general equilibrium effect. They have been used widely in policy analysis with a focus on trade and taxation, and recently in environmental analysis.

[60] For a review of the methodology, see Davies (2009), and Vaqar and Cathal (2007). This methodology has been increasingly used for different countries to assess the impacts on income distribution of different macroeconomic shocks such as trade, tax, world price, external balance, etc.

It has been shown in the literature that this type of macro-micro model tends to do a better job of income distribution analysis than the traditional representative CGE model.[61]

Figure 4.1- Sectoral growth-income distribution in CGE micro-simulation model



Source: Author.

There are many types of such micro-simulation model; this paper builds an income generation model initiated by Bourguinon et al. (2003). The model allows simulating income distributions with different vectors of prices and quantities resulting from the CGE model simulations under different growth scenarios. At the end, comparing a deviation of income distribution index of different growth scenarios with that of the base year will address the objective of the paper. The rest of this methodology section will present in detail the CGE and micro-simulation model for Vietnam, and the linking mechanism between the two.

[61] See Bourguignon et al. (2003) and Savard (2004) for a comparison between the traditional representative CGE model and the CGE micro-simulation model; for the applications of the methodology, see, for example, Vaqar and Cathal (2008) to Pakistan, Robilliard et Al. (2008) to Indonesia, Colombo (2008a) to Nicaragua, and Bussolo and Lay (2003) to Colombia.

4.3.2- Vietnam CGE model

The Vietnam CGE model in this paper is based on the framework extended from a static CGE model built by the International Food Policy Research Institute (IFPRI). The model is a recursive dynamic with a combined neoclassical-structuralist feature, documented in Thurlow (2004).[62] Lists of variables, parameters and mathematical equations of the model are presented in Appendix 4.1. The main features of the model are briefly presented in two parts, static and dynamic, as follows:

Static model

Overall, the model has 20 production sectors, as classified in my previous chapter; 20 corresponding commodities; three labour factors classified by skill level (skilled, semi-skilled and unskilled); and a land factor and a capital factor. The three labour factors are then further disaggregated into gender (male and female) and location (rural and urban). 16 types of representative households are in the model for demand modelling but not for income generation, since the actual households will be used instead in the micro-simulation model. The model also includes government, investment and saving, and the rest of the world. The rest of this section will present the behaviour and constraints of agents in the model, and macroeconomic institutions under which the agents operate.

The producers in the model maximise their profit subject to several types of constraints, which are presented in Figure 4.2 below. Firstly, production factors are combined in a form of constant elasticity of substitution (CES) function. Secondly, the combinations between production factors and intermediate inputs, among intermediate inputs, and between the commodities produced follow the Leontief function. This specification implies that combinations are determined by the technology, not the producers. Thirdly, imported and domestic goods are imperfectly substituted under a CES Armington specification, in which elasticity varies across sectors. Finally, exported and domestic goods are substituted under a constant elasticity of transformation (CET) function. In this model, Vietnam is assumed to be a small country, and therefore faces an infinite elastic world supply at fixed world prices. This assumption is usually used in the other CGE models for Vietnam as well as those of other developing countries. In general, this

[62] For more on the development of this CGE type model, see Dervis et al., 1982.

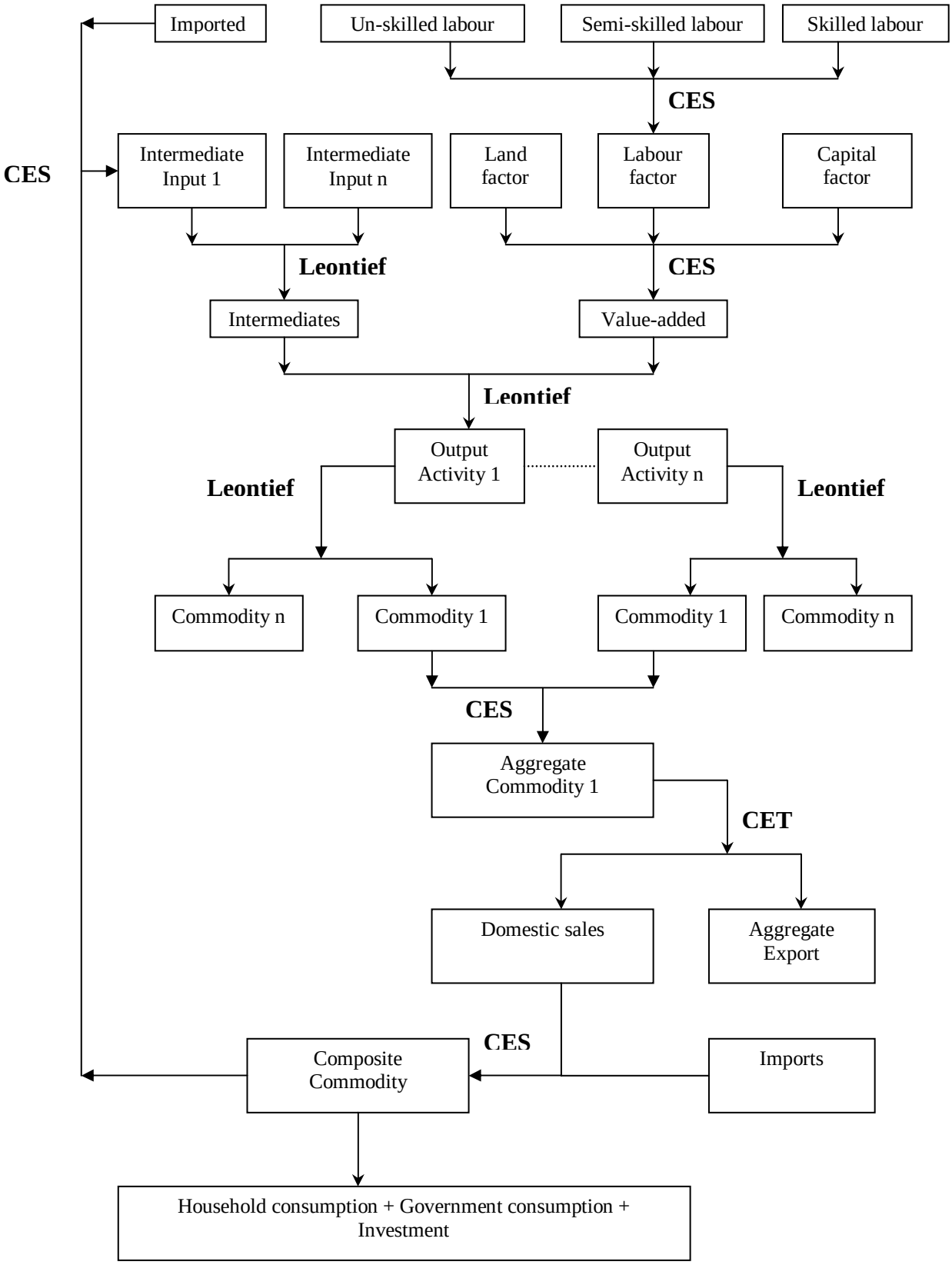
assumption is acceptable for most products from Vietnam, except a few agricultural products, such as coffee and rice.

Consumers maximise their Stone-Geary utility function, where the utility depends on the amount of goods consumed above the subsistence level, subject to the budget, obtained from a return of production factors. As a result, the household demand on commodity consumption follows a linear expenditure system (LES) under certain prices and incomes. The model also captures both self-produced consumption and market consumption of households, which is a prevalent feature in the rural areas of Vietnam. The government in the model gets revenue from direct and indirect taxes, and then spends it on their own consumption, on transfers to households and on payments to the rest of the world. All of these payments are fixed in real terms; therefore, the budget deficit is mainly financed through borrowing from the domestic capital market. The consumption of the government is separated from the production of government services.

The above agents in the model operate within a certain environment[63], which reflects both neoclassical and structural features of the model, and is similar to many other CGE models for Vietnam[64]. The goods and services markets are perfectly competitive, while there are rigidities in the factor markets, which reflect the transitional characteristics of Vietnam's economy in its transformation from a planning to a market economy. Capital and land are fully employed and immobile across sectors. The labour market is segmented in two. Semi-skilled and unskilled labour is redundant in Vietnam, so wages are fixed and supply passively responds to match the demand. Conversely, real wages of skilled labour adjust to make sure the demand equals supply.

[63] These are termed system constraints and macroeconomic closures in the CGE tradition.
[64] For example, Thurlow et. al (2010), Huong (2009), Jensen and Tarp (2007b), Chan and Dung (2006), and Toan (2005).

Figure 4.2- Production technology and commodity flows



Note: Leontief is a fixed share function, CES is a constant elasticity of substitution aggregation function, CET is a constant elasticity of transformation function.
Source: Adapted from Thurlow (2004).

The model does not explicitly model the investment decision but rather an equalisation of savings; the investment is an accounting identity. Savings by households and enterprises are collected into a savings pool from which investment is financed. This supply of loanable funds is diminished by government borrowing and augmented by capital inflows from the rest of the world. Therefore, the model adopts a savings-driven closure, neoclassical view in which the savings rates of domestic institutions are fixed, and investment passively adjusts to ensure that savings equal investment spending in equilibrium. Closures of current account and the government are selected based on current government policies. For the current account it is assumed that a flexible exchange rate adjusts in order to maintain a fixed level of foreign borrowing. In other words, the external balance is held fixed in foreign currency. In the government account, the level of direct and indirect tax rates, as well as real government consumption, are held constant. As such, the balance of the government budget is assumed to adjust to ensure that public expenditure equals receipts. Finally, the consumer price index is chosen as a numéraire such that all prices in the model are relative to the weighted unit price of households' initial consumption bundle. The model is also homogenous of degree zero in prices, implying that a doubling of all prices does not alter the real allocation of resources.

Dynamic model

This belongs to the recursive dynamic model[65], which is based on an adaptive rather than a forward-looking expectation. This is a reasonable assumption in the context of the transformation of Vietnam's economy, where policies have been changing quite regularly. The dynamic part of the model updates several parameters based on the adaptive expectation and results of the previous period. First, the previous period investment generates a new capital stock for the subsequent period. The allocation of new capital across sectors is influenced by sectors' initial share of aggregate capital income, the capital depreciation rate and sectoral profit rates. Sectors with above-average capital returns receive a larger share of investment than their share of capital

[65] The model can be made dynamic in several ways. According to Ginsburgh and Keyzer (1997), there are finite and infinite horizon dynamics. The model applied in this paper belongs to one of three finite horizontal dynamic models, namely single-period equilibrium model, T-period competitive equilibrium model and temporary equilibrium model. For more information about the dynamic CGE model, see Ginsburgh and Keyzer (1997).

income. The opposite is true for sectors where capital returns are below average. Second, population growth is exogenously imposed on the model, generating a higher level of consumption demand. The marginal rate of consumption for commodities is assumed to be unchanged. Third, skilled labour supply responds to changes in real wages over time, whereas real wages of unskilled and semi-skilled workers adjust across periods. In addition, the change of the former is attached to the change of the real wage of skilled labour in previous period. This specification allows for the endogenous determination of wages for less skilled workers, as well as the exogenous determination of skilled-unskilled wage convergence rates[66]. Fifth, factor-specific productivity growth is imposed exogenously on the model based on observed trends for labour, land and capital. Sixth, growth in real government consumption and transfer spending is also exogenously determined between periods, since within-period government spending is fixed in real terms. Seventh, projected changes in the current account balance are exogenously accounted for. Last, mining production is assumed to be predominantly driven by a combination of changes in world demand, prices and other factors external to the model. One such external factor might be the gradual exhaustion of non-renewable natural resources. Accordingly, the value-added growth of these sectors and the world price of exports are updated exogenously between periods based on observed long-term trends.

Data and model's solution

The parameters of the model are calibrated based on the Vietnam 2003 Social Accounting Matrix (SAM) and other data.[67] The Vietnam 2003 SAM was collected and formulated by Copenhagen University and Vietnamese institutions. The data has been used in the previous chapter and some other CGE models for Vietnam, such as Jensen and Tarp (2005). Besides SAM, the other data is taken from various sources in the literature, mainly from other CGE models for Vietnam and statistics offices, as follows:

- Trade elasticity (Armington and CET) is taken from Arndt et al. (2002) and Jensen and Tarp (2005); production elasticity is taken from Jensen and Tarp (2007c).

[66] This assumption is reasonable because there is recent evidence of wage convergence in Vietnam (Diep, 2009).

[67] In the literature, there are two ways of estimating the model parameters. One is a calibration approach, which is applied in this paper, and the other uses econometric methods. However, the econometric approach is data intensive and difficult to solve if the model is large; therefore, the majority of CGE models in the literature are calibrated, as is the model in this paper.

- Income elasticity of consumption is calculated from the Vietnam Living Standard Survey (VLSS) in 2002, presented in Chapter 3.
- Government consumption spending is taken from statistics from the Asian Development Bank (2009) for the period 2004-2006, and from Huong (2009) for the period 2007-2010.
- Government transfer to household, household and enterprise saving, capital depreciation rate, population growth, labour supply during 2004-2010 and Frisch parameter in 2003 are taken from Abbott et al. (2008).
- Import tariff during 2004-2010 are from Cling et al. (2008), which is extracted from Vietnam's WTO commitments.
- World export and import prices during 2004-2008 are from the General Statistics Office of Vietnam (2009); data for 2009 and 2010 is assumed to be the average price during 2004-2008.
- Sectoral growth rates during 2004-2008 are calculated from data from the GSO; data for 2009 and 2010 is assumed to be the average rate during 2004-2008.

The original model is written by Lofgren et al. (2002) and Thurlow (2004) in General Algebraic Modeling System (GAMS) software for South Africa. It is formulated as either a Mixed Complementary Problem (MCP) with a system of simultaneous linear and nonlinear equations or a Non Linear Program (NLP) minimising the excess demands in goods and factors markets. The MCP is solved by Path solver, and the NLP is solved by MINOS solver in GAMS. That model is then revised to suit Vietnam's economy and the objectives of the study.

4.3.3- Vietnam income generation model

Model

The income generation model for Vietnam is based on the framework of the model documented in Robilliard et al. (2008). It is a system of five equations used to calculate the income of household m based on the earning and employment choices of the k household member, as follows:

$$Y_m = \frac{1}{P_m}\left(\sum_{i=1}^{k_m} w_{mi} IW_{mi} + y_m Ind\left(N_m > 0\right) + y_{0m}\right) \quad (1)$$

$$Log w_{mi} = \alpha_{g(mi)} + X_{mi}\beta_{g(mi)} + v_{mi} \quad i=1, \ldots, k_m \quad (2)$$

$$Logy_m = \gamma_{f(m)} + Z_m \delta_{f(m)} + \lambda_{f(m)} N_m + \eta_m \quad (3)$$

$$P_m = \sum_{k=1}^{20} s_{mk} p_k \quad (4)$$

$$P(LC_{h(mi)} = j) = \frac{e^{\varphi_{h(m)j} F_{mij}}}{1 + \sum_{j=1}^{3} e^{\varphi_{h(m)j} F_{mij}}}$$

$$P(LC_{h(mi)} = 0) = \frac{1}{1 + \sum_{j=1}^{3} e^{\varphi_{h(m)j} F_{mij}}} \quad (5)$$

Equation 1 presents the total income of household m (Ym) equal to the sum of three components: income from wage (w_{mi}) earned by k_m household members i, where IW_{mi} is a dummy variable equal to 1 if the member has earnings from wages; income from self-employment y_m, where Ind is an indication function, equal to 1 if the number of self-employed household members is greater than zero and 0 otherwise; other income y_{0m} is considered as exogenous income in this model. That income is then deflated by the household index price, which will be estimated in equation 4.

Equation 2 is an econometric estimation of the income from the wages of household member w_{mi}, where the logarithm of the wage income depends on the household member characteristics X_{mi}, including age, age squared, schooling, experience, workload (full-time or part-time) and some household characteristics including location of the household and ethnicity of the household head; $\alpha_{g(mi)}$ and v_{mi} are constant and unobserved determinants of wage. Definition of the variables is in Appendix 4.2.1. Wage income will be separately estimated for 12 groups of labour $g(mi)$ (by skills, gender and location) as classified in the Vietnam CGE model.

Equation 3 is an econometric estimation of self-employment income of household y_m, where a logarithm of the self-employment income is determined by the characteristics of household and household head Z_m, including head age, head schooling, head experience, value of land, other household assets, a dummy variable for working in

forestry and aquaculture sectors, and location of the household. N_m is the number of household members who are self-employed. Definition of the variables is in Appendix B. This income is estimated separately for farming and non-farming employment, represented by $f(m)$. $\gamma_{f(m)}$ and η_m are constant and unobserved determinants.

Equation 4 is a calculation of price index of household P_m, which is used to deflate the household income in equation 1. It is a sum of the weighted price of 20 goods and services (as classified in the CGE model) consumed by the household $s_{mk} p_k$, where weight s_{mk} is a budget share of goods and services k of total household expenditure consumed by the household. This index is used to take into account the price effects of the different growth scenarios depicted in section 2.1. The change in the prices of commodities, which accounts for a higher share in a particular household budget, should have a bigger impact on that household. This is considered to be important in income distribution assessment because the spending structure of high-income groups tends to be significantly different from those with low incomes. The price of commodities in the base year (2004) is assigned a value of 1 so that the total income of households in 2004 will equal the income reported by households in the survey.

Equation 5 is a multinomial logit model represented as a probability of being employed in one out of four labour choices $LC_{h(mi)j}$, namely non-active, wage-employment, self-farming employment and self-nonfarming employment. Individuals of working age (greater than 16, and less than 55 for women and 60 for men) are placed in the employment categories based on their individual and household characteristics $F_{h(mi)j}$, including age, educational degree, experience, gender, household demography and location. Being self-employed in the farming sector is selected to be a base choice ($LC_{h(mi)} = 0$). The model is estimated separately for three groups of household members $h(mi)$, namely head of household, husband/wife and children. In addition to the determinants above, the employment choice of the two latter groups also depends on some characteristics of the household head, including work, experiences and wage. Definition of the variables is in Appendix 4.2. This equation is used to derive the probability of the individual being in one out of four employment choices mentioned above, so that when there is a change in employment level as a result of the CGE model, this equation will decide who gets a job (if employment is a result of CGE model simulation increase) and who loses a job (if employment decreases).

Data and model's estimations

The model uses cross-sectional data from the Vietnam Living Standard Survey (VLSS) 2004. The poverty and inequality index calculated from this data will be used as a base to compare those of different growth scenarios. Some basic indicators, which will be used as a base later on when comparing the distributional impact of growth scenarios, are presented in Table 4.1.

Out of five equations, only three equations, 2, 3 and 5, have to be estimated, while the other two are arithmetical equations. Equations 2 and 3 are estimated using either OLS or Heckman regression. If the selection bias is significant, Heckman regression will be used. Table 4.4 shows a result of the OLS estimation for three types of labour, skilled rural male, skilled rural female and skilled urban male. Definitions of variables and results of the regressions for nine other types of labour are presented in Appendix 4.2. The table shows that, in general, as expected, age and experience do not have a linear relation with wage. Higher education increases wage, and members of an ethnic minority seem to earn less than others. This result is generally consistent with current findings in the literature such as Pham and Reilly (2007).

Table 4.4- Results of wage earning equation

Variables	Skilled rural male		Skilled rural female		Skilled urban male	
	Coefficient	P value	Coefficient	P value	Coefficient	P value
Age	0.101	0.000	0.044	0.352	0.137	0.000
Age square	-0.001	0.000	0.000	0.622	-0.002	0.000
Schooling	0.119	0.000	0.245	0.000	0.108	0.000
Experience	0.011	0.032	0.018	0.481	0.058	0.000
Experience square			0.000	0.765	-0.001	0.001
Ethnic minority	-0.439	0.002	0.014	0.946	-0.269	0.170
Full-time working	0.680	0.000	0.465	0.000	0.733	0.000
Region 2	-0.071	0.495	0.105	0.449	-0.101	0.310
Region 3	0.186	0.419	-0.292	0.381	0.213	0.364
Region 4	-0.191	0.029	0.298	0.061	-0.242	0.023
Region 5	0.042	0.716	0.085	0.561	-0.204	0.031
Region 6	-0.057	0.739	-0.076	0.749	0.181	0.203
Region 7	0.375	0.000	0.574	0.000	0.331	0.000
Region 8	0.205	0.027	0.460	0.001	-0.176	0.088
Constant	5.028	0.000	3.871	0.000	4.298	0.000

Source: Author's estimation.

The objective of estimating the above equations is to predict the income of all people of working age based on certain controlled variables. The predicted income of unemployed persons will be used if they become employed due to an increase in employment as a result of the CGE model's simulations.

Table 4.5- Occupation model for household head

Variables	Wage		Self-employed in non-farming sector		Inactive	
	RRR	P	RRR	P	RRR	P
Age	0.97585	0	0.9992	0.85	1.083262	0.094
Primary education	0.86495	0.28	1.36861	0.001	3.87E-10	0
Secondary education	1.22702	0.122	1.62516	0	1.63E-09	0
High school education	2.10257	0	2.20843	0	5.24E-10	0
Higher than high school education	7.50158	0	1.63537	0.001	5.07E-10	0
Experience	0.95895	0	0.94764	0	6.49E-50	1
Female	1.15663	0.178	1.92798	0	3.64E+13	1
Dependency	0.99438	0.013	0.99593	0.015	0.9879778	0.614
Urban	10.3072	0	4.35139	0	15.59658	0.042
Region 2	0.61287	0.001	0.61715	0	7.46E+19	1
Region 3	0.401	0	0.36839	0	1.01E+24	1
Region 4	0.73937	0.063	0.75492	0.009	0.8365176	0.898
Region 5	0.98251	0.916	0.92597	0.523	4.03E+12	1
Region 6	0.33687	0	0.46339	0	9.38E+18	1
Region 7	2.15278	0	1.10033	0.394	3.548486	0.426
Region 8	1.20837	0.16	0.71522	0.001	0.7433612	0.812

Source: Author's estimation.

Equation 5 is estimated by a Maximum Likelihood method. The equation is run for three groups of household members, namely head of household, husband/wife of the head and children. Table 4.5 presents the results of the regression for the head of household. The regression results of other members and definitions of variables are presented in Appendix 4.2. Similar with the multinomial logit model in Chapter 2, Table 4.5 presents the Relative Risk Ratio (RRR) and its corresponding P value. The base occupation is self-employment in the farming sector. Therefore, if RRR is greater than unity and P value is less than 0.1, the corresponding variable increases the

probability of being employed as a wage earner rather than being self-employed in the farming sector. For example, the table shows that people with high school education or above are more likely to be employed as a wage earner than to be self-employed in the farming sector. The results presented in the table are generally consistent with current literature, such as Alatas and Bourguignon (2005).

This estimation aims to predict the probability of being employed as a wage earner given certain controlled variables. This will be used later on as a basis to decide who will be employed if employment increases, and who will be dropped out if otherwise.

4.3.4- Linking the two models and simulating the micro model

The linking process is conducted in such a way as to preserve the consistency of the two models. There are three main types of linking the two models in the literature: top-down, or sequential, approach, top-down/bottom-up and fully integrated approach. The performance of different linkage approaches is not very different[68], but the top-down method is straightforward and easy to implement, therefore widely used. The other two approaches in theory have the advantage of taking into account the feedback from the micro model to the CGE model, but this is at the expense of the difficulty in computation. This paper applies the top-down approach in linking the two models. The obvious disadvantage of this approach is that it does not take into account the feedback from the micro model to the CGE model.[69] Under this approach, the results of the CGE model on price, wage, employment demand and the growth rate of agriculture and non-agriculture will be used as an input for the micro-simulation model.

Firstly, the change in the prices of 20 commodities will be used to calculate the price index of the household (equation 4) under the formulation: $P_{ms} = \sum_{k=1}^{20} s_{mk}(1+\Delta p_{ks})$, where P_{ms} is a price index of the household under growth scenario s, Δp_{ks} is a change in the price of commodity k, resulting from the CGE model under growth scenario s, s_{mk} is the share of the budget of household m for commodity k. It is assumed to be the same for all growth scenarios.

[68] For detailed information on the top-down/bottom-up approach, see Savard (2003); for the fully integrated approach, see Corkburn (2001) or Clauss and Schubert (2009); for a comparison between different approaches, see Ag´enor et al. (2004), Colombo (2008b) and Herault (2009).
[69] For more details on the strengths and weaknesses of the top-down approach, see Lay (2010).

Secondly, the change in the employment level resulting from the CGE model channels to the micro model via the formulation $k_{gs} = (1 + \Delta k_{gs}).k_g^0$, where k_{gs} is the level of wage employment at skill level g under growth scenario s, Δk_{gs} is the change in corresponding employment resulting from the CGE model, k_g^0 is the level of employment at skill level g in the base year. As a result, the gap between k_{gs} and k_g^0 will be the level of employment that will be used to select who will change their employment status from unemployed to employed under a certain growth scenario, based on equation five of the model, as mentioned in section 2.3. And for those whose employment status changes, their predicted wage as estimated from equation 2 will be used to add to the wage income of the households. This way of linking the employment level between the two models, in fact, must rest on the assumption that the growth rate of wage employment equals average employment in the economy. This assumption must be made because the above CGE model for Vietnam does not separate waged employment from self-employment.[70]

Thirdly, the change in the wage of skilled, semi-skilled and unskilled labour resulting from the CGE model will be incorporated into equation 1 of the micro model through the formulation $w_{g(mi)s} = (1 + \Delta w_{g(mi)s}).w_{g(mi)}^0$, where $w_{g(mi)s}$ is the wage of member i of household m at skill level g under growth scenario s, $\Delta w_{g(mi)s}$ is the result from the CGE model on the change of the according wage, and $w_{g(mi)}^0$ is the corresponding wage in the base year.

Fourthly, it is ideal to apply a similar process as above to deal with the return to capital. However, due to the differences in the design of the 2003 Vietnam SAM and the VLSS survey, change in the return to capital from the CGE model cannot be used to calculate a change in the income sources of the households in the micro model. Therefore, the second best option, applied in this paper, is using the growth rate of agriculture and non-agriculture sectors to calculate the change in the self-employment income of the households as modelled in equation 3 under the formulation $y_{mfs} = (1 + Gr_{fs}).y_{mf}^0$, where

[70] A similar process can be done for the level of self-employment. The estimation of equation 3 will be used to calculate the self-employment income of a household as a function of the number of household members who are self-employed. However, this paper has not yet done so.

y_{mfs} is the self-employment income from sector f (agriculture or non-agriculture) under growth scenario s, Gr_{fs} is the growth rate of sector f under growth scenario s, and y_{mf}^{0} is the self-employment income of household m in sector f in the base year.

Finally, adding all above sources of household income to the other income in the base year allow us to consider household income under different growth scenarios.[71] This income will be used to calculate the poverty and inequality index corresponding to different growth scenarios. For a convenient comparison, the results presented in section 4.4.3 below are the gap between these indicators under different growth scenarios and those of the base year in 2004, as mentioned in section 2.3.

[71] In fact, other income sources can be modelled in a way similar to the above sources of income. One of those modelled in the CGE model is the transfer of government to households. However, this transfer is the same between different growth scenarios; therefore, it does not affect the comparative result between growth scenarios. Other sources, such as transfers among households, are not modelled in the CGE model.

4.4- CGE simulations and the results of the CGE micro-simulation model

4.4.1- CGE simulations

This section will present the formulation of the growth scenarios, which are also the simulations of the CGE model. The model simulates the different growth scenarios for Vietnam during the period 2003-2015. The baseline growth path of the model is that all 20 sectors grow by their actual average growth rate during 2003-2008. As a result, the average annual growth rate of the GDP for the baseline scenario is 7.09%. This growth path serves as a basis for the formulation of three growth scenarios. Depending on a certain scenario, the total factor productivity of several sectors will be exogenously increased. This is driven by the low efficiency and slow technological improvement of Vietnam's economy, as discussed in section 4.2. For a comparison of the distributional consequences, the total factor productivity of the sectors in each growth scenario is raised to the extent that the average growth rate of the GDP at factor cost of three growth scenarios is the same, at 7.80%. This is based on the Vietnamese government's draft target for the period 2011-2015, stating that target GDP growth rate during this period will be about at about 7% or 8% annually. Under the equilibrium framework of the model, these belong to the supply shocks, leading to the change in the relative prices of commodities, and then to the demand and returns to production factors of the economy, therefore affecting income distribution.

The baseline scenarios and three other simulations are summarised in Table 4.6. The first scenario is referred to as manufacture-led growth, which increases the total productivity of four manufacturing sectors, mining, transportation, communication and tourism, until the growth rate of the GDP increases by 7.8% annually. This scenario is based on the priority in the development strategy that the Vietnamese government is embarking on, as presented in section 4.2, to accelerate the country's industrialisation process. The second scenario is labeled pro-poor growth. This scenario increases the productivity of those sectors identified as the most pro-poor sectors in the previous chapter. They include agricultural, food processing and some service sectors. This happens to be a development strategy recently proposed by Sheehan (2008), as mentioned in the introduction, which can be an alternative to a conventional development strategy based on industrialisation. The third scenario is called current-accelerated growth, which raises the productivity of all sectors until the GDP growth

rate increases by 7.8% annually. In other words, this scenario maintains the same sectoral growth pattern as in the past.

Table 4.6- CGE simulations

Growth scenarios /Model simulations	**Contents**
Baseline growth	All sectors grow by their actual growth rate during 2003-2008, by which the GDP grows by 7.09% annually on average during 2003-2015.
Manufacture-led growth	Increases the total productivity of four manufacturing sectors, mining, transportation, communication and tourism, during 2010-2015 until the annual average GDP growth rate increases by 7.8% during 2003-2015.
Pro-poor growth	Increases the total productivity of agriculture, food processing and labour-intensive service sectors, such as trade, construction and other services, during 2010-2015 until the annual average GDP growth rate increases by 7.8% during 2003-2015.
Accelerated current growth	Increases the total productivity of all sectors during 2010-2015 until the annual average GDP growth rate increases by 7.8% during 2003-2015.

4.4.2- Macro results from the CGE model

Table 4.7 presents the results of the simulation from the CGE model. As mentioned earlier, the baseline growth replicates the growth path of Vietnam during 2003-2008 for the period 2003-2015 with an average annual GDP growth rate of 7.09%. All three alternative growth scenarios result in the same average annual GDP growth rate of 7.8%. Several observations should be made regarding the results. Firstly, in terms of the sectoral structure of the economy, it is quite obvious that the manufacture-led growth scenario leads to results that meet the Vietnamese government's target. Higher growth of the industrial sector in the manufacture-led growth scenario compared to other scenarios makes the share of industry in the GDP in 2015 increase in parallel with the decrease in the share of agriculture, which almost meets the target identified in

Vietnam's draft socio-economic development plan for 2011-2015. Meanwhile, the agricultural share in the other two scenarios maintains more or less the same level, or even slightly increases in the pro-poor growth scenario.

Table 4.7- Simulation results of different growth scenarios during 2003-2015

	Initial value in 2003	Base growth	Manufacture-led growth	Pro-poor growth	Accelerated current growth
Annual growth rate, %					
GDP	522	7.09	7.80	7.80	7.80
Agriculture	128	4.31	4.28	5.12	4.83
Industry	226	8.01	8.84	8.56	8.63
Service	169	7.62	8.53	8.50	8.55
Share of GDP	**in 2003**		**in 2015**		
GDP	100	100	100	100	100
Agriculture	24.51	17.88	16.46	18.11	17.53
Industry	43.17	47.81	48.48	46.96	47.33
Service	32.32	34.30	35.06	34.93	35.14
Real wage, annual growth rate, %					
Skilled labour		8.36	8.63	8.91	8.88
Semi-skilled labour		8.55	8.82	9.09	9.07
Unskilled labour		8.51	8.78	9.05	9.03
Labour demand, annual growth rate, %					
Skilled labour		4.13	4.24	4.35	4.34
Semi-skilled labour		4.24	4.34	4.46	4.44
Unskilled labour		2.22	2.27	2.28	2.35

Source: Vietnam CGE model.

Secondly, pro-poor growth results in the highest growth rate of real wages at all skill levels. This is probably because the higher growth of the sectors which are relatively more labour-intensive in the pro-poor growth scenario make the demand for labour higher in the pro-poor growth scenario than in the other scenarios. As specified in the CGE, the supply of skilled labour is relatively elastic; thus this leads to a higher real wage. Although the increased demand for unskilled and semi-skilled labour within the

period does not lead to an increase in the real wage of these types of labour due to the fixed-wage assumption, wages increase across the period in response to the increase in the real wage of skilled labour under the assumption of wage convergence. It is significant that all three scenarios benefit employed semi-skilled labourers slightly more than skilled and unskilled labourers, but the difference is quite trivial.

Thirdly, as expected, pro-poor growth creates the highest number of skilled and semi-skilled jobs of the three, but demand for skilled and semi-skilled labour clearly doubles that for unskilled labour. Meanwhile, demand for unskilled labour increases most in the accelerated current growth scenario.

4.4.3- Results from the CGE micro-simulation model

The results will be discussed around two objectives of the paper, as mentioned in the introduction. They are presented in three tables, where Table 4.8 focuses on the indicators at national level, which can be compared with the other findings in the literature. The other two tables will present the indicators in different groups which mainly address the concerns of Vietnam. Table 4.9 focuses on the results of spatial and ethnic poverty of different growth patterns, and Table 4.10 presents the results relating to inequality. In all tables, indicators are presented in an annual percentage change of indicators of four growth scenarios compared to the corresponding indicators of the base year, 2004.

The pro-poor sectoral growth pattern in the medium and long term

Table 4.8 confirms some findings from the current literature, such as Thurlow and Wobst (2006), Loayza and Raddatz (2006), War (2002) and my previous paper. First, the study shows that the pattern of growth hypothesis holds in a Vietnamese context; not all growth is equally good for the poor. This is not only true for countries which are less successful in poverty reduction, like Zambia, but also true for a country like Vietnam. In other words, this indicates that the sectoral growth pattern does matter for the poor in both short and long term. As shown in the table, all three scenarios have the same annual GDP growth rate of 7.8% but the consequence in poverty reduction is quite different. Manufacture-led growth reduces the headcount poverty rate by 8.51% annually, while pro-poor growth reduces it by 9.72% and accelerated growth by 9.12%.

Table 4.8- Annual percentage changes in income distribution at a national level during 2003-2015

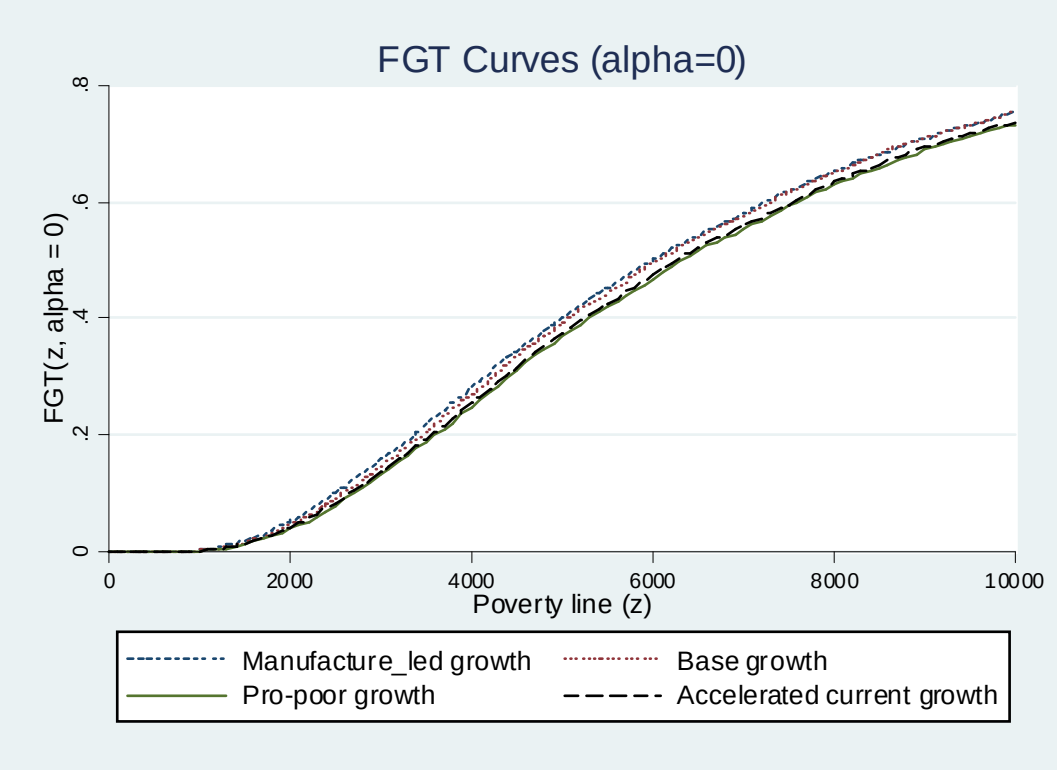
	Base growth	Manufacture-led growth	Pro-poor growth	Accelerated current growth
Poverty index				
Headcount (P0)	-8.55	-8.51	-9.72	-9.12
Poverty gap (P1)	-10.60	-10.41	-12.31	-11.62
Poverty distributional sensitivity (P2)	-11.16	-10.89	-13.10	-12.29
Inequality index				
Gini	0.37	0.49	0.30	0.39
P90/p10	1.10	1.44	1.12	1.27

Source: Vietnam CGE micro-simulation model.

Second, similar to the findings in the previous chapter for the short term, agriculture, the food processing industry and labour intensive service sector are indeed the most pro-poor in the medium and long term; therefore, pro-poor growth reduces the poverty rate most out of the three scenarios. Three main factors can explain the difference in the poverty impact of the different scenarios. Firstly, a scenario that increases wages and demand for labour, especially semi-skilled and unskilled labour, tends to benefit the poor more, since the earnings of the poor mainly come from labour. In this regard, the manufacture-led growth increases both wage and labour demand the least among the three scenarios. Pro-poor growth raises wages and demand for labour to the highest level, except demand for unskilled labour, which is slightly less than from current accelerated growth. Secondly, the scenario with a higher growth rate in the agricultural sector tends to be more pro-poor because it raises the income of self-employed workers in the farming sector, which constitutes the majority of the total income of the poor, as presented in Table 4.2. In this regard, pro-poor growth tends to benefit the poor more. Thirdly, the higher the increase in the price of food, the less pro-poor the growth scenario will be, because food expenditure accounts for a much higher share in the total expenditure of the poor compared to that of the non-poor, as in Appendix 4.2.2. As shown in Appendix 4.1.4, manufacture-led growth leaves the poor the worst off because it features the highest increase in the price of food among the three scenarios. The accelerated current growth scenario increases the price of food items the least.

To see if the above conclusion about the most pro-poorness feature of the pro-poor growth scenario depends on the poverty line or not, we apply the second order stochastic dominance analysis to compare the poverty rates in 2015 resulting from the four growth pattern scenarios above, along the scale of the poverty line. This is done with DASP (Distributive Analysis Stata Package) software, documented in Abdelkrim and Duclos (2009). The results of dominance analysis show that the poverty reduction of pro-poor growth dominates that of manufacture-led growth and accelerated-current growth at all poverty lines, and dominates that of the base growth after the VND 749,000 poverty line. Because the VND 749,000 poverty line is much lower than the poverty line in 2004 applied in this study, VND 2.7 million, in general the poverty reduction achievements of pro-poor growth are superior to those of the other growth scenarios. This is visually shown in Figure 4.3 below, where the poverty curve of pro-poor growth always lies below the poverty curves of the other growth patterns at almost all points on the poverty line scale.

Figure 4-3- Poverty headcount curves of four growth pattern scenarios



Source: Results of Vietnam CGE micro-simulation model.

Third, as mentioned in the introduction, one of the findings of the previous chapter is that, when price was fixed (implied short term), there could be a trade-off between

growth and poverty in Vietnam. This chapter continues to show that there is a possibility that the trade-off may continue to hold when price is flexible. It is illustrated by the fact that manufacture-led growth results in less poverty reduction, albeit a higher GDP growth rate, 7.8% annually, than that of base growth, which has a lower average annual GDP growth rate, 7.09%. This also means that under manufacture-led growth, Vietnam may be less successful in poverty reduction than in the past, unless there are significant policies that are favourable to the poor.[72]

In addition to the above similar findings to the current literature, some results are different. It is shown in Table 4.8 that scenarios that are more pro-poor are also more equitable, and vice versa. This is similar to other findings in literature on Vietnam that show that poverty reduction in Vietnam is associated with inequality reduction (Cuong et al., 2010; Hoi, 2010). However, this is different from the case of Zambia, as studied by Thurlow and Wobst (2006), where the most pro-poor scenario is the least equitable, while for the other scenarios inequality is relatively unchanged. This may be explained by the difference in the initial income distribution of the two countries. In Vietnam, as mentioned in section 1, poverty is a mainly rural phenomenon, and inequality in rural areas and between rural and urban areas explained most the level of national inequality. As a result, growth scenarios that most benefit poor people in rural areas will improve poverty indicators as well as inequality. This is indeed the case of Vietnam, as presented later in Table 4.9. In Zambia, the situation is quite different. Poverty was high in both urban and rural areas, and inequality was mainly manifested by the inequality between rural and urban areas. As a result, one of Thurlow and Wobst's growth scenarios, namely copper-led growth, reduced poverty in urban areas most, therefore yielding the highest poverty reduction but without helping to reduce rural poverty. As a result, this growth scenario is the most pro-poor but is not pro-equality.

Ravallion (2004) raises the point that the pro-poorness of a growth pattern depends on the initial inequality and the change in inequality created by the growth pattern. If the above discussion about Vietnam and Zambia is put in this theoretical framework, it suggests that initial poverty might be one of the factors that should be taken into account when explaining the relationship between the pro-poorness of a growth pattern and the change in inequality. As explained above, the high initial poverty rates in both urban and rural areas make the growth pattern that reduces poverty in urban areas the

[72] Such as the policy on education, which changes the educational profile of the poor in a way that allows them to reap the benefits of growth.

most pro-poor, but the inequality in this growth pattern is exacerbated due to the increase in the inequality between urban and rural areas. On the contrary, the poor are mainly located in rural areas of Vietnam, so the growth pattern that most reduces poverty in rural areas is also the one that most reduces inequality, because the gap between rural and urban areas is also reduced.

The above finding regarding the most pro-poor growth pattern suggests that exploring the possibility of the alternative development strategy proposed by Sheehan (2008) (partly represented by the pro-poor growth scenario) rather than sticking with the conventional industrialisation strategy (represented by the manufacture-led growth scenario) may result in more equitable and sustainable growth.

The results in Table 4.8 also provide some insights for future poverty and inequality reduction for Vietnam. First of all, it is clear that in any scenario poverty will continue to be reduced, and inequality will increase if Vietnam can maintain its past growth performance. In the worst scenario, the base growth of 7.09% annually, the poverty rate will be reduced by 8.55% per year. Second, the current prioritised strategy of the Vietnamese government, manufacture-led growth, will tend to deviate from the past successes in poverty reduction if other things hold constant. This scenario not only results in the lowest poverty reduction of the three alternatives but is also lower than that of the base-growth scenario. At the same time, the level of inequality is increased to the highest level among the three scenarios. If there is a negative relationship between poverty reduction and inequality level given the same growth rate, poverty reduction will be even more difficult in the long term. The policy implication here is that, if the government follows the manufacture-led growth and expects the same success in poverty reduction as in the past, more policies in favor of the poor are definitely needed, such as the education policy. These can help the poor improve their skills and education levels so that they can take part in the growth path. Pro-poor growth is an alternative that may result in more poverty reduction and a more equitable society.

Growth pattern and spatial and ethnic poverty: challenges beyond the MDG

Table 4.9 demonstrates that the economic growth pattern is part of the reason for the spatial and ethnic features of poverty in Vietnam. This table presents only headcount poverty because the other poverty index has the same properties. As discussed in section 4.2, the poverty rate in rural areas and ethnic minority groups is significantly higher than in urban areas and the ethnic majority group. However, as Table 4.9 shows, in all growth scenarios poverty reduction in rural areas and for ethnic minorities is much lower, especially for ethnic minorities, where the poverty reduction rate is about a third of that of ethnic majority groups in all scenarios. This is the same for regional poverty. North East, North West and Central Highland are three of the four regions with the highest poverty rates in Vietnam, but the poverty reduction created by growth in all scenarios in these regions is the smallest.

Table 4.9- Annual percentage changes in income distribution by locations and ethnic groups

	Base growth	**Manufacture -led growth**	**Pro-poor growth**	**Accelerated current growth**
By locations				
Rural	-8.44	-8.40	-9.69	-9.04
Urban	-10.20	-10.20	-10.20	-10.20
By eight regions				
Red River Delta	-8.92	-8.92	-8.92	-8.92
North East	-5.16	-5.16	-7.69	-6.28
North West	-2.85	-2.53	-4.94	-4.09
North Central Coast	-9.87	-9.87	-10.51	-9.87
South Central Coast	-14.10	-14.10	-16.74	-15.52
Central Highlands	-4.91	-4.82	-4.91	-4.91
North East South	-10.94	-10.94	-10.94	-10.94
Mekong River Delta	-13.12	-13.12	-14.05	-14.05
By ethnic groups				
Majority	-11.86	-11.85	-13.12	-12.31
Minority	-4.02	-3.94	-5.07	-4.74

Source: Vietnam CGE micro-simulation model.

The above demonstrates that Vietnam's growth pattern has indeed created spatial, ethnic and regional differences in poverty. This is the challenge beyond Vietnam's MDG, because the national poverty target as specified in the MDG has been reached, but poverty in rural areas and among ethnic minorities is still significantly pervasive. The above result also shows that the challenge may not be met if there is no strong government action, such as a redistribution policy to change the socio-economic conditions of some regions and ethnic minorities to alter the size of the income distribution created by growth. In fact, the Vietnamese government has adopted this policy for a long time (Huong and Vinh, 2004), but achievements so far seem modest. Stronger and more effective action may be needed.

Growth pattern and inequality

Table 4.8 shows that inequality increases in all four scenarios. Some papers, such as Binh et al. (2006), and Fesselmeyer and Kien (2010), explain that the increase in inequality between rural and urban areas in Vietnam, which contributes most to the national inequality, is attributed to the difference in endowments and returns to the endowments of these locations. This chapter suggests that sectoral growth pattern also plays a significant role in the inequality picture of Vietnam. In fact, Table 4.10 shows that inequality not only increases between rural and urban areas in all growth patterns, but the income gaps between ethnic minority and ethnic majority groups and between regions are also on the rise in all scenarios. The inequality is only improved in urban areas and some wealthier regions, such as North East South and Mekong River Delta. This is also the main reason for the worsening national inequality in all scenarios.

Table 4.10- Annual changes in income distribution by eight regions, %

	Base growth	Manufacture -led growth	Pro-poor growth	Accelerated current growth
Gini index				
Rural	0.29	0.39	0.25	0.32
Urban	-0.21	-0.18	-0.28	-0.24
Gini decomposition*				
Rural	0.23	0.34	0.15	0.24
Urban	0.84	0.95	0.77	0.86
Between	1.08	1.26	0.98	1.11
Gini index				
Red River Delta	0.25	0.35	0.15	0.24
North East	1.12	1.32	1.02	1.16
North West	0.70	0.86	0.56	0.69
North Central Coast	0.34	0.45	0.22	0.32
South Central Coast	0.02	0.13	-0.05	0.03
Central Highlands	0.65	0.79	0.61	0.70
North East South	-0.61	-0.54	-0.68	-0.62
Mekong River Delta	-0.75	-0.66	-0.75	-0.70
Gini decomposition				
Within regions	-0.53	-0.46	-0.46	-0.46
Between regions	1.96	1.83	1.89	1.91
Gini index				
Majority	0.23	0.34	0.15	0.24
Minority	0.84	0.95	0.77	0.86
Gini decomposition				
Majority	-0.05	-0.05	-0.06	-0.05
Minority	0.00	0.00	0.00	0.00
Between	1.03	1.09	0.97	1.03

*Note: *:* Gini decomposition shows the contribution of each component to national Gini; the overlap component is not reported here.

Source: Vietnam CGE micro-simulation model.

4.4.4- Sensitivity analysis

Unlike the econometric method, which uses either cross-sectional or time series data, the CGE model in this study is calibrated, not estimated; therefore, one cannot test the results to see if they are statistically significant. However, the main data in this model is from SAM and some other data, such as the substitution elasticities in the foreign trade function (Armington and CET substitution) and production function (factor substitution), and is not econometrically estimated but taken directly from other sources. Therefore, in order to see the robustness of the results, it is common for studies using the CGE model to conduct some sensitivity tests to see if the change in some of these elasticities can alter the results of the model.

In this section, three sensitivity tests were conducted. The first two tests deal with the elasticity between exports, import and domestically produced goods in the trade function. This data is taken from Arndt et al. (2002), and is calculated from data from Mozambique, because there is no such data for Vietnam. Some other papers using the CGE model for Vietnam also do the same, such as Jensen and Tarp (2005) or Toan (2005). However, a paper by Thurlow et al. (2010) applies the elasticity of GTAP 6 Data base. The elasticity for trade function in this data base is generally higher than the elasticity applied in this chapter; meanwhile, the factor production substitution elasticity is lower, especially for agricultural products. Therefore, the first and second sensitivity test is to increase the elasticity of all goods by 10%. The third test decreases the elasticity of the substitution between factors in the production function by 10%. For each test, all other data and model specifications remain the same. Results of these tests for all four scenarios above are presented in Table 4.11, which shows the annual percentage change in poverty reduction and inequality of each scenario. As the results show, the changes in the elasticities mentioned above do change the specific poverty and inequality impact of each scenario to a certain extent, compared to that of the original model. However, regardless of the change, the pro-poor growth scenario generally still yields the highest reduction in poverty and lowest increase in inequality compared to the other scenarios. Therefore, the result of the model is quite robust, at least in terms of which growth pattern is the most pro-poor and the most equitable.

Table 4.11- Results of sensitivity tests, annual percentage change

Sensitivity Tests	Indicators	Base growth	Manufacture-led growth	Pro-poor growth	Accelerated current growth
Original Model	**Poverty**				
	P0	-8.6	-8.5	-9.7	-9.1
	P1	-10.6	-10.4	-12.3	-11.6
	P2	-11.2	-10.9	-13.1	-12.3
Test 1	P0	-7.9	-6.7	-8.6	-8.1
	P1	-10.5	-9.4	-11.7	-11.0
	P2	-11.6	-10.2	-12.8	-12.0
Test 2	P0	-8.7	-7.8	-9.3	-9.0
	P1	-11.1	-10.1	-12.2	-11.7
	P2	-12.6	-11.3	-13.8	-13.1
Test 3	P0	-8.7	-7.8	-9.3	-9.0
	P1	-11.2	-10.0	-12.2	-11.7
	P2	-12.6	-11.1	-13.7	-13.1
Original model	**Inequality**				
	Gini	0.37	0.49	0.30	0.39
Test 1	Gini	0.331	0.474	0.284	0.348
Test 2	Gini	0.239	0.382	0.192	0.257
Test 3	Gini	0.238	0.387	0.196	0.253

Note: The rows of the original model replicate the results presented in Table 4.6 above. P0 is poverty headcount ratio; P1 is poverty gap; P2 is Poverty distributional sensitivity. Test 1 increased the elasticity between exports and domestically produced goods and services in the CET function by 10%; Test 2 increased the elasticity between imports and domestically produced goods and services in the Armington function by 10%; Test 3 decreased the elasticity of the substitution between factors in the production function by 10%.
Source: Vietnam CGE micro-simulation model.

4.5- Conclusions

This chapter continues to examine the issue of sectoral growth and poverty introduced in Chapter 3. By applying the CGE micro-simulation model, the chapter relaxes the fixed-price assumption in Chapter 3, and the issue can be analysed in a dynamic context, where behaviours and interactions of the agents in the economy are incorporated accordingly. The most recently developed method, which links the CGE model with the micro-simulation model, allows for better treatment of the issue of

household heterogeneity in modelling income distribution, and takes the issue of inequality into account. The chapter, therefore, discusses the issue in a medium- and long-term context, and discusses the future of income distribution for Vietnam.

The chapter shows that in the medium and long term, a faster growth of the sectors, identified as the most pro-poor in Chapter 3 is also the most pro-poor growth pattern, regardless of where the poverty line is set. The finding also means the growth pattern hypothesis mentioned in the introduction holds in a Vietnamese context. This result is robust to the change in some key substitution elasticities, as the sensitivity tests show.

The current literature identifies that spatial and ethnic poverty is very typical in Vietnam, as well as some other countries, such as Ghana, India and China. This also suggests post-MDG challenges for Vietnam; the national poverty target has been reached, but poverty is still widespread in rural areas and among ethnic minority communities and some regions. This chapter has shown that growth patterns are responsible for the current geographical and ethnic differences in poverty in Vietnam, and the situation will continue to worsen if no strong government action is taken. The current growth pattern decreases poverty in urban and less poor regions more than in rural areas and poorer regions. This holds for all growth pattern scenarios. In other words, even if Vietnam pursues the most pro-poor growth pattern, spatial and ethnic differences in poverty will still remain. However, the magnitude of the difference could be reduced if the most pro-poor growth pattern is pursued, because this growth pattern will reduce poverty in rural and poorer areas by a larger extent than the others. The pro-poor growth pattern has a higher poverty impact on ethnic majority and minority people relative to other growth scenarios.

The current growth pattern indeed helps Vietnam reduce poverty; this will continue in the future if Vietnam can maintain its growth performance. However, it also worsens the inequality in Vietnam through increasing the gap between rural and urban regions. This holds even for the most pro-poor growth pattern. This provides empirical evidence that growth patterns matter not only for poverty but also for inequality. In Vietnam, all growth pattern scenarios lead to an increase in inequality, although the most pro-poor growth pattern creates the most equitable growth. If inequality is indeed not good for the poor, as pointed out by Ravallion (2005), something needs to be done in order to sustain the poverty reduction achievements. This study reveals the most pro-poor

growth pattern is the most equitable growth, which also means the most sustainable poverty reduction.

It is noted that this study investigates the poverty and inequality consequences of different sectoral growth strategies; therefore, it can provide policy implications from this perspective only. In reality, in order to select growth strategies, besides the policy implication provided here, policy makers also need to consider the costs and returns on investments to achieve different growth strategies. This very much depends on the analysis of the actual policy formulation and implementation, and also the investment-to-growth linkage in the economy.

Appendix 4.1- Framework of Vietnam CGE model

4.1.1- List of sets, parameters and variables

Sets

Symbol	Explanation	Symbol	Explanation
$a \in A$	Activities	$c \in CMR(\subset C)$	Regionally imported commodities
$a \in ALEO(\subset A)$	Activities with a Leontief function at the top of the technology nest Commodities	$c \in CMNR(\subset C)$	Non-regionally imported commodities
$c \in C$	Commodities	$c \in CT(\subset C)$	Transaction service commodities
$c \in CD(\subset C)$	Commodities with domestic sales of domestic output	$c \in CX(\subset C)$	Commodities with domestic production
$c \in CDN(\subset C)$	Commodities not in CD	$f \in F$	Factors
$c \in CE(\subset C)$	Exported commodities	$i \in INS$	Institutions (domestic and rest of world)
$c \in CEN(\subset C)$	Commodities not in CE	$i \in INSD(\subset INS)$	Domestic institutions
$c \in CM(\subset C)$	Aggregate imported commodities	$i \in INSDNG(\subset INSD$	Domestic non-government institutions
$c \in CMN(\subset C)$	Commodities not in CM	$h \in H(\subset INSDNG)$	Households
$r \in R$	Imported regions*		

Note: * In Vietnam model, there is only one region for the imported commodities, rest of the world (row)

Parameters

Symbol	Explanation	Symbol	Explanation
$cwts_c$	Weight of commodity c in the CPI	pwm_c	Import price (foreign currency)
$dwts_c$	Weight of commodity c in the producer price index	$pwmr_{cr}$	Import price by region (foreign currency)
ica_{ca}	Quantity of c as intermediate input per unit of activity a	$qdst_c$	Quantity of stock change
$icd_{cc'}$	Quantity of commodity c as trade input per unit of c' produced and sold domestically	$\overline{qg_c}$	Base-year quantity of government demand
$ice_{cc'}$	Quantity of commodity c as trade input per exported unit of c'	$\overline{qinv_c}$	Base-year quantity of private investment demand
$icer_{cc'r}$	Quantity of commodity c as trade input per exported unit of c' from region r	$shif_{if}$	Share for domestic institution i in income of factor f
$icm_{cc'}$	Quantity of commodity c as trade input per imported unit of c'	$shii_{ii'}$	Share of net income of i' to i (i' ϵ INSDNG'; i ϵ INSDNG)
$icmr_{cc'r}$	Quantity of commodity c as trade input per imported unit of c' from region r	at_a	Tax rate for activity a
$inta_a$	Quantity of aggregate intermediate input per activity unit	$\overline{tins_i}$	Exogenous direct tax rate for domestic institution i
iva_a	Quantity of value added input per activity unit	$tins01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$\overline{mps_i}$	Base savings rate for domestic institution I	tm_c	Import tariff rate
$mps01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates	tmr_{cr}	Regional import tariff
pwe_c	Export price (foreign currency)	tq_c	Rate of sales tax
$pwer_{cr}$	Export price by region (foreign currency)	$trnsfr_{if}$	Transfer from factor f to institution i
α_a^a	Efficiency parameter in the CES activity function	δ_c^t	CET function share parameter

Parameters (continued)

Symbol	Explanation	Symbol	Explanation
α_a^{va}	Efficiency parameter in the CES value-added function	δ_{fa}^{va}	CES value-added function share parameter for factor f in activity a
α_c^{ac}	Shift parameter for domestic commodity aggregation function	γ_{ch}^{m}	Subsistence consumption of marketed commodity c for household h
α_c^{q}	Armington function shift parameter	θ_{ac}	Yield of output c per unit of activity a
α_c^{t}	CET function shift parameter	ρ_a^{a}	CES production function exponent
α_c^{m}	Shift parameter in the CES regional import function	ρ_a^{va}	CES value-added function exponent
α_c^{e}	Shift parameter in the CES regional export function	ρ_c^{ac}	Domestic commodity aggregation function exponent
β^{a}	Capital sectoral mobility factor	ρ_c^{q}	Armington function exponent
β_{ch}^{m}	Marginal share of consumption spending on marketed commodity c for household h	ρ_c^{t}	CET function exponent
δ_a^{a}	CES activity function share parameter	ρ_c^{m}	Regional imports aggregation function exponent
δ_{ac}^{ac}	Share parameter for domestic commodity aggregation function	ρ_c^{e}	Regional exports aggregation function exponent
δ_c^{q}	Armington function share parameter	η_{fat}^{a}	Sector share of new capital
υ_f	Capital depreciation rate		

Variables

Symbol	Explanation	Symbol	Explanation
Exogenous Variables			
$\overline{CPI}$	Consumer price index	$\overline{MPSADJ}$	Savings rate scaling factor (= 0 for base)
$\overline{DTINS}$	Change in domestic institution tax share (= 0 for base; exogenous variable)	$\overline{QFS_f}$	Quantity supplied of factor
$\overline{FSAV}$	Foreign savings (FCU)	$\overline{TINSADJ}$	Direct tax scaling factor (= 0 for base; exogenous variable)
$\overline{GADJ}$	Government consumption adjustment factor	$\overline{WFDIST_{fa}}$	Wage distortion factor for factor f in activity a
$\overline{IADJ}$	Investment adjustment factor		

Variables (continued)

Symbol	Explanation	Symbol	Explanation
Endogenous Variables			
AWF_{ft}^{a}	Average capital rental rate in time period t	QF_{fa}	Quantity demanded of factor f from activity a
DMPS	Change in domestic institution savings rates (= 0 for base; exogenous variable)	QG_{c}	Government consumption demand for commodity
DPI	Producer price index for domestically marketed output	QH_{ch}	Quantity consumed of commodity c by household h
EG	Government expenditures	QHA_{ach}	Quantity of household home consumption of commodity c from activity a for household h
EH_{h}	Consumption spending for household	$QINTA_{a}$	Quantity of aggregate intermediate input
EXR	Exchange rate (LCU per unit of FCU)	$QINT_{ca}$	Quantity of commodity c as intermediate input to activity a
GOVSHR	Government consumption share in nominal absorption	$QINV_{c}$	Quantity of investment demand for commodity
GSAV	Government savings	QM_{c}	Quantity of imports of commodity c
INVSHR	Investment share in nominal absorption	QMR_{cr}	Quantity of imports of commodity c by region r
MPS_{i}	Marginal propensity to save for domestic non-government institution (exogenous variable)	QER_{cr}	Quantity of exports of commodity c to region r
PA_{a}	Activity price (unit gross revenue)	QQ_{c}	Quantity of goods supplied to domestic market (composite supply)
PDD_{c}	Demand price for commodity produced and sold domestically	QT_{c}	Quantity of commodity demanded as trade input
PDS_{c}	Supply price for commodity produced and sold domestically	QVA_{a}	Quantity of (aggregate) value-added
PE_{c}	Export price (domestic currency)	QX_{c}	Aggregated quantity of domestic output of commodity
PER_{cr}	Export price by region (domestic currency)	$QXAC_{ac}$	Quantity of output of commodity c from activity a
$PINTA_{a}$	Aggregate intermediate input price for activity a	RWF_{f}	Real average factor price
PK_{ft}	Unit price of capital in time period t	TABS	Total nominal absorption
PM_{c}	Import price (domestic currency)	$TINS_{i}$	Direct tax rate for institution i ($i \in INSDNG$)

Variables (continued)

Symbol	Explanation	Symbol	Explanation
Endogenous Variables			
PMR_{cr}	Import price by region (domestic currency)	$TRII_{ii'}$	Transfers from institution i' to I (both in the set INSDNG)
PQ_c	Composite commodity price	WF_f	Average price of factor
PVA_a	Value-added price (factor income per unit of activity)	YF_f	Income of factor f
PX_c	Aggregate producer price for commodity	YG	Government revenue
$PXAC_{ac}$	Producer price of commodity c for activity a	YI_i	Income of domestic non-government institution
QA_a	Quantity (level) of activity	YIF_{if}	Income to domestic institution I from factor f
QD_c	Quantity sold domestically of domestic output	ΔK^a_{fat}	Quantity of new capital by activity a for time period t
QE_c	Quantity of exports		

Source: Thurlow (2004)

4.1.2- Mathematical equations

Production and price equations

$$QINT_{ca} = ica_{ca}.QINTA_a \tag{1}$$

$$PINTA_a = \sum_{c \in C} PQ_c.ica_{ca} \tag{2}$$

$$QVA_a = \alpha_a^{va}.\left(\sum_{f \in F} \delta_{fa}^{va}.\left(\alpha_{fa}^{vaf} QF_{fa}\right)^{-\rho_a^{va}} \right)^{\frac{1}{\rho_a^{va}}} \tag{3}$$

$$W_f.\overline{WFDIST_{fa}} = PVA_a.(1-tva_a).QVA_a.\left(\sum \delta_{fa}^{vaf} \left(\alpha_{fa}^{vaf}.QF_{fa}\right)^{-\rho_a^{va}} \right)^{-1}.\delta_{fa}^{va}.\left(\alpha_{fa}^{vaf} QF_{fa}\right)^{-\rho_a^{va}-1} \tag{4}$$

$$QVA_a = iva_a.QA_a \tag{5}$$

$$QINTA_a = \text{int}\, a_a.QA_a \tag{6}$$

$$PA_a.(1-ta_a).QA_a = PVA_a.QVA_a + PINTA_a.QINTA_a \tag{7}$$

$$QXAC_{ac} = \theta_{ac}.QA_a \tag{8}$$

$$PA_a = \sum_{c \in C} PXAC_{ac}.\theta_{ac} \tag{9}$$

$$QX_c = \alpha_c^{ac}.\left(\sum \delta_{ac}^{ac}.QXAC_{ac}^{-\rho_c^{ac}}\right)^{-\frac{1}{\rho_c^{ac}-1}} \quad (10)$$

$$PXAC_{ac} = PX_c.QX_c\left(\sum \delta_{ac}^{ac}.QXAC_{ac}^{-\rho_c^{ac}}\right)^{-1}.\delta_{ac}^{ac}.QXAC_{ac}^{-\rho_c^{ac}-1} \quad (11)$$

$$PER_{cr} = pwer_{cr}.EXR - \sum_{c'\in CT} PQ_c.icer_{c'cr} \quad (12)$$

$$QE_c = \alpha_c^e.\left(\sum_{r\in R}\delta_{cr}^e.\left(QER_{cr}\right)^{-\rho_c^e}\right)^{-\frac{1}{\rho_c^e}} \quad (13)$$

$$\frac{PER_{cr}}{PE_c} = QER_{cr}.\left(\sum_{r'\in R}\delta_{cr'}^e.\left(QER_{cr'}\right)^{-\rho_c^e}\right)^{-1}.\delta_{cr}^e.\left(QER_{cr}\right)^{-\rho_c^e-1} \quad (14)$$

$$PE_c = pwe_c.EXR - \sum_{c'\in CT} PQ_c.ice_{c'c} \quad (15)$$

$$QX_c = \alpha_c^t.\left(\delta_c^t.QE_c^{\rho_c^t} + \left(1-\delta_c^t\right).QD_c^{\rho_c^t}\right)^{\frac{1}{\rho_c^t}} \quad (16)$$

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PDS_c}.\frac{1-\delta_c^t}{\delta_c^t}\right)^{\frac{1}{\rho_c^t-1}} \quad (17)$$

$$QX_c = QD_c + QE_c \quad (18)$$

$$PX_c, QX_c = PDS_c.QD_c + PE_c.QE_c \quad (19)$$

$$PDD_c = PDS_c + \sum_{c'\in CT} PQ_{c'}.icd_{c'c} \quad (20)$$

$$PMR_{cr} = pwmr_{cr}.(1+tmr_{cr}).EXR - \sum_{c'\in CT} PQ_c.icmr_{c'cr} \quad (21)$$

$$QM_c = \alpha_c^m.\left(\sum_{r\in R}\delta_{cr}^m.\left(QMR_{cr}\right)^{-\rho_c^m}\right)^{-\frac{1}{\rho_c^m}} \quad (22)$$

$$\frac{PMR_{cr}}{PM_c} = QMR_{cr}.\left(\sum_{r'\in R}\delta_{cr'}^m.\left(QMR_{cr'}\right)^{-\rho_c^m}\right)^{-1}.\delta_{cr}^m.\left(QMR_{cr}\right)^{-\rho_c^m-1} \quad (23)$$

$$PM_c = pwm_c.\left(1+tm_c\right).EXR + \sum_{c'\in CT} PQ_{c'}.icm_{c'c} \quad (24)$$

$$QQ_c = \alpha_c^q.\left(\delta_c^q.QM_c^{-\rho_c^q} + \left(1-\delta_c^q\right).QD_c^{-\rho_c^q}\right)^{-\frac{1}{\rho_c^q}} \quad (25)$$

$$\frac{QM_c}{QD_c} = \left(\frac{PDD_c}{PM_c}.\frac{\delta_c^q}{1-\delta_c^q}\right)^{\frac{1}{1+\rho_c^q}} \quad (26)$$

$$QQ_c = QD_c + QM_c \quad (27)$$

$$PQ_c.\left(1-tq_c\right).QQ_c = PDD_c.QD_c + PM_cQM_c \quad (28)$$

$$QT_c = \sum_{c' \in C} \left(icm_{cc'}.QM_{c'} + icmr_{cc'}.QMR_{c'} + ice_{cc'}.QE_{c'} + icer_{cc'}.QER_{c'} + icd_{cc'}.QD_{c'} \right) \quad (29)$$

$$\overline{CPI} = \sum_{c \in C} PQ_c.cwts_c \quad (30)$$

$$DPI = \sum_{c \in C} PDS_c.dwts_c \quad (31)$$

Institutional incomes and domestic demand equations

$$YF_f = \sum_{a \in A} WF_f \overline{WFDIST}_{fa}.QF_{fa} \quad (32)$$

$$YIF_{if} = shif_{if}.\left(YF_f - trnsfr_{rowf} EXR \right) \quad (33)$$

$$YI_i = \sum_{f \in F} YIF_{if} + \sum_{i' \in INSDNG} TRII_{ii'} + trnsfr_{igov}.\overline{CPI} + trnsfr_{irow}.EXR \quad (34)$$

$$TRII_{ii'} = shii_{ii'}.(1 - MPS_{i'}).(1 - \overline{tins_{i'}}).YI_{i'} \quad (35)$$

$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{ih} \right).(1 - MPS_h).\left(1 - \overline{tins}_h\right).YI_h \quad (36)$$

$$PQ_c.QH_{ch} = PQ_c.\gamma^m_{ch} + \beta^m_{ch} \left(EH_h \sum_{c' \in C} PQ_{c'}.\gamma^m_{c'h} \right) \quad (37)$$

$$QINV_c = IADJ.\overline{qinv_c} \quad (38)$$

$$QG_c = \overline{GADJ}.\overline{qg}_c \quad (39)$$

$$EG = \sum_{c \in C} PQ_c.QG_c + \sum_{i \in INSDNG} trnsfr_{igov}.\overline{CPI} \quad (40)$$

$$YG = \sum_{i \in INSDNG} tins_i.YI_i + \sum_{a \in A} ta_a PA_a.QA_a + \sum_{c \in CMNR} tm_c.pwm_c.QM_c.EXR + \quad (41)$$
$$\sum_{r \in R} \sum_{c \in CMR} tmr_{cr}.pwmr_{cr}.QMR_{cr} EXR + \sum_{c \in C} tq_c.PQ_c.QQ_c + \sum_{f \in F} YF_{govf} + trnsfr_{govrow}.EXR$$

System constraints and macro-economic closures

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + QG_c + QINV_c qdst_c + QT_c \quad (42)$$

$$\sum_{a \in A} QF_{fa} = QFS_f \quad (43)$$

$$\frac{QFS_f}{QFS_f^0} = \left(\frac{RWF_f}{RWF_f^0} \right)^{etals_f} \quad (44)$$

$$RWF_f = \left(\frac{YF_f}{QFS_f} \Big/ \frac{CPI}{CPI^0} \right) \quad (45)$$

$$YG = EG + GSAV \tag{46}$$

$$\sum_{c \in CMNR} pwm_c.QM_c + \sum_{r \in R} \sum_{c \in CMR} pwmr_{cr}.QMR_{cr}.\sum_{f \in F} trnsfr_{rowf} \tag{47}$$

$$= \sum_{c \in CENR} pwe_c.QM_c + \sum_{r \in R} \sum_{c \in CER} pwer_{cr}.QER_{cr} + \sum_{i \in INSD} trnsfr_{irow} + FSAV$$

$$\sum_{i \in INSDNG} MPS_i.\left(1 - \overline{tins}_i\right).YI_i + GSAV + EXR.FSAV = \sum_{c \in C} PQ_c.QINV_c + \sum_{c \in C} PQ_c.qdst_c \tag{48}$$

$$MPS_i = \overline{mps}_i.\left(1 + MPSADJ\right) \tag{49}$$

Capital accumulation and allocation equations

$$AFW_{ft}^{a} = \sum_{a} \left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}}.WF_{ft}.WFDIST_{fat} \right) \tag{50}$$

$$\eta_{fat}^{a} = \frac{QF_{fat}}{\sum_{a'} QF_{fa't}}.\left(\beta^{a}.\left(\frac{WF_{ft}.WFDIST_{fat}}{AWF_{ft}^{a}} - 1 \right) + 1 \right) \tag{51}$$

$$\Delta K_{fat}^{a} = \eta_{fat}^{a}.\left(\frac{\sum_{c} PQ_{ct}.QINV_{ct}}{PK_{ft}} \right) \tag{52}$$

$$PK_{ft} = \sum_{c} PQ_{ct}.\frac{QINV_{ct}}{\sum_{c'} QINV_{c't}} \tag{53}$$

$$QF_{fat+1} = QF_{fat}.\left(1 + \frac{\Delta K_{fat}^{a}}{QF_{fat}} - \upsilon_f \right) \tag{54}$$

$$QFS_{ft+1} = QFS_{ft}.\left(1 + \frac{\sum_{a} \Delta K_{fat}}{QFS_{ft}} - \upsilon_f \right) \tag{55}$$

Source: Thurlow (2004)

4.1.3- Main input data of the model (other than 2003 SAM)

Armington, CET and production elasticity

	Substitution between export and domestic good	Substitution between import and domestic good	Factor substitution
Paddy	1.2	0.59	0.80
Other Crops	1.2	0.59	0.80
Livestock	1.2	0.59	0.80
Forestry	0.74	0.5	0.80
Fishery	0.42	0.9	0.80
Mining	0.5	0.9	0.80
Processed Food	0.56	0.87	0.80
Beverages Tobaco	0.56	0.87	0.80
Building Materials	0.56	0.87	0.80
Other Chemical Products	0.56	0.87	0.80
Fertilizer and Pesticides	0.56	0.87	0.80
Leather	0.56	0.87	0.80
Other Manufacturing	0.56	0.87	0.80
Electricity and Water	0.56	0.87	0.80
Construction	0.56	0.87	0.80
Trade	0.56	0.87	0.80
Transportation, Communication and Tourism	2.84	1.85	0.80
Financial Services	2.84	1.85	0.80
Agricultural Services	2.84	1.85	0.80
Other Services	2.84	1.85	0.80

Sources: Data on column 2 and 3 is from Arndt et al. (2002) and Jensen and Tarp (2005); data of column 4 is from from Jensen and Tarp (2007c).

Frisch parameters

Code		Frisch parameters
hhd	Average household	-1.96
h11	Rural-male-farm	-3.12
h12	Rural-male-nonfarm	-2.28
h13	Rural-male-wage	-1.73
h14	Rural-male-unemployed	-2.28
h15	Rural-female-farm	-3.12
h16	Rural female-nonfarm	-2.28
h17	Rural-female-wage	-1.73
h18	Rural-female-unemployed	-2.28
h21	Urban-male-farm	-3.23
h22	Urban-male-nonfarm	-2.25
h23	Urban-male-wage	-1.63
h24	Urban-male-unemployed	-2.25
h25	Urban-female-farm	-3.23
h26	Urban-female-nonfarm	-2.25
h27	Urban-female-wage	-1.63
h28	Urban-female-unemployed	-2.25

Note: Rural_male_farm means household in rural areas and its' head is a male and self-employed in farm sectors; the same rules applied to the other household groups.
Source: Abbott et al. (2008).

Factor supply growth rate *(annual percentage change)*

Code	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
lab11	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56
lab12	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56
lab13	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56
lab14	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.50	1.53	1.56
lab21	1.24	1.23	1.23	1.23	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20
lab22	1.24	1.23	1.23	1.23	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20
lab23	1.24	1.23	1.23	1.23	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20
lab24	1.24	1.23	1.23	1.23	1.22	1.22	1.21	1.21	1.21	1.20	1.20	1.20
lab31	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
lab32	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
lab33	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
lab34	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
land	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

Note: lab11, lab12, and so on is skilled rural male labor, skilled rural female labor, skilled urban male labor, skilled urban female labor, semi-skilled rural male labor, semi-skilled rural female labor, semi-skilled urban male labor, semi-skilled urban female labor, unskilled rural male labor, unskilled rural female labor, unskilled urban male labor, unskilled urban female labor, respectively.
Source: Abbott et al. (2008) for 2004-2005 and similar trend for the rest.

Population growth *(Annual percentage change)*

Code	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
hhd	1.4	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2
h11	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h12	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h13	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h14	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h15	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h16	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h17	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h18	4.1	2.8	2.1	2.3	3.8	2.1	2.1	2.1	2.1	2.1	2.1	2.1
h21	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h22	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h23	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h24	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h25	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h26	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h27	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9
h28	0.4	0.8	0.9	0.8	0.2	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Note: Code of households (h11, h12. so on) is the same as the code in the table on Frisch above.
Source: Asian Development Bank (2009).

Growth rates of some other exogenous variables (a*nnual percentage change)*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Government consumption spending	7.8	8.2	8.50	8.50	8.50	9.00	9.00	9.00	8.50	8.50	8.50	8.50
Government transfers to households	19.4	19.4	19.4	15.0	15.0	15.0	15.0	15.0	15.0	10.0	10.0	10.0
Activity tax	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps
Import tariffs	eps	eps	eps	-5.9	-12	eps	-5.00	eps	eps	eps	eps	-10
Export taxes	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps
Sales taxes	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps
Direct taxes	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps	eps
Household propensity to save	12.5	8.4	8.4	8.4	6.2	4.5	5.2	6.5	8.4	8.4	8.4	8.4
Enterprise propensity to save	1.8	7.5	7.5	7.5	4.5	2.5	3.5	4.5	7.5	7.5	7.5	7.5
Foreign savings	-22	-71	-63	60	8	-22	-22	-22	-22	8	8	8
Government savings	4.6	2.4	2.4	2.4	0	0.0	1.2	1.5	2.4	2.4	2.4	2.4
Exchange rate	-1.3	4.3	3.8	1	-1.3	-2.0	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
World export prices	12	13.9	7.3	7.2	24.8	7.2	7.2	7.2	7.2	7.2	7.2	7.2
World import prices	9.6	7.8	3.8	5.1	18.2	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Capital depreciation rate	10	10	10	10	10	10	10	10	10	10	10	10

Note: eps means a very small increase.
Source: Cling et al. (2008), GSO (2009), Asian Development Bank (2009), Huong (2009), Abbott et al. (2008) for 2004-2005 and similar trend for the rest.

4.1.4- CGE results

Average annual sectoral growth rate of different scenarios

	Base growth	Manufacture-led growth	Pro-poor growth	Accelerated current growth
Paddy	3.55	3.26	5.43	4.52
Other Crops	3.50	3.50	5.14	4.36
Livestock	4.50	4.50	6.14	4.50
Forestry	5.20	6.16	3.63	7.15
Fishery	8.59	8.59	9.88	9.80
Mining	0.54	1.79	1.70	0.54
Processed Food	3.73	3.42	5.72	4.76
Beverages Tobaco	7.16	7.16	8.44	7.16
Building Materials	8.41	9.57	10.09	9.93
Other Chemical Products	16.00	18.80	17.94	17.60
Fertilizer & Pesticides	0.82	-1.11	3.17	1.44
Leather	11.56	16.21	12.85	11.56
Other Manufacturing	9.37	10.56	6.73	11.66
Electricity & Water	10.75	10.75	12.04	10.75
Construction	9.68	11.04	11.45	11.70
Trade	7.30	8.79	7.88	8.54
Transportation, Communication. & Tourism	10.48	15.20	11.77	10.48
Financial Services	8.22	8.22	9.50	8.22
Agricultural Services	3.78	3.53	5.59	4.76
Other Services	7.47	7.47	8.75	8.78

Source: Results of Vietnam CGE model.

Average annual growth rate of commodity prices

Growth patterns	Base growth	Manufacture-led growth	Pro-poor growth	Accelerated current growth
Paddy	6.14	6.78	5.94	5.46
Other Crops	4.15	4.66	3.86	3.54
Livestock	6.06	7.40	7.14	3.89
Forestry	19.88	20.35	20.00	16.85
Fishery	-4.11	-4.02	-4.54	-3.95
Mining	6.63	5.43	7.88	7.21
Processed Food	2.18	2.90	1.58	0.90
Beverages Tobaco	-0.75	0.05	-0.14	-1.18
Building Materials	-0.68	-0.86	-0.51	-1.12
Other Chemical Products	-3.89	-4.81	-4.06	-3.86
Fertilizer and Pesticides	-2.44	-2.99	-2.89	-2.71
Leather	-1.69	-2.82	-1.52	-1.22
Other Manufacturing	-1.00	-1.68	-1.17	0.99
Electricity and Water	-2.51	-2.70	-1.91	-1.91
Construction	14.12	14.55	12.67	12.21
Trade	31.14	32.33	27.91	26.60
Transportation, Communication and Tourism	-2.25	-3.78	-1.79	-1.59
Financial Services	-1.97	-2.74	-1.64	-1.26
Agricultural Services	7.23	7.74	7.57	5.35
Other Services	-0.54	-0.81	-0.65	-0.17

Source: Results of Vietnam CGE model.

Appendix 4.2- Data and results of micro-simulation model

4.2.1- Definition of variables

Variables	Definition
Head-age	Age of household head
Age	Age of household member
Age2	Square of age of household member
Schooling	Years of schooling
Exp	Number of years of working experience
Exp2	Square of experience
Ethnic	Dummy variable, 0 is Kinh and Chinese and 1 is other ethnic minorities
Fulltime	Dummy variable, 0 is working part-time; 1 is working fulltime
Region1	Red River Delta (Reference region)
Region2	North East
Region 3	North West
Region 4	North Central Coast
Region 5	South Central Coast
Region 6	Central Highlands
Region 7	North East South
Region 8	Mekong River Delta
p_age05	Ratio of number of children less than 5 years old to total number of family members
Degree0	No education degree (Reference group)
Degree1	The highest education certificate is a primary education
Degree2	The highest education certificate is a secondary school
Degree3	The highest education certificate is high school
Degree4	The education degree is technical college/university degree or over
Female	Gender: Female is 1 and male is 0
Dependency	Ratio of the number of persons less than 15 and over 65 year-olds to the total number of household's members
Urban	Household located in the urban areas is 1 and o otherwise
Head employment0	Household head is unemployed (reference group)
Head employment1	Household head occupation is wage employment
Head employment2	Household head occupation is self-employment in farm sector

4.2.1- Definition of variables (continue)

Variables	Definition
Head employment3	Household head occupation is self-employment in non-farm sector
Headex	Experience of household head
Headwage	Wage of household head

4.2.2- Budget share of the households

	Poor	Non-poor
Other Crops	0.079	0.062
Livestock	0.121	0.137
Fishery	0.064	0.064
Mining	0.058	0.033
Food processing	0.404	0.257
Beverages and Tobacco	0.028	0.031
Chemicals	0.022	0.025
Garment and foot-ware	0.056	0.053
Other Manufacturing	0.036	0.056
Utility	0.030	0.063
Transportation, Communication and Tourism	0.000	0.005
Financial Services	0.001	0.003
Other Services	0.102	0.209

4.2.3- Results of earning regression

	Skilled rural male		Skilled rural female		Skilled urban male	
	Coef.	P	Coef.	P	Coef.	P
Age	0.101	0.000	0.044	0.352	0.137	0.000
Age2	-0.001	0.000	0.000	0.622	-0.002	0.000
Schooling	0.119	0.000	0.245	0.000	0.108	0.000
Exp	0.011	0.032	0.018	0.481	0.058	0.000
Exp2			0.000	0.765	-0.001	0.001
Ethnic1	-0.439	0.002	0.014	0.946	-0.269	0.170
Fulltime	0.680	0.000	0.465	0.000	0.733	0.000
Region (region 1=0)						
Region2	-0.071	0.495	0.105	0.449	-0.101	0.310
Region3	0.186	0.419	-0.292	0.381	0.213	0.364
Region4	-0.191	0.029	0.298	0.061	-0.242	0.023
Region5	0.042	0.716	0.085	0.561	-0.204	0.031
Region6	-0.057	0.739	-0.076	0.749	0.181	0.203
Region7	0.375	0.000	0.574	0.000	0.331	0.000
Region8	0.205	0.027	0.460	0.001	-0.176	0.088
Constant	5.028	0.000	3.871	0.000	4.298	0.000

	Skilled urban female		Semi-skilled urban female		Unskilled rural male		Unskilled urban female	
	Coef.	**P**	**Coef.**	**P**	**Coef.**	**P**	**Coef.**	**P**
Age	0.091	0.000	0.094	0.000	0.090	0.000	0.065	0.187
Age2	-0.001	0.002	-0.001	0.000	-0.001	0.000	-0.001	0.131
Schooling	0.092	0.000	0.026	0.236	0.012	0.477	-0.064	0.265
Exp	0.049	0.000	0.020	0.002	-0.023	0.000	0.050	0.270
Exp2	-0.001	0.024					-0.002	0.194
Ethnic1	0.286	0.117	0.228	0.432	-0.427	0.000	-0.679	0.032
Fulltime	0.683	0.000	1.081	0.000	0.784	0.000	0.546	0.010
Region								
(region 1=0)								
Region2	-0.330	0.001	-0.150	0.439	0.124	0.462	-0.101	0.912
Region3	-0.180	0.353	0.268	0.525	-0.080	0.693	0.971	0.430
Region4	-0.255	0.011	-0.183	0.481	0.213	0.191	0.808	0.401
Region5	-0.084	0.365	-0.122	0.463	0.034	0.829	0.174	0.782
Region6	-0.109	0.430	-0.705	0.001	0.149	0.341	-1.002	0.127
Region7	0.471	0.000	0.380	0.003	0.198	0.159	0.390	0.493
Region8	0.064	0.472	-0.377	0.021	0.100	0.422	0.030	0.959
_cons	5.385	0.000	5.906	0.000	6.288	0.000	6.988	0.000

	Semi-skilled rural male		Semi-skilled rural female		Semi-skilled urban male	
	Coef.	**P>z**	**Coef.**	**P>z**	**Coef.**	**P>z**
Age	-0.0353	0.0080	-0.0936	0.0000	-0.0491	0.0190
Age2	0.0006	0.0000	0.0017	0.0000	0.0007	0.0060
Schooling	0.0521	0.0000	0.1043	0.0000	0.0717	0.0000
Exp	-0.0295	0.0000	-0.0232	0.1160	-0.0035	0.8270
Exp2	0.0005	0.0840	0.0001	0.8560	0.0003	0.6300
Ethnic1	-0.2672	0.0000	-0.2657	0.0030	-0.3573	0.0040
Fulltime	0.7395	0.0000	0.8834	0.0000	0.6265	0.0000
Region (region 1=0)						
Region2	-0.0968	0.0650	0.2169	0.0160	-0.1271	0.1720
Region3	-0.1795	0.0510	-0.1050	0.5520	-0.5521	0.0010
Region4	-0.2127	0.0000	0.0683	0.4880	-0.1549	0.1690
Region5	0.1032	0.0610	0.1188	0.1960	0.0697	0.4520
Region6	-0.2606	0.0000	0.1660	0.1360	-0.0557	0.6020
Region7	0.2875	0.0000	0.4846	0.0000	0.3388	0.0000
Region8	-0.0860	0.0580	0.0514	0.5070	-0.0023	0.9790
_cons	9.2356	0.0000	9.7006	0.0000	9.4656	0.0000

(Continue)	Semi-skilled rural male		Semi-skilled rural female		Semi-skilled urban male	
	Coef.	P>z	Coef.	P>z	Coef.	P>z
Selection equation						
Age	0.1822	0.0000	0.1114	0.0000	0.1638	0.0000
Age2	-0.0024	0.0000	-0.0016	0.0000	-0.0022	0.0000
Schooling	-0.0367	0.0000	-0.0259	0.0120	-0.0204	0.2180
Exp	-0.0070	0.2940	-0.0178	0.0210	0.0369	0.0060
Exp2	-0.0003	0.1820	0.0003	0.2650	-0.0008	0.0820
p_age05	0.0032	0.0160	-0.0040	0.0070	0.0058	0.0150
_cons	-2.9478	0.0000	-2.1323	0.0000	-2.9285	0.0000
/athrho	-1.5771		-1.5816	0.0000	-1.9150	0.0000
/lnsigma	0.1571		0.4235	0.0000	0.1233	0.0010
Rho	-0.9182		-0.9189		-0.9575	
Sigma	1.1701		1.5274		1.1312	
Lambda	-1.0743		-1.4034		-1.0831	

	Unskilled rural female		Unskilled urban male	
	Coef.	P>z	Coef.	P>z
Age	0.0125	0.6290	0.0171	0.6140
age2	0.0001	0.8730	-0.0001	0.9040
schooling	0.0334	0.1740	-0.0730	0.0640
experience	-0.0406	0.0100	-0.0328	0.2440
ex2	0.0008	0.0910	0.0008	0.3550
ethnic1	-0.2281	0.0090	-0.5407	0.0020
Fulltime	0.5746	0.0000	0.6721	0.0000
Region (region 1=0)				
Region2	0.0080	0.9720	0.1917	0.7080
Region3	-0.1409	0.5470		
Region4	-0.1377	0.5380	0.5065	0.2390
Region5	0.1733	0.3940	0.6200	0.1430
Region6	0.2902	0.1370	0.2936	0.4850
Region7	0.5485	0.0030	0.6857	0.0720
Region8	0.1377	0.4280	0.3174	0.4130
_cons	8.3422	0.0000	8.1639	0.0000

Continue	Unskilled rural female		Unskilled urban male	
	Coef.	P>z	Coef.	P>z
Selection equation				
Age	0.0343	0.0450	0.0452	0.2910
age2	-0.0007	0.0040	-0.0009	0.0860
schooling	0.0155	0.3500	0.0290	0.5590
experience	0.0147	0.1290	0.0217	0.4900
ex2	-0.0008	0.0060	-0.0007	0.5320
p_age05	-0.0098	0.0000	0.0035	0.6040
_cons	-0.9018	0.0010	-0.4756	0.5380
/athrho	-1.5229	0.0000	-1.6095	0.0000
/lnsigma	0.2460	0.0000	-0.2223	0.0390
Rho	-0.9092		-0.9231	
sigma	1.2790		0.8007	
Lambda	-1.1628		-0.7391	

4.2.4- Results of employment selection equation

Multinomial logit regression of head of households

	Wage		Self-employed in non-farm sector		Inactive	
	RRR	P	RRR	P	RRR	P
Age	0.97585	0	0.9992	0.85	1.083262	0.094
Degree1	0.86495	0.28	1.36861	0.001	3.87E-10	0
Degree2	1.22702	0.122	1.62516	0	1.63E-09	0
Degree3	2.10257	0	2.20843	0	5.24E-10	0
Degree4	7.50158	0	1.63537	0.001	5.07E-10	0
Exp	0.95895	0	0.94764	0	6.49E-50	1
Female	1.15663	0.178	1.92798	0	3.64E+13	1
Dependency	0.99438	0.013	0.99593	0.015	0.9879778	0.614
Urban	10.3072	0	4.35139	0	15.59658	0.042
Region2	0.61287	0.001	0.61715	0	7.46E+19	1
Region3	0.401	0	0.36839	0	1.01E+24	1
Region4	0.73937	0.063	0.75492	0.009	0.8365176	0.898
Region5	0.98251	0.916	0.92597	0.523	4.03E+12	1
Region6	0.33687	0	0.46339	0	9.38E+18	1
Region7	2.15278	0	1.10033	0.394	3.548486	0.426
Region8	1.20837	0.16	0.71522	0.001	0.7433612	0.812

Husband or wife

	Wage		Self-employed in non-farm sector		Inactive	
	RRR	**P**	**RRR**	**P**	**RRR**	**P**
Age	0.9841	0.057	1.01185	0.035	1.152221	0.02
Degree1	0.65769	0.013	1.19232	0.075	1.354273	0.784
Degree2	1.07532	0.669	1.29849	0.014	1.074235	0.961
Degree3	1.39998	0.134	1.56215	0.004	0.7114475	0.847
Degree4	5.09502	0	0.9234	0.663	4.72E+12	1
Exp	0.95887	0	0.92131	0	4.43E-47	1
Female	0.25984	0	1.34733	0.035	5.58212	0.324
Dependency	0.99304	0.026	1.00094	0.653	1.026939	0.313
Urban	4.09681	0	2.68367	0	4.449336	0.297
Region (region 1=0)						
Region2	0.62433	0.009	0.54086	0	499041.7	1
Region3	0.4153	0.008	0.46961	0	4.38E+16	1
Region4	0.49432	0.002	0.81014	0.091	3.70E-10	0.999
Region5	1.12779	0.574	0.97296	0.848	2181894	1
Region6	0.43155	0.003	0.68373	0.012	6.43E+09	1
Region7	1.93458	0	0.85504	0.254	7.04E-10	0.999
Region8	1.26404	0.201	0.74174	0.016	5.09E-09	0.999
Head employment1	1.97287	0.013	0.94929	0.831	2.34E-10	0.999
Head employment2	0.22566	0	0.3139	0	5.18E-11	0.999
Head employment3	0.74998	0.253	3.28596	0	4.41E-09	0.999
headex	0.99654	0.639	1.03188	0	1.34824	0.022
headwage	1.00943	0.254	1.00419	0.571	1.050522	0.429

Children

	Wage		Self-employed in non-farm sector		Inactive	
	RRR	**P**	**RRR**	**P**	**RRR**	**P**
Age	1.05944	0	1.09885	0	1.038449	0.068
Degree1	0.99493	0.958	1.65668	0	2.21E-09	0
Degree2	0.78547	0.02	1.52246	0	3.82E-09	0
Degree3	1.30614	0.028	1.65876	0	2.99E-09	0
Degree4	6.72701	0	1.4662	0.055	1.40E-09	0
Exp	0.83846	0	0.88864	0	7.50E-26	1
Female	0.92479	0.228	1.78029	0	1.582781	0.185
Dependency	0.98611	0	0.99817	0.313	1.027241	0.011
Urban	5.32455	0	4.079	0	11.33562	0
Region2	0.27503	0	0.51501	0	0.6810762	0.537
Region3	0.14758	0	0.39035	0	0.4384055	0.455
Region4	0.82523	0.134	0.95548	0.74	1.641726	0.47
Region5	1.60047	0	1.16598	0.275	4.747357	0.147
Region6	0.22676	0	0.35089	0	0.6746952	0.716
Region7	2.02862	0	1.25841	0.077	1.008404	0.987
Region8	1.00515	0.959	1.00681	0.951	0.6503941	0.395
Head employment1	4.86558	0	1.59791	0.038	1.018878	0.982
Head employment2	0.69484	0.001	0.47582	0	1.807355	0.353
Head employment3	1.6515	0	4.1922	0	3.095781	0.057
headex	0.98994	0.002	1.0011	0.752	0.9865435	0.438
headwage	1.00377	0.718	1.00839	0.494	1.087797	0.062

Chapter 5- General conclusions and directions for future research

Poverty reduction is a long-lasting goal and poses a great challenge for both academics and policymakers alike. Thanks to tremendous efforts, significant results and better understanding have been achieved so far, but poverty is still a complicated and puzzling issue, deserving of more attention. Together with traditional resort to redistribution, academics and policymakers have paid increasing attention to the issue of adverse shocks and sectoral growth in poverty alleviation. Adverse shocks such as natural disasters and illness of household members can cause poverty and can also destroy poverty reduction achievements. Economic growth is insufficient but still an essential condition for sustainable poverty alleviation. In particular, sectoral growth patterns could be attributed to the difference in how much the poor benefit from growth. This study focuses on the above two issues, aiming to make a significant contribution to the literature. This chapter concludes the thesis by summarising the main findings, identifying contributions to the literature and providing policy implications and directions for future research.

5.1- Main findings of the thesis

First, relating to the issue of adverse shock, the thesis confirms the findings in the literature that shocks are indeed common for rural households, and increase the probability of keeping people poor and making them fall into poverty. However, the thesis further points out that different types of shocks have different impacts. In Vietnam, four types of important shocks are: natural disaster, illness of a household member, crop failure and disease of livestock. The first two shocks generate persistent impacts for at least five years after they happen, keeping people in chronic poverty; the latter two make households fall into poverty. This study finds that the persistent impact of shocks lasts longer than the three years suggested by other studies. For developing countries, such as Bangladesh, Chile, Rwanda, Vietnam and Ethiopia, different countries are affected by different types of shocks; however, these four types of shocks are among the most common shocks.

It is notable that the results are quite different depending on how the shock is measured. For example, if the shock is measured by a dummy variable (i.e. a value of 1 is affected

by the shock, and 0 otherwise), natural disaster does not have an impact on poverty. However, when the variable of natural disaster is measured by the amount of loss it creates, weighted by household assets, natural disasters have a negative impact on poverty. Intuitively, this is reasonable, because natural disasters can affect many households, but the severity differs from household to household.

The study highlights the significance of the impacts of the shocks on poverty by comparing them with the impacts of the other determinants of poverty. It is also notable that, compared to other determinants that have positive impacts on poverty, such as education, the impacts of shocks are very significant. The adverse impacts of crop failure or illness of a household member may completely eliminate the effort to reduce poverty through improving education. The impact of natural disaster and illness can be strong enough to nullify the achievement of poverty reduction made by reducing household size or increasing non-farming employment in the economy. Above all, the study finds that if all shocks are properly insured against, the poverty rate might fall by as much as 10% in Vietnam.

It is revealed that households use a variety of measures to cope with shocks, including asset insurance, informal assistance, credit, employment, government assistance and insurance. Similar to findings from other studies, formal institutions such as insurance and the social safety net are very poorly developed and play an insignificant role in coping with shocks. The system is established but does not protect households from the negative impact of shocks. Households thus have to rely on themselves and their network to cope with shocks. It is also shown that households have to cope with shocks by selling assets, but this makes them worse off, either making them fall into poverty or impeding their probability of escaping poverty.

In relation to the sectoral growth pattern and poverty, this study confirms the findings in the literature that sectoral growth pattern does matter for poverty reduction. However, instead of staying at the highly aggregated sectoral level (i.e. agriculture, industry and services), as usually found in the current literature, this study uses more disaggregated industrial classification. The study finds that each of the three highly aggregated sectors have some sub-sectors which are significantly pro-poor. For example, agriculture has crops, livestock and fishery, industry has food processing and construction, and the service sector has trade and some non-financial services. It is intuitively reasonable in the sense that crops might have an impact through increasing farmers' incomes, while

the growth of the food processing industry might create more jobs for farmers through a higher demand on the crops sector. The growth of some service sectors which employ low-skilled labour (i.e. poor people), such as trade, increases the income of their employees. In addition, this industry tends to grow with the increase of income level, due to its high interdependency linkage. As a result, promoting these pro-poor sub-sectors in the long term creates the most pro-poor growth sectoral pattern in Vietnam.

Going beyond this conclusion, the study emphasises that labour intensity is not the only factor explaining the poverty effect of sectoral growth. Three other features of the sector are also accounted for: the production linkage with the labour-intensive sector, the degree of sector interdependency, which is the second-round effect, including the impacts due to the increase in the demand of the domestic market, and the poverty sensitivity to income of the people who benefit from the growth of the sector. For example, for the agricultural sector, the contribution to poverty reduction is significant due to the employment channel; meanwhile, for food processing, it is due to its close production linkage with the agricultural sector. High contribution of trade, construction and some service sectors results from a combination of all four factors.

The study has made a clear distinction between the poverty impact influenced by the four factors above and the poverty impact created by the four factors and the actual growth rate of each sector. The former implies how much poverty can be reduced if each sector grows by the same rate given their four features (i.e. simulation 1); the latter estimates the poverty reduction made by the real growth rate of each sector (i.e. simulation 2). The study shows that these two impacts of each sector are quite different. Given the labour intensity and high production linkage, some sectors, such as crops, livestock and food processing, have higher impacts in simulation 1 than in simulation 2. This is because the growth rates of these sectors are lower than the average. Some other sectors, which do not have much pro-poor industrial features, such as fishery, mining, construction, trade and some other services, on the other hand have a higher impact in simulation 2. This demonstrates that Vietnam could have been more successful in reducing poverty if all sectors whose four features make them the most pro-poor grow faster.

The study also shows that there is probably a trade-off, at least in the short-term, between growth and poverty reduction, because some of the most pro-poor growth sectors are not the ones that can generate the strongest growth effect. This may partly be

a reason why some of the most potentially pro-poor sectors do not develop quickly enough to exploit their ultimate poverty impact based on their four features. However, in the long term, more information is needed to see the trade-off, because it depends on which growth pattern can yield more sustainable growth.

Growth patterns might be responsible for the current geographical and ethnic difference in poverty in Vietnam. The current growth pattern reduces poverty in urban and less poor regions more than in rural areas and poorer regions. This holds for all growth pattern scenarios, even the most pro-poor growth path. In other words, if Vietnam pursues the most pro-poor growth pattern, spatial and ethnic differences in poverty still remain. However, the magnitude of the difference could be reduced if the most pro-poor growth pattern is pursued, because this growth pattern would reduce the poverty in rural and poorer areas to a larger extent than the others. Pro-poor growth patterns have a higher poverty impact on both ethnic majorities and minorities relative to other growth scenarios.

The current growth pattern indeed helps Vietnam reduce poverty, and will continue to do so in the future. However, it also worsens the inequality in Vietnam through increasing the gap between rural and urban regions. This holds even for the most pro-poor growth pattern. The current literature is concerned with the inequality because of its potential impact on future poverty reduction, and the possible political impact. This study reveals that the most pro-poor growth pattern is also the most equitable growth, which also means the most sustainable poverty reduction.

5.2- Contributions to the literature

The thesis has contributed to the improvement of the research methodology and a better understanding of the literature on the relationship between shocks, sectoral growth and poverty. In terms of methodology, the thesis has made three contributions. First, the thesis has pointed out that the assessment of the poverty impact of shocks can be distorted according to how shocks are measured. In the literature, shocks can be measured by a dummy variable and a continuous variable. A dummy variable has a value of 1 if the household did suffer from shocks and 0 otherwise. The continuous variable is the loss created by shocks (can be normalised by the household assets), also called shock severity. In theory, it is understood that the use of a dummy variable instead of a continuous variable may create the loss of information and power, which

consequently distorts the selection of the appropriate econometric model (McLlelland and Irwin, 2003). By using both dummy and continuous variables to measure shocks, the thesis has clearly shown that dummy variables sometimes cannot detect the impact properly. Instead, continuous variables (i.e. shock severity) brought more sensible results. This may partly explain the fact that some papers, for example Dercon et al. (2005), do not find shock impacts as expected.

Second, the thesis has raised the issue of poverty impact based on the four industrial features (simulation 1) and the real poverty impacts (simulation 2) in assessing sectoral growth and experimenting with ways to do that. In the literature, this differentiation was not identified. Some papers, such as Thorbecke and Jung (1996) and Khan (1999), use the same basic analytical framework as this thesis, but estimate only the former. Other studies, such as Warr (2002), Ravallion and Datt (1996), Hansan and Quibria (2002), and Montalvo and Ravallion (2010), use the econometric method, which can only assess the real impact because they use data on the real growth rates of the sectors for the reduced form equation where the left hand sign is the poverty indicators and the sectoral growth rates in the other sign. Differentiating between these two impacts is important because they are indeed different; therefore, awareness of this differentiation will help to have more appropriate assessment of the poverty reduction contribution of each sector. When reviewing the literature one should know what type of impact is measured in the study; policy implications can be drawn accordingly. It seems more reasonable to draw policy implications based on the former because it tells us about how much poverty would be reduced if all sectors grow by the same percentage.

Third, the thesis has demonstrated that combining the SAM multiplier decomposition approach with the computable general equilibrium micro-modelling is a good method to thoroughly assess the poverty impact of sectoral growth. Both methods have their own advantages and complement each other. The former approach is less technical and data demanding than the latter, and is useful in identifying the factors which determine the poverty impact of the sectors and providing a base to build the simulation scenarios in the latter. However, it is constrained by the fixed-price assumption, which is relevant only for short-term analysis. The latter modelling approach is much more technical and data complex but it allows us to bring the dynamic dimension and agents' behaviour into the analysis, thus making it more appropriate in the long term.

In terms of empirical evidence, the study provides its most comprehensive empirical evidence on the impacts of shocks, from different types of shocks, with persistent or transitory impacts, to poverty dynamics and shock coping measures. It supplements the inclusive empirical evidence on the persistent impacts of shocks and the types of shocks. It shows that shocks may cause a persistent impact which traps people in chronic poverty, and the consequence can last for more than five years. Natural disasters and health shocks have this impact, while livestock disease and crop failure tend to make households fall into poverty. The study has supplemented current literature on the justification of paying more attention to adverse shocks in poverty reduction by showing how significant the impacts are in comparison with the impacts of other factors – so significant that they could destroy achievements in poverty reduction made by improving the education level of the people and other policies. Coping measures are very diverse; formal measures have been established but are extremely poorly developed, and asset selling is the popular method, but may trap people in chronic poverty.

This result provides further explanation and evidence for Van de Walle's (2004) finding that the safety net does not have an impact on poverty promotion and protection. The reason might be that too little is spent on preventing households from facing or recovering from illness, natural disaster, livestock disease or crop failure. The current safety net in Vietnam mainly covers losses from natural disasters; the results show that the system fails to adequately protect the poor. In addition, the poor are provided with free health insurance but illness still has a persistent impact on the poor. Illness of a household member also increases the probability of falling into poverty, thus it should be given more attention.

The thesis also contributes to explaining the mixed findings in the empirical literature on the contributions of the agriculture, industry and service sectors on poverty reduction. It is argued whether any of three sectors can generate significant poverty reduction because the magnitude of the effect depends on factors other than labour intensity, including close production linkage with labour intensive sectors, high interdependency with the rest of the economy and higher poverty sensitivity to the incomes of the people who benefit from the growth of the sector. In addition, the high real growth rate of the sector may also make sectors which are not the most pro-poor by nature become sectors which actually contribute most to poverty reduction. This may partly explain the cases of India, where the service sector generates the strongest

impact, and Taiwan and East Asia, where the industry sector plays the most important role.

The thesis provides new insights into the pro-poor sectoral growth literature, that in order to better understand the pro-poor sectoral growth pattern it is necessary to assess the sectors at a more disaggregated sectoral level rather than at a highly aggregated level (i.e. agriculture, industry and service). This is because each highly aggregated sector may have sub-sectors, which are the most pro-poor growth and therefore constitute the most pro-poor growth pattern. This is really the case of Vietnam. The current literature tends to look at a highly aggregated level; Thorbecke and Jung (1996) and Khan (1999) examine a more disaggregated level, but the issue has not been raised.

The current literature identifies that in some countries, such as Ghana, Vietnam, India and China, spatial poverty is typical. This thesis has shown that sectoral growth pattern is one of the factors attributed to this trend. It is notable that even when the most pro-poor growth pattern is pursued, the difference still remains.

The study also adds empirical evidence to the literature that growth patterns matter not only for poverty but also for inequality. In Vietnam, all growth pattern scenarios lead to an increase in inequality, although the most pro-poor growth pattern leads to the most equitable growth. If inequality is indeed not good for the poor, as pointed by Ravallion (2005), something needs to be done in order to sustain the poverty reduction achievements.

5.3- Policy implications and directions for further research

The findings from the thesis provide some policy insights for poverty reduction, which are not only relevant for Vietnam but also for other developing countries struggling with poverty. First, there is an urgent need to improve the safety net system that helps people cope with shocks. Poor development of formal institutions to cope with shocks makes farmers even more vulnerable to poverty in Vietnam. Uninsured frequent disease of livestock raises serious concerns about its behavioral impact, which may have a profound impact, trapping farmers in persistent poverty. When designing policies it is necessary to pay attention to different types of shocks, because different types of shocks may have different impacts on the poor. Once designed, formal shock coping measures should be strong enough to make a difference, drawing lessons from Vietnam, where a

formal system exists but its impact on poverty reduction is limited. This effort seems to have paid off; it is shown that if all shocks are insured, the poverty rate will be reduced by 10%.

The findings suggest that promoting pro-poor growth patterns promotes sectors that are labour intensive, close production linkage with labour intensive sectors and/or have stronger interdependency with the rest of the economy and poverty sensitivity. In Vietnam's case, the agriculture, industry and service sectors have some sub-sectors, including crops, livestock, fishery, food processing, construction, trade, etc. This widens the policy choice currently offered in the literature, promoting the agricultural sector, such as in Grimm and Klasen (2007), World Bank (2008d), and Montalvo and Ravallion (2010). Advocating the development of agriculture seems reasonable given that the majority of the poor work in the agriculture sector. The finding from this thesis does not rule out this recommendation because it is clear that the growth of the agricultural sector can have a significant impact on poverty reduction. However, in the broader context and especially in the long term, development of the agricultural sector may face some difficulties. First, compared to industry or services, agriculture faces a limitation in its input, land, although biotechnology can help somewhat. Second, by nature, agriculture suffers from decreasing terms of trade. Third, agricultural products are facing a difficulty in accessing the markets of developed countries, which will not end in the foreseeable future. Fourth, it suffers from risks, which have been negatively affecting households, as presented in Chapter 2. Fifth, during the development process, the share of agriculture in the GDP and employment is reducing relative to that of the other sectors (Timmer and Akkus, 2008); the concern is how the poor can benefit from this transformation process. Given these five points, the thesis introduces more diversified and broader insights into the pro-poor sectoral growth pattern, which can widen policy choices for countries and be tailored to the country's condition rather than narrowly advocating the development of the agricultural sectors. Of course, the country can be recommended to develop agriculture if this sector has more potential to grow after taking into account all six difficulties mentions above. Otherwise, the combination strategy can offer the country another policy choice, which may also be more relevant in the dynamic context as the country develops and transforms itself to the higher up development ladder.

The thesis indicates that targeting to reduce poverty also means bringing more equality into Vietnamese society. Findings from chapter 4 show that the most pro-poor growth

strategy brings the most equitable income distribution. This result further reinforces the findings in the literature (e.g. Hoi, 2010). However, even if the most pro-poor growth patterns have been pursued, inequality seems to still be on the rise, and the geographical and ethnic poverty difference still persists. As geography and ethnicity are the prominent features of poverty in Vietnam (Minot et al., 2006), this finding justifies a stronger spatial and ethnic dimension of redistribution to counter the impacts of the imbalance. Rural and more disadvantaged areas need to be invested in more in terms of infrastructure and human capital in order to change their resources, which may improve their living standard in the current growth pattern.

In addition to poverty, inequality deserves more attention because it will increase in all growth pattern scenarios in Vietnam, including the most pro-poor growth pattern. Inequality could impede future poverty reduction and future growth; one should be cautious with this increase, at least with "bad inequality". The immediate future research direction in this regard, useful from a policy point of view, is to explore whether the inequality increasing is "bad" inequality.

In terms of directions for further research, the computable general equilibrium-micro simulation model can be expanded into the following three directions: first, this thesis focuses on examining the link between sectoral growth pattern and poverty; this type of model, however, can be used to examine the ex ante effects of different policies such as tax, trade policies and even industrial policies (if any) on poverty and inequality. This can be done by formulating the scenarios on policy change.

Second, in the literature, when talking about the development process, a sectoral growth pattern approach is usually used to analyse the process where the share of agriculture decreases accompanied by an increase in the share of industry and services. This thesis uses the same approach. However, in essence, the development process is much more complicated and multi-faceted in that it can also, for example, reflect the transformation process from low to high-value added production activities or from low to high technology production. The current approach to the development process captures this issue to some extent but seems insufficient. For long-term sustainable poverty reduction, poverty and inequality should be analysed in the framework that the above issue should be treated more carefully and is worth exploring further in the future. The computable general model may have potential in modelling this development process.

Finally, as mentioned in the introduction, expanding the poverty measure from the income approach, used in this thesis, to the multidimensional one has received considerable interest. This helps give a more thorough understanding of the nature of poverty. The analytical framework applied in this thesis can be expanded in this direction to see the impact of different growth patterns on multi-dimensional poverty.

References

Abbott, P., J. Bentzen and F. Tarp, 2009. Trade and Development: Lessons from Vietnam's Past Trade Agreements. *World Development* 37 (2), 341-353.

Abbott, P., K. Boys, P.L. Huong, F. Tarp, 2008. Trade and Development in Vietnam: Exploring Investment Linkages. Paper presented at the Symposium on Globalization and the Rural-Urban Divide initiated by the International Agricultural Trade Research Consortium (IATRC), Seoul, Korea, June 29-July 1.

Ag´enor, P.-R., D. H. C. Chen and M. Grimm, 2004. Linking Representative Household Models with Household Surveys for Poverty Analysis: A Comparison of Alternative Methodologies. Policy Research Working Paper Series No.3343, the World Bank.

Alatas, V. and F. Bourguignon, 2005. "The Evolution of Income Distribution during Indonesia's Fast Growth, 1980-96", in Bourguignon F., F. H. G. Ferreira, and N. Lustig (ed.), *The Microeconomics of Income Distribution Dynamics in East Asia and Latin America*. The World Banks and Oxford University Press, New York.

Alderman, H. & C. Paxson, 1992. Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries. Policy Research Working Paper Series 1008, the World Bank.

Angeles, L., 2010. An Alternative Test of Kuznets' Hypothesis. *Journal of Economic Inequality* 8(4), 463-473.

Araar, A. and J.Y. Duclos, 2009. User Manual for Stata Package DASP: Version 2.1. PEP, World Bank, UNDP and Université Laval.

Arndt C., S. Robinson, F. Tarp, 2002. Parameter Estimation for a Computable General Equilibrium Model: a Maximum Entropy Approach. *Economic modelling* 19 (3), 375-398.

Asian Development Bank, 2009. Key Indicators for Asia and the Pacific. Available at www.adb.org/statistics.

Asselin, L.-M. and V. T. Anh, 2005. Dynamic Poverty Analysis in Vietnam 1992-2002: Multidimensional versus Moneymetric Analysis. Paper presented at the Many Dimensions of Poverty International Conference, Brasilia, 29-31 August.

Barslund, M. and F. Tarp, 2008. Formal and Informal Rural Credit in Four Provinces of Vietnam. *Journal of Development Studies* 44(4), 485-503.

Baulch, B. and J. Hoddinott, 2000. Economic Mobility and Poverty Dynamics in Developing Countries. *Journal of Development Studies* 36 (6), 1-24.

Baulch, B. and N. McCulloch, 1998. Being Poor and Becoming Poor: Poverty Status and Poverty Transitions in Rural Pakistan, Institute of Development Studies Working paper 79.

Baulch, B., H. T. Pham, and B. Reilly, 2008. Ethnicity and Household Welfare in Rural Vietnam, 1993-2004. University of Sussex.

Benfica, R., D. Tschirley and L. Sambo, 2002. The Impact of Agro Industrial Investmentson Poverty Reduction in Rural Mozambique. Food Security Collaborative Working Papers 56055, Michigan State University.

Besley, T. and L.J. Cord, 2007. *Delivering on the Promise of Pro-poor Growth*, Palgrave Macmillan and the World Bank. Washington WC.

Bhide, S. and A.K. Mehta, 2003. "Chronic Poverty in Rural India, An Analysis using Panel Data: Issues and Findings". Paper presented at Chronic Poverty Research Centre International Conference, Manchester, April.

Binayak, S., 2003. Drivers of Escape and Descent: Changing Household Fortunes in Rural Bangladesh. *World Development* 31(3), 513-534.

Binh N. T., J. W. Albrecht, S. B. Vroman, M. D. Westbrook, 2006. A Quantile Regression Decomposition of Urban-rural Inequality in Vietnam. Georgetown University and Asian Development Bank.

Boccanfuso, D. and T.S. Kabore, 2004. Macroeconomic growth, sectoral quality of growth and poverty in developing countries: Measure and application to Burkina Faso. Working paper 04-07, Université de Sherbrooke.

Bourguignon, F., 2002. The Distributional Effects of Growth: Case Studies vs. Cross-Country Regressions, Delta Working Paper 2002-23.

Bourguignon, F., 2004. The Poverty-Growth-Inequality Triangle. The paper was presented at the Indian Council for Research on International Economic Relations, New Delhi, on February 4.

Bourguignon, F., A. S. Robilliard and S. Robinson, 2003. Representative Versus Real Households in the Macroeconomic Modeling of Inequality. DIAL Document de travail DT/2003-10.

Bussolo, M. and J. Lay, 2003. Globalization and Poverty Changes in Colombia. OECD Development Centre Working Papers No. 226.

Cardenete, M. A., G. J. L. Díaz-Salazar, M. C. L. Díaz, C. R. Morilla, 2009. Detection of Key Sectors Using Social Accounting Matrix: An Alternative Approach. *Journal of Applied Input-Output Analysis* 13, 83-91.

Carter, M. and M. Ikegami, 2007. Looking Forward: Theory-based Measures of Chronic Poverty and Vulnerability. Working Paper 94, Chronic Poverty Research Centre, UK.

Chan N. and T.K. Dung, 2006. The Impact of Trade Liberalization on Household Welfare in Vietnam. MPIA Working Paper 2006-02.

Chenery H., 1975. *Redistribution with Growth*. Oxford Univertity Press.

CIEM, 2009. *Vietnam's Economy in 2008*. Political Publishing House, Hanoi.

CIEM, DOE, ILSSA, and IPSARD, 2007. *Characteristics of Vietnamese Rural Economy: Evidence from A 2006 Rural Households Survey in 12 Province of Vietnam*. Statistics Press, Hanoi, Vietnam.

Clauss M. and S. Schubert, 2009. The ZEW Combined Microsimulation-CGE Model: Innovative Tool for Applied Policy Analysis. ZEW Discussion Paper 09-062.

Cling J.P., M.A. Marouani, M.R.Ndrakoto, A.S. Robillard, and R. Roubaud, 2009. The Distributive Impact of Vietnam's Accession to the WTO. *Économie internationale* 118 (2009), 43-71.
Cling J.P., M.A. Marouani, M.R.Ndrakoto, A.S. Robillard, and R. Roubaud, 2008. The Distributive Impact of Vietnam's Accession to the WTO (in Vietnamese). The paper presented at the Economic and Finance Forum on 26-27/2, Danang, Vietnam.

Cockburn, J. 2001. Trade Liberalization and Poverty in Nepal: A Computable General Equilibrium Micro-simulation Approach. CRÉFA Working Paper 01-18, Université Laval.

Colombo, G., 2008a. The Effects of DR-CAFTA in Nicaragua: A CGE-Microsimulation Model for Poverty and Inequality Analysis. Proceedings of the German Development Economics Conference, Zurich 2008 No. 6.

Colombo, G., 2008b. Linking CGE and Microsimulation Models: A Comparison of Different Approaches. Discussion Paper 08-054, Centre for European Economic Research (ZEW).

Cord, L., 2007. Overview, in Besley T. and L. J. Cord (ed.), *Delivering on the promise of pro-poor growth.* Palgrave Macmillan and the World Bank, Washington WC.

Cruces, G. and Q. Wodon, 2003. Risk-Adjusted Poverty in Argentina: Measurement and Determinants. Discussion Paper DARP 72, London School of Economics and Political Science.

Cuong N. V., P. N. Truong, and R. Van der Weid, 2010. Poverty and Inequality Maps for Rural Vietnam An Application of Small Area Estimation. World Bank Policy Research Working Paper 5443.

Cuong, N. V., 2008. Is a governmental micro-credit program for the poor really pro-poor? Evidence from Vietnam. *The Developing Economies* XLVI (2), 151–87.

Dam, D. D., 2010. Profound Economic Growth Model and State Owned Enterprise Management Reform. Paper presented at the Forum on "Restructuring and Innovating the Management Regime of State Owned Enterprises towards to the Model for Efficient Economic Development, Hanoi, November 24.

Cypher J. M. and J. L. Dietz, 2009. *The Process of Economic Development*. Routledge, New York.

Davies, J. B, 2009. Combining Microsimulation with CGE and Macro Modelling for Distributional Analysis in Developing and Transition Countries. *International Journal of Microsimulation* 2(1), 49-65.

Deaton A., 1997. *The Analysis Of Household Surveys : A Microeconometric Approach To Development Policy*. Johns Hopkins University Press, London.

Deaton, A. 1992b. *Understanding consumption*. Clarendon Press, Oxford.

Deaton, A., 1992a. Saving and Income Smoothing in the Cote deIvoire. *Journal of African Economies* 1 (l), 1 -24.

Defoumy, J. and E. Thorbecke, 1984. Structural Path Analysis and Multiplier Decomposition Within a Social Accounting Matrix Framework. *The Economic Journal* 94, 111 - 136.

Deininger, K. and L. Squire, 1998. New Ways of Looking at Old Issues: Inequality and Growth. *Journal of Development Economics* 57, 259–287.

Dercon, S. and J. Hoddinott, 2004. Health, Shocks and Poverty Persistence, in *Insurance Against Poverty*, Dercon, S. (ed.), Oxford University Press, New York.

Dercon, S. and P. Krishnan, 2000. Vulnerability, Seasonality and Poverty in Ethiopia, *Journal of Development Studies* 36(6), 25-53.

Dercon, S., 1996. Risk, Crop Choice and Savings : Evidence from Tanzania. *Economic Development and Cultural Change* 44(3), 485-514.

Dercon, S., 2002. Growth, Shocks and Poverty during Economic Reform: evidence from rural Ethiopia. Paper prepared for the IMF Conference on Macroeconomic Policies and the Poor in Washington, DC, March 14–15.

Dercon, S., 2004. Growth and Shocks: Evidence from Rural Ethiopia. *Journal of Development Economics* 74 (2), 309–329.

Dercon, S., 2005. Vulnerability: A Micro Perspective. Discussion paper series. Department of Economics. University of Oxford.

Dercon, S., 2008. Fate and Fear: Risk and its Consequences in Africa. *Journal of African Economies* 17(2), 97-127.

Dercon, S., J. Hoddinott, and T. Woldehanna, 2005. Shocks and Consumption in 15 Ethopian Villages, 1992-2004. *Journal of African Economies* 14 (4), 559-585.

Dervis, K., J. de Melo and S. Robinson, 1982. *General Equilibrium Models for Development Policy*. Cambridge University Press.

Diao, X., P. Hazell, D. Resnick, and J. Thurlow, 2007. The Role of Agriculture in Development - Implications for Sub-Saharan Africa. Research Report 153, IFPRI, Washington DC.

Diep, P., 2009. A Report on Vietnam's Labor Market. Report of CIEM-DANIDA project.

Dollar, D. and A. Kraay, 2001. Growth is good for the poor. *Policy Research Working Paper* 2587, The World Bank.

Duclos J.and A. Araar, 2006. *Poverty and Equity: Measurement, Policy and Estimation with DAD.* Springer, USA.

Easterly, W., 2007. Inequality does cause underdevelopment: Insights from a new instrument. *Journal of Development Economics* 84, 755–776.

Fan S., P.L. Huong, and T.Q. Long, 2004. Government spending and poverty reduction in Vietnam. Project report prepared for the World Bank funded project "pro-poor spending in Vietnam", International Food Policy Research Institute, Washington DC, and Central Institute for Economic Management, Hanoi.

Fesselmeyer, E. and L.T. Kien, 2010. Urban-biased Policies and the Increasing Rural–Urban Expenditure Gap in Vietnam in the 1990s. *Asian Economic Journal* 24, 161–178.

Fiess, N. and M. D. Verner, 2004. The Dynamics of Poverty and its Determinants: The Case of the Northeast of Brazil and its States, World Bank Policy Research Working Paper 3259.

Fritzen, S. and C. Brassard, 2005. Vietnam Inequality Report 2005. Department for International Development (UK), published report commissioned for the Vietnam National Assembly.

Fritzen, S., 2002. Growth, inequality and the future of poverty reduction in Vietnam. *Journal of Asian Economics* 13, 635-657.

Gaiha, R. and K. Imai, 2002. Vulnerability, Shocks and Persistence of Poverty – Estimates for Semi-Arid Rural South India. Discussion Paper Series 128, University of Oxford.

Gaiha, R., K. Imai and W. Kang, 2007. Vulnerability and Poverty Dynamics in Vietnam Economics Discussion Paper EDP-0708, University of Manchester.

Ginsburgh, V. and M. Keyzer, 1997. *The Structure of Applied General Equilibrium Models*. MIT press, Cambridge, Massachusetts.

Glewwe P. and J. Gibson, 2006. Analysis of Poverty Dynamics. Available at http://unstats.un.org/unsd/methods/poverty/pdf/Chapter-8.pdf.

Glewwe, P., N. Agrawal and D. Dollar, 2004. *Economic Growth, Poverty, and Household Welfare in Vietnam*. World Bank, Washington, DC.

Green, W. H., 2003. *Econometric Analysis*. Prentice Hall, New Jersey.

Grimm M., S. Klasen and A. McKay, 2007. *Determinants of Pro-poor growth: Analytical Issues and Findings from Country Cases.* Palgrave Macmillan, London.

Grimm, M. and S. Klasen, 2007. Findings and Challenges in the Measurement and Analysis of Pro-poor Growth, in Grim M. and S. Klasen and A. McKay (ed.), *Determinants of Pro-poor Growth*. Palgrave Macmillan, London.

GSO (General Statistics Office of Vietnam), 2009. Statistical Data. Available at http://www.gso.gov.vn/default_en.aspx?tabid=494&itemid=2030.

Günther, I. and S. Klasen, 2007. Measuring chronic non-income poverty. Working Paper 79, Chronic Poverty Research Centre, UK.

Hansan, R. and M.R. Quibria, 2002. Poverty and patterns of growth. ERD Working Paper 18, Asian Development Bank.

Herault, N., 2009. Sequential Linking of Computable General Equilibrium and Microsimulation Models. Working Paper 2/09, Melbourne Institute.

Herrera, J., 2001. Poverty Dynamics in Peru, 1997-1999. The paper was presented at the LACEA/IDB/World Bank on inequality and Poverty held in October 11 at Rio de Janeiro, Brazil.

Hoddinott, J. and A. Quisumbing, 2003a. Method for Microeconometric Risk and Vulnerability Assessments. World Bank Social Protection Discussion Paper Series 0324.

Hoddinott, J. and A. Quisumbing, 2003b. Data Sources for Microeconometric Risk and Vulnerability Assessments. World Bank Social Protection Discussion Paper Series 0323.

Hoi, Q. L., 2010. The Linkages between Growth, Poverty and Inequality in Vietnam: An Empirical Analysis. Working Papers No.06, Development and Policies Research Center (DEPOCEN), Hanoi.

Hulme, D., and A. McKay, 2005. Identifying and Measuring Chronic Poverty: Beyond Monetary Measures. Paper presented at the International Conference on Many Dimensions of Poverty, International Poverty Centre, Brasilia, Brazil, 29–31 August.

Hung, P.T., B.A. Tuan, D.L.Thanh, 2010. Is Nonfarm Diversification a Way Out of Poverty for Rural Households? Evidence from Vietnam in 1993-2006. Poverty and Economic Poverty PMMA Working Paper 2010-17.

Huong, P. L. and P. T. Vinh, 2004. Income distribution in Vietnam. East Asian Development Network regional project report.

Huong, P. L., 2009. Rural-Agricultural Employment Forecast to 2020. A sub-project of the state funded research project in 2006 on Rural-agricultural employment transformation in Vietnam (in Vietnamese).

Huong, P.L., B.Q. Tuan, D. H. Minh, 2003. Employment Poverty Linkages and Policies for Pro-poor Growth in Vietnam. International Labour Office Discussion Paper 9.

Huppi, M. and M. Ravallion, 1991. The Sectoral Structure of Poverty During an Adjustment Period: Evidence for Indonesia in the Mid- 1980s. *World Development* 19 (12), 1653-1678.

Jacoby, H., and E. Skoufias, 1997. Risk, Financial Markets, and Human Capital in A Developing Country. *Review of Economic Studies* 64 (3), 311-336.

Jalan, J. and M. Ravallion, 1999. Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China. *Journal of Development Economics* 58, 61-81.

Jalan, J. and M. Ravallion, 2000. Is Transient Poverty Different? Evidence for Rural China. *Journal of Development Studies* 36(6), 82-99.

Jalan, J. and M. Ravallion, 2004. Household Income Dynamics in Rural China, in Dercon S. (ed.), *Insurance against Poverty*. Oxford University Press, Oxford.

Jensen, H. T., J. Rand., F. Tarp, P.L. Huong, and D.H. Minh, 2004. *A New Social Accounting Matrix for the Year 2000*. Science and Technology Press, Hanoi.

Jensen, H.T. and F. Tarp, 2005. Trade Liberalization and Spatial Inequality: a Methodological Innovation in a Vietnamese Perspective. *Review of Development Economics 9(1), 69–86.*

Jensen, H.T. and F. Tarp, 2007a. A Vietnam Social Accounting Matrix for the Year 2003. Study prepared under the CIEM-Danida Project “Strengthening the Development Research and Policy Analysis Capacity of CIEM”.

Jensen, H.T. and F. Tarp, 2007b. Agricultural Technology and Marketing Margins in Vietnam. Study prepared under the CIEM-Danida Project "Strengthening the Development Research and Policy Analysis Capacity of CIEM".

Jensen, H.T. and F. Tarp, 2007c. Vietnam 2003 CGE Model: Documentation. Department of Economics, University of Copenhagen.

Justino, P. and J. Litchfied, 2003. Welfare in Vietnam during the 1990s: Poverty, Inequality, and Poverty Dynamics. PRUS Working Paper 8, University of Sussex.

Justino, P. and J. Litchfied, 2004. Poverty Dynamics in Rural Vietnam: Winners and Losers during Reform. University of Sussex Working Paper.

Justino, P., J. Litchfield, and H.T. Pham, 2008. Poverty dynamics during trade reform: Evidence from rural Vietnam. *Review of Income and Wealth* 54 (2), 166-192.

Kakwani, N. and H. Son, 2006. Pro-Poor Growth: The Asian Experience. Research Paper 2006/56, UNU-WIDER.

Kakwani, N. and J., Silber, 2008. *Quantitative Approches to Multidimensional Poverty Measurement*. Palgrave Macmillan, New York.

Kakwani, N., 1980. *Income Inequality and Poverty: Methods of Estimation and Policy applications*. Oxford University press, New York.

Kakwani, N., 1993. Poverty and economic growth with application to *C6te* d'lvoire. *Review of Income and Wealth* 39 (2), 121-139.

Kamanou, G., and J. Morduch, 2002. Measuring Vulnerability to Poverty. Working Paper WP1012, New York University.

Kanbur, R., 2008. Poverty and Distribution: Twenty Years Ago and Now. Available at www.people.cornell.edu/pages/sk145.

Khan, H. A., 1999. Sectoral Growth and Poverty Alleviation: A Multiplier Decomposition Technique Applied to South Africa. *World Development* 27 (3), 521-530.

Klasen, S., 2010. Measuring and Monitoring Inclusive Growth: Multiple Definitions, Open Questions, and Some Constructive Proposals, ADB sustainable development working paper series 12.

Klump, R. and P. Prüfer, 2006. Prioritizing policies for pro-poor growth: Applying Baysian model averaging to Vietnam. Tilburg University Discussion Paper 2006-117.

Klump, R. and T. Bonschab, 2004. Operationalising Pro- Poor Growth: A Country Case Study on Vietnam. Report of a joint initiative of AFD, BMZ, GTZ, KFW Development Bank, DFID, and the World Bank.

Klump, R., 2007, Pro-poor growth in Vietnam: Miracle or Model?, in Besley T. and L.J. Cord (ed.), *Delivering on the promise of pro-poor growth*. Palgrave Macmillan and the World Bank, Washington WC.

Kochar, A., 1995. Explaining Household Vulnerability to Idiosyncratic Income Shocks. AEA Papers and Proceedings.

Kochar, A., 1999. Smoothing Consumption by Smoothing Income: Hours-of-work Responses to Idiosyncratic Agricultural Shocks in Rural India. *Review of Economics and Statistics* 81(1), 50-61.

Krishna, A., 2004. Escaping Poverty and Becoming Poor: Who Gains, Who Loses, and Why?. *World Development* 32(1), 121–136.

Lawson, D., A. McKay and J. Okidi, 2004. Factors Affecting Poverty Dynamics and Persistence in Uganda. Available at http://www.docstoc.com/docs/10904331/Factors-Affecting-Poverty-Dynamics-and-Persistence-in-Uganda-1.

Lawson, D., A. McKay and J. Okidi, 2006. Poverty Persistence and Transitions in Uganda: A Combined Qualitative and Quantitative Analysis. *Journal of Development Studies* 42(7), 1225-1251.

Lay, J. , 2010. Sequential Macro-Micro Modelling with Behavioural Microsimulations. *International Journal of Microsimulation* 3(1), 24-34.

Lin, J. and H.J. Chang, 2009. Should Industrial Policy in Developing Countries Conform to Comparative Advantage or Defy it? A Debate Between Justin Lin and Ha-Joon Chang. *Development Policy Review* 27 (5), 483-502.

Linh Vu Hoang, 2009, Vietnam's Agricultural Productivity: A Malmquist Index Approach. Working paper 0903, Vietnam Development Forum.

Lipton, M. and M. Ravallion, 1995. Poverty and Policy, in Behrman and T.N. Srinivasan (ed.), *Handbook of development economics*. Elsevier, edition 1, volume 3, number 4.

Liu, A. Y.C., 2001. Market, inequality and poverty in Vietnam, *Asian Economics Journal* 15(2), 217-235.

Loayza, N. and C. Raddatz, 2006. The Composition of Growth Matters for Poverty Alleviation. Policy Research Working Paper 4077, the World Bank.

Lofgren, H., R.L. Harris, S. Robinson, 2002. A Standard Computable General Equilibrium Model in GAMS. Microcomputers in Policy Research 5, IFPRI, Washington DC.

Lokshin, M. and M. Ravallion, 2000. Short-lived Shocks with Long-lived Impacts? - Household Income Dynamics in a Transition Economy. Policy Research Working Paper Series 2459, the World Bank.

Long S. and J. Freese, 2005. *Regression Models for Categorical Outcomes Using Stata*. Stata Press.

McKay, A., 2000. Should the Survey Measure Total household Income?, in Grosh M. and P. Glewwe (ed.), *Designing household survey questionnaires for developing countries: Lessons form 15 years of Living Standards Measurement study,* Washington DC.

McLlelland, G. and J. Irwin, 2003. Negative Consequences of Dichotomising Continuous Predictor Variables. *Journal of Marketing Research* 40, 366-371.

Minh, N. K. and G. T. Long, 2008. Measuring Agricultural Production Efficiency in Vietnam: An Application of Data Envelopment Analysis (DEA), Working Paper 0813, Vietnam Development Forum.

Minot, N., B. Baulch, M. Epprecht, 2006. Poverty and Inequality in Vietnam: Spatial Patterns and Geographic Determinants. Research Report 148, IFPRI, Washington DC.

Minot, N., M. Epprecht, T.T.T. Anh and L.Q. Trung, 2006. Income Diversification and Poverty in the Northern Uplands of Vietnam. Report 145, IFPRI, Washington DC.

Montalvo and Ravallion, 2010. The pattern of growth and poverty reduction in China. *Journal of Comparative Economics* 38 (1), 2-16.

Morduch, J., 1990. Risk, Production and Saving: Theory and Evidence from Indian Households. Harvard University, Cambridge, Massachusetts.

Morduch, J., 1994. Poverty and Vulnerability. *The American Economic Review* 84(2), 221-225.

Morduch, J., 1995. Income Smoothing and Consumption Smoothing. *Journal of Economic Perspectives* 9 (2), 103-114.

Muller, C., 2002. Censored Quantile Regressions of Chronic and Transient Seasonal Poverty in Rwanda. Centre for Research in Economic Development and International Trade, School of Economics, University of Nottingham.

Nazara, S., D. Guo, G.J.D. Hewings and C. Dridi, 2003. PyIO: Input-Output Analysis with Python. Regional Economics Applications Laboratory, University of Illinois.

Neilson, C., D. Contreras, R. Cooper and J. Hermann, 2008. The Dynamics of Poverty in Chile. *Journal of Latin American Study* 40, 251–273.

Nicol, C, 1993. An Empirical Comparision of Nonparametric and Parametric Engel Functions. *Empirical Economics* 18, 233-249.

Niimi, Y., P.V. Dutta, and A. Winters, 2003. Trade Liberalization and Poverty Dynamics in Vietnam. PRUS Working Paper 17, University of Sussex.

OECD (Organization for Economic Co-operation and Development), 2007. *Promoting Pro-Poor Growth-Policy Guidance for Donors*. OECD Publishing, France.

Omer, M. and S. Jafri, 2008. Pro-Poor Growth in Pakistan: An Assessment Over the Past Four Decades. *South Asia Economic Journal* 9(1), 51-68.

Pham T. H. and B. Reilly, 2007. The gender pay gap in Vietnam, 1993–2002: A quantile regression approach. *Journal of Asian Economics* 18(5), 775-808.

Pyatt, G. and J.L. Round, 1979. Accounting and fixed-price multipliers in a social accounting matrix framework. *Economic Journal* 89, 850-873.

Pyatt, G. and J.L.Round, 2006. Multiplier Effects and the Reduction of Poverty, in De Janvry A. and R. Kanbur (ed.) *Poverty, Inequality and Development: Essays in honor of Erick Thorbecke*, Springer, USA.

Quisumbing, A.R., 2007. Poverty Transitions, Shocks, and Consumption in Rural Bangladesh: Preliminary Results from a Longitudinal Household Survey. Working Paper 105, Chronic Poverty Research Centre, UK.

Quynh, N.N., 2004. Responses to Poverty and Risks in Vietnam: How Effectively Does the Vietnamese Public Safety Net Target Vulnerable Population?. Available at http://depot.gdnet.org/cms/conference/papers/Nguyen_paper_parallel_session2.2.pdf.

Ravallion, M. and D. Van de Walle, 2008. *Land in Transition: Reform and Poverty in Rural Vietnam*. Palgrave Macmillan and World Bank, New York.

Ravallion, M. and G. Datt, 1996. How Important to India's Poor Is the Sectoral Composition of Economic Growth?. *World Bank Economic Review* 10, 1-25.

Ravallion, M. and M. Huppi, 1991. Measuring Changes in Poverty: A Methodological Case Study of Indonesia During an Adjustment Period. *World Bank Economic Review 5*(1), 57-82.

Ravallion, M., 1988. Expected Poverty under Risk-induced Welfare Variability. *Economic Journal* 98, 1171-1182.

Ravallion, M., 1996. Issues in Measuring and Modelling Poverty, *Economic Journal* 106, 1328-1343.

Ravallion, M., 2001. Growth, Inequality and Poverty: Looking Beyond Average. *World Development* 29(11), 1803-1815.

Ravallion, M., 2004. Pro-poor growth: A Primer. Development Research Group, the World Bank.

Ravallion, M., 2005. Inequality Is Bad for the Poor. Policy Research Working Paper Series No.3677, the World Bank.

Ravallion, M., 2007. "Inequality is bad for the poor", in Jenkins S. P. and J. Micklewright (ed.), *Inequality and Poverty re-examined*. Oxford University Press, New York.

Ravallion, M., 2009, Do Poorer Countries Have Less Capacity for Redistribution? *Policy research working paper 5046*, the World Bank.

Ravallion, M., and S. Chen, 2004. China's (Uneven) Progress Against Poverty. Policy Research paper 3408, the World Bank.

Robilliard, A.-S., F. Bourguignon and S. Robinson, 2008. "Examining the Social Impact of the Indonesian Financial Crisis Using a Macro-Micro Model", in Bourguignon F, M. Bussolo, L.A.Pereira da Silva (ed.) *The Impact of Macroeconomic Policies on Poverty and Income Distribution: Macro-Micro Evaluation Techniques and Tools*, 93-118. Palgrave Macmillan and the World Bank, New York.

Rodrik D., 2004. Industrial Policy for the Twenty-first Century. Harvard University, the paper has been prepared for UNIDO.

Roland-Holst, D., Tarp, F., An, D. V., Thanh, V. T., Huong, P. L., & Minh, D. H., 2002. Vietnam's Accession to the World Trade Organization: Economic Projections to 2020. CIEM/NIAS Discussion Paper DP0204.

Rosenzweig, M and H. Binswanger, 1993. Wealth, Weather Risk and the Composition and Profitability of Argicultural Investments. *Economic Journal* 103, 56-78.

Rosenzweig, M and K. Wolpin, 1993. Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-income Countries: Investment in Bullocks in India. *Journal of Political Economy* 101(2), 223-44.

Round, J., 2003. "Social accounting matrices and SAM-based multiplier analysis", in Pereira da Silva L. A., F. Bourguignon (ed.), *The Impact of Economic Policies on Poverty and Income Distribution: Evaluation Techniques and Tools*, Oxford University Press, USA.

Round, J., 2007. Social Accounting Matrices and SAM-based Models: In Retrospect and in Prospect. Paper prepared for the 2007 KNSO International Conference, Daejeon, Korea on 25-26 October.

Sahay, R., P. Cashin, P. Mauro, and C. Pattillo, 2006. Macroeconomic Policies and Poverty Reduction: Stylized Facts and an Overview of Research", in Mody A. and C. Pattillo (ed.), *Macroeconomic policies and poverty reduction.* Routledge, Great Britain.

Savard, L., 2003. Poverty and Income Distribution in A CGE-Household Micro-Simulation Top-Down/Bottom-Up Approach. CIRPÉE Working Paper 03-43, Université Laval.

Savard, L., 2004. Poverty and Inequality Analysis within a CGE Framework: a Comparative Analysis of the Representative Agent and Micro- Simulation Approaches. CIRPÉE Working Paper 04-12, Université Laval.

Schmitz, H., 2007. Reducing Complexity in the Industrial Policy Debate. *Development Policy Review* 25 (4), 417-428.

Scoones, I., 2000, Sustainable Rural Livelihoods: A Framework for Analysis, IDS Working Paper 71, University of Sussex.

Scott, C., 2000. Mixed Fortunes: a Study of Poverty Mobility among Small Farm Households in Chile, 1968-1986. *Journal of Development Studies* 36(6), 155-180.

Seale, J, A. Regmi, and J. Bernstein, 2003. International Evidence on Food Consumption Patterns. Technical bulletin 1904, United States Department of Agriculture.

Shaffer, P., 2002. New Thinking on Poverty: Implications for Poverty Reduction Strategies. Paper Prepared for the United Nations Department for Economic and Social Affairs (UNDESA) Expert Group Meeting on Globalisation and Rural Poverty on November 8-9.

Sheehan P., 2008. Beyond Industrialization New Approaches to Development Strategy Based on the Service Sector. Research Paper No. 2008/60, UNU-WIDER.

Shorrocks, A. and R. Van de Hoeven, 2004. *Growth, Inequality, and Poverty: Prospects for Pro-Poor Economic Development*. Oxford University Press, USA.

Shorrocks, A. and R., Van de Hoeven, 2004. *Growth, Inequality, and Poverty: Prospects for Pro-Poor Economic Development.* Oxford University Press, USA.

Skoufias, E. and A.R. Quisumbing, 2005. Consumption Insurance and Vulnerability to Poverty: A Synthesis of the Evidence from Bangladesh, Ethiopia, Mali, Mexico and Russia. *The European Journal of Development Research* 17 (1), 24 – 58.

Socialist Republic of Vietnam, 2005. Vietnam Achieving the Millennium Development Goal. A country report on implementing Millennium Development Goal.

Son, H. H., 2007. Pro-Poor Growth: Concepts and Measures. ERD Technical Note Series 22, Asian Development Bank.

Suryahadi, A., D. Suryadarma, and S. Samuto, 2006. Economic Growth and Poverty Reduction in Indonesia: The Effects of Location and Sectoral Components of Growth. SMERU Research Institute Working Paper.

Swinkels, R. and C. Turk, 2006. Explaining Ethnic Minority Poverty in Vietnam: a summary of recent trends and current challenges. Background paper for CEM/ MPI meeting on Ethnic Minority Poverty in Hanoi on 28 September.

Takahashi, K., 2007. Sources of Regional Income Disparity in Rural Vietnam: Oaxaca-Blinder Decomposition. Institute of Developing Economies Discussion Paper 95, Japan.

Taylor, L., 2009. Growth, Development Policy, Job Creation and Poverty Reduction. United Nations DESA Working Paper 90.

Thang, N., L. D. Trung, V. H. Dat, N. T. Phuong, 2006. Poverty, Poverty Reduction and Poverty Dynamics in Vietnam. Background Paper for the Chronic Poverty Report 2008-09, Chromic Poverty Research Centre, UK.

Thomas T., L. Christiaensen, Q. T. Do, L. D. Trung, 2010. Natural Disasters and Household Welfare Evidence from Vietnam. Policy Research Working Paper 5491, the World Bank.

Thomas, V., 2009. Income Disparity and Growth. *Global Journal of Emerging Market Economies* 1(1), 63-86.

Thorbecke, 2006. The Evolution of Development Doctrine, 1950-2005. Research Paper No.2006/155, UNU-WIDER.

Thorbecke, E. and H.S. Jung, 1996. Multiplier decomposition method to analyze poverty alleviation. *Journal of Development Economics* 48(2), 279-301.

Thorbecke, E., 1992. Adjustment and Equity in Indonesia. OECD Development Centre, Paris.

Thorbecke, E., 2000. The Use of Social Accounting Matrices in Modelling. Paper Prepared for the 26th General Conference of The International Association for Research in Income and Wealth Cracow, Poland, 27 August to 2 September.

Thurlow, J. and D. E. Van Seventer, 2008. Who Benefits from South Africa's Bilateral Trade Agreements?. TIPS Working Paper Series 2008-01.

Thurlow, J. and P. Wobst, 2006. Not All Growth Is Equally Good for the Poor: A Case of Zambia. *Journal of African Economies* 15(4), 603-625.

Thurlow, J., 2004. A Dynamic Computable General Equilibrium (CGE) Model for South Africa: Extending the Static IFPRI Model. Trade and Industrial Policy Scenario Working Paper 1-2004.

Thurlow, J., F. Tarp, S. McCoy, N. M. Hai, C. Breisinger, and C. Arndt, 2010. The Impact of the Global Commodity and Financial Crises on Poverty in Vietnam, Working Paper No. 2010/98, UNU-WIDER.

Timmer P. and S. Akkus, 2008. The Structural Transformation as a Pathway out of Poverty: Analytics, Empirics and Politics. Working Paper Number 150, Center for Global Development.

Timmer, P., 2000. Agriculture and Economic Growth in Vietnam. University of California, the paper was presented at Conference on Vietnam, November 16-17, The Kenney Auditorium, Washington, D.C.

Toan, N.M., 2005. The Effect of Trade Liberalization on Income Distribution in Vietnam - Dynamic Computable General Equilibrium Approach. Economic Development and Policies Department, Graduate School of International Cooperation Studies, Kobe University.

Townsend, R., 1994. Risk and Insurance in Village India. *Econometrica* 62 (3), 539-591.

Townsend, R., 1995. Consumption Insurance: An Evaluation of Risk-bearing Systems in Low-income Countries. *Journal of Economic Perspectives* 9 (3), 83-102.

Udry, C., 1994. Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria. *Review of Economic Studies* 61(3), 495-526.

Van de Walle, D., 2004. Testing Vietnam's Public Safety Net. *Journal of Comparative Economics* 32, 661-679.

Vanzetti D, and P.L.Huong, 2006. Vietnam's Trade Policy Dilemmas. The Paper presented at the Ninth Annual Conference on Global Economic Analysis, Addis Ababa, Ethiopia, June 15-17, 2006.

Vaqar, A. and O. D. Cathal, 2007. CGE-Microsimulation Modelling: A Survey. MPRA Paper 9307.

Vaqar, A. and O. D. Cathal, 2008. Welfare Impact of External Balance in Pakistan: CGE-microsimulation Analysis. MPRA Paper 9267.

VASS (Vietnamese Academy of Social Sciences), 2007. Vietnam Poverty Update Report 2006: Poverty and Poverty Reduction in Vietnam 1993-2004. Available at http://siteresources.worldbank.org/INTVIETNAM/Resources/vietnam_poverty_update_report_2006_final.pdf.

Wagstaff A. and M. Pradhan, 2003. Evaluating the Impacts of Health Insurance: Looking Beyond the Negative. Development Research Group, World Bank, Washington, DC.

Warr P. G., 2002. Poverty Incidence and Sectoral Growth Evidence from Southeast Asia. Discussion Paper 2002/20, UNU-WIDER.

Willis, R., 1986. "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions", in Ashenfelter O. and R. Layard (ed.), *Handbook of Labour Economics*, Elsevier Science Publishers.

World Bank Institute, 2005. Introduction to Poverty Analysis. Available at siteresources.worldbank.org/PGLP/Resources/PovertyManual.pdf.

World Bank, 1999, Vietnam Development Report: Attacking Poverty. Joint Government-donor-NGO working group report, Hanoi.

World Bank, 2001a. *World Development Report 2000-2001: Attacking Poverty*. Oxford University Press, Oxford.

World Bank. 2001b. "Rural Infrastructure Development and Poverty Reduction: Major Targets and Monitorable Indicators", Paper prepared for Poverty Task Force Vietnam.

World Bank, 2003. Vietnam Development Report 2004: Poverty. Joint Donor Report to the Vietnam Consultative Group Meeting. Hanoi.

World Bank, 2006. *Vietnam Development report 2007: Aiming High*. Hanoi.

World Bank, 2007. *World Development Report 2008: Agriculture for Development*. Washington DC.

World Bank, 2008a. *World Development Indicators*. Washington DC.

World Bank, 2008b. *World Development Indicators: Poverty data-A supplement to World Development Indicators 2008*. Washington DC.

World Bank, 2008c. *The Growth Report: Strategies for Sustained Growth and Inclusive Developmen*t. Washington DC.

World Bank, 2008d. *World Development Report: Agriculture for Development*. Washington DC.